Principles and Recommendations for Population and Housing Censuses

Revision 3

United Nations

Preface

The first set of principles and recommendations for population and housing censuses was issued in 1958 at the request of the Statistical Commission of the United Nations in response to a need for developing international standards and as a cornerstone of the first World Programme on Population and Housing Censuses.

Over the years, the United Nations Statistics Division has played a pivotal role in the coordination of the World Programme by issuing and revising international recommendation, providing technical assistance to countries in census operations, and compiling and disseminating census results from countries or areas. The last global census recommendations were published in 1998 under the title Principles and Recommendations for Population and Housing Censuses, Revision 1 .

For the 2010 World Programme on Population and Housing Censuses, the Statistical Commission, at its thirty-sixth session, requested that the United Nations Statistics Division, through the United Nations Expert Group on the 2010 World Programme on Population and Housing Censuses, proceed with its work on the revision and update of Principles and Recommendations for Population and Housing Censuses.

The 2020 Population and Housing Census coincides with the Post 2015 Agenda which aims to locate sustainable development at the centre, leaving no-one behind, ensuring accountable and just systems of government, creating jobs and inclusive growth. The youth and future generations to come can be inspired and be convinced that a different and better world is within their reach. Will the 2020 Population and Housing census mobilize social compact and social solidarity to achieve a better life for all. This vision must drive a different agenda in conducting the next round of population and housing censuses and mobilise countries towards a better life for all. The 2020 Round of Population and housing census affords the opportunity that Statistics drive Transparency, Accountability, Results and Transformation.

A census undertaking in the 2010 Round of Population and Housing Censuses increasingly became different from those undertaken in the preceding decades and the 2020 Round and subsequent ones are poised to be dramatically different. The 2020 Round of Population census is the sixth round of world censuses. The difference in this round is not so much about what a census provides in the form of results, (which in the main are small area statistics that enable planning where it really counts), but it is in the way the planning is undertaken, implementation executed and dissemination of the results made possible that responds to the development planning needs of countries. For instance a 21st Century citizen is a member of an information society who expects results instantaneously to an information question. They expect in their information arsenal precision of geographic location and portability of information. This shift in expectations and ability to participate in the creation of the commons poses the biggest threat to a 21st Century State that has responsibility for organising and dispensing goods and services to an increasingly demanding information society and citizenry.

The biggest challenge is on how the information is harvested from citizens as well as how privacy is protected. This challenge imposes a paradigm shift in undertaking censuses in the way we knew them for the past century. Whilst the challenge is momentous, there are practices demonstrating that the barrier of collection can be solved. The Scandinavian countries have been trailblazers in resolving what the bulk of the world is faced with.

Given the context the task of mobilizing society to know, understand, participate in the production and utilization of the information is a task of immense proportions. Positioning the essence of the results and making their value visible amidst competing information products and services is no small task. Selecting the topics that are meaningful to society and convincing them to participate is a task that cannot be relegated but is central to the futures and survival of the globe and society.

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Explanatory notes

ASCII	American Standard Code for Information Interchange
EA	enumeration area
ECE	Economic Commission for Europe
EDI/EDIFACT	Electronic Data Interchange for administration, commerce and transport
ESCAP	Economic and Social Commission for Asia and the Pacific
FAO	Food and Agriculture Organization of the United Nations
FTP	File Transfer Protocol
GIS	geographic information system
GPS	global position system
ICF	International Classification of Functioning Disability and Health
ICIDH	International Classification of Impairments, Disabilities and Handicaps
ICLS	International Conference of Labour Statisticians
ICR	intelligent character recognition
ICSC	International Classification of Status in Employment
ICT	information and communication technology
ILO	International Labour Organization
ISCED	International Standard Classification of Education
ISCO	International Standard Classification of Occupations
ISDN	Integrated Services Digital Network
ISIC	International Standard Industrial Classification of All Economic Activities
IT	information technology
LAN	local area network
LPG	liquefied petroleum gas
OCR	optical character reading
ODA	official development assistance
OECD	Organization for Economic Cooperation and Development
OLAP	OnLine Analytical Processing
OMR	optical mark reading
PES	post-enumeration survey
PSTN	public switched telephone network
RDBMS	relational database management system
SNA	System of National Accounts
UNAIDS	Joint United Nations Programme on HIV/AIDS
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations Children's Fund
WAN	wide area network
WHO	World Health Organization
XML	Extensible Markup Language

Introduction

The most important capital a society can have is human capital. Assessing the quantity and quality of this capital at small area, regional and national levels is an essential component of modern government.

Aside from the answer to the question "How many are we?" there is also a need to provide an answer to "Who are we?" in terms of age, sex, education, occupation, economic activity and other crucial characteristics, as well as to "Where do we live?" in terms of housing, access to water, availability of essential facilities, and access to the Internet. The answers to these questions provide a numerical profile of a nation which is the sine qua non of evidence-based decision-making at all levels, and is indispensable for monitoring universally recognized and internationally adopted Millennium Development Goals.

Some nations are capable of generating this numerical profile for small areas from administrative records or through a combination of data sources. The vast majority of countries, however, produce these data on population and housing by conducting a traditional census, which in principle entails canvassing the entire country, reaching every single household and collecting information on all individuals within a brief stipulated period.

The traditional census is among the most complex and massive peacetime exercises a nation undertakes. It requires mapping the entire country, mobilizing and training an army of enumerators, conducting a massive public campaign, canvassing all households, collecting individual information, compiling vast amounts of completed questionnaires, and analysing and disseminating the data.

NSO's traditionally are about the production of statistics and associated statistical outputs and less concerned about utilisation. In recent times, more focus has been placed on dissemination of data which is a positive step towards meeting stakeholder needs. While this is a positive move in shaping the statistical value chain, it still falls far short of the necessary emphasis on utilisation of data. Starting with use in mind, necessarily creates a paradigm shift in the statistical value chain making statistical organisations, guarantors of use. It defines the role of statistics, not only as a decision support system, but accords a higher order definition at an outcomes and societal impact level.

In most cases, a traditional census is an opportunity for mobilizing the country and making statistical activity visible. For many people the census may be the only time that the State reaches them and asks them a question. In addition, successfully conducting a census becomes a matter of national pride for many countries.

Ensuring confidentiality is crucial for the census to succeed. Thus, it has to be made clear that the only reason for collecting individual data is for the production of statistics and that there will be no dissemination of individual information or any non-statistical linkage with existing records in other government databases and data collections. Indeed, principle 6 of the *Fundamental Principles of Official Statistics* states: Individual data collected by statistical agencies for statistical compilation, whether they refer to natural or legal persons, are to be strictly confidential and used exclusively for statistical purposes.

The United Nations recommends that all countries or areas of the world produce detailed population and housing statistics for small area domains at least once in the period 2005-2014, around the year 2010. For most nations that means conducting a traditional census, and the present revision of the *Principles and Recommendations for Population and Housing Censuses* thus focuses on the traditional census while also describing other approaches for generating reliable statistics on population and housing.

The population and housing census represents one of the pillars for data collection on the number and characteristics of the population of a country. The population and housing census is part of an integrated national statistical system, which may include other censuses (for example, agriculture), surveys, registers and administrative files. It provides, at regular intervals, the benchmark for population count at national and local levels. For small geographical areas or sub-populations, it may represent the only source of information for certain social, demographic and economic characteristics. For many countries the census also provides a solid framework to develop sampling frames.

Part I – Operational aspects of population and housing censuses

I. Essential roles of the census

1.1. Evidence-based decision-making is a universally recognized paradigm of efficient management of economic and social affairs and of overall effective governing of societies today. Generating relevant, accurate and timely statistics is a sine qua non of this model; producing detailed statistics for small areas and small population groups is its foundation. The role of the population and housing census is to collect, process and disseminate such small area detailed statistics on population, its composition, characteristics, spatial distribution and organization (families and households). Censuses are conducted periodically in the majority of the countries in the world; they have been promoted internationally since the end of the nineteenth century, when the International Statistical Congress recommended that all countries in the world conduct them. Since 1958, the United Nations has also been actively promoting the population and housing census by compiling the principles and recommendations for population and housing censuses.

1.2. While the roles of the population and housing census are many and will be elaborated in detail throughout the present revision of *Principles and Recommendations for Population and Housing Censuses*, several of the essential roles are listed below:

(a) The population and housing census plays an essential role in public administration. The results of a census are used as a critical reference to ensure equity in distribution of wealth, government services and representation nationwide: distributing and allocating government funds among various regions and districts for education, health services, delineating electoral districts at the national and local levels, and measuring the impact of industrial development, to name a few. Establishing a public consensus on priorities would be almost impossible to achieve if it were not built on census counts. A wide range of other users, including the corporate sector, academia, civil society and individuals, make use of census outputs, as described in paragraph 1.23;

(b) The census also plays an essential role in all elements of the national statistical system, including the economic and social components. Census statistics are used as benchmarks for statistical compilation or as a sampling frame for sample surveys. Today, the national statistical system of almost every country relies on sample surveys for efficient and reliable data collection. Without the sampling frame and population benchmarks derived from the population and housing census, the national statistical system would face difficulties in providing reliable official statistics for use by the Government and the general public;

(c) The basic feature of the census is to generate statistics on small areas and small population groups with no/minimum sampling errors. While the statistics on the small areas are useful in their own right, they are important because they can be used to produce statistics on any geographical unit with arbitrary boundaries. For example, in planning the location of a school, it is necessary to have the data on the distribution of school-age children by school area, which may not necessarily be equal to the administrative area units. Similarly, small area data from the census can be combined to approximate natural regions (for example, watersheds or vegetation zones) which do not follow administrative boundaries. Since census data can be tabulated for any geographical unit, it is possible to provide the required statistics in remarkably flexible manner. This versatile feature of the census is also invaluable for use in the private sector for applications such as business planning and market analyses;

(d) The census results are used as a benchmark for research and analysis. Population projections are one of the most important analytical outputs based on census data; future population projections are crucial for all segments of the public and private sectors.

1.3. In addition to the roles outlined above, it is critically important to produce detailed statistics for small areas and small population groups as a building block for efficient governance at all levels. For a vast majority of nations the method of choice for assembling this building block will be by conducting a population and housing census through universal and simultaneous individual enumeration of each individual within the nation's boundaries. Some nations will adopt alternative approaches; yet, all of these methods must result in identical outputs: detailed statistics for small areas and small population groups at the same moment in time.

II. Definitions, essential features and uses of population and housing censuses

A. Definitions

1. Population census

1.4. A population census is the total process of collecting, compiling, evaluating, analysing and publishing or otherwise disseminating demographic, economic and social data at the smallest geographical level appropriate pertaining, at a specified time, to all persons in a country or in a well-delimited part of a country.

1.5. Population is basic to the production and distribution of material wealth. In order to plan for, and implement, economic and social development, administrative activity or scientific research, it is necessary to have reliable and detailed data on the size, distribution and composition of population. The population census is a primary source of these basic benchmark statistics, covering not only the settled population but also homeless persons and nomadic groups. Data from population censuses should allow presentation and analysis in terms of statistics on persons and households and for a wide variety of geographical units, ranging from the country as a whole to individual small localities or city blocks.

2. Housing census

1.6. A housing census is the total process of collecting, compiling, evaluating, analysing and publishing or otherwise disseminating statistical data relating to the number and condition of housing units and facilities as available to the households pertaining, at a specified time, to all living quarters[1] and occupants thereof in a country or in a well-delimited part of a country.

1.7. The census must provide information on the supply of housing units together with information on the structural characteristics and facilities that have a bearing upon the maintenance of privacy and health and the development of normal family living conditions. Sufficient demographic, social and economic data concerning the occupants must be collected to furnish a description of housing conditions and also to provide basic data for analysing the causes of housing deficiencies and for studying possibilities for remedial action. In this connection, data obtained as part of the population census, including data on homeless persons, are oftenused in the presentation and analysis of the results of the housing census, if both operations are conducted together or there is a link between them..

B. Essential features

1.8. The essential features of population and housing censuses are individual enumeration, universality within a defined territory, simultaneity, defined periodicity and small area statistics.

1. Individual enumeration

1.9. The term "census" implies that each individual and each set of living quarters is enumerated separately and that the characteristics thereof are separately recorded. Only by this procedure can the data on the various characteristics be cross-classified. The requirement of individual enumeration can be met by the collection of information in the field, by the use of information contained in an appropriate administrative register or set of registers, or by a combination of these methods.

2. Universality within a defined territory

1.10. The census should cover a precisely defined territory (for example, the entire country or a well-delimited part of it). The population census should include every person present and/or residing within its scope, depending upon the type of population count required. The housing census should include every set of living quarters

[1] For the definition of "living quarters", see para. 2.412.

irrespective of type. This does not preclude the use of sampling techniques for obtaining data on specified characteristics, provided that the sample design is consistent with the size of the areas for which the data are to be tabulated and the degree of detail in the cross-tabulations to be made.

3. Simultaneity

1.11. Each person and each set of living quarters should be enumerated as of the same well-defined point in time and the data collected should refer to a well-defined reference period. The time-reference period need not, however, be identical for all of the data collected. For most of the data, it will be the day of the census; in some instances, it may be a period prior to the census.

4. Defined periodicity

1.12.Censuses should be taken at regular intervals so that comparable information is made available in a fixed sequence. A series of censuses makes it possible to appraise the past, accurately describe the present and estimate the future. It is recommended that a national census be taken at least every 10 years. Some countries may find it necessary to carry out censuses more frequently because of the rapidity of major changes in their population and/or its housing circumstances.

5. Small area statistics

1.12a. The census should produce data on the number and characteristics of the population and housing units down to the lowest appropriate geographical level, compatible with national circumstance, and for small population group with protecting individual confidentiality.

1.13. The census data of any country are of greater value nationally, regionally and internationally if they can be compared with the results of censuses of other countries that were taken at approximately the same time. Therefore, countries may wish to undertake a census in years ending in "0" or at a time as near to those years as possible. It is obvious, however, that legal, administrative, financial and other considerations often make it inadvisable for a country to adhere to a standard international pattern in the timing of its censuses. In fixing a census date, therefore, such national factors should be given greater weight than the desirability of international simultaneity.

C. Strategic objectives

1.14. The development of plans for a census should include the early preparation of a set of strategic aims and objectives that may be used to guide the implementation of the plans, set standards and form a set of benchmarks against which outcomes can be assessed to help determine the success of the census. Ideally, the starting point for developing these objectives would lie in combining information derived from evaluating previous census experience, from understanding user requirements for information from the census and from assessing changes in both society and technology. In practice, some of this information is difficult to obtain and often provides conflicting guidance. Nevertheless, such objectives can be used to assist in planning major elements of the process. Although the strategic objectives of the census will be specific to individual countries and will differ according to local circumstances, they can be described under the headings census content, impact on the public and on the census staff, production of census results, and cost-effectiveness.

1.15. *Census content.* The aim is to ensure that the topics are appropriate for meeting the demonstrated requirements of users, taking into account considerations of cost-effectiveness, , human resources, time availability and respondent burden. Subsidiary objectives under this element relate to (a) suitable consultation with existing and potential users at all stages, (b) establishment of measurable standards of reliability incorporating user views on priorities, and (c) adequate testing of new topics to ensure successful collection and production of reliable results.

1.16. *Impact on the public and on the census staff.* The aim *is* to ensure that all the aspects of collection operations and the dissemination of results are acceptable to the public and fully comply with legal and ethical standards for protecting the confidentiality of individual responses. The public should be fully informed about census objectives, content and methods, as well as about their rights and obligations with respect to the census.

Similarly, all census staff must be fully aware of their responsibilities. Subsidiary objectives include such issues as (a) keeping completed forms and other records containing personal information secure and confidential, (b) ensuring that public support for all aspects of the census is as strong as possible, and (c) producing requested customized output in a manner consistent with preventing disclosure of personal information, adhering to established reliability standards for the release of data, and implementing policies designed to safeguard the access of all users to census results.

1.17. *Production of census results.* The aim is to deliver census products and services and to meet legal obligations and users' needs with stated quality standards and a predetermined timetable. Subsidiary objectives include (a) producing outputs with a minimum of error suitable for the purposes for which the data are to be used, (b) providing standard outputs for the main results and services for customized output, (c) providing access to output, (d) using geographical bases appropriate for collecting and referencing data for output, (e) improving methods of enumeration, particularly in difficult areas so as to reduce levels of undercoverage and response error, (f) improving methods of evaluation and the means to convey findings to users, and (g) developing a measure of quality and targets.

1.18. *Cost-effectiveness*. The aim is to plan and carry out a census as inexpensively as possible in a manner consistent with the content and quality requirements considering methodological necessities. Subsidiary objectives relate to (a) using data collection approaches and related technologies to keep collection costs to a minimum, b) capturing data more cost-effectively, c) using efficient, speedy and reliable processing systems that are optimal, (d)contracting out appropriate parts of the operation where this would be both cost-effective and consistent with the other strategic objectives, particularly the need to retain public confidence in the confidentiality of individual responses, (e) exploring possible sources of alternative funding and, if appropriate, developing proposals for cost recovery and income-generation, and (f) using development resources efficiently to develop prototype systems that can accommodate change and give "value for the money" in the final systems.

1.19. These objectives can be used as benchmarks to assess user requirements and may also be built into appraisal systems which, with suitable weighting, can be used to compare and review options.

D. Uses in an integrated programme of data collection and compilation

1.20. Population and housing censuses are a principal means of collecting basic population and housing statistics as part of an integrated programme of data collection and compilation aimed at providing a comprehensive source of statistical information for economic and social development planning, administration, assessing conditions in human settlements, for research and for commercial and other uses.

1.21. The value of either a population or a housing census is increased if the results can be employed together with the results of other investigations, as in the use of the census data as a basis or benchmark for current statistics, and if it can furnish the information needed for conducting other statistical investigations. It can, for example, provide a statistical frame for other censuses or sample surveys. The population census is also important in developing the population estimates needed to calculate vital rates from civil registration data (see paras. 1.55 - 1.57). In addition, these censuses are a major source of data used in official compilations of social indicators, particularly on topics that usually change slowly over time.[2] The purposes of a continuing coordinated programme of data collection and compilation can best be served, therefore, if the relationship among the population census, the housing census and other statistical investigations is considered when census planning is under way and if provision is made for facilitating the joint use of the census and its results in connection with such investigations. The use of consistent concepts and definitions throughout an integrated programme of data collection and compilation is essential if the advantages of these relationships are to be fully realized. Of course, census-type information can also be derived from population registers and also can be estimated from sample surveys without undertaking a

[2] See, for example, *Handbook on Social Indicators*, Studies in Methods, No. 49 (United Nations publication, Sales No. E. 89.XVII.6).

complete enumeration. These alternative data sources are presented under "Census methodology" in paragraphs 1.58-1.61h.

1.22. A population and housing census also serves as the logical starting place for work on the organization and construction of a computerized statistical database to serve continuing national and local needs for data in the intercensal period.[3]

1. Uses of population censuses

(a) Uses for policymaking, planning and administrative purposes

1.23. The fundamental purpose of the population census is to provide the facts essential to governmental policymaking, planning and administration. Information on the size, distribution and characteristics of a country's population is essential for describing and assessing its economic, social and demographic circumstances and for developing sound policies and programmes aimed at fostering the welfare of a country and its population. The population census, by providing comparable basic statistics for a country as a whole and for each administrative unit locality and small areas therein, can make an important contribution to the overall planning process and the management of national affairs. Population censuses in many countries also represent the very foundation of their national statistical systems, with census data providing important baseline data for policy development and planning, for managing and evaluating programme activities across a broad range of sectoral applications, and for monitoring overall development progress. An emerging use for census data is the assessment of good governance by civil society groups. The performance of a democratically elected Government in improving the welfare of its citizenry can be monitored from one census to the other by ordinary citizens through the widespread and timely dissemination of census results. On the international front, the declaration of internationally agreed development goals and the focus on poverty eradication with the formulation of poverty reduction strategy papers have created a huge demand for periodic, regular and timely data for the monitoring and evaluation of such programmes. The census is helping to provide such data. Further and more specific examples and applications are given, along with references to appropriate manuals and guidelines, in part three, chapter IX.

1.24. Population censuses serve many planning needs by providing statistical information on demographic, human settlements, social and economic issues for local, national, regional and international purposes. For example, population censuses provide basic information for the preparation of population estimates/projections and detailed demographic and socio-economic analysis of the population. The census also provides data for the calculation of social indicators, particularly those that may be observed infrequently because they measure phenomena that change slowly over time, and those that are needed for small areas or small population groups.

1.25. One of the basic administrative uses of census data is in the creation or demarcation of new territorial divisions, for political or administrative reasons. Detailed information on the geographical distribution of the population is indispensable for this purpose. Certain aspects of the legal or administrative status of territorial divisions may also depend on the size and characteristics of their populations, for example, whether a previously rural area is now to be declared as urban.

(b) Uses for research purposes

1.26. In addition to serving specific governmental policy purposes, the population census provides indispensable data for the scientific analysis and appraisal of the composition, distribution and past and prospective growth of the population. The changing patterns of urban/rural concentration, the development of urbanized areas, the geographical distribution of the population according to such variables as occupation and education, the evolution of the sex and age structure of the population, and the mortality and fertility differentials for various population groups,

[3] For a fuller discussion of many of the technical and policy issues that arise in the construction and use of integrated statistical databases, see *The Development of Integrated Data Bases for Social, Economic and Demographic Statistics*, Studies in Methods, No. 27 (United Nations publication, Sales No. E.79.XVII.14).

as well as the economic and social characteristics of the population and the labour force, are questions of scientific interest that are of importance both to pure research and for solving practical problems of industrial and commercial growth and management.

(c) Uses for business, industry and labour

1.27. In addition to those uses given above, the census has many important uses for individuals and institutions in business, industry and labour. Reliable estimates of consumer demand for an ever-expanding variety of goods and services depend on accurate information on the size of the population in subnational areas and its distribution at least by sex and age, since these characteristics heavily influence the demand for housing, furnishings, food, clothing, recreational facilities, medical supplies and so forth. Furthermore, the census can be used to generate statistics on the size and characteristics of the supply of labour needed for the production and distribution of such commodities and services in conformity with International Labour Organization (ILO) Convention 160. Such statistics on the local availability of labour may be important in determining the location and organization of enterprises.

(d) Uses for electoral boundary delimitation

1.28. A compelling use of census data is in the redrawing of electoral constituency boundaries in most countries. This is often enshrined in the country's constitution and provides a legal basis for census taking. The current distribution of a country's population is thereby used to assign the number of elected officials who will represent people in the country's legislature.

(e) Use as a sampling frame for surveys

1.29. Population censuses constitute the principal source of records for use as a sampling frame for surveys, during the intercensal years, on such topics as the labour force, fertility, and migration histories.

2. Uses of housing censuses

(a) Uses for development of benchmark housing statistics

1.30. The housing census produces benchmark statistics on the current housing situation and is vital for developing national housing and human settlements programmes. The housing census is also valuable for providing the sampling frame for special housing and related surveys during the intercensal years.

1.31. Housing benchmark statistics are also critical for emergency planning for response to natural hazards (such as destructive storms, earthquakes, tsunami, and fires), or post-conflict situations. Following such situations, these statistics can be used to estimate the numbers of people and structures affected, the need for emergency response, and reconstruction requirements.

1.32. National statistical services would need to develop, from housing censuses, the sort of benchmark statistics in housing that could be supplemented by current building and construction statistics and would provide a continuous up-to-date picture of the housing position needed for the consideration of housing programmes. Since not all the basic information required to assess housing needs or to formulate housing programmes can be obtained through a housing census, additional data must be obtained through the population census, special housing surveys and environmental surveys, and from vital statistics, economic statistics and so forth; but data obtained from the housing census will constitute the basic framework within which the estimates are made, indices computed and further statistical inquiries planned.

1.33. When population and housing censuses are carried out as a single operation or independently but in a well-coordinated fashion, the combined information provided is of much higher value since the essential features of both censuses are interrelated. The information on housing censuses may be analysed in association with the demographic and socio-economic condition of the occupants and, similarly, the demographic characteristics of the population may be analysed in association with the data on housing conditions.

(b) Uses for the formulation of housing policy and programmes

1.34. The formulation of housing policy and programmes represents one of the principal uses of housing census data. Housing policy is normally influenced by social and economic as well as political considerations and available factual data concerning the housing situation provide objective criteria, which it is important for policymakers to take into account.

1.35. In most countries, housing programmes encompass both governmental and private activity. The data derived from a housing census are used by governmental authorities for making an analysis or diagnosis of the housing situation. Housing conditions are analysed in quantitative and qualitative terms and data from previous censuses are used to indicate the changes in the housing situation that have occurred during the intercensal periods; the housing deficit and future housing requirements are estimated and compared with the rates of dwelling production being attained; the characteristics of the households in need of housing are considered in relation to the availability and cost of housing. As part of overall development plans, such an analysis is necessary for the formulation of national housing programmes and for their execution.

1.36. Commercial users also study housing census data. Those engaged by the construction industry as well as financing institutions and manufacturers of housing fixtures and equipment and household appliances assess the possible demand for housing and perceive the scope of their activities within the overall programme.

(c) Assessment of the quality of housing

1.37. The materials used for the construction of housing units (roof, walls, floor) are a significant pointer to the quality of life in different parts of a country. Trends indicated by census data with regard to the type of housing materials can show improvements in the welfare of the citizenry, as the percentage of poor quality or slum-like housing facilities is decreased.

3. Relationship between the population census and the housing census

1.38. An especially close association exists between population censuses and housing censuses. The two censuses may constitute one statistical operation or they may be two separate but well-coordinated activities, but in either case they should never be considered completely independently of each other because essential elements of each census are common to both. For example, an essential feature of a population census is the identification of each occupied set of living quarters and of the persons living therein, and an essential feature of a housing census is the collection of information on the characteristics of each set of living quarters in association with the number and characteristics of its occupants.

1.39. In many countries, the population and housing censuses are taken concurrently, often with the use of a single schedule. In this way, the information on population and living quarters can be more readily matched, processing is facilitated and extensive analysis can be carried out. This also makes it possible to relate to the housing census data the information on demographic and economic characteristics of each household member that is routinely collected in the population census.

1.40. The advantages of simultaneous investigation may be offset to some extent by the additional burden on the respondent and the enumerator resulting from the increased amount of information that must be collected at one time. In countries where this is likely to be a serious problem, consideration might be given to collecting data for a limited number of topics on the basis of a complete enumeration in the population and housing census, with more complex data in both fields being collected on a sample basis only, either concurrently with or immediately following the full enumeration. Alternatively, consideration might be given to carrying out the housing census as part of the advance-listing operations of the population census.

1.41. The relationship between the population and the housing census will affect the means by which data on homeless persons are obtained. In the case of simultaneous censuses of population and housing, data on homeless persons will be obtained as part of the population census. Where the housing census is carried out independently of

the population census, it may be necessary to try to enumerate homeless persons in the housing census. Information collected from enumerating homeless persons may reflect, among other things, the magnitude of the housing problem in a given locality.

4. Relationship of population and housing censuses to intercensal sample surveys

1.42. The rapidity of current changes in the size and other characteristics of populations, and the demand for additional detailed data on social and economic characteristics of population and housing characteristics that are not appropriate for collection in a full-scale census, have brought about the need for continuing programmes of intercensal household sampling surveys to collect current and detailed information on many topics.[4]

1.43. The population and housing census can provide the frame for scientific sample design in connection with such surveys (see paras. 1. 438-1.441); at the same time, it provides benchmark data for evaluating the reasonableness of the overall survey results as well as a base against which changes in the characteristics investigated in both inquiries can be measured. To permit comparison of census and survey results, the definitions and classifications employed should be as nearly alike as possible, while remaining consistent with the aims of each investigation. Because of the relative permanence of living quarters, the lists available from the housing census (with suitable updating) may also provide a convenient frame for carrying out inquiries dealing with topics other than population and housing.

5. Relationship of population and/or housing censuses to other types of censuses and other statistical investigations

(a) Census of agriculture

1.44. While the population and housing censuses have a close relationship, their relationship with the agricultural census is less well defined. However, as the result of increasing integration within programmes of data collection, the relationship between the population and housing census and the agricultural census is now far closer than in the past and countries are increasingly looking at new ways to strengthen this relationship.

1.45. One issue in relating the two censuses is that they use different units of enumeration. The unit of enumeration in the agricultural census is the agricultural holding, which is the techno-economic unit of agricultural production, while the unit of enumeration in the population census is the household and the individual within the household. In many developing countries, however, most agricultural production activities are in the household sector and households and agricultural holdings are very closely related, often in a one-to-one relationship. Establishing links between the two censuses is particularly relevant for such countries.

1.46. The agricultural census collects various household/individual data for members of the agricultural holder's household. The *World Programme for the Census of Agriculture 2010,*[5] recommends the collection of data on household size and limited data on demographic characteristics and economic activity of members of the holder's household, as well as some limited information on persons working as employees on the holding. Users may find some agricultural activity data from the agricultural census more comprehensive than from the population census because the latter normally investigates only the principal economic activity of each person during a short time reference period and this may not identify persons connected with agricultural activity on a seasonal or part-time basis. On the other hand, the population census provides data on agricultural employment and agricultural population, which is not available from the agricultural census because it only covers households associated with agricultural holders. To get a complete picture, agricultural data users will need both agricultural census data and population census data.

[4] Designing Household Survey Samples: Practical Guidelines No. 98 (United Nations publication, Sales No. E.06.XVII.13).
[5] FAO (Food and Agriculture Organization of the United Nations) Statistical Development Series No. 11 (Rome, 2005).

1.47. In planning the population and housing census, every opportunity for developing the relationship between this census and the agricultural census should be explored. This can take several forms. Definitions used in the population and housing censuses should be compatible with those used in the agricultural census so that meaningful comparisons can be made between the two data sets. The population and housing census can also be of use in the preparation of the agricultural census, such as in the demarcation of enumeration areas, the preparation of the frame for the agricultural census or, if applicable, the sample design.

1.48. In planning the national census programme, consideration should be given to the possibility of collecting additional agricultural information as part of the population and housing census exercise that would facilitate the preparation of the frame of agricultural holdings in the household sector for a subsequent agricultural census. This could be done as part of the pre-census cartographic work and/or listing exercise or by adding an additional question to the census questionnaire. In the latter case, an additional item at the household level could be included on whether any member of the household is engaged in own-account agricultural production activities. Alternatively, additional data at the individual person level could be collected to identify persons involved in agricultural activities during a longer period, such as a year. These new items are included in the principles and recommendations (see para. 2.381-2.390). Where countries choose to adopt this approach of using the population and housing census to establish a frame for the agricultural census, the agricultural census should be synchronized with the population and housing census and conducted as soon as possible after the population and housing census, while the frame is still up to date.

1.49. The opportunity for linking population and agricultural census data should also be explored. This could add considerable analytical value to data sets from both censuses and save on data collection costs. Much of the demographic and activity status data collected in the population census are also collected in the agricultural census. If data from the two censuses could be linked, it would no longer be necessary to collect these data again in the agricultural census.

1.50. Some countries conduct the data collection for the population and agricultural censuses as a joint field operation. Normally, each census retains its separate identity and uses its own questionnaire, but field operations are synchronized so that the two data collections can be done at the same time by the same enumerators. Occasionally, the two censuses are merged into one. This may have a number of advantages, but its effect on field operations and data quality needs to be carefully considered.

(b) Census of establishments

1.51. Although the collection of information on industrial and commercial establishments does not constitute a part of the population census, some of the information that is collected regarding economic characteristics of individuals can be used for preparing listings of the proprietors of such establishments and/or of the establishments themselves. Experience shows that these listings can be used in a subsequent census of establishments or for supplementing the registers of establishments maintained by most countries and utilized in their establishment censuses. While most business registers cover at the least all establishments in which more than some minimum of persons (usually 5 or 10) are employed, the population census can be used to collect basic information (volume, activity and employment) of business establishments with employment below the minimum number of persons, particularly those operated by self-employed persons. However, special care should be taken in the choice of the unit of enumeration to ensure that there is no double counting of establishments owned by more than one person/household. It is essential that the information from the population census be available and used shortly after the enumeration is carried out because this information quickly can become outdated.

1.52. The population census information needed for these purposes is the industry and the status (as employer, employee, own-account worker and so on) of economically active persons, the name and address of their establishment (if any) and (for employers) the number of employees. If all of this information appears in the census questionnaire, the data for small employers and own-account workers can be extracted from the schedule or from the processing documents after the enumeration. If only industry and status appear on the schedule, the remaining information may be obtained from the desired group at the time of the population census enumeration and entered in a separate schedule.

(c) Census of buildings

1.53. It is necessary, as part of the housing census operation, to inquire whether or not all buildings (both residential and non-residential) are occupied. Thus, it may be convenient to record basic information for all buildings at the time of the housing census, even though detailed data may be collected only for those in which housing units or other sets of living quarters are located. The comprehensive list thus obtained sometimes provides the basis for a census of buildings, carried out concurrently with, or subsequent to, the housing census, or it may provide for the identification of special types of buildings significant for other inquiries, such as the census of establishments or the school census. If a listing of households is to be carried out before the actual enumeration, this would be most ideal for carrying out such an exercise.

(d) System of current housing statistics

1.54. Current housing statistics refer to housing activity. They reflect the number of dwellings constructed and certain related information such as value, number of rooms, floor space, and so forth, as well as number of dwellings destroyed or demolished. These data are usually obtained from a system of data collection based on the administrative procedures required in connection with the activity in question. For example, construction statistics may be derived from permits issued for the construction of dwellings, from records of dwelling starts or completions, or from certificates of occupancy. Statistics on dwellings destroyed may be obtained from the records maintained for the levying of rates and the collection of taxes. Compiled monthly or quarterly, current housing statistics reflect changes in the housing inventory and, although they may serve other purposes, they are also used to update the benchmark data obtained from housing censuses.

(e) Civil registration and vital statistics

1.55. Population census data serve as denominators for the computation of vital rates, especially rates specific for characteristics normally investigated only at the time of the census. Conversely, census results, time-adjusted by vital and migration statistics, can provide estimates of the future size, distribution and other characteristics of the population of the total country and subnational areas. Furthermore, census data on fertility can provide a benchmark check on the reliability of current birth statistics, and vice versa. It is consequently desirable that procedures for the collection of population census data, vital statistics and migration statistics be closely coordinated with regard to coverage, concepts, definitions, classifications and tabulations.

1.56. It may be noted that some countries have linked individual census returns for infants under one year of age with birth registration reports for the year preceding the census date as a means of checking on the completeness of one or the other type of investigation. Linkage of death reports with census returns has been used to compare the information on characteristics of the deceased as reported in the two sources. While the many problems posed in the past by the one-to-one matching of two types of records have not been entirely solved, their severity has been mitigated by developments in computer technology. Before under-taking either of the procedures, however, countries should consider carefully the possible advantages of using household sample survey returns rather than census returns in the operation. Moreover, such operations have to be carried out in complete accord with national laws and policies governing the confidentiality of information obtained in the census if public confidence in the census is to be maintained.

1.57. In the establishment of a vital registration system, census results on the geographical distribution of the population can be useful in the consideration of appropriate locations for registration offices.

E. Census methodology (NEW SECTION)

1.58. Summarizing the experiences of the previous population and housing census round, it became evident that a number of countries were exploring the use of alternative methodologies in respect to the traditional census for producing census statistics. The use of registers – primarily population registers - in combination with other sources is being considered in a number of countries for the purpose of producing detailed small areas statistics on population and housing, as well as the application of continuous surveys' methodology for the same purpose.

Furthermore, these alternatives to the traditional method of conducting population and housing censuses are becoming more diverse in terms of developing combinations of various data collection methods (see paragraph 1.58d), - hence a challenge to summarize and categorize them using generally accepted data sources methodologies.

1.58a. It should be noted that most of the countries are expected to continue using the traditional census approach – soliciting information from each household in a country - in the 2020 round of censuses, while at the same time, it is anticipated that moreand more countries would intend to use alternative methodologies. There are quite a few reasons for exploring alternative approaches, and the following presents a sample: i) needs for producing more frequent and timely statistics, ii) budget limitation for census taking, iii) reluctance of the population to participate in the census.

1.58b.This section aims to briefly elaborate on possible methodologies for conducting censuses based on the recent experience of countries. Also the section describes necessary conditions for using specific methodology and its advantages/ disadvantages and implications for census taking and contents. It should be kept in mind that countries using specific census methodology might have significant differences in implementation of this methodology considering country`s conditions and expectations. Regardless of the approach, the crucial principle of providing detailed statistics at the lowest geographical level remains of paramount importance.
1.58c. The various census methodologies are represented in a matrix in Table 1 where the rows describe data collection through field enumeration and the columns represent use of administrative and/or population registers for data collection. The matrix only presents options that have either been used or that are likely to be used by countries and not all possible combinations including theoretical ones.

1.58d. The different approaches are explained in the table that follows the matrix[6]. It is worth noting that alternative approaches have been adopted in different ways by different countries depending on national preferences, practices and the availability of appropriate data sources.

[6] For more details see different handbooks, for example, Using Administrative and Secondary Sources for Official Statistics: A Handbook of Principles and Practices (Unites Nations publications) and Register-based statistics in the Nordic countries; Review of best practices with focus on population and social statistics (United Nations publication).

Table 1. Overview of census taking methodological approaches

Type of data collection	Use of registers		
	No registers: Fully field enumeration-based and/or sample surveys[1]	**Population registers (Individuals/Households/ Dwellings)**	**Integrated administrative sources**[2]
Full field enumeration	Full field enumeration only (Traditional)	Population register and full field enumeration	Integrated administrative sources and full field enumeration
Rolling surveys (continuous surveys)	Full field enumeration and rolling surveys	Population register and rolling surveys	Integrated administrative sources and rolling surveys
	Rolling census		
Ad-hoc sample surveys		Population register and ad-hoc sample surveys	Integrated administrative sources and ad-hoc sample surveys
Existing sample surveys		Population register and existing sample surveys	Integrated administrative sources and existing sample surveys
No field enumeration (Fully register-based)			Fully register-based

[1] In a fully field enumeration-based census, data from registers are not used as a census data source, even though registers may be used as a frame and to support field operations.
[2] Integrated administrative sources include different kinds of registers, of which population registers are of primary importance: individuals, households and dwellings. These are linked at the individual level with information on business, tax, education, employment and other relevant registers.

Approach	Description
Full field enumeration or Full field enumeration and rolling surveys (see E.1)	Information on census topics concerning individuals and households is collected by census questionnaire directly from respondents, using enumerators, or other modes of data collection (e g. telephone interview, mail out/mail in, Internet, etc.), or by applying a combination of different modes of data collection. In a traditional census, full field enumeration may include an in-built ad hoc survey by use of the long form or can be combined with a rolling survey. It is common that a short form is used together with a long form. The short form then contains only questions intended for universal coverage (measuring the size and structure of the population), while the long form is used to collect information only from a sample of individuals and households. This long form usually contains detailed questions on particular topics in addition to covering complex topics such as fertility. Both forms are utilized during the same time frame of the census. While the long form estimates are not based on full coverage, they are regarded as census output. Through modelling the full field enumeration with the continuous cumulative survey is used to generate yearly (or other interval) estimates of detailed characteristics for different geographic levels. With this approach, the sample can be cumulated over time to produce statistics at the lowest levels of geographic detail to provide more frequent and relevant data .
Rolling census (see E.3)	Information on individuals and households is collected through a continuous cumulative survey covering the whole country over a long period of time (generally years), rather than a particular day or short period of enumeration. The two main parameters of a rolling census are the length of the period of enumeration (which is linked to the frequency of updates required) and the sampling rate (which depends on the available budget and the geographic levels required for dissemination purposes).
Combined methodology (see E.3)	Information on individuals and households are collected by combining data collected from one or more surveys with administrative and/or statistical registers. Data from registers are employed not only as a frame or to support field operations, but directly as a data source for some census information. In some cases, register data are used to prefill the questionnaires to be verified or corrected during interview. Ad-hoc sample surveys are used to provide information on census topics not available from administrative sources or to adjust data which are of poor quality in registers.
Population register and existing sample surveys or Integrated administrative sources and existing samples survey (see E.2)	Information on individuals and households are collected from existing administrative sources, namely, different kinds of registers, of which the following are of primary importance: individuals, households and dwellings. These are linked at the individual level with information from existing sample surveys. No field data collection will take place. Existing sample surveys include intercensual sample surveys on different topics, such as the labour force survey, living standards survey, etc.
Fully register-based (see E.2)	Information on individuals and households is collected from existing administrative sources, namely, different types of registers, of which the following are of primary importance: individuals, households and dwellings. These are linked at the individual level with information taken from other administrative/statistical sources such as business, tax, education, employment and other relevant registers.

E.1. Traditional census

1.58e. The traditional approach comprises a complex operation of actively collecting information from individuals and households on a range of topics at a specified time, accompanied by the compilation, evaluation, analysis and dissemination of demographic, economic, and social data pertaining to a country or a well-delimited part of the country. Members of the public respond to a census questionnaire, or interviewers are deployed to collect information from respondents. For interviewer-based censuses, enumerators assigned to different enumeration areas cover all households and persons in the enumeration area during a specified and usually short period of time in order to meet the requirements of universality and simultaneity. Either a single long form is universally canvassed, or a combination of short and long forms used. In the latter case, the short form contains only questions intended for universal coverage, while the long form is used to collect information from only a sample of households and population. This form usually contains detailed questions on a particular topic in addition to covering complex topics such as fertility. Both forms are utilized during the same time frame of the census. While the long form estimates are not based on full coverage, they are regarded as census output. Overburdening the census form is likely to adversely affect response rates and the quality of data.

1.58f. Through modelling the full field enumeration with the continuous cumulative survey, it would be possible to generate yearly (or other interval) estimates of detailed characteristics of population and housing. The primary benefit of this approach is to provide more frequent and relevant data on the population and housing would be available when a census is conducted only once a decade. However such a programme might be costly and technically difficult as it requires a multi-year of comprehensive planning, development and testing.

1.58g. As various methods can be used for collecting the data, including a mailed or dropped-off questionnaire, the telephone, the Internet, personal visit follow-up, or a combination of such methods, countries employing the traditional design may utilize very different collection approaches in doing so.

1.58h. The traditional census has merit in providing a snapshot of the entire population at a specified period and data for small geographic domains. In that sense, the traditional census is perhaps unique in nature. This approach is particularly suitable for countries requiring population numbers by various social and economic characteristics simultaneously for all geographical levels to meet the needs of planning and the allocation of funds. The delimitation of electoral boundaries also demands simultaneity, and for that reason also the traditional approach may be better. But at the same time, traditional censuses have been singled out as the most elaborate, complex and costly data collection activity that national census offices undertake. In addition to costs, this complex task requires full awareness and agreement of the public to participate in it. Due to the complexity and expense of such censuses, they are usually undertaken only once every 5 or 10 years. Hence census data are often several years out of date.

Necessary Conditions

1.58i. It is essential to have a national legislation for conduct of census to ensure confidentiality and completeness of coverage. A permanent central census organisation, which may or may not be part of the statistical office, needs to be exist in the country, which can be expanded during the time of the census. Since a traditional census is quite expensive to conduct, sufficient funding for a field operation covering the entire country and subsequent data processing needs to be ensured.

Advantages and disadvantages

1.58j. The two biggest advantages of a traditional census are comprehensiveness of coverage and simultaneity. Another major advantage is the flexibility in deciding the topics to be covered and design of the questionnaire. There is lesser need for complex data adjustment since processing of raw data provides all inputs. The census frame becomes the base for all subsequent sampling frames. Finally, the focused and time bound nature of the field operation implies that the work is finished in a short period and does not require long term or constant monitoring.

1.58k. One of the biggest disadvantages of a traditional census is its cost and administrative complexity. Also, since it can be conducted only after five or ten year intervals, data tends to become outdated.

Some considerations for census taking and content

1.58l. Meticulous planning is required for every stage of census taking in the traditional approach, due to the sheer volume of work and overlapping time frames. The questionnaire needs to be comprehensive, since all data has to come from it. The recruitment and training of a large number of census takers adds to cost and complexity. Involvement of administrative machinery at the central, provincial and local levels is essential for the successful field operations.

1.58m. Since the data obtained in the traditional method is respondent/ enumerator based, unlike in other approaches where verified administrative databases contribute to the data collection, there is a scope for error in canvassing the questions and in the quality of response. This, however, can be minimised through proper design of the questionnaire, effective training, and wide publicity.

1.58n. Data can be provided for every administrative level subject to privacy/ confidentiality considerations, which may not always be possible if some parts of the data collection are based on sample surveys.

1.58o. Essential features of population and housing census are fully satisfied with the traditional census method.

E.2. Register-based census

1.59. The concept of producing census-like results based on registers emerged in the 2000 round of censuses, although it has been debated and tested to various degrees since the 1970s, and several countries succeeded in using this approach to generate census data in the 1990 round of censuses. The philosophy underlying this concept is to take advantage of existing administrative sources, namely, different kinds of registers on individuals, households and dwellings. In the next iteration these are linked at the individual record level with information held on business, tax, education, employment and other relevant registers. While it is theoretically possible to link records on the basis of the name and other unique details of the individuals, the existence of a unique identification number for each individual, household and dwelling allows a much more effective and reliable linkage of records from different registers.

1.59a. The process involves collecting information on the characteristics of individuals, which has been provided to an administrative register for other purposes. To be effective, access to administrative data for statistical purposes must be given by law and/or by agreement, providing the capability to:

(a) transfer the data as individual records to the statistical database; or
(b) temporarily link the registers to form a proxy register for statistical purposes.

1.59b. Administrative registers are kept primarily for administrative purposes. Units and variables of administrative data are described according to administrative rules and demands. Before a register is used for census purposes, the suitability of its data in terms of definitions, concepts, content, reference date, accuracy etc. should be statistically tested by comparing it with previous census and survey results, and conducting quality and compatibility surveys. A pilot census may be used for this purpose. Some of backbone registers and administrative sources are:

- Population register (base –usually covers births, deaths, marriage and migration)
- Buildings and dwelling register (base)
- Business register (-base)
- Taxation register
- Employment register
- Pension register
- Job-seeker register
- Student register

1.59c. All persons within the defined territory who meet the coverage rules are enumerated. In concept, the enumeration is taken from a population register in which the fields for different census attributes are populated from

subsidiary registers relating to specific topics. Information is extracted from the register as it reflects the situation of individuals at the pre-defined census reference date. The timing of the census extraction may require careful thought where register update cycles vary. Registration delays and administrative delays in updating between regional and national databases can otherwise have a serious impact on the quality of the output.

Register source with existing sample survey

1.59d. A special case of register-based census is when population and/or integrated administrative registers are combined with existing sample survey(s). Different data sources are integrated as part of a "virtual census" processes. The data for the census exercise are derived from many types of registers and surveys, covering different population groups throughout the country and its sub-regions. Compared to conventional census methods, this process is lower in cost and staff requirements, and uses more frequently updated data sources. Over coverage and under coverage problems are rarely encountered. Significantly, by combining data that are already available from other sources, the virtual census makes no additional respondent burden, increasing its public acceptability.

1.59e. A weakness of the use of sample data within the census exercise is that the sample size may not be sufficient to offer the geographically detailed outputs that are an essential feature of the census. Importantly though, the use of data from existing regular surveys will often mean that time series of data are available. By combining samples for several survey exercises, it may be possible to produce reliable estimates for small geographical areas.

1.59f. However, the use of existing surveys does present a number of problems compared to the use of ad hoc surveys. The timing, content, statistical definitions and sampling approaches used in an existing survey may not be appropriate to allow the data to be readily combined with data from the administrative source(s). For example, many major household surveys are not designed to cover persons living in institutional households (such as student accommodation, hospitals, prisons, military establishments), meaning that an additional source of information is needed for these persons.

Necessary conditions

1.59g. One of the essential preconditions of this approach is that the country should;

a) have a national legislation providing for the creation of a population register and permission to use the data contained in it for statistical purposes
b) have an established central population register
c) the data in the population register should be of high quality
d) the register should have comprehensive geographical coverage
e) there should be an effective system of continuous updating of the population register

In case other administrative registers are used, the following are essential:

f) the access to data in the various registers should be allowed through legislation
g) the concepts and definitions used in the various registers should be harmonized
h) a universal personal identification (unique identity) system should be in place to facilitate proper linking of data
i) quality and consistency checks should be conducted to ensure suitability of the data contained in various registers

Advantages and disadvantages

1.59h. The primary advantages of a register based approach are reduced costs and greater frequency of data. However, establishing and maintaining administrative registers involve higher costs than the census alone may justify. The need for the register will largely be based on its contribution to more reliable and efficient administration. The use for statistics may be valuable but is likely to be a secondary consideration.

1.59i. Certain potential drawbacks with the use of administrative data sources also need to be taken into account. One limitation is that the scope of statistical topics, key definitions and, indeed, the population base of the exercise, depend on the information that can be compiled from the available registers. These, in turn, will be based on the underlying administrative purpose and procedures of the registers. In addition, it is common for national legislation

to restrict or prevent the use of administrative registers for other purposes, including the production of statistics. This may impose restrictions with respect to the characteristics that are available for description, and may also undermine international comparability. When a registered data item is changed, new or updated information is not always registered immediately. In certain cases, new or updated information may not be registered at all. Where this occurs, the register information does not accurately reflect real circumstances.

Some considerations for census taking and content

1.59j. Administrative registers can, depending of content and quality, be used in all phases of census-taking. In principle, where greater amounts of information can be obtained from administrative sources, the production of census-type statistics will be faster, cheaper and more complete. The most complete use of registers will be where all census statistics topics can be based on register information. It is possible to improve the quality of the administrative register by conducting sample survey (s). This sample survey may either use the register as a sampling frame, or else be completely independent of the register.

1.59k.The use of register data may reduce the flexibility of the census exercise in terms of the variables that are available and their definitions. It may be difficult to change the variables as these are defined in line with administrative priorities. A significant potential risk for the success of the census exercise is that the administrative source will often be outside the control of the statistical authority. The influence of the statistical authority over the administrative source can be very limited. The content and availability of the administrative source may change at relatively short notice and without reference to statistical needs. For example, a change in taxation legislation may mean that a key administrative register may no longer collect information needed for the census. This risk can be minimized by establishing close and regular communication between the statistical authority and the owners of the administrative sources.

1.59l. In practice, only persons legally present in the various registers would get covered through this approach. For example, unregistered births, deaths and marriages, illegal immigrants, homeless persons, nomadic/ floating population, tourists, persons involved in illegal activities, etc., are not likely to find place in any such administrative register.

1.59m. Summing up, subject to the caveats mentioned in the paragraphs above, the feature of individual enumeration is satisfied in this approach as separate information is collected regarding the characteristics of each individual. As regards “universality within a defined territory”, this criterion is satisfied as the enumeration is taken from a population register in which the fields for attributes are populated from subsidiary registers relating to specific topics. With regard to “simultaneity”, the timing of the census extraction may require careful thought where register update cycles vary. Finally, with respect to “periodicity”, this approach allows extraction at desired frequencies, including “at least once in 10 years” noting again the need to manage the updating cycles for the registers.

E.3. Combined methodology

1.60. In recent years, it has been observed in a number of countries that:

- the quality of the administrative registers is relatively good (at least for certain key census variables);
- information for some census topics is not available in the administrative registers; and
- the population generally, and certain population groups in particular, are becoming more sensitive to the handling of personal information, and possibly more reluctant to cooperate with the statistical office.

1.60a. In these cases, a combined census that uses register(s) and questionnaire(s) could be an option. Essentially, the combined methodology makes use of registers relevant to a census, complemented by surveys and/or complete enumeration. The use of survey/enumeration data is intended to:

a) improve the accuracy of the population counts;
b) provide information for census variables that cannot reliably be based on administrative data; and
c) check, update and improve the quality of census data derived from administrative sources.

1.60b. Information on individuals, households and dwellings is collected by combining data from registers with data collected from one or more surveys. Data collection may be based on full enumeration, an ad hoc sample, an existing sample and rolling survey methods. Data from registers are employed not only as a sampling frame or to support field operations, but directly as the data source for some census information.
In case registers are used along with total enumeration, data from registers may be prefilled in questionnaires, and respondents may be asked to check, update and confirm their details. In the alternative, the items of information available in the registers may be prefilled in the questionnaires and confirmation/updating sought during the field enumeration. Other questions relating to fields not available in the registers may also be canvassed during this exercise. In case of new individuals/ households/dwellings which do not feature in the register, all fields of information that are required for the register as well as the census are to be canvassed afresh. When registers are used along with sample surveys (ad hoc samples, existing samples or rolling surveys), some census tables may be produced entirely from the information available on the register(s), while for other census tables, information from the survey(s) duly weighted to the population totals, could be used. The surveys would also serve to evaluate the accuracy of the register counts.

Necessary conditions

1.60c. A register-based census along with total enumeration can be adopted even when the register is incomplete. The enumeration could be used to complete the register as well as generate additional information required for the census.
However, the option of a register-based census with sample surveys can be adopted only if all necessary census information is available from the various administrative or survey sources, and it is possible to link the information from the different sources at the record level. During the process of integrating individual records, care should be taken to check the accuracy of the data and remove inconsistencies prior to the production of statistical outputs.

1.60d. The data sources would include verified and accurate personal information (name, id number, date of birth, sex, marital status**,** family structure etc.) and a dwelling register. In an ideal situation, a 'base' register can be envisaged, to include unified identity codes for both people and address components in order to link more efficiently the related register and survey data. The link between persons and their dwellings is equally important, giving the household unit. Other administrative data sources include tax files, social security files, public records of unemployed, registers of educational qualifications, etc. It is preferable to have a centralized base register. If this is not available, regional registers will need to be consolidated.

Advantages and disadvantages

1.60e. The register-based census combined with full enumeration/surveys offers several advantages:

- it can be much cheaper than a traditional census with a full enumeration collecting all census items from the whole population;
- it will reduce the burden of enumerators and respondents;
- it will reduce the non-response in case information are driven from registers and
- it should be possible to correct the survey data for differing levels of non-response in different population groups.

1.60f. Micro-integrated data might be expected to provide very reliable results, because they are based on a maximum amount of information. The coverage of sub-populations may be more reliable because when data are missing in one source, another source may be used. Another advantage of micro-integration is that there may be less reason for confusion among statistics users. For example, there will be one figure on each socio-economic phenomenon, instead of several different figures depending on which sources have been used.

1.60g. A disadvantage is that it involves more work to produce the tables from the sample survey micro-data as weighting problems may arise. As the combined census may lack the high public profile and publicity of a traditional census, there may be less interest in and use of the census results as there is no longer a single census event to attract public attention. Other potential disadvantages may be a lack of transparency (no-one external to the process may be able to reproduce the information), data quality and dissemination of the results.

Some considerations for census taking and content

1.60h. Data validation, processing and dissemination may be more complicated as this approach involves both total counts based on the register and sample data from surveys. In addition, as some variables are based only on sample data, it may be impossible to meet the level of statistical and geographical detail required in some tables. On the other hand, however, the possibilities of reducing cost and response burden provide a very strong reason to adopt this approach.

1.60i. Some of the required variables will need to be constructed from different sources. The census results obtained may differ to some extent from those that would be obtained from a full enumeration covering all census topics. This may have a negative impact on the comparability of results between countries and over time.
An advantage of registers is that, in effect, they offer complete coverage. It is preferable that statistical authorities make full use of the register data that are available.

Examples of combined methodology

1.60j. There are many different approaches to the implementation of combined census methodologies. These differences can be categorized according to whether a non-continuous or continuous approach is adopted, as well as the ways and extent to which the different data sources are used. Methods used by countries using either a fully register-based census approach or one based partly on administrative sources are examined in detail in a research report[1]. This report presents information for six fully register-based and ten partly register based countries, giving information on the methods used to combine register and survey data, and to compensate for missing information. The use of repeated weighting, register estimation methods, calibration of data and micro or macrodata integration are discussed.

Non-continuous approach

Population register[2] and/or integrated administrative sources[3] with full field enumeration

1.60k. One approach can be to combine the full enumeration with base register (s). The questionnaire used in the total enumeration can then contain fewer questions compared to a traditional census questionnaire, but still covers the whole population of individuals, households and dwellings. Over time, countries may decide to adapt this model, increasing in successive censuses the use of integrated administrative registers and reducing the number of questions in the questionnaire. The registers can be used to prefill information as name, address, family composition, education, occupation, dwelling characteristics etc. on the questionnaire. These prefills can then be used to ask the respondents if the information still is valid or needs to be changed. That can greatly reduce the work involved in coding of the census questionnaire.

Advantages and disadvantages

1.60l. The main advantage with using this model is that it will reduce the response burden for respondents and reduce the cost of the census. The model also allows the preparation of small area statistics as all variables are collected as total counts.
However, this model will still involve a large data collection exercise with the use of enumerators. Mail-out/mail back data collection may sometimes be used but a significant proportion of respondents may require enumerator follow-up and assistance in completing the questionnaire.

[1] Schulte Nordholt, Eric, 'Efficiency in Population Censuses – the situation of the European register-based 2011 Censuses', Available at: http://www.statistics.gov.hk/wsc/STS067-P3-S.pdf .
[2] Examples of base register can be population register and/or dwelling register/address register and/or business register.
[3] Examples of integrated administrative sources can be administrative or statistical registers of education and/or occupation..

Population register[14] and/or integrated administrative sources[15] with Ad-hoc sample survey(s)

1.60m. Another model involves the use of an ad-hoc sample survey instead of a full enumeration. The backbone register could then be used as a sample frame and also to prefill some information such as name and address on the questionnaire.
The ad-hoc sample survey questionnaire can be specifically designed to complete the
data coming from registers – covering those variables not available from the register. The sample can be sized and stratified in such a way that data are available for small groups and geographical areas.

Advantages and disadvantages

1.60n. This model requires far fewer enumerators than a full enumeration, so a more specific training operation with skilled and prepared professional interviewers can be carried out. The follow-up of the operation is also simpler. There is no need to obtain information from each member of the population, giving a clear reduction in of response burden. Non response can be corrected in the sample by the use of statistical techniques to ensure information are still representative of the population.

1.60o. By using a sample and a much smaller number of enumerators, a significant reduction in the cost of the census is possible, in particular when compared with the traditional approach.

1.60p. The extent to which this model can produce detailed statistics (in particular for municipalities or smaller geographical areas) will depend on the size of the sample survey. A larger sample should allow more detailed statistics to be produced but this will correspondingly increase the financial cost of the exercise. Even with a large sample, the availability of detailed information is likely to be lower than if a comprehensive approach were taken – such as with a traditional census or fully register-base exercise.

Continuous approach

Rolling census

1.61. In a rolling census, information is collected on individuals, households and dwellings by a continuous cumulative surveys covering the whole country over a period of time (generally years), rather than a particular day or short period of enumeration. The two main parameters of a rolling census are the length of the period of enumeration and the sampling rate (which depends on the geographic levels required for dissemination purposes). For example, it is possible to build a sample framework in order to produce national results with one annual survey, regional results by cumulating three annual surveys, and small area results by cumulating data over five years. Annual surveys may be conducted over the full course of the year or in a particular month or other shorter time frame.

1.61a. Implementation of such an approach requires highly complex sampling and modeling techniques; a high quality sampling frame in order to allow sampling at very low levels of geography; and successful consultation to gain acceptance of the approach with major stakeholders, including national and local governments and the user community.

Combined rolling surveys and/or population register and/or integrated administrative sources

1.61b. An alternative to a rolling census is to combine the rolling surveys with a population register and/or integrated administrative sources. As far as possible, information on individuals, households and dwellings, is collected from the existing administrative sources, and combined with information collected from rolling surveys to supplement data not available from administrative sources and to adjust data of poor quality in administrative sources that might otherwise compromise their usability. These quality problems may include data that may be rarely updated, coverage errors, or the use of classifications and definitions that are not completely harmonized.

1.61c. The administrative sources include different kinds of registers, of which the following are of primary importance: individuals, households and dwellings. These are linked at the individual level with information on business, tax, education, employment and other relevant registers. The existence of a unique identification number

for each individual, household and dwelling is important, as it allows much more effective and reliable linking of records from different registers. Considering the frequency with which a person leaves traces in an administrative source, there is potentially an enormous amount of spatial data available for census purposes.

Necessary conditions

1.61d. The necessary conditions partly depend on the complexity of the sample framework. If the sampling units are addresses, a master address file is to be built first. But if the sampling unit is larger, for example municipality, it is only necessary to have enough information to spread the municipalities over the different years. It will be necessary to explain to statistics users the impact of the rolling sample on the use and interpretation of data, as many users are more used to snapshot data rather than period data.

Advantages and disadvantages

1.61e. The main advantage of the rolling census approach is the higher frequency for updating data: a traditional census provides benchmarks every five or, more commonly, ten years. In contrast, the rolling census provides annual updates. Another advantage is the reduction in the burden on the public. The high peak costs and labour requirements of a traditional census are instead spread over a longer period. Furthermore, it is possible to improve the census process over time, and to test methodological refinements and new technologies as they emerge. An additional advantage of the combined rolling survey is that information from administrative sources can be used in different parts of the rolling survey process to improve the reliability of the sample estimates.

1.61f. The disadvantage is that the rolling census approach no longer provides a snapshot of the whole population, complicating comparisons between areas due to different enumeration times. In addition, as the rolling census covers the whole country over a period of time, some respondents will move. Thus some people may be surveyed several times and others may not be surveyed at all. As a result, universality might not be ensured unless careful methodological adjustments are made.

Some considerations for census taking and content

1.61g. It is better to begin a rolling census just after a full traditional census, in order to exploit the recent census information to build the sample framework. As the operation is annual, the process must be very carefully prepared, since any delay can be problematic for the following stages.

1.61h. A rolling census is able to include all usual census topics. There is also the possibility of changing the questions more regularly than in a decennial cycle. This enables the census to be more reactive to changes in the needs of users, even if comparability over time must be preserved. However, only if the questions are stable over a number of years can a rolling census produce statistics at the same level of detail. Depending on the census organization and procedures, it may be possible to add some thematic surveys if required.

III. Planning, organization and administration of population and housing censuses

1.76. The present chapter deals primarily with the operational aspects of traditional population and housing censuses and the very lengthy and detailed preparations that must be made in order to take such censuses successfully. Because of the technical and administrative complexities involved, the principles of census management provided below should be considered a review of the points to be taken into account in planning and executing a traditional population and housing census rather than a comprehensive treatment of the subject.

1.77. A population and housing census (or a population census by itself) is perhaps the single most extensive, complicated and expensive statistical operation, consisting of a complex series of interrelated steps that a country undertakes. Some of these steps, for example, the printing of the census questionnaires, may be massive in scale; other steps, for example, the training of the supervisory staff, must be carried out in a uniform manner in all parts of the country; and still others, for example, the actual enumeration, must incorporate both features. Also, since censuses take place after five to ten years, the planning and preparation for each new census round has to take into account the changes in field conditions; census methodology; technological innovations; user requirements/ census questions; and changes in personnel.

1.78. To ensure that the diverse operations occur in their proper sequence and in a timely manner, the entire census and its various component steps must be planned for carefully in advance. An apparently minor oversight in planning may lead to serious defects in the census results and to costly inefficiencies in the census operations. Careful planning is therefore critically important to a successful census, not only in countries with comparatively little statistical experience but also in those with a well-developed system of statistics. Coupled with the need for careful planning is the need for appropriate organizational and administrative arrangements and procedures. Such arrangements and procedures are necessary to ensure both that the extensive human and material resources mobilized for the census are effectively and efficiently used and that its very tight time schedules and massive logistic requirements are met.

1.79. It must be stressed, however, that at each stage of census planning and implementation, the various administrative arrangements developed will need to be guided by sound technical considerations. The quality and timeliness of the census data will almost certainly suffer unless sufficient weightage is given throughout the census to a wide range of subject-matter and statistical requirements. This is especially valid in the case of cross-cutting issues, such as information technology, present throughout many essential phases of the census. It is for this reason that the management of a large statistical operation, and especially a population and housing census, cannot be considered a routine administrative assignment.[1]

1.80. All censuses do not follow a uniform pattern but there are certain major elements that must be taken into account in every one of them. In general, census operations can be divided into seven phases: (a) preparatory work and testing, (b) enumeration, (c) data processing, (d) building of databases e) evaluation of the results (f) dissemination of the results,), and (g) analysis of the results. In addition, distinct sets of operations related to the systematic recording of census experience and the quality assurance and improvement programme must accompany and support the main census operations. It will be readily apparent that these phases are not entirely separate chronologically or mutually exclusive. For example, some census results are usually released before all data-processing activities are completed; the analysis and the dissemination of census results overlap quite extensively; and the systematic recording of census experience should start at the beginning of the preparatory work and continue through all the subsequent phases. Furthermore, certain elements that are discussed below under Preparatory work, such as the budget and staff, may have to be amended according to the circumstances arising at a later stage of operations. The elements of each of these phases are discussed below in terms of their implications for sound census management.

[1] For a discussion of statistical management generally, see *The Organization of National Statistical Services: A Review of Major Issues*, Studies in Methods, No. 21 (United Nations publication, Sales No. E.77.XVII.5) and *Handbook of Statistical Organization, Third Edition: The Operation and Organization of a Statistical Agency*, Studies in Methods, No. 88 (United Nations publication, Sales No. E.03.XVII. 7).

1.81. When the housing and population census are carried out together, the planning, organization and administration of the two censuses should be considered separate aspects of a single, integrated field and processing operation, that is, the separate technical requirements of each census have to be taken into account in planning and carrying out the combined operation. A combined population and housing census will be more costly and complex than each census considered by itself but less expensive than the total operation of carrying out both censuses independently. Moreover, the combined census will be capable of providing a greater wealth of cross-tabulations than both censuses carried out independently. Each country will have to decide on the trade-offs involved in the light of its own needs and circumstances (see also paras. 1.38-1.41). However, from the perspective of overall census planning and management, the decision is not a critical one. Whether the census is a combined operation or a separate population or housing census, the basics of census planning, organization and administration as described below remain unchanged, except for the added cost and complexity of the combined operation.

A. Preparatory work

1.82. The preparatory work for the census is necessarily long in duration and involves many distinct activities. It should be noted, however, that these activities may be interrelated but they also overlap to a large extent. When planning these preparatory activities, techniques for sound project management should be employed.[2] For purposes of presentation, these preparatory activities are divided into 18 19 elements:

1. Legal basis for a census (paras. 1.83 and 1.84)
2. Financial basis for a census (paras. 1.85-1.94)
3. Budget and cost control (paras. 1.95-1.102)
4. Census calendar (paras. 1.103-1.107)
5. Administrative organization (paras. 1.108-1.111)
6. Census communication activities: user consultations, census publicity and promotion of census products (paras. 1.112-1.116)
7. Plans for the quality assurance and improvement programme (paras. 1.117 and 1.118)
8. Mapping (paras. 1.119-1.163)
9. Small-area identification (paras. 1.164-1.172)
10. Living quarters and household listing (paras. 1.173-1.176)
11. Tabulation programme and database design (paras. 1.177-1.180)
12. Questionnaire preparation (paras. 1.181-1.192)
13. Census tests (paras. 1.193-1.196)
14. Plan of enumeration (paras. 1.197-1.200)
15. Plans for data processing (paras. 1. 201-1.205)
16. Plans for evaluation of census results (paras 1.205a-1.205d)
17. Plans for census outputs and dissemination (paras. 1.206-1.209)
18. Staff recruitment and training (paras. 1.210-1.215)
19. Avoiding gender biases and biases affecting data on minority populations (paras. 1.216-1219).

1. Legal basis for a census

1.83. Legal authority for the census is required for fixing primary administrative responsibility, for obtaining the necessary funds, for determining the general scope and timing of the census, and for placing a legal obligation upon the public to cooperate and give truthful answers, a legal obligation upon the enumerator to record the responses faithfully, and specific responsibilities upon other census field personnel at various supervisory levels. In addition, the confidentiality of the individual information should be strongly and clearly established in the census legislation and guaranteed by adequate sanctions so as to provide a basis for the confident cooperation of the public. In countries that lack permanent legal authority for the taking of periodic censuses, it is important to act early to establish ad hoc legal authority or, preferably, legislation calling for a system of periodic censuses.

1.84. The principle of conceptual and organizational flexibility should be observed in drafting the census legislation. The legislative provisions should ensure data security and confidentiality. However, the inclusion of too rigid provisions regarding the type of data to be collected or the structure and relationships of the various parts of the census organization is undesirable. Rather, necessary details should be contained in the census regulations promulgated by the census authorities. Moreover, provision may have to be made, in either the legislation or the regulations, for sanctioning the use of simplified administrative procedures, including the appropriate delegations of authority for the procurement of equipment and supplies and the recruitment of personnel during the operational phase of the census.

2. Financial basis for censuses

1.85. A census is the primary source of data about the size and characteristics of the population; it provides a demographic profile of a country and is the basis for developing area sampling frames for use in surveys. Censuses, however, are usually one of the largest and costliest statistical activities that governments and/or their national statistical offices undertake. As a result, countries have been forced to delay or even cancel a census owing to funding constraints. Countries that have been able to secure partial funds or secure funds but at a late stage of their census preparation have been forced to compromise their data collection, data processing and dissemination of census results. It is therefore recommended that all census operations including planning, cartography , enumeration, processing, analysis and dissemination, be budgeted from the beginning and efforts made to mobilize the required funds Inflation should be taken into account, keeping in mind that duration has an impact on cost.

1.86. Hence, there is growing pressure to look into the solutions to census funding, taking into account the role of key stakeholders, namely, Governments and their statistical agencies, and the greater involvement of international donors and the private sector. Concurrently, cost-effective strategies need to be put in place that would reduce census costs without compromising the quality of census data.

1.87. It should be emphasized, however, that censuses cannot be carried out merely by national statistical/census offices alone. Rather, conducting a census should be seen as a national task involving all stakeholders. Thus, government departments, non-governmental organizations and the private sector end-users should be consulted at all stages to ensure the legitimacy and need for conducting the census and, at the same time, to improve the advocacy for sufficient funding. Although the conducting of a census is principally financed by the Government, the census must be designed in partnership with all political actors so as to obtain their involvement in the census process. A high level committee which consists of the Government, the private sector and civil society, including non-governmental organizations, communities and donors could be formed to discuss issues related to the cost and funding of the census.

1.88. National statistical/ census offices need to advocate the importance of investing in censuses within their own Governments. It is also important for the national statistics/ census authorities to ensure continuous feedback and promote the use of statistical data from previous censuses, in order for users to recognise the importance of population census as a source of vital statistical data and give their support. The possibility of cost sharing with other government departments, such as education and health ministries, should be further explored. These institutions could be supportive in providing logistics arrangements for the census, such as the use of existing infrastructure, transportation, communications facilities and the sharing of employees of other government departments.

1.89. Good planning is an essential prerequisite for not only achieving a cost-effective census but also securing comprehensive financial support for its funding. Technologies and methods that will be used in mapping, data collection and processing, questionnaire design etc. must be decided upon in advance as these have influence on costs. The census planning must bring out the links between the various components, which will include types of resources (such as personnel, cost of stationery or printing) as well as tasks , including data collection and capture, data processing, and data management and dissemination. Cost tags must be attached to each of these components together with a justification. Experience from past censuses or similar activities must be considered when estimating costs for the next census. Where multiple modes of data collection and new technologies are being used for the first time, these must be tested for data quality and cost implications .

1.90. For each stage of the census the costs must be optimized, . A careful choice of the appropriate technology will greatly assist in this. Recent advances in technologies throughout the census process such as digital mapping, computer-assisted or internet data collection, scanning, data processing and data management and archiving, as well as census data analysis and dissemination, may be of assistance in achieving significant reductions in cost (or doing more within the same cost). In addition, the proper selection and use of such technologies will speed up the computation of results and enhance their preservation. However, the choice of technology should be made only after carefully evaluating the costs and benefits of possible options. Some potential risks to canvass include the following: some approaches only become cost effective for large operations; some are dependent on expensive and scarce inputs (for example very high quality satellite images or paper for scanning); some are dependent on services that may not be available throughout the country (for example internet access) and others require significant investments in high quality computers and upfront investment in human resources. The options examined in the cost/benefit analysis could incorporate consideration of leasing (rather than purchasing) equipment and/or sharing it between countries that are undertaking censuses at convenient times.

1.91. Outsourcing to the private sector could be considered as another cost-saving option, particularly in the context of publicity or for systems development for data collection, processing and dissemination. While not necessarily less costly, it may contribute technical expertise or resources not available within the national statistical office.

1.92. It is anticipated that international donors will continue to play a pivotal role in helping to fund census costs in many countries. Technical cooperation and assistance from international agencies have also contributed greatly to the success of censuses in many countries. It is worth noting that a population and housing census has some intangible positive values. It is an opportunity for mobilizing the whole country and reaching even the most remote corners of it. In the life of many citizens, a regular census is often the only time that the State reaches out to them and asks them some questions. Successfully conducting a census is a matter of pride in many countries and a welcome opportunity to recruit a massive labour force and generate jobs and train people in valuable tasks (such as data entry) or in other ways to add to the national infrastructure.

1.93. In general, population and housing censuses are exclusively the responsibility of national Governments and structures; this is particularly true for funding the census. Thus, All activities related to funding need to be elaborated, documented, justified and presented to all stakeholders in a transparent and comprehensive manner.

3. Budget and cost control

1.94. While no universal system of census budgeting and cost control can be suggested since financial practices vary greatly among countries, a few generally accepted principles can be noted. First and foremost, effective planning and control of the various census operations are not possible without a very careful financial estimate of the cost of each census operation, including all of its components, no matter how small. It is recommended to draft a detailed list of activities related to censuses and, as much as possible, to draft the budget in such a way that it corresponds to this list of activities. Second, it is critical for this census plan and budget to be presented by national statistical/census agencies to their respective Governments with adequate lead time, to facilitate the appropriation of sufficient resources from national budgets, or where required, from the international development community. Moreover, funding of the census must be accompanied and developed on a sound and adequate legal basis if effective national census operations are to be enabled.

1.95. Information on expenditures from the previous census classified by census phases, starting with the expenditure for different elements of the preparatory work and ending with expenditure for the dissemination of the census results, provides an important basis for estimating the budget of the census. Figures from the previous census will of course have to be reviewed and modified in order to take into account quantitative and qualitative change in hardware and software, changes in wage rates and the costs of equipment, supplies and so on, planned changes in census content, methods and procedures, and anticipated changes in the population itself (for example, total size, percentage urban, and average household size), all of which may affect the cost structure of the census. In most countries, several cost elements tend to increase (for example, wage rates and the size of population) so that there is considerable pressure to achieve economies in other items of the census budget.

1.96. The census offices need to implement transparent accounting procedures and financial management systems to ensure speedy disbursement of funds, proper receipting of expenditures and an efficient audit. This would enable prompt release of periodic allocations of census funds by national Governments. A clean outcome from a financial audit adds credibility to the census process so that the Government and civil society are more likely to accept the final results.

1.97. In the case of external/donor funds, the required conditions should be established well in advance by discussion between the donor and the national statistical/ census office. This will avoid delay in the release of such funds for census operations.

1.98. Control measures and monitoring systems must be developed for cost effectiveness. Activities to be outsourced must be clearly defined and contracts for outsourcing be well prepared with clear deliverables and timelines.

1.99. For planning the costs of a census, detailed and precise data will be required on the following: (a) number and cost of census staff classified by function and manner of payment; (b) type of equipment and material used for the census, manner of acquisition (in other words, purchase or rental) and cost; (c) office space (surface measurement), classified by use and type of cost (in other words, for construction or for rent); (d) type of services used for census operations. The usefulness of the above information would be enhanced if the information could be recorded by source of funding, in other words, in terms of whether the expenditure has come from (a) the official census budget; (b) other funds of the census office (for example, a regular annual budget not specifically intended for census purposes, or general funds of the governmental agency or department of which the census office is a part); (c) other parts of the Government; (d) non-governmental organizations, (e) international donors.. This information is needed not only for fiscal planning and control but also in order to examine the trade-offs in terms of costs and benefits among alternative ways of carrying out various census operations. Although cost experience from a previous census in a country may provide useful experience for planning the next census, much more caution should be exercised in using the cost parameters from other countries. Differences in census content, organization and operations, as well as in cost accounting, can introduce serious incompatibilities into such country-to-country cost comparisons.[3]

1.100. It is important that the persons at the administrative and supervisory levels who will be responsible for the execution of each operation participate in estimating the budget items. Such an organization of the work presupposes detailed advance planning and "cost-consciousness" on the part of those responsible for a census.

1.101. The census plan as executed will certainly change in a number of respects after the making of the original calculations. Consequently, a perfect correspondence between the estimates and the final costs is not to be expected. Changes in the prices of major components of census costs should be monitored on a regular basis with either the census budget adjusted accordingly or the census plans modified. Indeed, the development of the census budget is usually an incremental process in which rough initial estimates are replaced by more detailed and precise statements of resource requirements. Throughout the period of census taking and compilation of census results, the budget will have to be re-examined and performance compared with plans. With detailed information on expenditure, the governmental and census authorities will be better able to exercise control over keeping the development of census operations within the census budget as well as to assess and control the effectiveness and efficiency of these operations. This information is also very useful for studying possible improvements in census techniques and census methodology.

4. Census calendar

1.102. An indispensable element in the planning of a census is a calendar or timetable indicating the sequence and estimated duration of each of the component operations of the census. At the early stages of census planning, a

[3]See United Nations Statistical Commission and Economic Commission for Europe, Conference of European Statisticians, *Costing Aspects of Population and Housing Censuses in Selected Countries in the UN/ECE Region*, Statistical Standards and Studies, No. 46 (United Nations publication, Sales No. E.96.II.E.15).

provisional calendar of selected key dates should be prepared as an overall framework for the census. The calendar must be shared with stakeholders in advance for advise and support. The calendar should be revised and made more detailed as planning proceeds, with the aim of establishing final dates as soon as practicable.

1.103. Such calendars are essential, since they indicate the dates on which each of the numerous operations that make up a census are to be started and completed, and they serve as a guide for measuring the progress of each stage of the census operation. Serious delays in work, or errors in time estimates, can be detected by comparing the calendar target dates with the actual dates of each operation. A census calendar is a very efficient instrument not only in the timing control of each census operation but also in the control of the complex of all census operations that are interdependent. Therefore, when modifications in the census timetable are necessary, all related operations should be taken into consideration in order to avoid disruptions in the whole census programme. Obviously, the time schedule will differ for each national census depending upon the general census plan and the resources that are available.

1.104. The census calendar usually shows the various operations grouped into three broad sectors: (a) pre-enumeration, (b) enumeration and (c) post-enumeration. The last-named sector includes evaluation and analysis as well as processing and dissemination. The basic date on which the census calendar and the scheduling of all other operations hinge is the starting date for the general enumeration of the population. For purposes of control, many operations that in fact overlap are shown separately in the calendar. Census calendars sometimes take the form of a chart or graph, in addition to a detailed checklist of operations. Project management software may help in the preparation of the census calendar.

1.105. In establishing the census calendar, it is necessary to consider the relationship of the population and housing censuses to one another as well as to other statistical projects or other large-scale national activities. Although a joint population and housing census operation is likely to constitute, for the period of its duration, the major statistical undertaking of the Government, care should be taken that it does not interfere unduly with the other regular statistical activities that may be going on at the same time. A balanced statistical programme should avoid having too many simultaneous competing inquiries which might place too heavy a burden on the statistical services and on the public, with a possible resultant loss of both administrative efficiency and public cooperation.

1.106. It is often useful to draw up a comprehensive diagram showing the sequence, interrelationship and timing of all the various steps in the census programme. This type of analysis often reveals the consequences of a delay at one step in terms of delays at other steps in the programme. It can therefore be a useful instrument against which the actual progress of the census preparations may be compared. Indeed, some countries have attempted to use such critical path analyses not only as an aid to census planning but also as a tool for the ongoing management of their census operations. In these instances, it is essential to establish procedures for revising the critical-path analysis in response to actual progress. It should be stressed, moreover, that the usefulness of such devices depends on how soundly they are designed, applied and understood. A project management software can be useful in linking the diagrammatic structure of census operations with information about nodes and/ or centres of responsibility for individual broad or detailed operations so as to control the chain of responsibility. Alternatively, event calendars can provide a broad view on the steps of census programme and allow follow up. Different tools can be found on internet for download or online use. Online versions allow immediate update and make easier to work in group, but are dependent on internet access. Other tools, commonly referred to as groupware and collaboration software as well as internet and social media forums, can support census operations by providing an environment for exchange of information, files, and data among dispersed teams.

5. Administrative organization

1.107. In planning the organization and administration of a census, it is important to consider the role and relationship of the various executive and advisory organs. National, subnational and local commissions and committees are frequently useful in the planning and preparations of a census. Such bodies may be composed of representatives of governmental agencies, community leaders with due representation to all sections of society, and of non-governmental users of the census data, particularly those involved in policy-oriented analysis of census results and analytical studies of the social, economic and demographic situation of the country. This ensures broad based and complete participation of the people to ensure proper canvassing of sensitive issues such as ethnicity,

gender, disability, migration, and marginalised groups. It is important, however, that their advisory and promotional functions be clearly defined and that the final responsibility for planning and execution rest with the executive agency.

1.108. There are definite advantages in having an office continuously responsible for census work established as an integral part of the statistical system of a country. Such an office assures continuity in census work and is the principal centre for the formulation of the programme and the initiation of preparatory work for the next census. Its permanence permits the development of specialized and experienced personnel and the maintenance of statistical and cartographic information, including cross-cutting issues such as information technology, essential for planning the next census.

1.109. At the pre-enumeration stage, the census office will need to be expanded to form the nucleus of the full census organization, which must be capable of directing the field organization during the preparatory work as well as during the enumeration. and processing In order to provide immediate supervision in each area, field offices at various levels are needed for the later part of the preparatory work, including staff recruitment and training, as well as for the enumeration period. Supervisory personnel in such offices should be persons who, being familiar with the particular area and the local language, are able to deal with local problems. This does not mean, however, that all supervisory positions need necessarily be filled by persons from the area. Personnel may be transferred from the central office or from other areas as the need arises. Prior training of all such available personnel is necessary, so that they have a working knowledge of all aspects of the current census programme. An essential part of the preparatory work is local administrative planning, which would set out the likely problems and challenges specific to the local area and how they are to be dealt with. Adequate coordination with local public authorities is always important so that the enumeration work is not interrupted due to other activities.

1.110. Subsequent to the enumeration, the census organization is usually readjusted to meet the needs involved in compiling, evaluating, analysing and publishing the results and to provide the continuity desirable for promoting the continued use of census materials . Census organisations need to pay special attention to continuity of knowledge and skills from one census to the next, since the intervening gap, which is usually a whole decade, is likely to cause loss of institutional memory and attrition of qualified personnel. Comprehensive documentation of census activities while they are being carried out, training of younger personnel to create a pool of knowledgeable and experienced persons by the time the next census comes.

6. Census communication activities: user consultations, census publicity and promotion of census products

1.111. A comprehensive programme of communications for a population and housing census covers three distinct audiences: (a) major users of census data, (b) persons and institutions participating in the census operations and (c) the general public. Since the census is a national activity that is completely dependent for its success upon the wholehearted cooperation and assistance of the general public and many governmental and local organizations, the entire communications effort should be developed as a coordinated activity in close conjunction with the other substantive preparations for the census. These communications activities are valuable not only for informing others about the census but also for providing census authorities with early and continuing information about the reactions to census plans and activities of the general public in various parts of the country and of key persons, groups and institutions.

1.112. Consultation with users of census data on topics, on definitions and, particularly, on planned tabulations and the development of the census database is an indispensable step in the preparations for the census that should be taken early. These consultations will assist the census authorities in planning for a census that, within the resources available, is as responsive as possible to user needs in terms of the collection, processing, tabulation, storage and availability of meaningful data. Such consultations can also serve to foster a wider and more informed understanding of and support for census plans and activities. The users to be consulted should be from governmental departments, ministries, universities and other research institutions, the private sector, and other organizations (or individuals) representing the economic, social, educational and cultural life of a country. The consultation process can take many forms. If done in the form of meetings, it is often more useful to hold separate consultations with different types of users with common interests, such as administrators, policymakers, planners, demographers, researchers, users in the business community and so forth, rather than a simultaneous consultation to

all data users. Such combined consultations frequently prove frustrating to participants because there are substantial differences among users in their technical background and in their concern with the details of census content and operations.

1.113a. Because of the importance of the census in providing data for local planning and administration, it is also often advisable to have consultations with users in provincial and local governments and institutions in various parts of the country. Particularly in large countries or countries where the provincial or local governments have a comparatively high degree of autonomy, consultations with users at the subnational level is essential if the full potential of the census is to be achieved. Strategies should be chosen according to the target group. Meeting data users is very efficient but imposes physical and budget limitations. Broad consultation can be implemented on the website of the census office or government. The strategy can be used both to collect suggestions from users (for example on census questionnaire) and also to give transparency towards the census preparation activities. Other forms of technology can be considered to hold decentralised or remote consultations. Users may be sent an electronic questionnaire to collect their priority information requirements, or invited to complete the questions online. Video-conferencing may also be considered if available.

1.113. In order to complete the preparatory work for the census and to carry out the census enumeration itself, the census office will have to expand its staff substantially. In addition, numerous governmental and non-governmental organizations outside the census office may be called upon to provide personnel, equipment, supplies, space, transportation or communications facilities and so on to help in the census work. As a result, large numbers of temporary personnel will have to be trained (see paras. 1.210-1.215) and the contributions of a diverse group of national and local organizations will have to be effectively mobilized. A well-planned communications programme can contribute to both efforts.

1.114. Arranging the publicity for the census is another of the important tasks in the census operation. This entails an educational campaign, the purpose of which is to enlist the interest of the general public and its cooperation. The aims, as a general rule, are not only to dissipate any anxiety regarding the purposes of the census but also to explain the reasons for the various questions in the questionnaire and to offer some guidance as to the manner in which these questions should be answered. The publicity campaign may also be an important tool for increasing the completeness of census coverage, particularly among hard-to-enumerate groups. It is desirable that planning for the general publicity campaign should start as soon as the census is authorized. The campaign itself should be closely synchronized with other census activities and full-scale publicity should not begin too far in advance of the date on which enumeration is scheduled to start. Plans for the publicity programme should be closely coordinated with those for the census tests (see paras. 1.193-1.196). The programme will have to provide the publicity needed to carry out the census tests. In addition, the programme can use these tests to study the impact of alternative publicity materials and methods. If either the cartographic or house-listing operations require extensive fieldwork and widespread contacts with the public, it should be recognized that personnel involved in these activities often provide the public with its first impression of the census. Training and publicity programmes should take this factor into account.

1.115a. The general campaign should be directed to all sections of the country and all segments of the population through the use of all available publicity media. The general campaign may be supplemented by a number of specialized campaigns aimed at specific segments of the population to sensitise on specific subjects, such as gender, migration, ethnicity and disability, in which the quality of response may depend on the level of prior sensitisation in the general public.. In multilingual countries, creating campaigns in the local languages is crucial. Apart from national and local mass media such as newspapers, TV, radio etc, the use of interactive media, such as a toll free helpline, social media such as Facebook and Twitter, Short Messaging Service (SMS), Multimedia Messaging Service (MMS) and local events where the public can participate, go a long way to improve public awareness and build trust.

1.115b. Disseminating information about the rational of the census, and its utility, helps alleviate possible misconceptions among the general public, thus increasing participation and coverage. Media advisories issued by the statistical office will usually be widely covered by the media at no cost. Outreach campaigns involving different organisations and enlisting the support of local leaders and opinion makers to spread the word about the census in their area of influence is also a good strategy. In addition to recruiting such organisations and leaders as partners, the census organisation may develop key messages, web buttons, posters and other material to support them in their activities. The use of publicity may also be considered to support the recruitment of field personnel.

1.115c. In the rural areas, weekly markets, fairs and public festivals are a good opportunity to publicise the census message among people who may not have much exposure to mass media. An excellent opportunity exists to create widespread awareness of the census through a campaign targeted at schools. Other kinds of local level publicity such as wall writing and village announcements can be planned according to the local conditions.

1.115. An integral part of census communication and publicity is informing key census data users and the general public about the availability of the census results and its utility (1.23 – 1.37).. Awareness about census data and utilisation should be done during the inter-censal period before the commencement of the next census. This is to make sure that the public recognise the importance of the census and appreciate statistics that are generated from it. It is critical that such communication strategies be developed as an integral part of census planning and not left as an optional add-on. It has been the experience of quite a few countries that the engagement of professional media and communication personnel adds value to the campaign.

7. Plans for quality assurance and improvement programme

1.117. Most countries conduct population and housing censuses, once in 10 years. Thus carrying over experience from one census to the next is fairly limited. But experience from previous population and housing censuses as well as other censuses such as agricultural census is very useful to plan for a quality assurance and improvement programme for the current one. Moreover, numerous activities that comprise the census operation have to be carried out in a limited time period. This means that countries must employ a large number of persons for census work for a few weeks or months. Usually a different set of persons are employed on a temporary basis for each of these operations. As a result, the quality of work is likely to vary from person to person, from one area to another and from one time to another. It would be very useful if errors detected from previous censuses or similar activities are documented and used as the basis for developing quality assurance measures for the next census. Each country must have a quality assurance and improvement programme in place to measure quality of each stage of the census. It is therefore important to be able to measure how well each census operation is proceeding by building in quality assurance procedures throughout the census. It should be stressed that a major goal of any quality assurance programme is to detect errors so that remedial actions can be taken even as the census operations continue. Thus, a quality assurance programme should also be viewed as a quality improvement programme. Without such a programme, the census data when finally produced may contain many errors which can severely diminish the usefulness of the results. If data are of poor quality, decisions based on these data can lead to costly mistakes. Eventually the credibility of the entire census may be called into question

1.118. The quality assurance and improvement system should be developed as part of the overall census programme, and integrated with other census plans, schedules and procedures. The system should be established at all phases of census operations, including planning, pre-enumeration, enumeration, document flow, coding, data capture, editing, tabulation and data dissemination. Following a detailed schedule will ensure that sufficient time is allocated to testing and evaluation activities at each stage, reducing the risks of errors. Establishing a quality assurance and improvement system at the planning stage is crucial to the success of the overall census operation. For a more extensive discussion of the components of a quality assessment framework, see paragraphs 1.228-1.277 below

8. Mapping

1.119. There is widespread recognition that it is important for national statistical agencies to develop a continuing cartographic capability to serve their specialized cartographic needs. Such a capability can make a major contribution to the population and housing census and other elements of the national statistical system. A continuing cartographic capability within the statistical agency can also contribute to the analysis and presentation of census results.

1.119a. Collection cartography has a major bearing on dissemination geography. While this is driven by workload consideration against tight timeframes of enumeration, it must be borne in mind that data has to be disseminated in

aggregates that make sense in usage such as reporting on villages, wards etc. Therefore the demarcation of enumeration areas must be consistent with as far as possible to domains of dissemination.

1.120. Statistical agencies, however, are usually not mapping agencies and should not, for the most part, try to duplicate the functions of one. Likewise, mapping agencies are not statistical agencies and often may not fully appreciate the statistical value of the information they hold or how best to present statistical information in map-based products. Despite this, undertaking a census can provide a catalyst for the statistical and mapping agencies to work together to the benefit of both agencies and the community

1.121. It should be stressed that there is now a wide range of techniques and technologies available for use in a census mapping exercise . The following sections do not make any recommendation as to which system would be most appropriate for any country or countries at any stage of development. Rather, these sections summarize the options available at the time of writing, from which the NSO can choose and adopt at the appropriate level of skill and experience, and note particular issues that should be addressed by countries in deciding the type of operation to be undertaken for their census.

(a) Strategic basis for a census mapping programme

1.122. The aim of census mapping is to provide the cartographic basis to be used during the actual process of counting. The census enumeration team needs to have a set of unique maps covering the entire country that accurately defines the boundaries within which each enumerator has to work during the enumeration phase of the census. Therefore, the quality of maps used in the census has a major influence on the quality and reliability of census data.

1.122a. In the pre-census stage, maps ensure coverage consistency and facilitate pre-enumeration operations (maps showing enumeration areas thus providing an essential device that guarantees coverage of the census).

1.123. In the enumeration phase, maps play a vital role in guiding enumerators to dwellings and other places where people are likely to be during the enumeration period. They are important in ensuring full and unduplicated coverage of geographic areas.

1.124. It is still the case that in many countries there are only a limited range of maps available and these often do not show sufficient detail to enable the boundaries of small areas to be clearly defined. This is particularly likely to apply in areas of unplanned settlement. It is thus common to supplement the maps with other material, such as (a) lists of households (preferably compiled by statistical agency staff as part of the process of delineating enumeration areas, but on occasion provided by local leaders) see paragraphs 1.173 to 1.176; and/or (b) a textual description of the boundary including roads, railway lines, power lines, rivers and other physical features. This description may also include obvious landmarks on the boundary (school buildings, water points and other reference features).

1.125. However, it is not appropriate for field staff to rely entirely on a list of households, written or verbal descriptions and directions, or on local knowledge of the area boundaries. Reliance on verbal descriptions or local knowledge very often leads to confusion and error because people tend to have mental images (or mental maps) of places and these images may not coincide with the area as it really is reflected in the design of the enumeration area. For the same kind of reason, the supervisor's mental map of an enumeration area may differ markedly from that of an enumerator. To overcome such problems, it is important that the best possible quality maps be the basis for census enumeration operations and that the collection staff receive comprehensive training in the correct use of the maps and associated textual material if that is provided.

1.126. Similarly, maps, which are now commonly in the form of digital products, play an increasingly important role in the dissemination phase. Statistics compiled from census data can be geographically referenced and provide for methods of analysing the geographic characteristics of those statistics. Maps may then be used effectively to relate statistical data to the geographical area to which the census results refer. This makes the statistics easier to understand and more readily usable by both expert users and the general public.

1.127. In addition to the maps required for the census, a systematic, complete and up- to-date listing of localities is required. Such a listing is needed for the coding of place names and for determining to what extent data for

localities will be tabulated. In some regions, the establishment of a definitive list of localities is a major operation because of difficulties arising from the frequent fragmentation, disappearance or combination of small localities, and from changes in name, variations in spelling, the existence of more than one name for the same place or the use of identical names for different places. This listing should be held as a formal database or as an integral component of the databases forming part of a geographic information system (GIS).[4]

1.128. Where a digital base map is prepared, this may be used in conjunction with a GIS technology as the basis for coding information supplied in the census. This could apply to address of usual residence now and/or in the past, place of work and similar topics. The most important recent developments have been in use of Global Positioning System (GPS) which has revolutionized field data collection. Personal Digital Assistants (PDAs) and other hand-held devices replacing traditional paper questionnaires are increasingly linked with a digital map of the enumeration areas and GPS for geo-referenced census data collection, thus helping enumerators find the dwellings and places where people will be counted, shortening the total amount of time required for data processing and improving data accuracy and quality. Furthermore, the new generation of high-resolution satellites provide images with enough detail to support numerous mapping applications

(b) Conceptual planning for census mapping operations

1.129. The types of maps required for census mapping include the following: (a) small-scale reference maps for use in the census agency to manage the overall operation; (b) large-scale topographic maps for use by enumerators;(c) maps of the subregions or administrative areas, for the use of managers, showing the location of small population settlements and dominant physical features, such as roads, rivers, bridges and the type of terrain. The use of satellite imagery to generate these maps is now increasingly common across countries.[5]

1.130. The lead times necessary to create, maintain, print and distribute enumeration area maps are significant, and careful consideration should be given to the mapping activity during the census planning and preparation phases. The lead time for a country will be determined by a wide range of factors, including the number of maps to be produced, the technology available to produce them, the availability of funds to acquire additional resources and the time required for distribution of the maps to field staff. However, as a working rule it could be suggested that the mapping programme be established working back from a deadline of reproducing the last map three months before the census day. This will provide sufficient time to distribute the maps prior to commencement of the training of field staff. Particular care must be taken in this regard where consideration is given to using more advanced technologies (see paras. 1.135 to 1.142). Additional time as well as human and financial resources may be required to gain the capacity needed to use the technology effectively

1.131. Prior to developing the mapping programme for the census, consideration needs to be given to the geographic classification to be used and the mapping infrastructure available to carry out the mapping tasks. As the geography on which the census is collected will determine the geography on which the census data can be disseminated, a geographic classification should be devised in conjunction with the development of census mapping. The details of designing a general geographic classification, including the definition of the various areas of the geographic classification and their relationship to one another, are more complex than those involved in census mapping and will not be covered further in this volume.[6] However, the design of enumeration areas and other census management areas are of crucial importance for the census and are outlined in the following paragraphs.

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[4] For further details on GIS mapping, see *Handbook on Geospatial Infrastructure in Support of Census Activities*, Studies in Methods, No. 103 (United Nations publication, Sales No. E.09.XVIII.8).

[5] It may be noted however that hand drawn maps by the enumerators demarcating the enumeration area with all the houses and other physical features like roads, rivers continue to have their utility in countries where the enumeration area boundary is provided to enumerators by description rather than through pre-generated maps

[6] For an example of a more detailed description of the units that are considered in one country's statistical geography, see Australian Bureau of Statistics, "Australian standard geographical classification" Bulletin 1216.0, chap.10. The range of units classified are shown in the structural chart in that chapter. Note that the lowest unit "census collection district" is equivalent to enumeration area.

(i) *Design criteria for enumeration areas*

1.132. Enumeration areas (EAs) are fundamental to both the statistical areas structure and to the census management area structure. Issues that need to be considered include:

(a) Achieving complete coverage by showing clearly that there are no gaps or overlaps in the area to be enumerated;

(b) Improving the ability of personnel to manage field operations effectively by equitable and well-defined distribution of workload amongst enumerators and ensuring that EA boundaries are designed so that they follow easily recognizable features such as roads, waterways, established walking tracks and railway or power lines to the extent possible. The use of features such as village or local government boundaries should be carefully considered, taking into account the difficulty of identifying boundaries using features such as compass bearings or lines of sight;

(c) To the extent possible the design of enumeration areas should avoid including significantly different types of housing within a single EA. This will facilitate dissemination of information on specific housing situations, such as slums (an issue specified as part of the Millennium Development Goals);

(d) Dissemination objectives also require taking into account the demand for small area data, the confidentiality of personal information and the ability to be aggregated to present information on larger geographic units. For some defined boundary areas, an approximation formed by aggregating boundaries may be used for dissemination.

1.133. Procedures should be developed that will allow comparability of areas from one census to the next. Change analysis at the local level is greatly facilitated if the units of enumeration remain compatible between censuses. A unique code should be assigned to each enumeration area and the changes (for example in case of splitting areas with high level of growth) should be tracked. The statistical office is often the custodian of coding schemes in the country and should also be the focal point for the design of the census mapping codes. In cases where this is not possible, the criteria can outline design principles that will allow users to easily compare EA-based data across censuses. When the population and housing census are conducted separately, effort should be made to use the same EA frame for both censuses as far as possible.

(ii) *Design criteria for census management areas*

1.134. Census management areas will consist of aggregations of enumeration areas brought together for ease of managing the enumeration staff. Where existing government staff and structure are used for enumeration purposes, the census management areas may be the same as the administrative regions. It should be noted that this may be a matter of administrative convenience and the particular hierarchy (or way of combining enumeration areas into larger areas) for this purpose need not necessarily be the same as that for the dissemination phase, which must be driven by the needs of users. However, the greater the congruence between enumeration areas and pre-existing administrative boundaries the easier is the task of conducting census.

(iii) *Appropriate technology*

1.135. Before census mapping commences, the census agency needs to determine the appropriate technology for mapping. Countries need to choose technologies to improve efficiency of census operations, data quality and timeliness balancing these with cost keeping in view their national needs and circumstances . The application of technology must also ensure that confidentiality of data is maintained... .

1.135a. In general, countries need to approach the use of technology for mapping as a continuous process rather than merely a sequence of mapping and dissemination operations. Use and application of geospatial technologies and geographical databases are very beneficial to improve the overall quality of census activities at all the stages of the census. Major technological advances include the widespread availability of personal computers, hand-held computers and personal digital assistants (PDAs), global positioning systems (GPS), geographic information systems (GIS) software and low-cost aerial and satellite imagery. These advances would be of interest to national statistical organizations to collect more accurate data in timely manner.

1.135b. Each country needs to evaluate how available mapping options fit into the context of its own census programme and national planning. Such issues as existing geographic resources in the country, technology resources and qualified (or skilled) staff, available funds and the time frame allocated to complete the geographic tasks for the census will determine the best mix of technology and approaches for each individual case.

1.136. In circumstances where it has not been possible to acquire appropriate base maps for areas of geography, enumerators (or other enumeration staff) may produce hand-drawn maps, accompanied by a textual description of the boundary features, to enable a successful enumeration. Hand-drawn maps do not possess the level of accuracy offered by high-quality topographic maps, but are an option when maps for an area: (a) do not exist; or (b) are too small a scale to provide sufficient detail for an enumeration area map; or (c) are seriously out of date and cannot be updated in the time available.

1.137. Where reasonable-quality topographic maps are available, they should be used as a base and hand-drawn enumeration area boundaries can be added as an overlay on transparent film and the combination photocopied for use by the enumerators. Alternatively, the EA boundaries could be hand drawn on the printed map and the result can be used further. However, either of these kinds of combination maps need to be used with caution; field personnel need to be aware that the maps could possibly have errors or inconsistencies, which it is their responsibility to resolve and record when in the field. All base maps produced for census should be referred to a unique, consistent, geodetic reference system all over the country.

1.138. Where accurate and current maps at relevant scales are not available for a country, or part of a country, the technological alternatives described in the following paragraphs could be employed subject to consideration of the constraining factors described in paragraphs 1.139-1.142:

(a) *Satellite images.* A satellite image typically covers a large area and can be cost-effective compared to other sources. Imagery should be pre-processed by the supplier so that it is rectified and geo-referenced (a known scale and orientation, with some latitudes and longitudes, is printed on the face of the image);

(b) *Aerial photography.* Acquisition of aerial photographs for large areas of a country may be expensive. However, existing archives of photographs can be an excellent resource for preliminary counts of dwellings and as a base for basic maps. In some cases digital aerial photographs can be a cost-effective by way of initiating some components of a geographic information system (GIS);

(c) *Global positioning systems (GPS).* Making hand-drawn maps, or digital maps from a GIS for use by enumerators in the field can be greatly assisted by GPS. A simple, hand-held GPS receiver will give latitude and longitude coordinates with reasonable accuracy of key points. Depending upon the system selected, a GPS may also track linear features and thus be useful for mapping boundaries. Maps printed from a GIS or hand-drawn map can be enhanced by the addition of latitudes and longitudes recorded at key points to provide orientation, scale and absolute position. Such information will be particularly valuable for dissemination purposes or if the work is a component of developing a GIS for later use.

(d) *Georeferenced address registry.* Some countries create and develop an address database in two ways. The first consists in assigning to each building address or dwelling a coordinate in a proper geographic reference system. Each building of the country receives a coordinate. The second consists of street or road segments: for each line segment in the street database, the range of address numbers needs to be recorded

for both sides of the street. It is possible to combine the two methods for different types of location, as urban and rural areas.

1.139. The implementation of strategies using such technologies must be thoroughly planned with the guidance of qualified staff or external experts with formal qualifications in the use of advanced mapping technology. It is particularly important that the cost of acquiring and maintaining the hardware required to use this technology is factored into the budget (and a sound cost-benefit analysis undertaken to support such changes), and adequate plans are made to ensure the availability of sufficient quantities of hardware in time for the census.[7] . To lower the cost of using such technologies, services and equipment can be shared with other government agencies or private companies.

1.140. It should be noted that there may be additional risks due to the need for equipment to be operated in suboptimal conditions, including poor weather, dusty conditions and/or poor lighting. Despite its versatility, GPS may not be able to differentiate the coordinates of overlapping or closely located dwellings in multi-storey buildings and in this circumstance should only be regarded as providing coordinates for the building rather than the dwelling units within it.

1.141. It is important to ensure that where such systems are employed they are clearly understood by enumeration staff. This should be achieved by ensuring that the staff, whether at the cartographic update (pre-enumeration) stage or enumeration stage, are given adequate training in the interpretation of the maps. Should the maps be incorporated in digital devices such as personal data assistants, the staff should be trained in the use of both the hardware and the software.

1.142. As with all other significant changes to census procedures, it is crucial that census geographic and mapping processes are successfully included in tests prior to being used in the main operation. This is particularly the case where a change in level of technology is being considered.

(iv) *Geographic information systems*

1.143. In recent years, many countries have adopted the use of GIS to facilitate census mapping in the production of both enumeration maps and dissemination products. As the cost is declining and the basic technology is now well established, it is expected that this will continue. It is likely that the census could be a useful catalyst for increasing capacity within the statistical office (or the country as a whole). Adoption of GIS should thus be seen as a major strategic decision with impacts beyond the census operation, and many issues need to be considered. A GIS database, a census geographic database built at the EA level, is an important infrastructure for the NSO to manage, analyze and disseminate census data, and monitor the continual change in geography between successive censuses. It also constitutes a fundamental component of a national geographic information infrastructure that allows the NSO and other national organizations to integrate socio-economic and environmental data for evidence-based decision making. A pre-requisite to the building of a geographic database at the EA level, is the development of a geocoding scheme – where each enumeration has a unique code, an administrative identifier that can be used to link the geographic features to the attributes recorded for them.

1.144. The (potential) benefits and costs of GIS are summarized as follows:

(a) Benefits

(i) A closer linkage between maps for enumerators and map-based products for users;
(ii) Enriched dissemination of census data as they can be visualised in geographical areas for easy understanding by users
(iii) The cost of intercensal updating of the base map will be less with a digital base

map, enabling among other things the construction and updating of sampling frames

(iv) Producing duplicate maps may be less expensive with a GIS solution;
(v) GIS will have increased ability to undertake quality assurance of geographic boundaries;
(vi) The census agency will have a greater ability to perform spatial queries and advanced analysis under GIS;
(vii) Space needed to store input maps for digital purposes will be far less;

(b) Costs

(i) GIS requires additional technical expertise;
(ii) GIS will require a higher level of computing infrastructure;
(iii) A clerical census system can proceed on the basis of basic maps. However, use of GIS in this task requires that a digital map base exists. If it is necessary to create the digital map base, significant lead times are required as well as significant funding. In both cases, more experienced technical staff are required;
(iv) In most cases, the preparation of maps and/or GIS will not be the core business of a statistical agency.

(v) *Contracting out for census mapping*

1.145. The development of a mapping project beyond rudimentary clerical systems requires considerable knowledge of mapping, cartography and geographic systems. In the event that a census agency cannot draw on such skills from within the agency, it may be required to contract out some or all of the elements of preparation of census maps.

1.146. Mapping for field purposes under a contract or agreement basis requires the statistical agency to specify its requirements and prepare clear terms of references (TORs) to the contractor. These may include the following: (a) acquiring the base map data; (b) creating (or obtaining) the statistical boundaries and aligning them to the base map; (c) providing a process for enumeration area designers to advise on changes to boundaries (and updates to associated spatial data); (d) producing hard copy maps as specified for field work.

1.147. The statistical agency should undertake the enumeration area design work and validation of the associated spatial data, as well as take delivery of the hard copy maps for quality assurance checks and subsequent delivery into the field. The statistical agency must also accept full responsibility for the quality standards and delivery of the maps to field staff as required. After the census, any feedback received from enumerators about the base map should be communicated to the mapping agency

1.148. Mapping for dissemination purposes may be more challenging because the outputs will involve representation of statistical information (with, or as part of, a map) and often be accompanied by analysis or commentary about the information. Advances in mapping software have made it easier for census agencies to produce a wide variety of standard thematic maps. However, advanced mapping products may require the expertise of a contractor. In these cases, it may be better for the statistical agency to focus on the statistics and let the contractor provide the technical skills required to produce the actual products with tight quality assurance procedures in place to ensure that the output from the contractor satisfies the end users requirements described above.

(c) Operational implementation of a mapping programme

1.149. The development of a mapping system within the census agency requires the coordination of a series of complex tasks with relatively long lead times. It is important that project plans are established to manage this process. The main activities to be reflected in such plans are discussed below:

(a) *Establishing a mapping unit*. The census mapping project requires a specialized

project team. Where mapping activities are outsourced, the mapping project teams will be responsible for specifying the requirements of the census for mapping products and coordinating arrangements with the provider of mapping services;

(b) *Developing a timetable.* The critical date is the date that maps must be delivered to the field. The mapping programme must commence early in the census cycle to allow sufficient time to produce national coverage of maps well before the census date and before training of field staff;

(c) *Sourcing of basic mapping and digital geographic data.* A major step in the mapping project is establishing a map base of the country, including digital map data if required. If a census mapping project already exists, the agency may still require updates to their existing holdings.

1.150. It will be most helpful if the concerned governmental authorities freeze the boundaries of various administrative units at least six months in advance of the census date so that no further jurisdictional changes are effected until the enumeration is over. This would be of considerable help in delimiting enumeration areas and, minimizing chances of omission or duplication.

(i) *Sources and types of hard copy maps*

1.151. Where a hard copy map base is to be used, official published maps may be available from national or provincial government mapping agencies, the local government or municipal bodies. Other sources of maps may be other government agencies or private companies. Where the maps are obtained from sources outside the census agency, permission to use the maps collected must first be sought from the original source and any copyright issues addressed.

(ii) *Requirements for digital mapping data*

1.152. When establishing a digital geographic database, a major consideration is the determination by the census agency of data requirements. With increasing amounts of digital spatial data becoming available, it is also important that standards and a common data specification be produced to ensure data validity and consistency.

1.153. The key rules to be followed in selecting data items for inclusion are to question whether (a) the data item will be useful to enumerators in navigating their way around their enumeration area, and/or (b) the data item is relevant to users. Assessing the utility of data items to users in a census mapping context must place significant emphasis on the users' needs for small and/or customized areas. Data items that meet neither of those criteria should not be included in the database.

(iii) *Updating maps or digital mapping data*

1.154. Preparing or updating base maps, or base map digital data, requires substantial resources. The final content of base maps will have a major bearing on the accuracy and completeness of enumeration area maps and, subsequently, the effectiveness of census enumeration. The updating of base maps should be scheduled according to priorities, based on areas in which changes to the number or characteristics of the people require the maps to be updated. Important features to be updated include (a) accurately named and presented roads and waterways, (b) administrative boundaries, and (c) landmark features, such as schools, place of worship, post offices, parks and large buildings.

(iv) *Operational design for enumeration and supervisory areas*

1.155. Whether a hard copy or digital base is employed, an enumeration area (EA) design manual should be produced that contains the design criteria and the procedures to be followed when designing EA. The manual can be used as a basis of training for those involved in the EA design process.

1.156. If possible, EA design should be conducted by regional statistical office staff who are primarily responsible for EAs in their province or region. This ensures that local knowledge can be utilized in the EA design process. A considerable part of the EA design process is the gathering of information on where population and boundary variations have occurred in order to determine the best way to design particular EAs. As a result of EA design, a list should be produced that provides the enumeration phase with all relevant field data for each EA, and the dissemination phase with relevant geographical data.

1.157. The design of field supervisor and regional area boundaries can be determined at the completion of the process through the aggregation of EAs, and the allocation of geographic identification codes.

1.158. Quality assurance measures should be implemented to ensure that data are correct to a minimum standard, both for field navigation and technical correctness in cases where a digital base is to be used as an output medium.

(v) *Printing and content of field maps*

1.159. Careful consideration should be given to the (considerable) time required for printing maps when establishing the project plan for census mapping.

1.160. Maps should be provided to every level of field staff. If paper maps are used, at least one map must be printed for every EA in the country. It is recommended that two copies of the map be produced, one copy to be used by the enumerator and the other by the field supervisor for training and reference purposes (and subsequently retained by the statistical office as input to the following census cycle). The use of computer technology for data collection such as tablets, laptops and other handheld devices may also be suitable for displaying maps available to field personnel

1.161. Other considerations for the preparation of enumeration maps (whether based upon hard copy or digital data) include the following:

(a) Enumerators may be required to navigate in poor lighting conditions and thus details should be easily read;

(b) The maps must be easily interpreted with text and symbols readily identifiable and correctly placed, along with the information being presented in a standard format compared to other source maps;

(c) Boundaries (such as EA boundaries) overprinted on the maps must be clear and unambiguous;

(d) EAs must be distinguishable when compared to the surrounding area;

(e) Folding or refolding of large paper maps (larger than A2 in size) is inefficient for staff;

(f) Paper maps need to facilitate the addition of handwritten enumerator comments;

(g) Production of the maps should be cost-effective;

(h) The maps should be suitable for reprinting to meet dissemination purposes where this reflects user demands.

1.162. Paper maps for supervisors or regional managers should be smaller scale, providing sufficient detail to identify major features but not so large as to be difficult to handle easily in the field . In many cases, the use of inset or supplementary maps may be required if the map is to cover a relatively large area. For all levels of senior field staff, the maps should show the boundaries of all subsidiary units for which they are responsible.

(vi) *Maps for dissemination purposes*

1.163. While preparation of maps, typically as hard copy, for enumeration purposes rightly receives the highest priority and attention from census managers, the need for maps for dissemination purposes should also be accommodated in the process. Data users require maps as hard copy or in digital form to understand how the EAs fit together and build up to higher geographic levels. Therefore, dissemination maps need sufficient topographic details in order to allow the boundaries and social and cultural features, such as schools, hospitals and major retail and work areas to be identified. Other factors that should be considered include the following:

(a) The formats chosen should be widely used within the country so that output products can be prepared readily to meet a wide market;

(b) The data should be suitable for commonly available desktop mapping applications.

9. Small-area identification

1.164. Two somewhat different methods are available to provide the census with a flexible capability for generating tabulations in terms of a wide variety of geographical aggregations including those needed for public and private sector data uses at the local level. The first method simply extends the traditional hierarchical system for coding all major and minor civil divisions so as to cover at the lowest level the enumeration area (EA), sometimes referred to as the "enumeration district". The second method, which at greater cost permits finer geographical specificity, is usually based on some coordinate or grid system, such as that of latitude and longitude. This method is often referred to as a "geocoding system".

1.165. Particularly in the absence of a comprehensive system of street names, numbers or similar addresses, the first method, which uses the EA as the key unit for the production of small-area data, is to be preferred. Proper administration and control of a census require that the EAs be well defined and their boundaries identifiable on the ground. It is useful to let EA boundaries coincide with natural dividing lines in the field -- not just rivers and major roads, but also limits of neighbourhoods and city blocks in urban areas. Not only does this help enumerators clearly understand the boundaries of their territories, it also prevents difficulties later on when small-area statistics have to be produced. As a rule, the EA boundaries are also traced on maps and the maps can carry the EA code numbers. The EA code numbers can then be included, along with the other geographical codes and the statistical information, at data entry. This makes it possible to produce, from the census database, any kind of recorded information for any given EA or combination of EAs at minimum cost, subject to the constraints imposed by the need to protect the confidentiality of individual responses (see paras. 1.376-1.377, on privacy and confidentiality).

1.166. The fact that census data, whether published or unpublished, are
available by EA provides for considerable flexibility. Such flexibility can be of value given that the geographical divisions used by various branches of the administration or by other data users do not always coincide and may therefore require different regroupings. Moreover, when changes are planned in administrative boundaries, tabulation of census data by the planned new entities can also be facilitated through the EA approach. However, if these changes cross EA boundaries and it is decided to try to re-tabulate the census according to the new boundaries, very complex recoding of individual records may be involved. As an alternative, statistical concordances, showing the quantitative relationship between the previous and current classifications could be used. Further, where buildings or housing units have been geocoded, these geocodes can be used to directly allocate each household to the correct area under either classification

1.167. The tabulation of population and housing characteristics by EA, which may be shown on statistical maps, is also a useful tool for analysis. On the other hand, the linkage of data from other sources is not usually possible on the EA level because of the difficulty of obtaining such information for individual census EAs. Moreover, comparison between successive censuses is possible only to the extent that EA boundaries remain unchanged.

1.168. Countries may sometimes find it useful to have even greater flexibility in the regrouping of census data into different geographical aggregations than that

provided by a coding system based on the EA. In these situations, the use of some system of geocoding may be considered.[8] Among the advantages of geocoding, particularly if based on the grid squares approach, are its permanence, clarity and uniformity, as well as the possibility that it offers of interlinking statistics from a wide variety of sources..

1.169. On the next level above the EA (or the block faces or nodes identified in a geocoding system), the situation in urban areas is somewhat different from that in rural ones. Large urban municipalities are often divided into units (quarters, wards, barrios, and so on), which may have a well-known and relatively permanent administrative status. Data tabulated by such units are of great practical value for all planning and analysis. If such area units do not exist or if they are too large for fruitful analysis, other, intermediate units may be formed for statistical purposes. These should be made as homogeneous as possible. In either case, these intermediate areas must be identified in the codes entered for each record. Possibilities for data linkage and for comparisons over time are clearly greatest for area units that have administrative status. Purely statistical areas that lack such status are the more useful the more widely they are recognized and the more permanently they are kept from census to census.

1.170. At a minimum, developing countries that are predominantly rural will certainly wish to be able to identify villages which are usually the most important local units in rural areas. In many countries , however, the village has not been uniformly a higher-level geographical unit than the EA. Although no problem arises when larger villages are divided into several EAs (as long as a village identification code is included in the record), a serious problem does arise if a single EA is composed of two or more small villages. In this situation, the EA codes cannot be used to generate village statistics. It may therefore be advisable to limit each EA either to one village or to a portion of a village or to an area not included in any village, bearing in mind that an individual enumerator can always be given more than one EA to enumerate depending upon the work load that the enumerator can accomplish during the enumeration period".. There are other problems connected with identification and delimitation of villages, and these must also be dealt with in planning the cartographic work. Owing to the organic role it plays in rural life and development efforts in many developing countries, the village should not be neglected in census plans or in census statistics.

1.171. The statistical value of the village is further enhanced when it is possible to link census village data with village data from other sources. In many developing countries a wide range of data is compiled for each village, such as location, altitude, road connections, communications, facilities of various kinds or distances from such facilities, cultural or ethnic characteristics of the population, major industries, major crops, and so forth. The village as a unit is relatively stable but in the course of time new villages are created and old ones may disappear or merge. A village directory and its cartographic base therefore require frequent updating. The use of GPS receivers to identify real-world coordinates for establishing and maintaining a village directory has great benefits (see para. 1.127).

1.172. In rural areas there may also be a need to create an intermediate statistical level between the village and the minor civil division if the former is generally too small and the latter too large for local data uses. In such cases, the intermediate units should be made as homogeneous as possible and changes in their boundaries over time should be avoided. On the other hand, it may be necessary to identify areas smaller than EA or village, particularly in the case of isolated settlements, with due care given to confidentiality considerations at the dissemination stage.

10. Living quarters and household listing

1.173. A list of sets of living quarters, structures containing living quarters or households that are available at the start of the census is an aid in the control of the enumeration, particularly in the absence of adequate and updated maps. Such a list is also useful for estimating the number of enumerators and the number of schedules and other census materials needed in an area, for estimating the time required for the enumeration and for compiling provisional results of the census. It is also very useful for determining the enumeration areas and for establishing necessary links between population and housing censuses when they are carried out separately. Finally it can be used as guide to monitor the completeness and quality of the enumeration of the population in a given area.

1.174. Consideration should be given to providing permanent identification to streets and buildings, which can be used for successive censuses and for other purposes. A listing of sets of living quarters, particularly in densely settled places, cannot be made unless streets have names and buildings have unique numbers. Individual apartments in multi-dwelling buildings need to be numbered or otherwise unambiguously identified. Where these prerequisites do not exist, numbering immediately prior to the census would prove useful.

1.175. Where such information is available, it is useful to provide the enumerators with additional assistance in the form of lists of addresses to visit. Address lists will be essential if self-enumeration, whereby questionnaires are sent to the households by mail, is part of the plan. Some countries have population registers that allow more or less complete address lists to be generated relatively simply. The census can then not only use these lists, but also assist in further improving the population register by reporting any discrepancies found in the field. Where official population registers are not available, or insufficiently complete, it may be possible to obtain additional address lists from postal authorities, utility companies or the private sector (for example, mail-order companies). A definitive list for the enumerators could then be prepared by merging the lists obtained from these various sources.

1.176. Where a good population register exists, it may be possible to pre-fill
the household questionnaires with information such as the names of the persons expected to be members of a household, already available from the register. This reduces the response burden, accelerates the information-gathering process, and helps to pinpoint deviations. On the other hand it might have a negative psychological effect if respondents believed that the authorities were monitoring them too closely. An approach using one or several registers as the point of departure for a census that still includes full-coverage field enumeration is sometimes called a register-based census. Differences between the register(s) and the field situation will necessarily come to light, and rules will be required to deal with such differences

11. Tabulation programme and database design

1.177. In most countries, the tabulation programme represents a compromise between the full range of desired tabulations and the limits imposed by practical circumstances. To ensure that this compromise is made transparently and efficiently it is important that planning the census dissemination task is started at the earliest stage of the census development cycle by a round of user consultations. Once the census testing programme has identified a practicable range of data items to be included in the questionnaire, data users should again be consulted on the specific cross tabulations required and the relative priority for their production. It is essential that the programme be outlined sufficiently early so that the procedures and costs involved may be investigated thoroughly before a final decision is reached. The type of questionnaire and the method of enumeration may limit the kinds and amount of data that it is possible to collect. Publication time and costs, and the data-processing resources available, will determine the number and complexity of the tabulations that can be produced within a reasonable time. This will enable prospective census data users to make firm plans and the census data processing staff to complete all systems analysis, programming and testing work in a timely manner.

1.178. The tabulation programme presented on the website of UNSD
is that fulfilling the most essential and/or generally required tabulations. Other requests for statistical information by specialist users will be made subsequently. The databases of census information can be used throughout the intercensal period to address such needs

1.179. It is important to plan the tabulation programme in such a way that final results can be issued within a reasonable period of time after the enumeration and before the information has become out of date for current needs. It is desirable that the details of the tables be prepared and the order of their preparation be decided early in the planning so that the processing of the data will not be delayed.

1.180. Special tabulations may be requested at any time after the census enumeration. Once the census database has been produced by recording, editing and correcting the raw data, tabulation software packages can be introduced. These packages allow fast and relatively inexpensive production of tables for selected subsets of the total database or for alternative aggregates, assuming the information has been preserved in the database in terms of the needed detailed classifications.

12. Questionnaire preparation

1.180a. Although a majority of countries are still using face-to-face interviews with paper questionnaires, many countries have started to explore multi-mode enumeration methods. Some of these methods are: face-to-face interview with electronic questionnaire, telephone interviewing, self-enumeration with a paper questionnaire collected by enumerators, self-enumeration with a paper questionnaire returned by mail, self-enumeration via the internet, register-based enumeration, and use of pre-existing administrative records. Whatever methods are chosen these need to be tested and assessed in advance for data quality and feasibility. It is also important that data security and confidentiality is maintained in whatever modes or approaches that are used.

1.180b. The design of the questionnaire must be based on the type of data collection mode and approach used. Questionnaire design should also be based on the approach for data processing, for example, whether data processing will be done through scanning, manual entry, or electronic transmission to the database.

1.181. The following paragraphs relate only to those approaches that involve direct enumeration of the individuals covered by the census. While many of the principles of designing a statistical questionnaire will also apply to the design of the administrative instruments underpinning a register-based approach, those instruments may also be based upon specific requirements of the administrative programmes they address

1.182. Further, where countries utilize the Internet or handheld device to collect
their census information, or portion of that, layout and organization of the data collection instrument may differ from that of the paper questionnaire. It is important to note that most often, adopting an Internet approach also means moving from an enumerator based approach to a self-completion approach. The questions must be designed to be completed by the respondent without outside assistance. Therefore the census management should involve the information technology team right from the questionnaire preparation stage. While many of the same principles (for example, clarity of wording, omission of unnecessary material) will apply also to an Internet and handheld device based collection of information, specialized advice should be sought regarding such issues as (a) the technology employed to present the questions to the respondent, (b) the method of capturing the response, and (c) quality assurance checks employed during the capture process.

1.183. A crucial principle is that questionnaire design must be regarded as part of an integrated process of satisfying users' demands by collecting, processing and disseminating information provided by respondents.

1.184. The type of questionnaire, its format and the exact wording and arrangement of the questions require the most careful consideration, since the handicaps of a poorly designed questionnaire cannot be overcome during or after enumeration[9]..Among the many factors that should be taken into account in designing the questionnaire are the method of enumeration, the type of questionnaire (see para. 1.164), the data to be collected, the most suitable form and arrangement of the questions, technologies used and the processing techniques to be employed.

1.185. The method of enumeration- in particular, whether the form is to be canvassed and filled by the enumerator or is to be filled by the respondent (see paras. 1.197-1.200) governs to some extent the type of questionnaire that can be used (for example, single individual, single household or single set of living quarters, multiple household or multiple living quarters, combined population and housing). It may also impact up where each type of questionnaire can be used and the framing of the questions and the amount of explanatory material that must accompany them.

1.186. It is important that questions and response options are free from ambiguity. Moreover, questions should not be offensive; in many cases this can be avoided by excluding extremely sensitive topics from the census questionnaire, but care must always be taken to consider the reaction of respondents when designing questions. In

[9] In this regard, testing the questionnaire using eye-tracking technology is beneficial to design questionnaires more scientifically as reading patterns of respondents can be recognized technically through this test. Eye tracking is a technique using "an eye tracker" whereby an individual's eye movements are measured so that the researcher knows both where a person is looking and the sequence in which their eyes are shifting from one location to another. An eye tracker is a device to gather data about eye position, gaze direction or eye movements by using projection patterns and optical sensors. It is useful in exploring how changes in the visual or syntactic part of a questionnaire may improve respondent's attention when reading survey questions

addition, it should be noted that the quality of information collected in a census will be reduced if the questionnaire is excessively long. These issues should be carefully assessed during the testing programme including cognitive test and the so-called *pilot census* (see paras. 1.195-1.196) since poorly worded questions will not only collect poor quality data, but, by confusing respondents and/or enumerators, may also impact upon subsequent questions in the questionnaire.

1.187. Special provision will have to be made if two or more languages are used in the country. Several methods have been used to deal with this situation, such as (a) a single, multilingual questionnaire; or (b) one version of the questionnaire for each major language; or (c) translations of the questionnaire in the various languages available in the enumerators' manual. or on the Internet site for the Census. The problem is more serious in the case of non-written languages. Information on the distribution of languages in the country is important for sound census planning and, if not available, will have to be collected at some stage of the census preparations. Staff recruitment and training procedures (see paras. 1.210-1.215) will also have to take language issues into account

1.188. If the housing census and the population census are to be carried out concurrently, it will be necessary to consider whether a single questionnaire should be utilized to collect information on both population and housing topics. If separate questionnaires are used, they should be uniquely identified in a way that links the component forms so as to permit subsequent matching, both physical and automated, of the data for each set of living quarters with the data that refer to the occupants thereof. This will be particularly important where a single housing form is used to cover separate personal forms for each individual.

1.189. When paper questionnaires is used for data collection, the use of processing techniques,[10] such as optical mark reading (OMR) and intelligent character recognition (ICR) will have a significant effect upon the questionnaire design(see paras. 1.304 to 1.306) . In the case of OMR, it is necessary both to allow for the spacing of response areas and to ensure printing is undertaken to precise tolerances so that the data capture software is able to capture all required data but not any of the material around the designated response areas. With regard to ICR, it is crucial to allow sufficient room for response areas and to ensure that these are designed according to the requirements of the processing system so that each response box contains only one character, and that the character is correctly formed (usually in upper case). In most modern ICR software, the provision for colour drop-out needs very precise tolerances in the colours used and will need high-quality printing . In turn, many decisions regarding the detailed design of the processing system are dependent on the final content, form and arrangement of the questionnaires. As noted in paragraph 1.188, where the scanning process requires that a booklet questionnaire is separated into component pages, it is important that some form of linking (for example, by serial numbers or bar codes) is employed to ensure that the correct information is amalgamated in the computer records.

1.190. Questionnaire design must be driven by a planning process based upon dialogue between the statistical agency and those demanding information. Information to be collected must respond to user needs both at national and international levels and therefore user consultation is crucial in this regard. Previous census questions which are no longer relevant must be dropped as these do not add any more value. This is essential if the questionnaire is to be designed to provide the information needed by users. This will, in turn, determine the tabulation programme, as it is to some extent conditioned by the limitations imposed by the questionnaire.

1.191. The final questionnaire(s) must be drafted in time to allow for printing
and developing the data collection application, in case of using electronic questionnaire (making allowance for the many contingencies, such as industrial action and breakdown of printing equipment, delay of programming activities, that can arise in these processes); undertaking quality assurance checks to ensure the printing is of sufficient quality to be used in the data capture regime and the data collection application is running correctly under the data entry rules; adequate training of census officials at all levels, and adequate publicity to be generated on the content

1.191a. As some countries are also utilizing internet portals and handheld devices for conducting census, sufficient time must be given to design, develop, test and implement bug free e-questionnaires and related software systems.

Last minute inclusion or changes in the questionnaire may affect the overall quality of the programs in turn the census results.

1.192. In view of the many issues to be addressed in designing a census questionnaire, it is not feasible to suggest specific model questions for the census topics covered in part two. However, images of all census questionnaires that have been made available to the United Nations Statistics Division have been placed on the Division's website (see http://unstats.un.org/unsd/demographic/sources/census/censusquest.htm) together with research papers relating to questionnaires used to collect information on the various topics recommended for collection and also using the different technologies (internet, handheld).

13. Census tests

1.193. The testing of various aspects of a census plan prior to the enumeration is a very useful practice for all countries, and an essential one for countries without a long history of census taking and for those in which fundamental changes in census methods or use of new technologies are being considered. Census tests can be designed for different purposes and in different ways. To yield full benefits, tests should be employed for all stages of the census, including enumeration, processing and evaluation of results. Separate test should be conducted to test new technologies such as internet and handheld devices in order to allow identifying problems linked to the data collection application design and architecture, the data transfer system as well as the integrity and security of data transferred. Such tests can give important information on the adequacy of the field organization, the training programme, extent of respondent burden, the processing plan, budget and other important aspects of the census. They are particularly valuable in probing for weaknesses in the questionnaire, in the instructions or in enumeration procedures that might affect the quality of the data. They can be designed to provide information on the relative efficacy of alternative methods of enumeration and technology, and on the average time required for enumerating a single household or a single set of living quarters. Such information is useful in estimating staff and cost requirements. In addition, census tests serve as practical training for the nuclear staff of supervisors and other officials.

1.194. The first kind of tests carried out during census preparations are questionnaire tests. Their purpose is to test the suitability of intended census questions, including their formulation and the instructions provided, as well as the suitability of the questionnaire design. Such tests can be particularly helpful in assessing the suitability of the proposed material for enumerating specific population groups, as well as the general public. These tests are also used for estimating the time requirements in enumeration. It is practical to carry out questionnaire tests on a small scale in several purposively selected places. Because they are relatively inexpensive, repeated rounds of questionnaire tests may be carried out until a satisfactory questionnaire has been evolved.

1.195. A comprehensive test of all census procedures is often called a "pilot census".
Such large scale tests should be designed and managed to thoroughly test the entire system. Essential features of a pilot census are coverage of one or more sizeable administrative divisions and encompassment of the preparatory, enumeration and processing stages of a census, by which it thus tests the adequacy of the entire census plan and of the census organization.. In order to best serve this purpose, care should be taken to ensure that conditions in the pilot census are close to the conditions that would be present during the actual enumeration, For this reason, it is often taken exactly one year before the planned census so as to conform to the expected seasonal patterns of climate and activity. It is generally unwise to consider the pilot census a source from which to derive usable substantive data. Apart from the sampling problems involved, such a use inevitably detracts from the central purpose of the pilot, which is to prepare for the main census

1.196. It is critically important to undertake a set of tests of the information and communication technology (ICT) solutions that are planned to be applied in the census. Depending on the extent and characteristics of ICT, these tests should include all ICT components related to the field work, data transfer or entry and processing well ahead of the census itself. This is particularly important if a new technology is being introduced, such as internet, handheld devices or other electronic collection tools, and scanning the questionnaires as a means of capturing data. Tests should include the testing of applications, systems and the equipments itself, as well as the underlying circumstances necessary to avoid equipment malfunctioning, such as climate, or significant delays due to inadequate

quality of paper causing paper jams or unexpected problems in programming activities. In the context of new approaches using electronic data collection testing should include daily data transfers to the major depository of data. Testing the efficiency of data entry rules, coding, editing and tabulation applications should be done based on results collected by the *pilot census*.

14. Plan of enumeration

1.197. Different approaches to enumeration are possible. Traditionally, each household is contacted and enumerated on a face-to-face basis. This approach is still used in most developing countries and for at least part of the population in many developed countries. In those circumstances where up-to-date and comprehensive address or population registers exist or can be established and the level or literacy is high, the enumeration process often involves mailing out the census forms, or having the public mail back the completed forms, . Where telephone and internet services have broad coverage, telephone and internet data collection can also be used. Approaches such as mailing, telephone and internet data collection may also be used in combination to the face-to-face interview mode. Whatever approach is to be used, the complete enumeration plan should be prepared well before the enumeration begins. This involves (a) the determination of the enumeration method to be used and the basic procedures to be followed in the collection of the data and the control of the enumeration, (b) the procedures for the control of the quality of the data and (c) an estimation of the number of sets of living quarters and the probable size of the population to be enumerated so that the number of questionnaires and other materials required for the enumeration, and the number of enumerators and supervisors needed, can be properly ascertained.

1.198. With the advent of the Internet, several countries have also employed enumeration methods that allow respondents to submit their questionnaires through the online equivalent of their paper census questionnaires. It should be noted that only countries that have high penetration rates of information technology including the Internet have implemented this method, and mainly in conjunction with more traditional ones. It should also be mentioned, however, that these options may never entirely replace the need to conduct face to face enumeration as even where the society enjoys a high degree of using information technology, the theentire population cannot be reasonably expected to comply to a mode of self-enumeration.

1.199. The universal enumeration of population and living quarters should be made on a geographical basis, that is to say, the country should be divided into census enumeration areas, which can be clearly distinguished on ground. Normally, each area should be small enough to be covered by one enumerator during the period of time allowed for the enumeration. There may however be cases where larger areas are carved out as enumeration areas. In such cases, sub enumeration areas could be formed and assigned to more than one enumerator. Other sources of information, such as registers of population or registers of properties, could be used to produce census data in countries that have established continuously updated population registers of high quality and good coverage. It should however be noted that the presentation of data need not be at the level of the enumeration area but could be aggregated at an appropriate smallest level of geography.

1.200. Special attention should be given to the procedures to be followed for the enumeration of nomadic and semi-nomadic populations. These procedures should take account of the specific difficulties in locating such population groups, which are characterized by movement from place to place (see paras. 1.281-1.283). Special arrangements may also need to be made to enumerate homeless persons as well as the special categories listed in paragraph 2.41 below, to the extent that these categories are included within the scope of the census. Where their number warrants, additional information that would indicate the reason for homelessness may need to be sought.

15. Plans for data processing

1.201. Plans for data processing should be formulated as an integral part of the overall plan of the census, and those responsible for the processing of the census should be involved from the inception of the planning process. Data processing will be required in connection with the results of census tests, compilation of preliminary results, preparation of tabulations, evaluation of census results, analysis of census data, arrangements for storage in and retrieval from a database, identification and correction of errors, and so on. In addition, data-processing technologies are playing an increasing role in the planning and control of field operations and other aspects of census administration. Data processing has an impact on almost all aspects of the census operation ranging from the

selection of topics and the design of the questionnaire to the analysis of the final results. Therefore, data-processing requirements in terms of personnel skills and knowledge, , space, equipment and software (computer programs) need to be looked at from the point of view of the census as a whole and at an early stage in the planning

1.202. The existing data-processing staff will certainly need to be expanded and will probably need some upgrading in terms of skills, particularly if new computer hardware and/or software is to be used in the census. Any training that is required should be completed early enough so that those benefiting from the training can play an active role in census planning and operations.

1.203. Decisions will need to be made concerning the location of the various data-processing activities within the country, including the extent to which the processing work is to be decentralized. This decision should be partly based on the ability to recruit the required personnel for the processing operations. Acquisition of both equipment and supplies can require long lead times; estimates of both data capture and computer processing workloads must be made early to enable timely procurement. Closely related to the question of equipment is that of the provision of adequate space. Although the maintenance of most personal computer equipment no longer requires adherence to rigid standards in terms of temperature, humidity, dust and so on, attention to issues related to power supplies is still important. Inevitably, more important is the attention to be devoted to the maintenance of servers (especially heavy duty servers), where most of the information processing is likely to take place and saved, as well as the data-transmission infrastructure. The last issue is essential to ensure smooth and noise-less Internet and/or web communications between different units and centres engaged in census operations. Moreover, in the case of traditional archiving, well-protected space for the storage of the completed census forms before, during and after processing will have to be secured.

1.204. In addition to considering the hardware, decisions will have to be made on the software to be used in editing and tabulating the census data. Several portable software packages are available for census editing or tabulation. Commercial personal computer spreadsheet, database or tabulation packages are also available. Every country should assess its software requirements in the light of its own needs and resources. Regardless of the software used, sufficient time will have to be allowed for customisation of the software and training staff in its use.
..

1.205. Outsourcing some of the predominantly IT-related operations may be considered. Outsourcing should be implemented in such a way as to bring immediate economic and quality advantages to census operations. Furthermore, national statistical offices should take adequate measures to ensure that outsourcing of census operations does not compromise data confidentiality and that necessary steps are taken so that the contractor does not have free access to the basic census databases. It is worth mentioning that responsibility for hosting of census databases rests with the national statistical offices and that outsourcing of these activities is not recommended. In short, outsourcing should be implemented so as to facilitate a transfer of knowledge into the census organization and always in such a way that essential features, such as the privacy of individual respondents and the confidentiality of the data, are fully protected.

16. Plans for evaluation of census results

1.205a. The quality of population and housing census data is very important for many reasons, building public trust and understanding in the national statistical system. The purpose of census evaluation is to provide users with a level of confidence when utilizing the data, and to explain errors in the census result. It is therefore important to choose an appropriate way of sending out these messages to the right group of people. It is universally accepted that a population census is not perfect and that errors can and do occur at all stages of the census operation. Therefore, many countries recognise the need to evaluate the quality of their census results.

1.205b. Errors in the census results can be classified into two general categories - coverage errors and content errors. Coverage errors are the errors that arise due to omissions or duplications of any of enumeration units: persons, households or housing units in the census enumeration. Content errors are errors that arise in the incorrect reporting or recording of the characteristics of persons, households and housing units enumerated in the census.

1.205c. There are a number of methods used to evaluate census results including: demographic methods (including indirect techniques); comparison of census data with results of existing household surveys and previous census results; and post enumeration surveys. Each method has advantages and disadvantages with respect to its technical requirements, underlying assumptions and organisational aspects.

1.205d. A census evaluation program should be developed as part of the overall census program and integrated with other census activities. Therefore, it should be planned in the planning phase of the census. Scope and objectives of evaluation programme should be decided well in advance to determine early enough the adequate resources (both financial and human resources) needed for evaluation programme. It is important to establish a team responsible for planning, organisation and implementation of evaluation programme. The cost of evaluation should be covered in census budget as separate item. For more detail discussion of methods for census evaluation, see paragraphs1.379-1.400.

17. Plans for census outputs and dissemination

1.206. A census is not complete until the information collected is made available to users in a form suited to their needs. A wide range of statistical products can be made available to the public, the private sector, government agencies, local authorities and the academic and research communities. The information may be included in published tables or reports for general distribution, online in various tabular or graphical formats, produced as tables in unpublished form for limited distribution or stored in a database and supplied upon request either on magnetic and optical media . A detailed plan for producing different census outputs should be guided by early user consultations (1.112) to ensure data and information requirements will be met in a format commensurate with user needs and demands; such a plan will also be a useful guide to prioritizing data processing and tabulations

1.207. Not all of the processed materials need to be disseminated widely or in a single format. Tabulations required by only a few users can be supplied in unpublished form. Some data may not be tabulated until they are required at a later date. The information stored in the census database allows fast and relatively inexpensive production of additional tables. Countries may offer on-demand services to provide census information to users who require tables or other outputs not produced, or aggregates not available, through other means. If suitable electronic dissemination is available, customised tabulations and applications might also be designed and extracted directly by end-users. In this case, the census organization should prepare in advance and then implement an authorization and security policy, so that the risk of breaching confidentiality in data provided to outside users is avoided.

1.208. Printed publications, despite their production cost, remain in many countries the preferred vehicle for dissemination of the main results. Target
dates for publication should be determined well in advance and processing and printing programmes should be planned accordingly. In addition to traditional methods of printing, there are various methods of reproduction available that are fast, economical and good-quality, and these should be investigated. For an increasing number of users,, computer-readable magnetic and optical media as well as online electronic data dissemination are a better means than printed paper, based on the factors of cost, storage capacity, (and therefore weight of documents), ease of reproduction, and direct availability of the data for further computer processing. In addition to the processed Tabulation, sample data at the unit level is also provided by some countries for research purposes. In such cases, the sample should be carefully drawn to ensure adequate level of representation while at the same time ensuring that anonymity is not compromised. Some countries have also adopted very creative techniques for data dissemination and visualisation. The development of such data products should be part of the planning process of census

1.209. A wide range of dissemination strategies must be developed for meeting the requirements of different users. Appropriate technologies and media need to be identified for effective and easy dissemination of census data and information. Geographical Information System (GIS) makes information more user-friendly by including thematic maps. Census maps in printed or digital form, should be included in the overall dissemination programme of a population and housing census. Budgetary provision should be made in the initial planning stage itself. In addition to preparing maps for the census tables and reports, countries should also produce a population atlas and try to make most data available in a geographic information system on a CD ROM, at different and nested levels of administrative geography, thus exponentially increasing the usefulness and utilization of census data. A number of census products have been developed that allow data-users to visualise and customise data on maps. These are

available as on-line, off-line computer and mobile applications. Depending on the need and resources available, the development of such products should also be explored.

18. Staff recruitment and training

1.210. Early arrangements are necessary to secure the proper number and type of personnel required for each of the various census operations. For reasons of efficiency and economy, it is important that the staff be selected on the basis of competence. Consideration may also be given to the use of the same staff for successive operations, thus reducing the turnover of personnel. While the preparatory and processing work generally calls for office employees possessing or able to learn certain specialized skills (cartographers, coders, data entry operators, programmers and so on), the enumeration stage usually demands a large number of persons capable of going to their assigned urban or rural enumeration areas and collecting the information according to specific definitions and instructions. The number of enumerators required being quite high compared to normal staff strengths, and the period for which their services are needed being rather short, the method of recruiting them needs to be worked out carefully in advance to facilitate quick, simultaneous, and transparent hiring and subsequently compensating them and relieving them from their duties promptly and efficiently. Consideration should be given to computer skills if electronic means of enumeration are going to be used. It is essential that the enumerators and, to the extent possible, their immediate supervisors be conversant with the languages or dialects of the area in which they will be working. It is only prudent to recruit and train sufficient reserves to take care of any attrition

1.211. Once the cartographic preparations are substantially complete and the questionnaire has been sent for printing, perhaps the single most important means that the census authorities have for influencing the success of the census is the training programme. The contribution that a well-planned and executed training programme can make to the quality of the census results therefore cannot be stressed too strongly. Such a training programme must of course focus on the widely dispersed and difficult-to-supervise field staff (namely, the enumerators and their immediate supervisors) but it must also cover others (for example, the higher-level supervisors, editors, coders, computer operators). Giving all office employees who are working with the census preparations a brief, uniform basic training of all aspects of the census has the dual advantage of ensuring that everyone understands the importance and the context of their part of the task; secondly, since they are conversant with the basics, they can be swiftly deployed in the field for supervision or coordination during the actual census operations whenever and wherever needed.

1.212. The entire census training programme should be designed to cover each phase of the work and provide an efficient and consistent means of effectively equipping large numbers of fresh employees with the necessary skills . The programme will need to correspond closely to the needs of the various operations and, where appropriate, may include both theoretical and practical instruction, with emphasis on the latter. In the case of the enumerators and their immediate supervisors, the training is most effective if it includes several opportunities for the trainees to participate in practice interviews and role-playing exercises , including the use of adopted IT solutions, if any. (In countries in which multiple languages are used, the method and content of the enumerator training programme will need to be suitably adjusted. For example, if the questionnaire is printed in another language, provision will have to be made for instructing enumerators on the correct formulation of the census questions in the vernacular). Enumerators and supervisors should be trained as close to the field operations as possible so as to avoid recall lapses. This leaves very less time for conducting the training. Therefore, the logistics need to be worked out carefully in advance. The training programme for editors, coders, operators of data recording equipment and so forth should also provide opportunities for the trainees to practice under the supervision of the trainers. . The intermediate- and higher-level technical staff, such as programmers and system analysts, should also be givenspecial training with emphasis on recent technical developments of relevance to the forthcoming census and on the interrelationships among the various aspects of census plans and operations. Thorough training in census is an extremely important component of quality assurance. Elaborate documentation of instructions with appropriate illustrations is a basic requirement in this regard. A proper training methodology and a variety of training aids would go a long way in enhancing the training effort.

1.213. The organization and conduct of training courses should be entrusted to those having the necessary qualifications to carry out this task successfully, taking into account not only their professional abilities but also their ability in teaching. This means that staff in charge of training should have certain qualifications that will enable them to stimulate the interest of trainees and to transfer the required knowledge, since otherwise well-qualified

technical personnel who are unable to transfer their knowledge to the trainees in a satisfactory manner will be unsuitable as instructors for group training activities. This must be taken into consideration when selecting instructors and it is recommended that objective criteria should be used. In practice, however, it is difficult to find the necessary number of instructors who have both the professional and the teaching qualifications; for this reason, the instructors selected should themselves undergo training in how to organize and conduct training courses. The use of professionally designed training guides can add immense value to the training effort. The involvement of experienced professional experts in the design and delivery of training programmes is also very useful. It should be however noted that the content should be the responsibility of the census authorities and not that of outside experts.

1.214. It is important that training manuals for each training programme are made available to the census organizers and training instructors. Such a manual would be a valuable guide and would help considerably in the efficient training of census staff. It would also contribute to the uniformity of training, which is an essential factor for a successful enumeration, taking into account the great number of census instructors who will be engaged in training. Simple audio-visual aids (for example, film strips, posters, compact disk recordings) can also be used to help make the training more effective and uniform throughout the country. If available, new multi-media technologies can facilitate the provision of training at distant locations (distant learning) and be effective and efficient supplementary tools for training. Standardized training may also be provided in e-learning format on Internet and on hand held devices..

1.215. It is very important to determine the time required to train staff for the various aspects of the census. This depends on several factors like : the task for which they are being trained, , the complexity of the content, the educational level of trainees, the number of instructors available and the funds available. .Apart from fixing the number of days for training, it is also important to allocate appropriate time for each subject. Drawing up lesson plans for each session of training is an effective way of ensuring that all subjects are covered with the right amount of time being devoted to it.

19. Avoiding gender biases and biases affecting data on minority populations

1.216. Gender-based stereotypes can introduce serious biases in census data and the conclusions drawn from these data. These biases are discussed in more detail in part two (see, for example, paras. 2.114-2.119 and 2.231-2.300 relating to household relationships and economic characteristics, respectively). There is much that can be done in the preparatory stages of the census to help minimize gender-based biases. These preparatory activities are of two broad types: those related to census content and those related to census operations.

1.217. Issues of census content, including what information is sought and how, the definitions and classifications used, and the manner in which databases and tabulations are specified, are important in generating data needed to examine questions of gender equity. In addressing these content issues, census planners and users will need to be alert to prevailing stereotypes so as to develop a census that both minimizes the influence of the stereotypes that respondents may hold and avoids further perpetuation of these stereotypes.

1.218. With regard to census operations, particular attention will need to be given to
the selection, training and supervision of the field staff. This involves ensuring that both men and women are recruited to the field staff (both as interviewers and supervisors) and that manuals and training materials cover gender bias issues just as they do other important sources of error. Consultations with women's groups and others concerned with gender equity can help in addressing both content and operational issues

1.219.Gender-related stereotypes and biases are concerns that have relevance for all countries. Census authorities in a number of countries must also be alert to the possibility of stereotypes and biases affecting data on minority population groups. Such groups may include ethnic, linguistic, national, racial, religious, indigenous and nomadic minority populations. Persons with disabilities may often be subject to similar bias.As with gender issues, the problem will need to be addressed in terms of both census content and census operations. Representatives of these minority groups can often provide census planners with important information and insights relevant to both census content and operations. Thus, special efforts should be made to consult with them when planning the census. In the

case of minority populations living in isolated settlements or enclaves, such consultations are often critical for minimizing under-enumeration among these populations

B. Contracting out

1.220.Today, many countries contract out some tasks or activities of the census as a way of increasing efficiency by utilizing the advanced methods and technologies not necessarily available in the national statistical office or public sector responsible for conducting the census. At the same time, cost reduction through a competitive selection process can be achieved. However, not all census tasks are appropriate for outsourcing or contracting out and by doing so, will not bring the desired benefit of strengthening national capacities. Census activities may be broadly classified as core and non-core activities. As a general rule of thumb, core activities should not be contracted out. If for some reason, core activities need to be contracted out, then it is essential that the strategic control of such activities should firmly be with the census authorities at all times.

1.220a. The terms of engagement (scope of work), the deliverables and the timelines should be clearly laid down with definite dispute redressal mechanisms.
Illustrative examples of items of work that can be contracted out are as follows:

a) Design and printing of census questionnaires
b) Packaging of census questionnaires
c) Dispatch and delivery of census material
d) Census mapping
e) Publicity and Public Relations
f) Training
g) Return collection of census questionnaires and other material
h) Inventory and storage of filled in questionnaires
i) Scanning/Data Entry
j) Data Processing and Tabulation
k) Publication and Dissemination

1.220b. Time is of essence in all these activities and it is vital that adequate time is allocated. At the same time, back up plans should be in place without fail in order to deal with any failure on the part of the vendors. Fundamentally, census operations are time critical and commercial compensation is secondary. Depending on whether an activity is on the critical path or not, adequate flag should be provided. Milestones and timelines are also essential. The moment, there is a failure in achieving any milestone, alerts should automatically be raised.

1.220c. The appropriateness of contracting out should be determined step-by-step and after subdividing the overall census tasks into stages. In the context of quality management, the outsourcing of components of census operations still requires the national statistical office to take full responsibility for, and manage the quality of, the census data. Throughout the overall process, activities should be conducted by a method (considering accuracy and timeliness of the results) that can best satisfy the general public. No part of the work tasks should be done by a method that may result in loss of trust of the general public. When outsourcing, the statistical office needs to ensure that it continues to be in a position to understand and manage elements that contribute to final data quality So, in judging the propriety of contracting out, it is recommended that national statistical offices should carefully consider the following criteria:

(a) Strict protection of data confidentiality;
(b) Method of confidentiality assurance that satisfies the general public;
(c) Guaranteed measures of quality assurance;
(d) Ability to manage and monitor the outsourced census tasks/activities;
(e) Control over the core competence of the national statistical office, and appropriateness judgement, considering the specific situation of each country.

1.221. Confidentiality assurance is the first and most important issue that should be considered by national statistical offices. National statistical offices are responsible for data confidentiality, in terms of both perception and reality. It is extremely harsh for national statistical offices to find leakage or misuse of confidential information by ex post facto monitoring and controls. Consequently, contracting out of tasks that have the risk of such an incidence should be avoided. For example, in the phase of data gathering, it is highly recommended that contracting out should be avoided because the task is closely related to the earning of trust from citizens and the strict protection of confidentiality. Where temporary enumeration staff are engaged under contract, this should be done in such a way that they are subject to strict measures of monitoring and control by the national statistical office. These enumeration staff should be engaged in such a way that their activities are governed by the relevant statistical legislation to preserve the confidentiality of the data they collect.

1.222. The second important and related issue that should be considered carefully is conveying confidentiality assurance to the general public. As described in the "Essential roles of the census" (see paras. 1.1-1.3), a census should be undertaken by the method that can produce the most reliable results and in a manner that wins the trust of the general public in terms of both perception and reality. If either one of these attributes is not met, then the method used as well as the results obtained may not meet the approval of the general public and could result in the existence of the census itself being highly questioned. Thus, protecting data confidentiality refers not just to the actual protection of confidential data, but to protecting the perception of confidentiality among the general public and providing a sense of inward security.

1.223. The third significant issue to be considered in outsourcing is the guarantee of quality assurance in the outsourcing environment A key point is that the national statistical office is satisfied that the goods or services paid for are provided. Cost should not be the first priority in considering and judging the successful bidder in this respect unless prescribed by procurement rules. Although it is desirable to engage in fair competition among several companies to reduce costs, it is worth mentioning that merely considering low price bidding as a determinant factor may adversely affect the quality of the job to be done by the successful bidder. Low quality work could cause a significant loss of trust among the general public.To assess the quality of work, as part of the contract allocation process, potential contractors should be required to provide samples of their work (for example, for printing, manufacturing satchels, and other work), or if this is not possible, to list referees who could be contacted to verify their claims and/or sites at which previous work can be inspected. The contracting process should state all the key requirements for the services sought and bidders should be measured against these. Although not a guarantee of quality, it will minimize surprises. Once the contract has been awarded, continuous monitoring of the progress of work entrusted to the selected company is necessary and the national statistical office should ensure that a system for monitoring quality is built into the contract. Consequently, in considering the proper contracting-out procedures, national statistical offices should also take into account the costs for constructing a system of surveillance for monitoring progress of the work being contracted out

1.224. The fourth major issue in outsourcing census activities is the procedure of assessment and evaluation of the capabilities of the candidate companies. A quality assurance framework and implementation should be established in a first phase of outsourcing. Through this procedure national statistical offices should fully assess both the capabilities and the disabilities of companies in order to select the winner to which the activity/ies in question are to be outsourced. It is highly recommended that practical and financial peculiarities of companies should be considered after the assessment of their capabilities. Each private company has a potential risk of bankruptcy or of changing the field of its activity. It should be kept in mind that if a selected company is unable to fulfil the assigned tasks, the probable problems might not be resolved by applying penalties. However, a very significant problem that could occur is that people might not be able to make use of accurate and timely census results. In such a case, national statistical offices might lose the trust of the general public in the census and even in future censuses or other routine statistical projects conducted by the statistical office. It is, therefore, very important for national statistical offices to adopt a method in which risks are as low as possible.

1.224a. Some approaches to outsourcing put an emphasis on "turn key" arrangement – in which contractors deliver system according to a set of predetermined client specifications with the expectation that the client focuses solely on the outputs and not the internal working of the system. This assumes that the census agency completely understands and can fully anticipate all data quality issues that might arise during the census and has included these in the

specifications. The client is not expected to have any understanding of how these systems work or how they might contribute to the final outputs. Any changes to the system typically require cumbersome processes to determine contract responsibilities and heavy financial costs. This sort of approach effectively hands over the quality of the census data to the contractor, while the risks associated with intervention remain with the census agency. It removes any flexibility and greatly restricts the ability of the census agency to react to quality problems that emerge during processing.

1.224b. Suppliers should be made fully aware of the quality targets at the outset of the census programme, and the quality requirements of the outsourced components that enable the overall census quality target to be achieved. Operational quality control should apply to outsourced services in the same way as those that are not outsourced

1.225. In addition to managing the outsourced activities or tasks, the ability or the flexibility to cope with sudden or unpredicted change in the situation is also very important. It should be mentioned that contracting out does not necessarily mean lower costs; sometimes the burden of monitoring cost, emergency costs and other matters may jeopardize the census. It is recommended that some tasks and /or activities which are hard to manage should be done by the national statistical offices themselves. National statistical offices should judge and determine whether to contract out census activities from this viewpoint.

1.226. It should also be recommended that for critical activities, such as the coding of education, occupation and industrial classification, special care should be taken to ensure adequate training of the personnel to undertake the task, particularly when it is contracted out. The same amount of care and training is required even when the task is performed by the national statistical office or the census organization. This is due to the fact that the coding depends on the minor differentiation and level of coding (general and detailed classifications according to different coding standards), as well as the coding manual and the education of the coders. In the light of such subtle criteria for judgement, it is difficult to prepare a complete coding manual in advance before checking the filled questionnaire.

1.227. Censuses are large operations with massive quantities of data that require coding and editing. To reduce the staff resources required and to improve timeliness, uniformity and accuracy, automated coding procedures may be employed. Some countries have already implemented automated coding procedures for addresses, countries, education, occupation, and industry. The development of the application software could be contracted out although the rules to be followed must be carefully specified by the national statistical office, which should retain responsibility for implementing the system. The software application can often be used for other statistical collections undertaken by the national statistical office When outsourcing, the staff of the national statistical office should be able to modify the parameters of such operations themselves at little cost and in a timely manner. By having this ability, the national statistical office can manage the appropriate balance between data quality, cost and timeliness.

C. Quality assurance and improvement programme

1.227a. Quality management should be comprehensive and should cover all activities including planning, development, data collection, processing, evaluation and dissemination of results. If census data is of poor quality, decisions based on this can lead to mistakes and eventually the credibility of the entire census may be questioned.

1.228. There is general agreement that, ultimately, quality has to do with user needs and satisfaction. In statistics, quality used to be primarily associated with accuracy; in other words, taking mainly into account errors, both sampling and non-sampling, which influence the value of the estimates, and intervals based on such knowledge upon which precise confidence statements could be made. Such measures are still considered necessary, but it is now recognized that there are other important dimensions to quality. Even if data are accurate, they do not have sufficient quality if they are produced too late to be useful, or cannot be easily accessed, or conflict with other credible data, or are too costly to produce. Therefore, quality is increasingly approached as a multidimensional concept.

1.229. It is suggested that the output of any statistical exercise should possess some or all of the following attributes:

(a) Relevance, understood as the degree to which statistics meet users' needs, and suggests the need to avoid production of irrelevant data, namely, data for which no use will be found;
(b) Completeness, degree to which statistics fully cover the phenomenon they are supposed to describe;
(c) Accuracy, distance between the estimated value and the (unknown) true value;
(d) Comparability, degree to which statistics are comparable over space (between countries) and time (between different time periods);
(e) Coherence, degree to which data from a single statistical programme, and data brought together across statistical programmes, are logically connected;
(f) Timeliness, time elapsed between release of data and reference period;
(g) Punctuality, degree to which pre-announced release dates are met;
(h) Clarity, degree to which statistics are understandable for non-expert users;
(i) Accessibility, ease with which statistical data can be obtained by users;
(j) Interpretability of census data including metadata, availability of information describing sources, definitions and methods

1.230. Quality is the outcome of processes, and deficiencies in quality (for example, delays in processing or lack of accuracy in the results) are usually the result of deficiencies in process rather than the actions of individuals working in that process. Therefore, process should at least show:
(a) Methodological soundness, adherence to professional methods and (internationally) agreed standards;
(b) Efficiency, degree to which statistics are compiled in such a way that the cost and the respondent burden are minimized relative to output.

Quality will be better supported by sound institutional arrangements, such as:
(a) Legal environment, degree to which statistical legislation is enacted, in conformity with the Fundamental Principles of Official Statistics;
(b) Planning mechanisms, the degree to which countries have instituted procedures for systematic, long-term planning of statistical operations;
(c) Resources, the degree to which statistical systems are properly funded and staffed. taken in relation to (different types of) cost and to each other.
(d) Administrative support and co-ordination among census stakeholders and administrative authority

1.231. In the census context, some attributes of quality assurance may be emphasized over the rest. The census should produce statistics that are relevant to data users. A census is a particularly expensive exercise to undertake and creates a burden on respondents. Therefore, it is crucial to ensure that any unmet demand for data is kept to a minimum and that topics for which there is little demand are not included on the census form. Consulting with users of census data as one of the first steps in designing the census process is a positive public relations undertaking and an efficient, transparent means of determining the demand for potential census topics
1.232. The *relevance* of data or of statistical information is a qualitative assessment of the value contributed by these data. Value is characterized by the degree to which the data or information serve to address the purposes for which they are produced and sought by users. Value is further characterized by the merit of those purposes, in terms of the mandate of the agency, legislated requirements and the opportunity cost to produce the data or information. In the context of a census it is important to note the importance of the concept of fitness for purpose as a measure of relevance. If it is only necessary that data are available at broad level (for example, national or major civil division level of geography; broad demographic level) user requirements could be met more cheaply and effectively through a sample survey

1.233. Completeness is an extension to relevance, for completeness means not only that statistics should serve user needs, but also that they should serve them as completely as possible, taking restricted resources and respondent burden into account

1.234. *Accuracy* of data or statistical information is the degree to which those data correctly estimate or describe the quantities or characteristics that the statistical activity was designed to measure. Accuracy has many attributes, and in practical terms there is no single aggregate or overall measure of it. Of necessity these attributes are typically measured or described in terms of the error, or the potential significance of error, introduced through individual major sources of error, for example, coverage, sampling, non-response, response, processing and dissemination.

1.235. Data are most useful when they enable reliable *comparisons* across space, such as between countries or between regions within a country, and over time.

1.236. *Timeliness* of information reflects the length of time between its availability and the event or phenomenon it describes, but considered in the context of the time period that permits the information to be of value and still acted upon. It is typically involved in a trade-off with accuracy.

1.237. *Accessibility* reflects the availability of information from the holdings of the agency, also taking into account the suitability of the form in which the information is available, the media of dissemination, the availability of metadata, and whether the user has reasonable opportunity to know they are available and how to access that information. The affordability of that information to users in relation to its value to them is also an aspect of this characteristic.

1.237a. *Data coherence* reflects the degree to which the census data can be combined with other statistical information within an integrated framework over time. The use of standard concepts, definitions and classifications promotes coherence.

1.238. The cost of providing information, respondent burden and ability of respondent to provide the requested information are also components of the trade-off with accuracy and timeliness. If this were not so, data could achieve (near) perfect accuracy with little or no time delay.

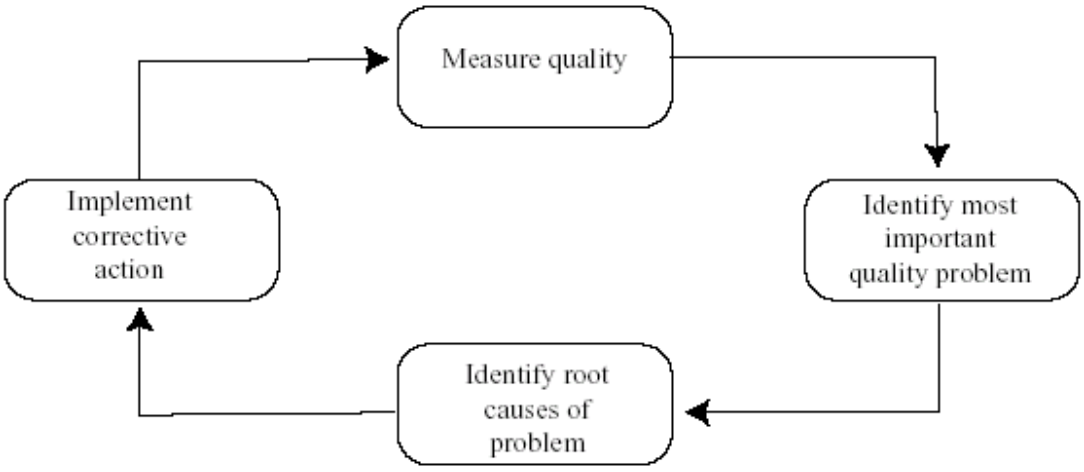
1. Need for a quality management system for the census process[11]

1.239. The essential quality attribute of relevance of census output, and how to assure it, has been discussed above together with the need for consideration of accuracy, timeliness and cost. Quality is relative, and in the end is based on what is acceptable or fit for the purpose, rather than a concept of absolute perfection.

1.240. Deficiencies in quality (for example, delays in disseminating output) are usually the result of deficiencies in process rather than the actions of individuals working in that process. The key to quality assurance and improvement is to be able to regularly measure the cost, timeliness and accuracy of a given process so that the process can be improved when a fall in quality is indicated. The focus of quality assurance is to prevent errors from reoccurring, to detect errors easily and early and inform the workers so that they do not continue. This simple feedback loop is represented in figure 1

Figure 1. Quality assurance circle

[11] This section draws heavily upon material in *Handbook on Census Management for Population and Housing Censuses*, Studies in Methods No. 83 (United Nations publication, Sales No. 00.XVII /Rev.1), chap. 1C.



1.241. Being iterative, the quality circle is particularly applicable to tasks that are highly repetitive, such as the processing phase of the census. However, the general principle applies to all processes. For example, there is less opportunity to evaluate performance, identify problems and implement corrective actions in phases such as enumeration owing to time constraints, the once-only nature of some of the processes and communication issues. However, it still can be established with careful planning and documentation in advance of the census.

1.242. It is important that a complete evaluation takes place and is documented at the end of each phase of the census. This should be done particularly for phases such as enumeration, so that the organizational learning inherent in the quality circle is carried forward to the next census

1.243. Since people play a key role in most census processes, they are in a good position to identify problems with quality and provide solutions. Quality is therefore not just the outcome of mechanical application of predetermined measures but relies on a combination of:

a) Established, documented processes including quality targets (for example response rates, level of error in processing, etc)
b) Systems to monitor the outcomes of these processes;
c) Active encouragement by management to involve staff undertaking the processes in identifying and resolving deficiencies with quality

1.244. While elements of the quality circle, such as mechanisms to monitor quality, may have some superficial resemblance to some of the elements of traditional quality control approaches, they are quite different[12]. Traditional quality control is based on correction of error after the event, whereas the emphasis of the quality circle is on improving the process that caused the "error", which may be any of the cost, timeliness or accuracy attributes falling below specified levels. A simple error correction process may suffer from any of the following:

(a) It adds significantly to the cost of the operation;
(b) Errors in the inspection process can fail to detect true errors or falsely identify errors;
(c) The correction process can introduce errors into the data;
(d) Operators take less responsibility for the quality of their work, believing it to be the responsibility of the inspectors;
(e) Where a sample of units is inspected, the quality of data is only ensured for

[12] *Handbook on Census Management for Population and Housing Censuses*, ibid., contains in annex IV a case study of a system combining the quantitative components of the traditional system within a conceptual framework of a quality management approach. Annex IV also illustrates the important differences between the two approaches.

those units that are inspected.

1.245. The emphasis should be on process improvement rather than correction. Therefore, an important aspect of quality management may be to not correct errors detected through the quality monitoring process unless they are of a severe nature or are generally applicable. For example, a generally applicable error could be a systems error that miscodes every occurrence of a common event. Resources are thus better focused on improving processes and thus overall quality.

2. The role of managers

1.246. Managers have a vital role in establishing quality. The biggest challenge to managers is first to establish a culture within the census agency that has a focus on quality issues and to obtain the commitment of staff to strive to achieve high-quality goals. At the same time, managers need to be aware that to achieve high-quality outcomes they need to give their staff responsibility to achieve these outcomes. Managers who do not delegate responsibility will find it difficult, if not impossible, to establish teams that strive for high-quality outcomes.

1.247. Managers must ensure that staff understand the philosophy behind the approach to quality. As mentioned above, staff involvement is a vital ingredient to quality improvement. Therefore, an environment needs to be established in which staff contributions are expected.

1.248. The second part of their role is to ensure that clients' expectations are known and that these expectations are built into planning objectives and into the systems that are to deliver them.

1.249. Thirdly, processes need to be documented and understood by the staff implementing them. Systems and processes for implementing the quality circle also need to be documented and put in place. Questions such as how quality is going to be measured, who is involved in identifying root causes of problems with quality, and how the process improvements are going to be implemented need to be answered. These will vary greatly depending on the nature of the process. Appropriate quality assurance techniques for each phase of the census are summarized below.

1.250. The greatest test of management commitment to genuine quality improvement will occur in how management approaches problem solving. Staff will monitor management responses closely and adjust their own behaviour accordingly. Staff will act in accordance with how they see managers behave rather than what they hear managers say.

1.251. Managers who always react to problems by seeking out people to blame, or who establish systems that focus disproportionately on the merits or demerits of individuals at the expense of the team, are sending messages that are contrary to the thrust of quality improvement. An environment where the emphasis is on fault finding, rather than on finding solutions to problems, or on excessive competition, will assure that staff cease to be part of the solution and become part of the problem. Managers need to take upon themselves the responsibility for problems, as they are ultimately responsible for the systems or processes that caused the problems. They should not seek to transfer the problems to lower-level staff

1.252. However, even in the best managed processes, there are circumstances where individuals can be justifiably blamed for impacting on quality. These may be individuals who are incapable of performing their duties, deliberately flaunt procedures or even deliberately sabotage the process. These individuals need to be dealt with by management and in some circumstances their employment should be terminated. Managers must deal quickly with these cases and act in a consistent manner. By doing so, managers will demonstrate to all other staff their commitment to quality.

1.253. To be successful, it is necessary to create a culture in which everyone has the opportunity to contribute to quality improvement. Most of the staff engaged in census operational work undertake routine tasks, and it is up to management to help them see the bigger picture, to motivate them and to encourage them to assume ownership of their work. This can be done by promoting a commitment to quality improvement and by adopting a consistent approach to management.

3. Quality improvement and the census

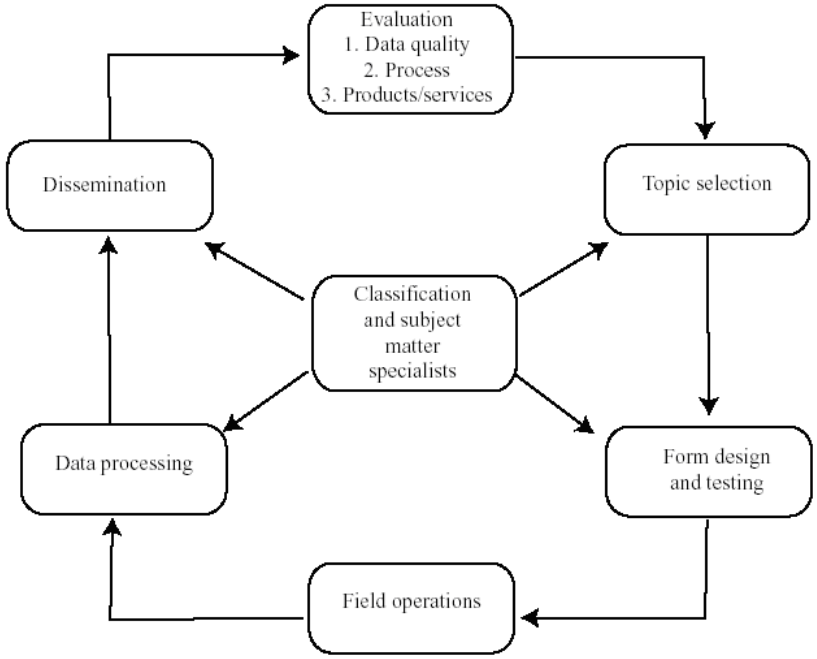
1.254. The quality circle can be applied to the entire census cycle with:

(a) Performance in the previous phase being evaluated at any given level of detail;
(b) Problems with quality ranked in order of importance;
(c) Root causes identified and corrective action implemented.

1.255. The dependencies in the census cycle are represented in figure 2.

1.256. It is worth noting that it is possible to start at any point in the diagram and achieve the same result.

Figure **2.** **Quality circle dependency chart**



1.257. The following sections outline the way in which the concept of a quality circle is superimposed over the census cycle. Much of the discussion on form design, enumeration, processing and dissemination is in terms of relevance and accuracy. However, these are subject to constraints of time and cost that may be established prior to commencing the census cycle. These are discussed briefly below.

(a) Topic selection

1.258. The first step in managing the quality of the product (namely, the statistics to be produced) is to ensure that the product will be relevant. The key process is extensive consultation with actual and potential users of census information. The key success factor in this process is full, frank and open communication with users and all areas concerned with the census (in particular, subject matter and classification experts). As should be expected, users are reluctant to propose their needs for a future census until they have been able to assess the extent to which their current needs have been satisfied by the output from the previous census. This should be seen as an evaluation process feeding into the current cycle, the first step of quality management.

(b) Form design and testing

1.259. The next quality management task concerns the testing of each census question and the testing of the design of the form. (paper and/or electronic version according to instrument(s) used) Again, the quality circle approach is used, with the results of each test being analysed and evaluated before being fed into further design and testing. The following areas are the key internal stakeholders of the form design process and their requirements need to be taken into account:

(a) The dissemination team,; (to ensure that the questions asked will deliver the data to meet the needs of users);;
(b) The subject matter specialist team;
(c) The team responsible for development of the processing system. For example, positioning of text and delineation of response areas may be dependent on data capture and the processing methodology to be adopted. It is critical that there is ongoing coordination between the form design and processing areas;
(d) The field operations team, which is responsible for training the enumeration workforce and printing the form.

(c) Field operations

1.260. The quality management process continues throughout the design of the census field operations. These are tested as far as possible, in conjunction with form designs testing. The key internal client of field operations is processing. However, field operations can also impinge on other areas, such as dissemination and classification and subject matter areas where certain concepts, such as what constitutes a dwelling, are implemented during the field operations phase. Several components of field operations can be subject to specific quality circle mechanisms as these are likely to take some time and involve iterative processes. These components include:

(a) Demarcation of enumeration areas;
(b) Map production;
(c) Form printing, where a sample of forms is rigorously tested for adherence to standards.

1.260a. All systems supporting data collection must be thoroughly tested before collection. This is especially critical if new collection technology is used such as handheld or laptop computers. All data quality benefits of using such technology could be compromised if problem arise during enumeration.

1.261. Quality monitoring should be established for each of these components and mechanisms put in place to ensure that the outcomes of the monitoring are used to improve processes. It is more difficult to implement the quality circle during actual enumeration owing to the very tight time constraints. However, this can be achieved by:

(a) Clearly establishing the aims of the field operations phase;
(b) Applying thoroughly documented procedures;

(c) Ensuring that the enumerators understand their role through appropriate training and providing inspection of corrupted forms;
(d) Providing opportunities for field staff to be observed operating on the job so that feedback can be given and retraining undertaken.
(e) Establishing communication and feedback loops with the general public through helplines, online/ social media, etc so that problems in the field can be detected and corrected in real time.

1.262. However, it has to be acknowledged that during the actual carrying out of the enumeration this approach tends to identify "problem enumerators" rather than systemic or process errors. This means that evaluation following collection is vital. The evaluation should attempt to capture the experiences and suggestions of a range of enumerators and other field staff so that improvements can be made to the subsequent census.

1.263. A general overview of the quality of enumeration can be obtained through:

(a) The use of techniques such as post-enumeration surveys to gauge the level of under-or over enumeration of people and dwellings;
(b) Overall response from the target population or level of non-response at the question level;
(c) Feedback from field staff;
(d) Measures of the quality of any coding undertaken by field staff;
(e) Mechanisms that may be in place to handle queries from the public

1.264. The effectiveness of the public communication strategy may be assessed by the amount of press coverage (positive and negative) of the census and follow-up surveys to test the reaction to particular advertising.

(d) Processing

1.265. The key clients of processing are the dissemination area and the areas of the country's statistical agency responsible for maintaining standard classifications and those with specialist subject matter knowledge. The dissemination area depends on the processing team to obtain data in an agreed format and compiled to agreed quality standards. This is necessary so that the data can be used in dissemination systems.

1.266. Since the census is part of an overall national statistical system, data from the census are likely to be used in conjunction with data from other collections. Thus the classification and subject matter specialist areas, which are responsible for those other collections, need to be satisfied that the coding, editing and other data transformation processes are conceptually sound and deliver data of acceptable quality.

1.267. Extensive testing of processing systems must be undertaken in advance of the census. Coding processes and training packages need to be prepared and tested using the type of staff likely to be involved in the operations. The processing phase gives the fullest scope for the use of quality improvement techniques, as many of the processes in this phase are repetitive and take a reasonable amount of time. This enables the quality circle to go through much iteration. It is vital that structures are put in place not only to monitor quality but also to involve processing staff in the identification of problems with quality and in proposing solutions.

1.268. It is generally not possible for processing to improve the accuracy of census data. At best, processes such as editing may reduce some inconsistencies within the data. However, in the end, the data coming from the processing system will not be of any better quality than the information supplied on census forms. Much effort can be expended in correcting apparently inconsistent or inaccurate census data with no real improvement in the fitness for the purpose of the data. It may be a better strategy to educate users to accept slight inconsistencies in census data, rather than developing highly complex procedures that may introduce other errors and impose heavy costs in terms of delay in release of the data and cost to the community.

(e) Dissemination

1.269. Census dissemination can easily be overlooked in the chain of providing a quality outcome for the census as management attention is diverted to the costly and risky enumeration and processing operations. The dissemination area is responsible for the timely delivery of products and services to the census data users. Therefore, insufficient planning and resources for this phase can have the effect of delaying the release of the data and thus compromising the overall achievement of the census objectives. The dissemination phase should also be regarded as an ongoing process that will service the needs of users over a long period of time.

1.270. Management of quality in census dissemination is driven by concerns to (a) deliver relevant products and services (b) maintain accuracy of the data, and (c) Ensure timeliness and predictability of data release within agreed cost constraints.

1.271. The first of these objectives is to provide relevant products and services. This can only be done by reviewing the experiences of the previous census products and services and by user consultation processes with both current and potential users of census data.

1.272. The second objective is to ensure that the data supplied from the processing system are accurately transformed into output products. A quality assurance strategy to ensure that data tabulations and transformations are carried out accurately needs to be documented and followed. The quality circle approach to these processes needs to be applied and any gaps identified and corrected through extensive testing prior to the census and ongoing process improvement during the dissemination phase.

1.273. The third objective is the timely and predictable release of data from the census. While this is the responsibility of all phases of the census programme, the role of dissemination is crucial. The dissemination area needs to be realistic about release dates and ensure that these are communicated to clients early so as to manage client expectations. The involvement of staff actually responsible for the dissemination phase in devising these dates is recommended where this is possible. Dissemination systems and processes need to be available, documented and tested prior to the release of data from the processing phase.

1.273a. A Release Calendar needs to be prepared to keep the user community informed about the likely month of release so use of data can be planned in advance. A mechanism to provide metadata on census indicators and the geography at which these are made available needs serious consideration. Every country should assess the requirements and put in place a dedicated team to assist data users. Services of call centres may be used if the number of data seeker cannot be handled in-house.

(f) Evaluation

1.273b. Evaluation of the overall census operation is vital for identifying strengths and weaknesses of census phases including planning, enumeration, data processing and dissemination and also for the purpose of analysing the quality of census statistics which is the major output of these processes. With quality assurance and improvement programme, the main objective is to ensure that quality assessment is consistently incorporated in all phases of the population and housing census - focusing on efforts in controlling the occurrence of errors and taking actions to ensure the highest quality of both the processes and their outcomes. Yet, errors appear to be inevitable in such a complex undertaking – consequently, there needs to be a mechanism put in place to determine the deficiencies and their quantitative impact on the census results.

1.274. Census evaluation with all dimensions of quality (see paragraph 1.229) requires comprehensive evaluation programme for assessing and documenting the outcomes of each process using appropriate and customized methodologies. Methodologies for evaluation should be planned well in advance - in the planning phase of the census. It should be noted that this is continuous process implemented from the planning to the end of census operations. Therefore, it would usually be considered the last stage in the census cycle. However, it is also appropriate to consider it as being the first step in the subsequent census cycle. Similarly, evaluation of one process within a census cycle could be the first stage in the next process of the same census cycle.

1.275. Evaluation of the accuracy of the census data should also be undertaken, to the extent possible, by conducting post enumeration survey for measuring coverage and content errors, by comparing the census results with similar data from other sources and by applying demographic analysis. As for other sources, these include surveys and administrative records in a similar time frame, and previous census results. The purposes of evaluating the accuracy of the data are to inform users of the quality of the current census data and to assist in future improvements. Future improvement may be achieved by (a) improving processes; and (b) establishing performance benchmarks against which the quality of the data from subsequent censuses can be measured.

1.276. Evaluation of data accuracy may have two parts. Preliminary evaluation will enable the identification of any problem areas that have not been previously detected through the quality management processes in earlier phases of the census. More extensive evaluation should be undertaken on data items where problems have been identified or where new questions or processes have been attempted.
1.276a. Census evaluation programme would be undertaken by subject-specialist staff according to the agreed goals and methodologies covering all possible dimensions of quality. The followings are some examples:

i) Identification of the deficiencies/achievements in data capture, coding and editing (through mechanisms developed for checking the quality of process and the work of personnel);
ii) Relevance of census data with users`s needs and satisfaction of users with dissemination tools and products (based on information collected through user consultation);
iii) Achievements and difficulties in use of new technologies and methodologies and identification of possible improvements for the next census;
iv) Estimating coverage and content errors of census data (based on demographic techniques and/or post enumeration survey);
v) Realization of census calendar including calendar of releasing census results , in case of changing calendar, the reasons and consequences;

1.277. The results of evaluations of census operation for both operational aspects and the quality of data should be made available to the stakeholders

D. Enumeration

1. Method of enumeration

1.278. There are two major methods of enumeration. In the canvasser (or enumerator) method, information for each individual (in a population census) and for each set of living quarters and the occupants thereof (in a housing census) is collected and entered in the questionnaire by a census official designated to perform this operation in a specified area. In the householder method, the major responsibility for entering the information is given to a person in the unit being enumerated (usually the head of the household), although the questionnaire is usually distributed, collected and checked by a census official. In some countries, internet data collection and postal distribution of the questionnaire, with or without postal return, is used in conjunction with the householder method. Both procedures can be used exclusively or combined with checking by a census official.

1.279 Each method has its own advantages and limitations. The canvasser method is the only method that can be used in largely illiterate populations or in other population groups that may be unwilling to complete the census forms themselves or find it difficult to do so. On the other hand, in countries where literacy is virtually universal and educational attainment relatively high, the householder method may often yield more reliable results at substantially lower costs, particularly if internet data collection or a mail-out/mail-back procedure can be used. However, the postal services may be used to distribute the census forms only when a comprehensive and up-to-date list of

addresses is available or can be prepared. Another consideration is the emphasis to be placed in the census on obtaining responses, whenever possible, directly from the person concerned. The householder method allows for, and its instructions may encourage, at no extra cost to the census organization, consultations among family members when they complete the census form. In contrast, with the canvasser method it may be prohibitively expensive to encourage enumerators to go beyond even the "first responsible adult" they encounter in each household. In the light of these considerations, it may sometimes be desirable to rely on one method for enumerating most of the population and to use another method in certain areas or for special groups of the population. With the advance of Information Technology the penetration of Internet has increased in recent decades. In these circumstances, it is recommended that Internet survey methodology should be explored depending on national circumstance. This method can be cost-effective as the expense of printing questionnaires and wages of field staff can be cut down. Also, self-enumeration through Internet can secure the privacy of respondents, so it would be welcomed as more and more people would like to protect their privacy. However, a combination of a traditional method and Internet survey can result in duplication or omission during enumeration. Therefore, careful consideration on the management of household list and editing is essential. Overly complex designs should be avoided and adequate quality checks introduced to avoid duplications and frauds

1.280. The decision regarding the method of enumeration to be employed should be taken at an early stage on the basis of thorough testing of the various alternatives in terms of their costs, the quality of the data produced and their operational feasibility. Even where a method has been followed traditionally, it is well to periodically reassess its relative advantages in the light of current census needs and changing techniques. An early decision is required because the method of enumeration used affects the budget, the organizational structure, the publicity plan, the training programme, the design of the questionnaire and, to some extent, the kind of data that can be collected.

1.281. To successfully carry out the enumeration of nomads, it is particularly necessary to pay full attention to the preparatory work in order to determine the suitable enumeration techniques. It should be pointed out that there is no absolute methodology for the enumeration of nomads and conditions vary from country to country. The particular method suitable for a country undertaking to enumerate nomads as part of the census should be determined only after a detailed preliminary study and after field testing. Some of the methods used to enumerate nomads and semi-nomads may be classified as follows: (a) group-assembly approach, (b) tribal or hierarchical approach, (c) enumeration-area approach, (d) water-point approach and (e) camp approach. Sometimes a combination of two or more methods may be used.

1.282. In the group-assembly approach, the nomads are asked to assemble at particular interview sites on certain fixed dates. This method can be adopted only through the administrative and/or tribal authorities. The tribal or hierarchical approach is a favourite method, since the nomads usually follow what is dictated by the tribal or hierarchical chief. The enumeration work can be carried out as a kind of administrative census by contacting the tribal chief and collecting, sometimes from memory and sometimes from a register, all the needed information on the chief's followers. The other approach is to contact those followers with the assistance of the chief or a representative and to collect the necessary data directly from the household. In this case, the unit of enumeration is not areal but tribal. The enumeration-area approach presupposes creating conventional census enumeration areas and then contacting each nomadic household that happens to be staying in the enumeration area during the census. In the water-point approach, a list of all water-points available to the nomads during the period of enumeration is prepared. Since numerous temporary water-points are created during the rainy season, a meaningful list of water-points may be prepared with reference only to the dry season. The enumerator is given the task of locating and visiting every nomadic household that may be using a certain water-point. In the camp approach to enumerating nomads, a list of camps is prepared together with the approximate location of each within the country, and enumerators are sent to visit all the households in each camp.

1.283. [1]

2. Timing and length of the enumeration period

[1]Economic Commission for Africa, "Study on special techniques for enumerating nomads in African censuses and surveys" (E/CN.14/CAS.10/16).

1.284. The choice of the time of year in which the census will be taken is of great importance. The main consideration should be to select a period in which the census is likely to be most successful and to yield the most useful data. This may depend on a number of factors. First, it is necessary to avoid those seasons in which it will be difficult to reach all inhabited areas because of rains, flooding, snow and so forth or in which the work will be particularly arduous, as is the case during extremely hot weather. Second, a time should be chosen when most people are staying at their place of usual residence; such a choice will simplify the census operations both in a de jure and in a de facto enumeration, and it can make the results of a de facto enumeration more meaningful. Seasons of peak agricultural activity should be avoided because it is difficult to interview persons who work late every day and who may even stay nights on their land if the land is far from home. Great traditional festivals, pilgrimages and fasting periods are also unsuitable times for census work. Since in many developing countries the bulk of the field staff is recruited among schoolteachers and older students, the conduct of the census may be feasible only during school holidays, though, as already indicated, the days of major festivals should be avoided.

1.285. In a country that includes areas of sharply contrasting seasonal patterns of weather or activity or in which potential census personnel are in very short supply, it may be necessary to enumerate different parts of the country at different times or to enumerate the nomads or other special population groups at a different time from that established for the settled population. This, however, is generally not a very desirable solution both because the nomads cannot always be clearly differentiated and because there may be mobility among the settled inhabitants. Furthermore, such a solution creates complications in respect of the use of the census data.

1.286. When a census has been taken and the census date is found to have been on the whole satisfactory, the next census should be taken at the same time of the year, unless there are strong reasons for changing this date. A regular census date enhances the comparability of the data and facilitates analysis. The tradition of a fixed census date in a country also provides administrative discipline, motivating all those involved in the census to make necessary preparations in a timely manner.

1.287. It is desirable to keep the enumeration period short in order to avoid double counting and omissions, which can occur in spite of a single reference date. On the other hand, the shorter the enumeration period, the greater the number of field staff that have to be recruited, trained and supervised. This increases the cost and may lower the quality of the data. How these different considerations should be reconciled depends on the size and nature of the country and on the resources at its disposal. The length of school holidays is sometimes a restricting factor, although Governments of several developing countries, recognizing the great national importance of a census, have prolonged the school holidays in the census year in order to allow teachers and students to work on the census as long as required.

1.288. In recent censuses, most developing countries have allowed about one week to 10 days for the training of enumerators, while the enumeration period has generally varied from a few days to two weeks. Short periods are often feasible in small countries while longer periods may be necessary in large countries with poor communications.

1.289. One method sometimes used to allow sufficient time for enumeration and yet make the census simultaneous is first to enumerate the population over a longer period, say a week or more, and then, in one single day, to recanvass all households, deleting and adding persons as needed to update the files. This procedure is, however, not practicable in very sparsely settled areas.

3. Monitoring and Supervision

1.290. Adequate supervision of the enumeration is essential. When the enumeration lasts only a few days, control of the quantity and quality of the work accomplished after the first day of enumeration is recommended, in order to facilitate the correction of inefficiencies and to maintain satisfactory progress during the enumeration period. Where the enumeration extends over more than a few days, periodic and systematic assessment should be organized.

1.290a. A supervision system to monitor the progress of the operation is important to allow for correction of errors and making necessary adjustments for proper quality of the work. In countries where internet or handheld devices is used in data collection a computerized online system can be developed and some automated procedures introduced

for the supervision. Automated selected units can be contacted as well as automated selected questions can be re-filled to allow for checking coverage and quality of data collected by enumerator or informed by respondent.

Monitoring the enumeration

1.290b. Close monitoring during the enumeration phase is essential to ensure coverage, quality and compliance with deadlines. It must be ensured that all staff involved in the data collection have access to up-to-date reports with relevant information. These reports should be made available periodically in printed or digital form. Data from previous census or other sources can be utilised to improve monitoring. For example, indicators like proportion of occupied and vacant dwellings; average number of residents per dwelling etc. can be used. Significant changes in such parameters may indicate a problem in the collection process.

1.290c. As the enumeration is one of the core census processes, each task performed during the enumeration stage must be carefully planned, executed and monitored to achieve the qualitative and quantitative targets. The following are recommended to achieve the desired outcome from the monitoring process.

Using Historical data

1.290d. Monitoring processes executed during the enumeration phase will be most effective and provide desired results when planned properly during early stage of the census. Historical information may be used to improve the performance by providing a benchmark for the interpretation of current cycle results.

Preparing policies and procedures

1.290e. Policies and procedures to be used as the base line for monitoring during enumeration should be defined at early stages of the census, with endorsement from the highest levels of decision making, for proper management support.

Setting up Goals and targets

1.290f. As population census is a time bounded project, extension can be considered as failure. Setting up goals and targets will be very important to measure if the series of activities are under control or not.

4. Use of new technologies

1.290g. Technology is becoming increasingly important to the conduct of Censuses. The technologies listed below and their related benefits can be considered as part of census planning based on the particular conditions of each country:

Electronic questionnaire

1.290h. Combined with or instead of paper questionnaire, an electronic-questionnaire can be used in either the canvasser or household method. Electronic forms can provide improved data quality and operational efficiencies by implementing validation rules on individual questions, cross validation between questions or with other records, automatic sequencing (take the operator to the next appropriate question), more options in pick lists, capturing more detailed data, providing computer assisted coding and the ability to ask tailored supplementary questions. Electronic questionnaires can give access to guidelines, help material and even videos to provide instruction to the interviewer or household.

1.290i. Electronic questionnaires can also provide census results more quickly by transferring data to a central database immediately or soon after the enumeration, either using real time connectivity, or by transferring using physical media to a local center. Electronic forms reduce the amount of material (like questionnaires) to be printed, distributed and returned, as well as reducing data scanning/capture costs and data scanning/capture errors. The electronic questionnaire can also capture a range of operational information which can be used to monitor operations and analyze responses, including the time taken to complete the form, the date/time the form was completed and the device used to complete the form.

Electronic questionnaire– Canvasser method

1.290j. Census interviews can be undertaken using an electronic questionnaire on smart phones, tablets or laptops. Each device or enumerator can be linked with the enumeration area so that the records are tagged with the respective enumeration area to avoid duplication. The device may also be able to capture information on the location of the interview, time of day and other metrics that may be useful.

Electronic questionnaire– Household method

1.290k. Achieving a good percentage of enumeration using this method can reduce the operation costs substantially. Electronic questionnaires for households have been implemented in a secure internet portal and also in secure documents that are distributed via email. Households are usually provided with a unique identifiers that is used to initiate their questionnaire or resume a partially complete questionnaire. Householders may prefer to respond using an electronic rather than paper questionnaire. If the Census is collected in a multimode approach, for example offering both electronic and paper questionnaire options, a system will be required to track the status of each dwelling (questionnaire) throughout collection to ensure completeness of coverage and ensure non-response follow-up is not conducted with responding dwellings.

Handheld or Mobile devices

1.290l. Whether using a mobile device solution for canvassing or field worker systems, it needs to be determined whether the Census agency will purchase and provide the device, or whether the field officer will provide their own device. As the availability and proliferation of devices increases there can be financial benefits, as well as reduced training needs, if field officers can utilise their current device rather than be provisioned with a new device. Although this does introduce a range of technical, security and legal considerations, this deployment option has been commonly used with mobile phones for the last ten years in a number of nations.

Geographical Information System – GIS

1.290m. Geographical information systems may be used to create digital maps on GPS enabled handheld devices, as well as producing paper maps. For each enumeration area, buildings can be identified within the application using GPS coordinates. As the households to be visited are known, GPS co-ordinates can be used by a navigation option built for the device to allow enumerators to reach the household easily.

Field worker systems

1.290n. Census operations can be made more efficient through the availability and use of systems by field workers for administrative tasks (providing bank account details for payment or recording the number of hours worked), one or two way communication of key messages or work allocation and regular submission of progress information. There are several ways of providing such systems. The technology based solutions vary from the use of Short Message Service (SMS) Text Messages to websites/portals to mobile/handheld applications.

Contact center

1.290o. Contact center or call center is an important element and can be used in each and every process of the census to smoothen the operation. Interactive Voice Response (IVR) technology can be used to address the call to a specific agent based on the options selected by the caller, or to resolve the call by providing a common answer. Website call back and chat can be implemented to help respondents while filling the online e-questionnaire in the portal.

Short Messages Service

1.290p. Short Message Service (SMS) may be used in various stages of the census project to share information with field personnel and respondents. The service may be used to send passwords, guidelines, alerts, marketing messages, reminders etc. If the SMS gateway is integrated to the central database of the census, various alerts can be sent to the census management upon the various business critical events and violation occurs, for example when the monitoring system detects that "coverage is lower than expected".

5. Use of sampling in the enumeration

1.291. Sampling may be employed in the enumeration for collecting information on any topics that need not be tabulated for small areas or small population groups. Questions designed to apply only to a sample of the population or of the living quarters may be included on the regular questionnaire or a special sample questionnaire may be used in addition to a complete enumeration questionnaire. For a discussion of the use of sampling in the enumeration, see paragraphs 1.408-1.437 below.

E. Data processing

1.292. No matter how thorough and accurate the census enumeration is, the usefulness, quality and timeliness of the census tabulations will suffer unless the collected data are properly processed. An important element of a successful processing operation is the close and continuing collaboration, at all levels, between the data-processing staff, and the subject-matter and the general statistical staff. At a minimum, the subject-matter and the general statistical staff will need to become familiar with and take a continuing interest in the processing plans and operations, while the processing staff will need to become familiar with and take a continuing interest in the substantive aspects of the census.

1.293. The most common procedure is to have the census documents arrive in the processing centre in batches by enumeration area (EA). Maintenance of these batches throughout the data processing is recommended, since documents for a given EA reflect the work of one enumerator and may contain a series of errors typical of that person. To ensure the integrity of the batches, the census documents should be stored in a specially designed census document storage facility. The batch for each EA should first be checked for completeness, geographical identification codes and other characteristics of acceptability before being sent to the next stage of data processing, like coding. Transcribing all coded data onto another sheet (for example, the coding form) should be avoided since it may add transcription errors. The same considerations apply to the case of electronic transmission of questionnaires or when the first phase of data processing consists of the scanning and text/image recognition of census questionnaires. In the case of questionnaires transmitted electronically (self-enumeration on the internet or using e-Forms), it is appropriate to set up a *metadata model* where the EA can be recorded. As far as storage is concerned, if paper questionnaires are scanned, their digital version, not only the originals in paper, should be recorded onto secure media for backup.

1.293a. If the Census is conducted in a multi-mode approach, for example using self-response by internet and field follow-up of non-respondents, it will not be possible to batch questionnaires by EA for processing. A master

control system will be required to track the status of each dwelling (questionnaire) throughout collection and processing operations and ensure completeness of coverage.

1. Method of processing

1.294. The choice of an appropriate method of processing is determined by the circumstances of each country. Rapid advances in data-processing technology have greatly increased the speed and reliability of producing detailed tabulation, thereby making computer processing the standard method of processing around the world. Furthermore, an alternative to mainframes, whose computational power was necessary before the advent of lighter and more scalable IT hardware solutions, is the use of a client-server environment. Several lighter tasks, including editing and tabulation of data files, can very well be done on small-sized desktop systems which can be placed in substantive departments and in field offices. On the server side, most of the heavier computing operations, such as scanning, aggregation and analysis of large sets of microdata, coordination of data transmission, Intranet web hosting and so forth, can be executed more reliably than on microcomputers. However, a client-server environment to handle census data must operate over a robust and secure local area network (LAN) or wide area network (WAN). Therefore, computer work is not necessarily dependent on a centralized data-processing facility, provided that a robust LAN or WAN interconnects workstations dispersed over various offices, buildings and different parts of the country.

1.295. In a census office that utilizes a networked computer environment, the central file or database servers allow both data and program files to be stored in a central location. This system economizes specifications of client computers and removes the need for much physical movement of programs and data on computer media, such as diskettes, compact disk read-only memory (CD-ROM), digital versatile disk read-only memory (DVD-ROM) or universal serial bus (USB) Flash Drive. . Data storage requires frequent backups of the system information to avoid major data loss due to hardware or software faults. Thus, servers have a strategic importance and their location and administration must be well defined and secure enough to ensure data protection Also, it is recommended that proper business continuity and security policies duly certified by the competent authorities should be in place.

1.296.In determining the type of equipment to be employed and the advisability of a new machine installation (either complete or partial), or of additions or upgrades to existing equipment, consideration should be given to all the processing requirements of the data-collection programme for which the population and housing census is but one part. Only on this basis can a reasonable decision be made. Decisions on the type of data recording equipment and computer equipment should be made at least one year in advance of the scheduled date of enumeration in order to allow appropriate questionnaire design and proper preparation of instructions to enumerators, development of coding schemes, specification of data handling controls and procedures, and recruitment and training of data-processing personnel. Rapid processing of pre-test or pilot census that covers end-to-end census operation such as enumeration, initial census result, output dissemination, handing over and closure procedures are particularly important for identifying improvements needed in the census questionnaire, instructions to enumerators computer systems or whatever other preparations may be needed. It is recommended, therefore, that arrangements for using appropriate equipment and software be made well in advance of such tests. It is also recommended that all systems used to support census operation be thoroughly tested in advance of operations to ensure that they function as intended and that they are secure (i.e. they will not lead to loss of data).

2. Coding

1.297.Whenever possible, pre-coded responses should be used in census questionnaires with numerical or alphanumeric codes being printed next to each category or shown as combo-box in case of electronic questionnaire . Since computer editing and tabulation of textual material are not practical, verbal responses will have to be replaced by a code. This can be done by a dedicated computer program for automatic coding or by a coder (possibly computer-assisted) for situations where answers cannot be automatically coded. .. There are obvious advantages to directly coding the respondent's answer into the questionnaire during the interview, since the respondent is still present to provide clarifications if necessary. Unfortunately, in most cases this is not practical because enumerators are normally insufficiently trained and they cannot be expected to carry the required code books and manuals during census enumeration. In any of the enumeration methods, if an appropriate code is not concluded by the respondent or the enumerator, the response can be collected as text, and later converted to proper code by code experts and/or

by calling the respondent from the contact centre. Given the size of the coding operations in a Census, time should be spent optimising the automatic coding operations to reduce human intervention (see paragraph 1.301).

1.298. Automatic or computer-assisted coding will support efficiently the coding activity, by enhancing the quality of operations, reducing coding errors, and speeding up the coding process. When required, aA coder normally works with one or several code books for various items in the questionnaires. Coders may specialize in certain variables, with one group of coders handling only geographical references, another responsible for detailed occupation and industry coding, and so forth. In any event, this is tedious work and can be an important source of errors. To avoid new sources of errors, coders should not rely only on their memory; they must base their function on the use of the *code books*.

1.299. *Computer-assisted coding* uses personal computers to assist the coders. The process requires that all the codes be stored in a database file and be accessed by coders during the coding operation. Computer-assisted coding is based on at least two general approaches. In the first one, coded answers are matched to a set of keywords. Textual information from the census questionnaire is parsed and compared to an indexed list of keywords, and then the likelihood of matching between found keywords and coded answers is measured and scored. If the score results are over a certain (high) threshold and there is no ambiguity, a sorted list of coded answers is presented to the coder, who retains the ultimate decision of accepting or refusing the system's proposed answers. In using this method, it may be advantageous to change the order of activities so that the capture of pre-coded information in the questionnaire occurs first, followed by the capture and computer-assisted coding of the remaining information.

1.300. In the second approach, which is mainly used in image processing of data (intelligent character recognition method) for non-Latin or multilingual countries, owing to the difficulty and existing problems in character (alphanumeric string) recognition, the procedure is as follows: After the scanning and during the coding operation phase, the image of the text will be shown on the monitor, and at the same time, a pull-down menu from a coding database will present the coder with the ability to enter as few key entries as possible to get to the full textual and coding content of a specific case. When the coder selects a code, it will be allocated and saved in the database for that specific case. Although this approach is more time consuming and costly in comparison to the first approach, the quality of coding is much higher than in the traditional way of coding.

1.301. On the other hand, both techniques have several similar advantages: (a) capturing the pre-coded information at an early stage leads to some data files becoming rapidly available, which opens up the possibility of generating and releasing preliminary census results; (b) the computer-assisted coding process provides an opportunity for a computer system to alert the operator to problems with data supposedly already captured, for example, missing information for a fully pre-coded variable; (c) the coder works directly on the computer screen; (d) information from other variables may be helpful in determining applicable codes for write-ins.

1.302.Automatic coding is a process in which the decision about the code to be assigned is delegated to a computer program. The main difference from computer-assisted coding consists in the automatic acceptance of the answer if its score is over a predetermined threshold and relatively higher than possible identified alternatives. Both computer-assisted and automatic coding systems may exploit self-learning capabilities of neural networks to fine-tune their capacity of detection. A human operator becomes involved only in those cases where the software cannot resolve the issue. Computer coding may use, in addition to the written response for the item in question, other relevant information available in the record or the questionnaire. Therefore automatic coding is more applicable in cases where the data capturing process has already been completed, either by internet, handhelds or other forms of electronic data collection, manually or by some form of automatic reading. Developing computer software for automatic coding is a complex task. Automatic coding methods need to be complemented by computer-assisted or conventional coding methods for unresolved responses.

3. Data capture

1.303.Converting the information obtained in the census to a format that can be interpreted by a computer is called data capture. It is possible that several simultaneous and different methods for data capture are being used in a census. They include *keyboard data entry*, (including collection by internet or using handheld or laptop computers) optical mark reading (OMR), optical character reading (OCR) and image processing techniques like intelligient

character recognition (ICR).. Computer-assisted keyboard data entry is usually carried out using personal computer data entry programs with built-in logic controls. Some of the tasks accomplished by the programs are (a) verifying that EA codes are valid, and copying them automatically from one record to the next; (b) assigning a number to each person in a household automatically (and perhaps to each household within an EA); (c) switching record types automatically if the program's logic requires it; (d) checking that variable values are always within pre-determined ranges; (e) skipping fields if the logic indicates doing so; (f) supporting keyboard verification of the information entered earlier; and (g) generating summary statistics for the operator and the batch. In order not to delay the data capture task, data entry applications should limit checking to problems that are either very serious (for example, wrong EA code), or likely to be caused by a simple misread or key entry mistake. More sophisticated checking is deferred until the editing stage

1.304. *Optical mark reading* (OMR, often called optical mark recognition) equipment has been available for many years and has nowadays reached very good levels of reliability. OMR is the simplest of commonly available form data capture technologies. Owing to relatively stringent requirements for the successful data capture of the paper, countries with very dusty or humid climates and poor transport infrastructures are discouraged from using OMR. It is necessary to heed special questionnaire design restrictions as well as consider the quality of the paper and adhere to precise specifications regarding the printing and cutting of the sheets. In some developing countries, this may mean that local production of the questionnaires will be problematic. The need to reserve a relatively large space for marking areas and to adhere to other limitations imposed by OMR equipment sometimes makes it difficult to design the best questionnaire from the point of view of the enumeration process.

1.305. OMR questionnaires can be marked by the respondent or by the enumerator. Marking by respondents is attractive from a cost perspective, but it depends on the presence of a cooperative spirit and relatively universal literacy. A practical problem is that most OMR devices put restrictions on the writing instrument and the colours that can be used in the marking. Assuming the rules are followed, the rejection rate for marked forms is often low, especially if the forms have been inspected visually before being fed into the readers. Converting a manually completed census questionnaire to OMR format after it has been received in the census office is inefficient and becomes a source of errors, and should therefore be avoided.

1.306.Optical character reading (OCR; also called optical character recognition) and Intelligent Character Recognition (ICR) consist of the use of special equipment to read characters at specific locations in the questionnaire. These two terms identify very similar technological approaches. Specialized sources tend to identify with OCR the capability of recognizing printed characters only, whereas ICR would extend this capability to handwritten text. There is no agreed definition of ICR. In the context of censuses, therefore, this would require that handwriten text in the filled-in questionnaire be as standard as possible so as to enable efficient recognition . In general, recognition of numerals is more efficient in an uncontrolled environment, that is to say, where the machine has not been adapted to the writing style of a particular person. ,, . OCR/ICR technology has matured considerable with sophisticated recognition algorithms and the use of neural networks for self-learning

1.307. *Imaging techniques* and *scanner devices*, together with OCR /ICR software, have been used by several countries for data capture. Experience shows that significantly low error rates are achieved at an optimum cost using these techniques . The efficiency is more in the case of *Numerical and alphanumeric characters* written by trained enumerators. However, *alphanumeric characters* are more prone to higher error rates. Extensive testing must be conducted well in advance to determine the best type of equipment and paper. The use of imaging techniques is also dependent on the availability of local maintenance and support capabilities. Whatever methods of coding and data capture are chosen, it is essential that they be carefully tested before final adoption. Recognition engines can be customized to recognize various sets of characters and scripts, but unless good experience is available at the census office, careful planning and preliminary work are needed in conjunction with the OCR/ICR system providers. A combination of ICR (for numerical characters) with computer assisted coding (for alpha characters) is also an effective method used by some countries.

1.308. In addition to the benefits of the scanning technology for capturing the information, an important by-product of scanning census questionnaires is that this allows for the possibility of digitally filing and naming the scanned questionnaires. This increases the efficiency of storage and retrieval of the questionnaires for future use, particularly during subsequent data editing operations.

1.309. Though OMR/OCR/ICR is becoming increasingly common, there usually are some fields in paper questionnaires which need to be filled in by longhand, for which keyboard data entry before processing is the preferred input method.The quantity and type of data entry equipment required will depend on the method of data capture selected, the time available , the size of the country, the degree of decentralization of the data capture operations, and a number of other factors. such as the use of digital enumeration approaches. For keyboard data entry, the average input rates usually vary between 5,000 and 10,000 keystrokes per hour. . Among the factors that affect operator speed are (a) the supporting software and program with easy navigable screens, spell checker on the description fields if any, keyboard shortcuts throughout the program, less utilization of mouse etc ; (b) the complexity of the operators' tasks; (c) the ergonomic characteristics, reliability and speed of the equipment; (d) the question whether work is always available; (e) the training and aptitude of the recruited staff; and (f) the motivation of the workers.

1.310.Several options are available to help ensure that data entry operations are completed in a timely manner. They include (a) procuring more equipment, (b) increasing the number of working hours by working double or even triple shifts and during weekends and (c) applying independent verification to varying extents. In the case of keyboard data entry, with the increasing safeguard of data quality by data entry programs, complete verification has become less necessary. Full independent verification may be applied only in the initial stage of data entry and may be reduced when each worker has achieved an acceptable level of quality. After that, a sample verification plan can be applied. Operators may be assigned to sample verification depending on their observed error rate. The work of reliable operators may be verified only for a small sample of the EAs, while more extensive verification is continued for the more error-prone operators. Data entry operators should be retrained or removed if they are obviously lacking in talent for the work (see paras. 1.252-1.253 on quality assurance techniques).

4. Data editing[2]

(a) Micro-editing

1.311.Raw data files contain errors of many kinds, some generated by the respondents and others caused by enumerators who misunderstood the respondent’s answer. Further mistakes are introduced in the data processing operations and during coding and data entry, or in the course of the transcriptions that take place. From an operational point of view, such errors are of two types: (a) those that have the potential of blocking further processing (critical errors), and (b) those that introduce distortions into census results without interrupting the logical flow of subsequent processing operations – non-critical errors. All of the first type of errors and as many as possible of the second type must be corrected. Prior to error correction operations and in case there is a need to go back over work, precautionary action should always be taken by following proper version management procedures and versioning the changes with a back-up copy of the original data file at every stage, in case there is a need to go back over the work

1.312.Since for large censuses, manual correction is rarely economically feasible, the conditions for such corrections are usually specified in specially designed computer programs for automatic error scrutiny and imputation based on other information for the person or household or for other persons or households. Whenever imputation is used, a flag should be set so that analysts are able to distinguish between reported information and that imputed by the editing system. For cases where sufficient information is unavailable for the specific persons or household to correct apparent errors, *imputation* methods can be used. such as the hot deck approach This technique uses information obtained from previously processed persons, families or households with similar characteristics as the “best suited” value in replacing missing values or values that have failed processing edits. However, this technique requires careful programming work, considering the fact that search for appropriate information in the census database would slow down computer program execution.

[2] For further details on census data editing, see *Handbook on population and housing census editing*, Studies in Methods, No. 82 (United Nations publication, Sales No. 00.XVII.9).

1.313. In some cases, the best solution will be to move out-of-range or clearly inconsistent values into a special category, prior to deciding how such cases should be edited and classified. In this way, the pitfalls of introducing statistical biases are considerably reduced. But precautionary measures should also be defined and set for the fact that overambitious automatic editing programs may cause the so-called corrected data to be significantly flawed. In this respect, it would make sense to have an acceptable cut-off value for error rates at the enumeration area level. If a data scrutiny program finds that more than a certain percentage of the records in a particular batch have one or more serious problems, the whole batch should be rejected and subject to human and/or field work verification.

1.314.Editing and imputation rules should be formulated by subject-matter specialists, not by computer programmers; also, an error scrutiny and editing plan should be elaborated at an early stage of the census. A set of consistency rules and corrective measures should be put in writing and made available to the programming staff, leaving no room for confusion, misinterpretation or unwarranted independent initiative. The computer programmers should implement these editing rules by working as a part of a team with the subject-matter specialists The programs should be tested by subject matter experts and software testing experts for various scenarios before using them with the census dataset.

(b) Output or macro-editing (Validation)

1.315. The outcome of micro-editing is a set of records that are internally consistent and in which person records relate logically to other person records within the same household. This process does not, however, provide the full range of assurance necessary to accept the data set as the best possible. A range of conditions could cause errors that cause the data to be consistently wrong: for example, perhaps a condition in the editing suite itself is set incorrectly; proportions in an imputation program may be set wrongly; or enumerators may complete a collection control panel incorrectly. To identify such consistent errors it is necessary to critically review some key aggregate tables to isolate outlier aggregates and identify the cause of the unusual values. These key tables may be a subset of those intended for output or may be tables specifically designed for this purpose.

1.316. It is recommended that a bottom-up approach be used in this process. That is, the tables should first be examined for a selection of enumeration areas (EAs), then the next level up and so on up to the first set of national tables. There are two reasons for this:

(a) The first EA will complete the processing cycle well before any other geographic level. Thus, commencing at this level gives the earliest possible warning of a problem, enabling corrections to be made before a large amount of reprocessing is required;
(b) It is far simpler to examine a few hundred hard copy records within an EA than to attempt to resolve the problem in the millions of records in a national file.

1.318. A crucial stage in the process is designing the analytical tables. One way of approaching this could be to identify a set of variables which are conceptually consistent with those in the previous Census (or a major survey) or administrative records from various authorities in the country, such as expatriates visa issued, national id program, number of registered establishments etc. Thus a set of benchmark values could be constructed before the Census operation commences and compared with those from the current enumeration. The content of the benchmark set will depend upon the content of the enumeration and much of this must therefore be determined by each country. However any Census will include the variables age and sex so a comparison of the age pyramid and sex ratio for each 10-year age cohort would be basic elements of such analysis.A second component of the analysis is the compilation of a set of information regarding expected changes since the benchmark survey. For example:

(a) It is possible that in the due time (since the previous collection) improvements in maternal health care programmes have led to an increased survival rate for women. Thus a decreased sex ratio around the childbearing ages may be noticed;
(b) If literacy is included in the analysis and government policy has been to strongly support increased school attendance, an increase in the proportion of literate people could be expected.

1.319. There will be a need for careful judgement when the analytical tables show a significant and unexpected difference from the benchmarks. While it may be found that the difference is due to a problem with the current collection, it could also be due to:

(a) A problem in the collection that has generated the benchmarks;
(b) A genuine and previously undetected social change that is being correctly revealed by the current collection.

1.320. In the latter two cases it would be wrong to make any change to the current data set. However, it is crucial that details of the investigation are made known to users (by preparing suitable metadata) so that they would be able to treat and analyse the data correctly. If the analysis indicates that there is a problem with the current collection it will also be a matter for judgement as well as how to react to it. One proposition is to revise the input processing system in order to prevent the problem from being continued. After applying such changes, and in order to avoid introducing further problems, it is essential that they be fully tested and accepted. The second proposition is to make decision in regard to whether to reprocess the records which have already been processed or not. This decision should be guided by the following:

(a) Significance of the error;
(b) Number of questionnaires that have already been processed;
(c) Time duration for the reprocessing;
(d) Impact of such a decision on other consecutive phases of the census (such as tabulation and dissemination);
(e) Cost and expenditure of that decision.

5. Processing control

1.321. Careful planning and control are required to ensure an uninterrupted flow of work through the various stages from receipt of the census questionnaires through preparation of the database and final tabulations. The plan should provide for the computer edit to follow closely the coding/checking/recording of the data so that errors can be detected while knowledge related to them is fresh and appropriate remedial actions may be taken.

1.322.Countries may wish to establish a computer-based processing management and control system to check individual forms or groups of forms for each EA or for other processing units. Such a system should link the databases for EAs and other geographical entities with the control information. The system would check and manage progress from process to process so as to ensure the completeness of records at each stage of the processing operations. As specified earlier, project management software may support the formal description of different processes, and provide an environment to control the execution of all operations connected to an individual phase or status of the census. This system should be fed into the overall quality assurance and improvement system whose management is elaborated in paragraphs 1.246-1.253. If a computer-based processing system is established, a close and real time communication between the headquarter, local offices and field enumerators should also be established. This is beneficial for the control of field staff and the management of logistics of enumeration materials. Also, as any problem occurred in the enumeration field and this solution can be shared through the bulletin board in the system, non-sampling error can be greatly reduced.

6. Master file for tabulation

1.323. When data editing is in progress, new files consisting of *clean* data records for each person are produced; these can be assembled so as to build a master file for later tabulations (often called the micro-data file). This master file, like the raw data files, can have a simple rectangular sequential format. There is usually no need for (but neither should it be discouraged) having the master file organized with a database structure with index files. However, the master file should usually be maintained in geographical order, starting with the lowest geographical entity, sorted by housing unit, household or family. Another way commonly used to generate tabulations involving both the individual and the family, household or housing unit is to include in the head of household's record selected characteristics of these latter units. Alternatively, a single hierarchical file can be created involving, for example,

person, family and housing unit records. Whatever the chosen structure, the master file must allow for easy checks, controls, and computations to be performed.

1.324. One of the most common and problematic errors in census files is that different EAs carry, for one reason or another, the same identification codes. Upon sorting the file, these EAs may have been merged, generating households with abnormal characteristics such as two heads of household, twice the usual number of members, two housing records, and so on. To avoid this problem, the EA geocodes should be checked carefully prior to the editing phase. This is best done by keeping a check file of all expected code combinations, and marking a code as "used" once an EA using the code has been processed. A module of this functionality can be part of the editing program. The check file will serve to flag impossible or double identification codes, and towards the end will show which EAs were expected but have not been processed.

1.325. Census master data files are usually very large and require powerful servers to process files of such size. Well-equipped desktop systems have also higher computational power and are equipped with much bigger and cheaper mass-storage devices. Nonetheless, the hardware infrastructure available to several countries is older, thus two strategies are applied to reduce file size and to make data management simpler. The first involves working with the next lowest geographical entity as a basis, processing the data on this level and aggregating later to obtain national results. The second remedy is to apply on-the-fly compression/decompression to the storage medium. Census files can be compressed quite significantly to less than 20 per cent of their original size. Since tabulation programs access the data in sequential order, using the compressed data will result in a faster reading process.

7. Methods of tabulation

1.326. Preparing the tabulation plan is the substantive responsibility of the demographers and other subject-matter specialists who have the necessary expertise in interpreting the census results. This will require consultation with principal users of the census information (see paras. 1.112-1.116). The duties of the data-processing department should be limited to checking the logic of the various accumulations, designing the required programs and producing correct results within the shortest possible time. It is possible that the need for initially unforeseen tables will become apparent, so the census organization should always be prepared to produce additional aggregations. This may involve newly defined classes for certain variables, new types of cross-classifications, differently defined geographical subdivisions, and so on. If the master file is organized according to the principles of relational databases in a relational database management system (RDBMS), original and additional aggregations can be designed according to the relatively easy Structured Query Language statements. In case of a list of records with a rectangular structure, online analytical processing (OLAP) tools might be used to generate multidimensional tabulations. However, if the information needed to produce these aggregations is not available in the master file, it will usually be prohibitively expensive to attempt to add this information at a later date.

1.327. The use of software packages specifically designed to produce census tabulations is highly recommended. These packages will make the job of preparing a useful program much simpler (and thereby help prevent errors). Usually designed for maximum execution speed (given that large files are to be processed), these systems are often available free of cost, or for just a nominal fee.

1.328. Tabulation work can also be easily done by software belonging to either of two other classes: statistical analysis and database software. However, these packages have not been designed with large-scale sequential or geographical processing in mind. They may require substantially more computer time than a specialized census tabulation system. In countries with a limited capacity of powerful computers, this can be an important consideration.

1.329. Other factors that should be taken into consideration when selecting software packages for tabulation work include:

(a) The availability of expertise in the census office. It makes no sense to switch to a software system that is only marginally better when this would require a major retraining effort;

(b) The need for customisation of the software to perform advanced functions, such as random perturbation to preserve confidentiality.

Moving to a different software environment should be the result of a careful analysis of all the factors concerned.

8. Provisional census results

1.330. Based on the summaries prepared by enumerators, provisional census results may be processed manually or by computer and issued soon after the enumeration is completed. For reasons of efficiency and quality, the use of computers is always preferable. The ability to verify data quality during the enumeration phase with the help of validation programs, quick indicator reports, data consistency reports, and tabulations greatly increases the confidence with which provisional results can be announced. Provisional results will normally cover information only on total population by sex and by major division. The number of households and housing units may also be derived easily from this exercise. Since provisional and final results may differ (for example, the summaries on which provisional results were based might contain errors), it is important that users be warned about the possibility of such differences. The final census results will be the output of the main tabulation program (see chap. IX below). Tabulations may be based on all of the returns or on a sample. The preliminary result of the census can be reported right after the end of census by utilizing the summary of household lists without individual data processing. This can be possible as the summary usually includes the total population, households and housing unit in each major division. If some of the topics are collected on a sample basis only, proper weights will have to be applied in the tabulation stage to produce valid national estimates. In addition, the census office should be prepared to facilitate the production of tables requested by researchers and users (see paras. 3.49-3.54).

F. Databases

1.331. In order to expand the life and usability of the data, and as a complement to the standard production of tables, national statistical offices are encouraged to store the census data in various computerized database forms so as to better satisfy the full range of needs of internal and external data users. Census databases assist data users by providing easy access to a wide range of census data.

1.332. The establishment of such databases can enhance the dissemination of the census results as well as increase their usefulness by combining census data together with related information from other demographic inquiries in a common format. (An important special case is bringing together the data from prior censuses into a single database.) In addition, such databases can improve the coherence of the input and output processing systems.

1.333. Needs vary widely from user to user according to specific interests and circumstances. There is therefore no preferred approach to setting up a census or population database. For example, a basic decision must be made whether to provide micro-data, aggregated data or both. Other basic design issues to be considered include whether an effort is to be made to incorporate the new census results in an existing database structure or whether one or more new census databases are to be established, and if the latter is the case, whether the new database(s) will be exclusively in the form of a census database or constitute instead the nucleus of one or more population databases incorporating data from other sources. Consideration will also have to be given to such issues as identification of the different types of users, their information requirements, types of information to be stored in the database, sources and maintenance/update of information, processing of user queries, identification of the appropriate commercial software or, alternatively, whether it is feasible to develop such software, and selection of the appropriate hardware capable of supporting the current database and its anticipated growth.

1.334. Since building a census or population database requires careful planning and can be time-consuming, such implementation should fit within the global statistical framework of the organization, and be seen as an ongoing process both complementing the data dissemination strategy and strengthening the statistical capacity of the organization.

1. Database for micro-data

1.335. Micro-data (records of individual persons and households) collected in the census can be stored either in their raw form, or in their final edited form, or in a file that combines both raw and edited records. To limit problems of conservation, the data should be stored preferably on a medium of excellent reliability such as, currently, compact

disk read-only memory (CD-ROM) or a digital versatile disk read-only memory (DVD-ROM), which has much more capacity than a CD-ROM or universal serial bus (USB) Flash Drive. New technologies for mass storage will have evolved. Such new technologies present two issues for census managers and technicians: (a) the issue of when it will be appropriate to adopt a new technology as the standard and (b) that of the need to convert materials stored in older media to the new standard or otherwise provide accessibility to the older materials.

1.336. With technological advances in mass storage devices and media, it is now feasible to store the full census data file (one character per byte) as a single large rectangular file. After adding a data dictionary that describes the data format and a tabulation module, one obtains a set that could be described as a census database. The micro database requires a cross-tabulation program which can be either part of the package or external. The software normally used for census tabulation still requires some prior training and may be confusing to inexperienced users. More intuitive tabulation software is available, but may be either too slow in processing or too limited in its options to be fully satisfactory.

1.337. The organization of the micro-database may take several formats, for example the software may allow for reorganizing the data in a transposed format (for example, one separate file per variable). This can substantially reduce the need for storage space and increase the speed of tabulations. However, establishing this kind of database is more complex, technically demanding and time-consuming. There would be advantages in storing census micro-data with standard commercial databases. This approach has the advantage that many users are already familiar with such software and so it is easier to find programmers and system analysts in the labour market. Even though the storage space required would be comparatively larger, today's market for mass storage has made available very large and fast hard disks at much cheaper prices than a few years ago and the hardware market seems to continue to follow this trend.

1.338. One of the main advantages of a micro data base is that it permits the retrieval of data, at least in principle, at any level of detail. Since micro-data could be used to obtain information on individual persons, families, households or family enterprises, privacy concerns must always be taken into consideration. In most countries, the use of the census data to identify individuals is prohibited by law. Moreover, the long-term reputation of the national statistical authority may well be jeopardized if such disclosures occur.

1.339. There are several methods (such as sampling, introduction of random disturbances, recoding and aggregation) that can be used to make such micro-data available while still protecting individuals' rights to privacy. All have in common the fact that they sacrifice some information in order to eliminate or greatly reduce the risk of disclosure. However, it is important that census organizations interested in disseminating micro-data to outside users should take the appropriate precautions to protect privacy and confidentiality.

2. Database for macro-data

1.340. Aggregated census data can be stored in many formats, either as the results for one census, as a database covering more than one demographic inquiry, or in a broad database of statistical information. Whereas micro-data are saved to allow aggregations to be made that were not programmed initially, macro-data are stored to preserve earlier aggregations, to provide the broad public with readily usable information, and to prevent double work by those who may find that the summary data they require have already been produced.

(a) Publication equivalents

1.341. The simplest form of what could be called a database for macro-data is a straight copy of a publication on a computer medium, usually on an optical disk (CD-ROM or DVD-ROM) or on the website of the census office. A machine-readable publication-equivalent database may have the advantage of being less expensive to prepare than its hard copy counterpart. In addition, electronic or paper copies can be made quickly, with copying of only part of the publication if only part is required. A disadvantage is that a user needs a computer, and one possibly provided with compatible software, in order to have access to the census information.

1.342. The original printed publication can be captured on the computer medium by (a) exporting the camera-ready output to some portable file formats or scanning the printed pages, which generates raster-type images, or (b) copying the original computer files American Standard Code for Information Interchange (ASCII) text form and/or

worksheet/database formats. The former approach makes it extremely simple to retain all the formatting and to include graphs and other illustrations. The latter solution has the big advantage of allowing the user to process the information further by computer without having to re-enter the data. This, as noted before, economizes effort and prevents transcription errors. The information content in this case is usually limited to tables, perhaps with some explanatory texts. Because of the important advantages of each of these storage methods, census organizations can use both. The user receives a computer medium holding the camera-ready output file or the scanned images as well as ASCII files of the tables. If tabulated data are provided in readable format, they may also be organized with some kind of data-browsing software. In this case, the software should always allow for downloading in a variety of non-proprietary and the most popular spreadsheet formats. This is possible especially when the medium has a large capacity.

(b) Table-oriented databases

1.343. More advanced users may prefer that a census database of macro-data offer more than an equivalent of the printed publication. They might like to be able to manipulate the tables in various ways in order to obtain views or results that represent their specific requirements more precisely. Associated graphing and thematic mapping capabilities may also be welcome. Several statistical offices have successfully filled this need. However, a major problem often encountered is that there is no generally accepted definition of what constitutes a statistical table and of the rules that should be followed when designing one.

1.344. In a controlled environment, such as that of a given census or national statistical organization, it is possible to standardize table definitions. The most common way is to design a basic layout having a number of attributes that together fully describe a table. Appropriate software will then give users access to a number of operations that process the table or several tables at the same time. Examples of such operations are reclassifying a variable (for example, from one- to five-year age groups), eliminating a dimension from a multidimensional table or joining tables that have a dimension in common.

1.345. The availability of a standard table description language offers important advantages in exchanging tables as data-processing objects among national and international organizations. However, as mentioned before, some statistical tables are not easily pressed into the mold provided by formal descriptions. In this respect, it should be noted that statistical tables have little in common with the structures known as relational tables in popular database management systems.

1.346. Nevertheless, census offices should be aware of the potential offered by Extensible Markup Language (XML). XML is not, as a matter of fact, a language itself but rather a metalanguage system designed to be used on the Internet. With XML, users can define their own "tags" to structure the information within a document. XML thus offers the potential of precisely describing all elements composing a statistical table: title, subtitle, units of measure, indicators, values, the time dimension and footnotes and in short the metadata. Other solutions, such as EDI/EDIFACT (electronic data interchange for administration, commerce and transport), are a set of internationally agreed standards, directories and guidelines for the electronic interchange of structured data between independent, computerized information systems.

(c) Time-series and indicators databases

1.347. Databases can also cover more than one demographic inquiry, and census results can be integrated with various other data sets, including the results of earlier censuses. In developing databases that are aimed at serving a heterogeneous user community, the issue of a number of basic trade-offs will have to be addressed. For example, on the one hand, the number of variables should be kept as small as possible to make the database easy to use; on the other hand, it should be as comprehensive as possible to address the broadest possible requirements. A minimum data set of versatile indicators should consist of those variables that are useful for a wide range of applications and consistently available across space and time, and whose characteristics are clearly defined. In developing such a database, not only storage of the key indicators and variables themselves, but also the inclusion of some basic figures (absolute numbers or basic data) as a way of standardizing the basic statistical framework, is recommended.

1.348. It would be ideal to have a broadly accepted storage format that could improve interchangeability between producers and users. The principal problem is that series usually contain a number of descriptive attributes that have not been standardized. Metadata such as key code, definition of the variable, periodicity, unit of measure, universe covered, number of terms recorded, base year (for an index), adjustment applied, and so on ,are required to interpret the series properly.

1.349. In addition, various processing modules (custom-made or commercial) can be attached, allowing seasonal adjustment, interpolation and extrapolation, model building, and adding or subtracting of series if relevant, and so on. Spreadsheet manipulation, as well as graphing and mapping capabilities, can greatly enhance data presentation and analysis.

(d) Graphing and mapping databases

1.350. By having associated graphing and mapping capabilities, databases will greatly increase their usefulness. Ideally users should be able to generate the graphs and/or maps required by themselves and then print or plot them, paste them into a report or make the images available for other uses.

1.351. Many users want data for relatively small areas concerning such matters as home ownership, educational profiles, and the labour market. While the database may be for one census, some historical information can be included to allow users to observe prevailing trends over time.

1.352. Both micro- and macro-data can be at the basis of these dissemination products. However, owing to disclosure problems as well as in order to increase processing speed, some form of prior aggregation is usually applied, for example by using summary data. Such summary data could also be combined with the general-purpose graphing and mapping software. However, this would result in a reduction of the user community to those able to handle rather more complicated processing jobs. Making available a census database with tightly integrated graphing and mapping capabilities (which usually implies a tabulation function) is an excellent way to improve the effectiveness of census information dissemination. If it is to be commercially successful, the product must be easy to use.

3. Geographic information systems

1.353. A geographic information system (GIS) can be seen as a system of hardware, software and procedures designed to support the capture, management, manipulation, analysis, modeling and display of spatially referenced data.[3] In practical terms, such a system may range from a simple desktop mapping facility to a complete GIS system that is capable of solving complex planning and management problems or producing detailed georeferenced inventories. Its ability to use space to integrate and manipulate data sets from heterogeneous sources can make its application relevant to planning and managing the census process itself. For example, a GIS provides functions for the aerial interpolation of statistical data in cases where the boundaries of aerial units have changed between censuses. However, the development and implementation of such a repository of georeferenced data are not easy tasks to accomplish, and simple desktop mapping systems generating thematic maps from a database of base maps and indicators will satisfy the needs of most census organizations.

1.354. GIS technology should be considered only at a level appropriate to the skills and resources available, and constitute an integral part of the overall work of the organization. Cooperative arrangements with other agencies should be pursued particularly with regard to the acquisition and maintenance of base map data, which should not be the responsibility of the statistical organization. Statistical organizations should proceed with GIS development or implementation only where it is feasible to maintain such a system during the intercensal years and where there is no dependence on external support.

[3] For further details on GIS mapping, see *Handbook on geographic information systems and digital mapping*, Studies in Methods, No. 79 (United Nations publication, Sales No. 00.XVII.12).

1.355. Statistical offices may nevertheless develop GIS applications with population data and other georeferenced data from other sources for more advanced forms of spatial analysis. The task could be shared with other institutions, or be delegated completely to specialists elsewhere. The role of the census office would then consist in supplying census data at the right level and in the right format for such a system. Census offices provide vital information on current demographic conditions and future trends for policymakers in a range of sectors such as health care, education, infrastructure planning, agriculture and natural resources management; and the provision of spatially referenced census databases is an essential prerequisite of the facilitation of the use of demographic data in these fields.

1.356. In this regard, it should be noted that the GIS should be capable of generating additional geographical delimitations beyond those used in the census, such as school districts, water catchment areas or power service units. These entities will have to be constructed from the smallest geographically identified units available in the census (for example, block faces, grid squares, or EAs). If (as is the case in most developing countries) EAs are the smallest unit, this will have important implications for the establishment of EA boundaries. Cooperation with the authorities responsible for these geographical entities before the boundaries of EAs are drawn can reduce later problems.

1.357. Being a rather complex technology and a resource-consuming one, GIS needs to be introduced in developing countries carefully and gradually. As an alternative to immediately launching full-scale GIS applications, countries may start with a simple and robust design that is likely to be understood and maintained by a wide array of users, transferable to a wide range of software packages and independent of any hardware platform. GIS implementation in a developing country may follow a hierarchical strategy, with the national statistical office employing a high-end commercial GIS with extensive capabilities for handling and analyzing large amounts of spatial data. Widespread dissemination of databases can then be achieved by creating a version of the finished databases using a low-end mapping software format for distribution at low cost and through web dissemination of macro-information in an online GIS.

G. Dissemination of the results

1.358. A census is not complete until the information collected is made available to potential users in a format suited to their needs. The information may be included in published tables and reports for general distribution, produced as tables in unpublished form for limited distribution or stored in a database and supplied upon request, or disseminated online (in this case it will be available only to connected populations).

1.359. All dissemination is subject to issues of (a) quality assurance, (b) possible disclosure of information about identifiable respondents and (c) copyright and ownership. In addition, the issue of cost recovery has become important to many statistical organizations. Each medium of dissemination has its advantages and limitations, and the choice of one or more of them depends on the context, and on the intended categories of users. In most instances, these methods complement each other and can provide effective ways to reach out to the public and private sectors.

1.360. When data is provided in electronic form, special attention should be given to providing users with easy means of data retrieval. The options for obtaining the relevant meta-information and the data should be accessible in standard format (ASCII text), comma separated value format as well as in common database and spreadsheet format for easy retrieval and manipulation.

1. Publication of printed tables and reports

1.361. Although more and more countries use software for online dissemination of their census results, printed publications remain an often selected choice for the dissemination of the main census results. At least for the present, they reach out to the largest number of potential census users. Paper media do not require that the user have any particular equipment, software or technical skills.

1.362. It is important that plans be made and sufficient funds be allocated to ensure publication of the tabulations of widespread interest. The final tabulations should be presented and explained in a way that will facilitate their

widespread use. The data should be shown for appropriate geographical and administrative divisions and classified by important demographic variables. The census publications should also contain information on how the data were collected and processed, results of available evaluation studies, and appraisals of the substantive significance of the results presented. In addition, a sufficient number of maps should be provided in the census publication to allow the identification of the geographical units for which the statistics are presented.

1.363. Using tabulation programs to produce output directly for publication allows the traditional method of dissemination of statistics through printed reports to be integrated more closely and more inexpensively with the statistical production process. If the software used for tabulation cannot produce camera-ready output, the files containing output tables can be moved into a document that could be assembled using desktop publishing or word-processing software. Manual retyping of tables once generated should be avoided as much as possible to prevent transcription errors and delays.

1.364. The choice of how the actual printing is to be done entails in fact a trade-off involving quality, cost and speed. The best results can usually be obtained by sending the documents in computer-readable format to a professional printing plant. This will allow high-quality typesetting and the use of supporting colours. Alternatively, master printouts can be made in the census office and sent to the printer for cheaper duplication or offset printing. There are also affordable high-speed printing systems that can be directly controlled by the microcomputers in the census office.

1.365. Target dates for publication should be determined well in advance and processing and reproduction programmes should be planned accordingly. In addition to traditional methods of printing, there are various methods of reproduction available that are rapid, economical and legible, and these should be investigated.

1.366. As a cheaper alternative to printing, census reports can be reproduced on microform (microfilm or microfiche). This technique allows broadening the publication programme without incurring proportionally higher costs. A drawback is that microform requires special reading equipment, and even then most users do not find it easy on the eyes. Dissemination of census publications on microform has largely given way to the electronic alternatives described below.

2. Dissemination on computer media

1.367.For an increasing number of users, computer-readable magnetic and optical media are the preferred medium of dissemination. This is because data in this form are often cheaper to obtain, copy and store. In addition, they are directly available for further computer processing and analysis.

1.368. Technologies such as CD-ROM, DVD-ROM, provide a medium of distribution for large data sets that are not subject to frequent change or updating. Standard CD-ROMs and DVD-ROMs are read-only optical media. They have a very large storage capacity, they are durable and they can be produced inexpensively. Because the results of a particular statistical inquiry such as a census are supposed to be final, dissemination on a read-only support should be satisfactory.

3. Online dissemination

1.368a. Archiving the micro-data as well as the final cross-classified tables published by the census organization is important. Often this important aspect of archiving census data for posterity is neglected as result of which country do not have a complete collection of all reports and tables published by them over the years. Printed publication become brittle and non-usable due to ageing. Each country should set up a digital archive of census publications.

1.369. . Online dissemination of all kinds of information, including statistical information, has increased with new innovative formats for displaying census data. The advantages of online dissemination are found primarily in terms of speed, flexibility and cost and providing accessibility to the results to a wide range of data users. . The information is available to the user as soon as the provider has loaded it on the server and cleared it for access by users. Information can be static or dynamic. The cost to the user is limited to the expenses of communication with the Internet service provider plus whatever charge the information provider is placing on top of these. There is no expense involved in the production and distribution of printed materials or other data supports There are however

financial resources needed for the implementation of the online data platform and potential training needed for staff to operate such technologies.

1.370. Online dissemination of data had been common well before the Internet gained prominence. The simplest option open to statistical organizations had been bulletin board systems (BBS), now largely replaced by Internet and Intranet websites. One could use the same website for both internal and broad community communication, with the granting of access rights in certain areas to privileged users only. Security measures, including passwords, callback procedures and so on can be used to exclude unauthorized users from reaching these areas. However, this is risky, since resourceful hackers may find their way around the barriers and gain entrance to confidential information. Firewalls are hardware and/or software security systems that limit the exposure of a computer or network to malicious infiltration from an external location. The census office website is probably the first dissemination medium where Internet connected users would look for census information. It is recommended that micro-data should not be stored on a website in direct contact with the public. It is also recommended that a powerful firewall constitute a security layer between the website that is visible to the public and the working network of the census office. Websites of public administrations are under constant attack from hackers and very sophisticated security measures must be adopted when "opening up" on the Internet. Internet security, despite being an issue of a technical nature, has to be mandated, demanded and provided resources for by the highest levels of management of the census office.

1.371. An Internet website can be used not only to make information available as soon as it has been cleared, but also for other forms of communication with users. Possibilities include online ordering of publications and one or more receiving areas for questions that would be answered later through the same medium by appropriate specialists. One such area could be the census forum or “chat room”.

1.372. Internet websites may support “door” or “gateway” applications that allow users to run outside programs on the computer on which the Internet web server operates. Interactive access to census outputs can be offered to most types of databases and census products, including reports, publications, tables, maps and graphs. When the required data are not readily available, users could run an on-the-spot query to obtain and retrieve results that satisfy their needs. This can be done by offering to an interactive tabulation systemProgram execution by users on the outside, however, raises important questions of cost, efficiency and confidentiality, which have to be resolved. For reasons of efficiency, it is recommended that information which is provided or likely to be heavily requested by users accessing the census website be made available in a static format, which is faster to download. Letting the user run data extraction on online databases, which would be a dynamic way of accessing the census information, is more resource-consuming and should be the second choice for those users needing more detailed data than those available through static pages.

1.373. Other media such as sociql media are useful in disseminating census information targeted at different sectors of the population. More generalist media, such as the radio, television programmes, newspapers, press conferences and so forth offer the possibility of reaching out to sectors of the population not otherwise reachable.

1.374. A hybrid solution for data dissemination that appears to combine the advantages of several approaches is one whereby the statistical or census organization makes basic data available to users on a computer-readable medium, usually through a website or optical media, while additional information may be provided by telephone or some other online protocols, such as File Transfer Protocol (FTP) sites. This will usually take the form of a package that contains basic data, metadata and data browser software. The basic data may contain existing time-series, report files and the like, as well as country and region maps that can be used to generate thematic maps with various indicators. Maps made available to general users need not ensure the same geographical detail as maps used for EAs. Lighter versions of maps at any subnational level may be provided to the general public, and more sophisticated and detailed ones to those fewer users who would actually need an increased level of detail. It is thus important that the website specify the instructions on how to contact officers responsible for special dissemination needs.

1.375. For some users, if the particular statistical information is not yet available on the physical distribution medium, special access may be granted, provided that adequate screening of their credentials and security checks are performed, to protected areas of the Internet site where up-to-date census information becomes available. Since “opening up” online resources to users has to be planned carefully and a clear policy established in advance (so that

criteria for deciding whether or not to grant access are unambiguous), it is not recommended. Instead, provision of an online data tabulation system for expert end users is advised.

4. Privacy and confidentiality

1.376. All the information stored in the census database allows the production of tables not only for very small areas (such as enumeration areas or villages) but for all individual units in these areas. Therefore, when a census database is constructed, not only technical considerations but also the maintenance of confidentiality and the protection of individual privacy -- which must be a primary consideration in designing the data-collection and data--processing programme -- must be taken into account. Accordingly, micro-data, such as name and local address, or the unique characteristics that permit the identification of individual respondents, must be removed from the database or otherwise altered.

1.377. The same care must be taken if a transcription of information from original questionnaires (that is to say, from a representative sample) is needed for use by qualified agencies and research institutes engaged in special studies beyond the purview of the regular census programme. Such needs have sharply decreased with the almost universal use of computer technology. However, when such a procedure is possible under the census law, individual privacy should be ensured and no exception should be authorized.

5. Acceptance of results

1.378. In countries with limited prior census experience and without a well-functioning civil registration system, where population data are based largely on estimates, it is important to inform the users, particularly the governmental authorities, that the census results could differ from such estimates and to explain the reason for these differences. In some cases, there may be doubts expressed about the census results; usually those doubts focus narrowly on the total population of the country, major subdivisions or population sub-groups, rather than on the bulk of the census data relating to characteristics of the population or on the data for local areas. In this situation, it may be possible to take such doubts into account by modifying the census evaluation programme or by adding appropriate qualifications to the text of the census reports or in tabular footnotes. Nevertheless, the Government may proceed with the processing and dissemination for official purposes. In any case, every effort should be made to process and evaluate the full census and to make appropriate use of as many of the census tabulations as possible.

H. Evaluation of the results

1. Purpose of census evaluation

1.379. The quality of population and housing census data is very important for many reasons, building public trust and understanding in the national statistical system. The purpose of census evaluation is to provide users with an acceptable level of accuracy and confidence when utilizing the data, and to explain errors in the census result. It is therefore important to choose an appropriate way of sending out these messages to the right group of stakeholders.

1.379a.The evaluation methods discussed here are those that apply to traditional censuses. To some extent they also apply to register-based censuses and other census methodologies, but these also present their own particular challenges and solutions. 4

1.380. It is universally accepted that a population census is not perfect and that errors can and do occur at all stages of the census operation but these errors should be measured. Errors in the census results are classified into two general categories - coverage errors and content errors. Coverage errors are the errors that arise due to omissions or duplications of any of enumeration units: persons, household or housing units in the census enumeration. The

[4] See, for example, *Census Quality Evaluation: Considerations from an international perspective*, note produced by the UNECE Secretariat for the 11th Joint UNECE/Eurostat Meeting on Population and Housing Censuses, Geneva, 13-15 May 2008, http://www.unece.org/stats/documents/2008.05.census.html

sources of coverage error include, *inter alia,* incomplete or inaccurate maps or lists of enumeration areas, failure on the part of enumerators to canvass all the units in their assignment areas, duplicate counting for persons who have two or more places of residence, persons who for one reason or another do not allow themselves to be enumerated, erroneous treatment of certain categories of persons such as visitors or non-resident aliens, loss or destruction of census records after enumeration, and so forth. Content errors are errors that arise in the incorrect reporting or recording of the characteristics of persons, households and housing units enumerated in the census. Content errors may be caused by poorly phrased questions or instructions, or enumerator errors in phrasing the census questions; inability or misunderstanding on the part of respondents in respect of answering specific items; deliberate misreporting; errors due to proxy response; coding or data entry mistakes, and so forth.

1.382. Many countries have recognized the need to evaluate the overall quality of their census results and have employed various methods for evaluating census coverage as well as certain types of content error. Comprehensive evaluation should however also include assessment of the success of census operations, in each of its phases, including evaluation of activities such as the census publicity campaign, data collection, data processing, data dissemination and data utilization. Countries should ensure, therefore, that their overall census evaluation effort addresses the census process, as well as the results. The present section is devoted to evaluation of the results. However, the section on the quality assurance and improvement programme (paras. 1.228-1.277) provides further recommendations relating to controlling and assessing the quality of census operations Evaluation efforts focused on census results should generally be designed to serve the following objectives: first, to provide users with some measures of the quality of census data to help them interpret the results; second, to identify as far as is practicable the types and sources of error in order assist the planning of future censuses; and third, to serve as a basis for constructing a *best estimate* of census aggregates, such as the total population, or to provide census results adjusted to take into account identified errors at national or sub national levels.. As discussed below in the following subsection, a number of methods exist for carrying out census evaluation. In practice, many countries use a combination of such methods in order to fully serve these objectives.

1.383. The final publication of census results should include an estimate of coverage error, together with a full indication of the methods used for evaluating the completeness of the data. The publication should also provide users with some cautions or important notes about the results, in addition to some guidance on how they might use the evaluation results. It is also desirable to provide, as far as possible, an evaluation of the quality of the information on each topic and of the effects of the editing and/or imputation procedures used

1.384. The range and quality of editing in regard to the correction of the inconsistent data and imputation possible in a population census are greatly enhanced by the use of computer edit programmes that permit inter-record checks (for example, the replacement of missing values based on one or more items on the basis of reported information for other persons or items). If any imputation is made, the topics affected, the methods used and the number of cases affected should be documented and clearly described in the census report.

1.385. The process of census evaluation should not be permitted to delay the prompt publication of the principal results of the census.

2. Methods of census evaluation

1.386. The choice of evaluation methods to be used depends upon the evaluation objectives. These, in turn, depend on national census experience in terms of past and anticipated errors, user and public concerns, and the financial and technical resources available for evaluation. The decision whether to measure coverage error, content error or a combination of the two must be made. In addition, both gross and net error must be taken into account in developing the overall evaluation plan. Gross coverage error in a census is defined as the total of all persons omitted, duplicated or erroneously enumerated. Net coverage error takes into account the underestimates due to omissions and the overestimates due to duplications and erroneous inclusions. When omissions exceed the sum of duplications and erroneous inclusions, as is usually the case in most countries, a net undercount is said to exist; otherwise, a net overcount results. Similarly, both gross and net content errors have to be considered in the evaluation design.

1.387. Numerous methods are available to estimate the coverage and content error of censuses. These include simple techniques of quality assurance such as internal consistency checks. Comparisons of results with other data

sources including previous censuses, current household surveys and/or administrative records are also useful techniques. Such comparisons may be made in aggregate, that is to say, by comparing the overall estimates from two sources (net error only). Alternatively, record-checking, in which individual census records are matched against alternative sources and specific items of information are checked for accuracy, may be used. Both gross and net errors can be estimated in record checks, which may involve field reconciliation of differences, a costly exercise that cannot be overlooked. An important but complicating factor in the use of record checks is the requirement of accurate matching. It is essential to plan carefully for this aspect, since the operation can be tedious and costly. It should be noted that record checks are best employed to study the coverage of certain segments of a population, such as children whose birth records are complete, since these checks are, by definition, limited to subpopulations with complete, accurate records.

1.388. Demographic analysis and post enumeration surveys (PES)5 are two very important methods for evaluating census data, and these are discussed in further detail in the following two subsections.

3. Demographic analysis for census evaluation

1.389. Demographic analysis offers a powerful methodology for evaluating the quality of a census and countries are encouraged to use it as part of their overall census evaluation methodology. A wide variety of demographic techniques have been developed and used, ranging from visual inspection of census data to comparative analysis of two census age distributions. A basic procedure for assessing census quality on age-sex is graphical analysis of the population pyramid. Age-heaping or the tendency of respondents to report a particular ending digit is a useful check of the quality of age reporting, as are sex ratios by age and certain summary indices of age-sex data, including the United Nations Age-Sex Accuracy Index which extends age-sex ratio analysis by observing deviations of the observed age-sex ratios from the ones expected for each five-year age group and combining the results into a single score.6 Other summary indices are Whipple's Index and Myer's Blended Index, used for judging age-heaping.

1.390. Stable population theory has also been used in the past to assess the quality of census distributions by age and sex. It is based upon measuring the reported age-sex distribution against that of an appropriately chosen stable population., assuming that the population is not affected by significant international migration. However, nowadays there are few countries where the other two conditions assumed under the model, namely constant fertility and constant or recently declining mortality, are satisfied. Recent declines in fertility render the technique less useful as an evaluation tool, since the technique is sensitive to changes in fertility levels. Nevertheless, if the population is closed to migration, it can be assumed to have been stable in the not-too-distant past and if approximate estimates of recent fertility and/or mortality declines and/or recent growth rates are available, it may still be possible to assess the plausibility of the current age-sex structure in the light of these trends by iteratively fitting projected population structures to the observed numbers.

1.391. The methods mentioned above, while useful in providing overall assessment of census quality, cannot differentiate the sources of census error in terms of the relative contributions from under-coverage (or over-coverage) or content error. Better information about coverage error, through demographic analysis, derives chiefly from comparative analysis of data from successive censuses, in which four methods are used.

1.392. The four methods include (a) derivation of an expected population estimate taking account of vital registers of births, deaths and net migrants between censuses, as compared with the latest census, (b) population projections based on the results of the prior census plus data on fertility, mortality and migration from various sources and comparing the projected estimates with the new census results (cohort component method), (c) comparison of two census age distributions based on intercensal cohort survival rates and (d) estimates of coverage correction factors using regression methods to make the age results from the two censuses mutually

[5] Note that for the purposes of this publication, a post-enumeration survey, or PES, is defined as being a post-census evaluation survey.

[6] See *Methods of Appraisal of Quality of Basic Data for Population Estimates: Manual II* (United Nations publication, Sales No. E.56.XIII.2). *Tools for Demographic Estimation*. 2013, International Union for the Scientific Study of Population (IUSSP) . http://demographicestimation.iussp.org/content/reverse-survival-methods.

consistent (cohort survival regression method).[7] It should be noted that the first two methods would likely have to be restricted to evaluation studies of coverage at the national level, especially in countries that do not have good subnational data on migration.

4. Post-enumeration survey

1.393. The post enumeration survey (PES) can be defined as the complete re-enumeration of a representative sample of the census population and matching each individual who is enumerated in the post-enumeration survey with information from the main enumeration. The objectives of the post enumeration survey can be summed up as follows:

(a) To assess the degree of coverage during census enumeration;
(b) To examine the implications of coverage deficiencies, if any, on the usefulness of the census data;

(c) To obtain information for the design of future censuses and surveys;

(d) To examine the characteristics of persons who may have been missed during census enumeration.

1.394. While a PES can be designed to provide a comprehensive evaluation of coverage and content error, especially when supplemented by and integrated with detailed demographic analysis of census quality, the methodology of a sound PES is complex, so that countries must accordingly weigh with care the demanding technical requirements and the costs of conducting a successful PES, and elaborate a clear statement of its objectives, before deciding to undertake such a survey. Careful advance planning is crucial. To be valid, a PES has to function within a number of operational and statistical constraints. These include the requirement that the PES be carried out within a few months of the end of the census to ensure that the impact of natural population changes (births, deaths and migration) and lapses in respondent recall do not hopelessly complicate the exercise.

1.396. Another basic property of PES design and execution,, involves matching and reconciliation. Matching the PES person-record or household-record against the corresponding census record is an operation whose performance must be of very high quality to ensure that inaccuracies in the PES itself do not effectively ruin the estimate of coverage error. Matching is especially difficult in countries where many surnames are identical or where individuals are known under more than one name, and well-defined street addresses do not exist. Part of the matching operation usually involves a field visit to reconcile differences between the census and the PES as regards either coverage or content. Reconciliation of course adds another dimension of cost and complexity, since it entails a second visit to the field for PES-related purposes.

1.397. Clearly defining the objectives of a PES is the first and most crucial step in planning the survey. The objectives might include estimation of coverage error at the national level; estimation of coverage error for major subnational domains or population sub-groups, each with its own specified level of precision; and/or measurement of content error for specific census items.

1.398. As mentioned, the design of a post-enumeration survey is complex and there are various alternatives, primarily depending upon whether single or dual system estimation is to be utilized. A number of references are available that set out highly detailed procedures for designing a PES and the conditions under which they may or should be considered.[8] However, in general, when designing a PES it is important that:

(a) Time between the census and the PES be minimized to avoid as much recall

[7] Detailed methodologies including step-by-step procedures for applying all the demographic techniques mentioned above, plus others, are contained in *Evaluating Censuses of Population and Housing* (Washington, D.C., United States Department of Commerce, Bureau of the Census, 1985).

[8] *Post Enumeration Surveys, Operational Guidelines, United Nations, DESA, Statistics Division, 2010, http://unstats.un.org/unsd/demographic/standmeth/handbooks/Manual_PESen.pdf*

error as possible and impact of population changes (births, deaths and migration);

(b) The PES must be independent of the census. PES interviewers must not have census information about the areas they are working. When interviewers have knowledge of census responses, they tend only to confirm what the census recorded;

(c) To preserve the independence of the PES, its data collection and processing operations must be completely separate from the census data collection and processing;

5. Re-interview surveys

1.399. Sometimes a post-census survey is designed to measure content error only, in which case it is usually known as a re-interview survey. The advantage of a well-designed re-interview survey is that the results are more accurate than those of the census insofar as the operation is much smaller and can be more effectively controlled. Estimates of relative response bias can be obtained from a re-interview survey, which (rather than the census) is generally taken as the standard in this area on the grounds that the survey, with its better-trained interviewers and more intensive survey procedures, yields superior results.

1.400. As part of the design of some post-enumeration surveys, a sample of the original census enumeration districts, blocks or areas is chosen and recanvassed for the PES. As regards methodology, this constitutes a useful *re-interview* technique for measuring content error, and such an element in the design is often put into practice because the matching operation between survey and census records is then dramatically simplified. When this technique is also used to estimate census coverage error, the single system estimation methodology has to be employed since the PES and census are not independent.

I. Analysis of the results

1.401. In order to ensure the fullest possible utilization of census results by national and local governmental authorities, by academic researchers and by others, it is advisable to draw up a comprehensive and coordinated programme of analytical studies, phased over a period of several years. This will help allocate effort and resources in such a way as to ensure that important policy needs are adequately met, undue duplication of research effort is avoided and priorities are observed as far as possible. In these studies, the data of the current census should be examined not only by themselves but also as complemented by relevant data from other sources and from earlier censuses, in order to obtain a broader context, improve the estimates and establish trends.

1.402. The analytical studies to be included in such a programme will vary according to the needs and circumstances of the country. The programme may include descriptive summaries of results, policy-oriented analyses of census results and detailed analytical studies of one or more aspects of the demographic and social situation of the country. Some of these studies may be undertaken by the census organization itself, but others, particularly the more time-consuming studies, can most effectively be carried out in cooperation with specialists in different subjects having experience in in-depth analytical studies from universities or other research centres. In any case, it is desirable to invite specialists from other governmental offices and experts outside of the Government to take part in drawing up this programme of studies and it is natural that they would play an important part in the execution of various parts of the analytical programme.

1.403. One important aspect to be considered in establishing a programme of analysis is the possible use of census results in achieving the goals and objectives of population, human settlements or similar policies and strategies at the national and local level and in applying available resources effectively towards the improvement of conditions in these fields. For this purpose, it will be necessary to analyze population and housing census results within the framework provided by other available information so as to achieve an integrated approach to the solutions of population, human settlements and similar problems.

1.404. A permanent census office should be the central repository of all census results; it would thus be equipped with the information needed for comparative studies, which will indicate long-term trends in the phenomena investigated. However, to facilitate the fullest possible use of census results by others, subsidiary depositories should be established that serve different substantive or geographical groups of users.

1.405. Aside from the studies that are part of the overall census programme, additional analyses carried out on their own initiative by research organizations, universities or other experts should be encouraged.

J. Systematic recording and documentation of census experience

1.407. The cumulative experience of past censuses in a country is very useful in the preparation of a new census. Because of the lapse of time between censuses (generally 10 years) and the likelihood that experienced staff may leave the census office, it is essential that there is a comprehensive record of how the census was planned, organized and conducted.

1.407a. The census office should, therefore, plan for and implement a knowledge management system to assemble complete records on plans, activities, and decisions taken during the entire census operation. This would entail documentation and archiving of information related to plans and their implementation, as well as problems encountered and how they were resolved at each stage of the census cycle. It is recommended that documentation of census experience be undertaken at each stage of the census operation and not be left until the end of the census process. This would include plans, decisions and activities related to preparatory activities, the methodology of the census, field work or other data collection activity, data processing, cost and implementation of the census budget, as well as on evaluation of performance of each of these activities. Examples of items to track or monitor include implementation of activities, time taken to complete an activity, resources used, and cost. All these should be assessed against set goals so that changes to plans can be recorded including information on what changed and why. Tracking and systematically recording census experience should also take into account risks encountered as well as how these risks were managed. For more information see section on “Quality assurance and improvement”, paragraphs (1.227a-1.277).

1.407b.Use of knowledge management tools and techniques is thus beneficial for preserving institutional memory in a codified way so that lessons learnt from the past may be used for better management of future census planning and execution. Records in the system should be arranged in such a way that information on each aspect of the census operation is found easily..

1.407c. Systematic recording of census experience is not an end in itself. It is recommended that every country prepare and, if possible, publish an administrative and methodological report, as a census “historical memory”, based on information that has been recorded in the knowledge management system (see paras. 3.26 on administrative report). Depending on the methodology of the census, the administrative and methodological report should contain information on the manner in which the census was planned, organized and conducted, as well as important methodological and other problems encountered at various stages of the programme. As appropriate, the report should provide specimens of the census questionnaires and forms, instructions for the enumeration, and detailed information on the cost of the census and on the implementation of the census budget, as well as points to be considered in future censuses.

1.407d. The structure of the report could be similar to the structure of the project plan. It is important that the report be as comprehensive as possible, covering all stages and aspects of census planning and operations, including fieldwork, processing, analysis, dissemination, evaluation, and so forth. It is important to note that while such a report would be based on items and information in the knowledge management system, it may not necessarily contain detailed descriptions of all the processes or information as some may be for internal use only. This report would both assist the users of the census results in appraising and interpreting the data and facilitate the proper planning of future data-collection programmes, including population and housing censuses.

K. Operational aspects for register-based census or combined methodology (New section)

1. General aspects and Pre-conditions

1.407e. Population and housing censuses are an integral part of the system of official statistics in each country. They are expected therefore to fully encompass the fundamental principles of official statistics9.

a) Legal framework

1.407f. If administrative data are used for census purposes, statistical authorities should have a clear legal mandate to collect administrative data for statistical purposes. Individual historical, cultural and political factors of each country lead to highly diverse legal frameworks. Therefore, only broad recommendations can be given.

- Privacy, integrity and security
  To secure the handling of data and strengthen the trust from the general public some legal acts should be in place. Examples of these are Statistical Act, Secrecy Act and Data Act. These regulations should regulate how data can be transferred, handled and delivered inside the Statistical Institute and between the Institute and other departments, organizations and users.

- Data access
  A legal basis should enable the statistical authority to collect administrative data. The required data sources should be described clearly. Data supply by governmental or private organizations should be specified as compulsory. The type of data transmission should be described. Limitations to the data access (e.g. duration of access, confidentiality) should be described.

- Data use
  All variables of census relevance, with metadata, including identifiers of administrative data sources, should be listed completely and described clearly. Limitations to the data use (e.g. duration of use, deletion of micro-data) should be described. Furthermore, it should be clearly defined that data compiled for statistical purposes will not be re-transmitted to the data providing organization or other governmental authorities.

b) Co-operation

1.407g. A joint effort towards register-based statistics production requires firm and explicit commitment at the highest possible political level, as well as close collaboration among relevant authorities. Co-operation between statistical and administrative authorities generates a mutual and deeper understanding of the primary purpose of the registers and the needs of the statistical authority.

d) Confidentiality and public approval

1.407h. In the context of a census, the most important principle for the population is the confidential use of individual information, as stated in the 6th fundamental principle, which requires that the use by statistical authorities of individual data, whether they refer to natural or legal persons, be strictly confidential and used exclusively for statistical purposes.

1.407i. The political decision concerning the use of administrative data in a census can be highly influenced by public approval or refusal. In the run-up to implementing a new or modified census methodology it is helpful to inform the public about the project. It can be expected that people will become more and more sensitive towards the

[9] The fundamental principles of official statistics were adopted by the United Nations Statistical Commission at its Special Session of 11-15 April 1994.

collection and analysis of personal data by governmental authorities. In addition to outlining the general benefits and risks of the use of administrative data, information to the public should focus on the confidentiality of personal microdata. Clear limits and rules regarding the use of administrative data provide a common understanding that individual data collected for statistical purposes will not be passed on to other governmental authorities.

e) Administrative routines

1.407j.A decision about the use of register data for statistical purposes largely depends on the nature of register itself, including qualities such as integrity, reliability and lifespan. For this reason, there should be confidence in the administrative authority's capacity to be a reliable partner and data supplier. This implies the presence of administrative routines and safeguards. Has the administrative authority extensive experience with the collection of the data that may be used for statistical purposes? Is the administrative authority well organized and is it anticipated that the necessary data collection will continue into the future? Are there existing quality guidelines for the administrative authority that guarantee long-term data quality?

f) Identifiers

1.407k. Regardless of the census methodology adopted, it is extremely important that a unique primary key variable is used in all the data sources. The use of a unique identifier is essential in order to link information successfully. This primary key may already exist in the country, for example, a national personal identification number. Where it does not exist, or it exists but with poor quality (for example, too many duplicates), it can be artificially created for statistical purposes.
A statistical linkage key can be built from unchanging variables for persons, such as "family name at birth", "first name", "date of birth", "sex" and "place of birth". Care needs to be taken with alternative spellings, for example, incorrect or incomplete registry entries, transcription errors, and the varying transcription of foreign languages, names or place names.

1.407l. Unique identifiers assist in the detection (and correction as necessary) of identical statistical units (duplicates). Duplicate records most often arise when collecting data from more than one decentralized register, but are also possible within one centralized register. The problem with duplicate data entries is the risk of multiple counting of identical statistical units.

1.407m. In the case of fully register-based censuses, information from different registers should be matched using good quality identifiers. It is important to define how often information from different sources is updated and the reference date of the information stored in the different registers. When two or more data deliveries with the same content from the same administrative authority are planned, a linkage key will enable validation of data quality with regards to the statistical reference period.

1.407n. For the combined census method, a wide variety of different methods can be used to collect information including paper, internet, hand-held devices, telephone interview, etc. Electronic devices have important advantages that influence the quality of the information obtained: validation controls can be included in the different questions, time to answer the questions is reduced and the analysis and dissemination of information is faster. Where data are collected via different routes (such as when having internet collection available in parallel to face-to-face interviews) controls are needed to avoid duplication of information.

1.407o. Successful data linkage may be compromised by poor quality of the source data. Information stored or provided by data owners may have errors resulting in non-linkage or multi-linkage of records. In these situations, probabilistic approaches that choose the closest candidate, or the use of geographic information (starting from the lowest detail level and gradually increasing), can help to improve the linkage process.

2. Data processing

1.407p. Partially or fully register-based censuses have several important advantages when compared with the traditional approach. For example, response burden on the population can be reduced10. Methods may be adapted to the specific national circumstances. Non-response can be treated with methods that make use of the information that exists in other data sources11. Depending on the amount of information available from different data sources and its degree of integration, data processing can be more complex with these census methods than with a traditional census, although good quality results can be obtained.

1.407r. The decision to use administrative sources in the statistical production process requires a close collaboration between the administrative authorities and the national statistical offices. During preparations for the data delivery, all parties concerned must agree on date(s) of delivery and the content of the data. This implies a bilateral agreement at a high hierarchical level on a detailed data set description, scheduled delivery dates and the statistical reference period. Test data deliveries help to solve or minimize problems with the subsequent data processing by the national statistical institute. Validation techniques appropriate to administrative data should be applied, including checks on the plausibility, completeness and reference periods.

1.40s. For combined census methodologies, it is important to store control information and indicators at the lowest geographical level available in the central database, covering issues related to the census operation such as progress with the field work, response rates, and comparisons with information in registers. This control information - normally based on web reports and analyzed daily by project managers or regional offices - can be used to detect problems that can appear during the field work and to plan necessary actions to overcome these problems. If data are analyzed on a daily basis, close monitoring of the ongoing field operation and data entry is possible.

1.407t. Register information may contain errors (for example, records showing people as being implausibly old, invalid occupations, information about migration that is not consistent with other data). Edit rules may be defined to highlight inconsistent or implausible information. Correction or imputation of records with errors can be attempted in different ways: first, if possible, using another data source (register) that also has information about that specific record and topic; or second, carrying out probabilistic imputation based on available information that is thought to be reliable.

1.407u. Missing or implausible data can create serious problems for data analysis. Cases that have missing or implausible values may be deleted but this can result in a loss of representativeness and completeness, and the introduction of bias. Various imputation methods can be considered, with a general distinction between single and multiple imputation techniques.

1.407v.Sometimes information about topics can be obtained through different data sources (registers and survey). In this situation, it is very common that calibration techniques are used in order to reduce inconsistencies between data from different sources. However, calibration only guarantees coherence to a certain geographical level, generally modifying or adjusting the sampling factors. It may be necessary to explain to users the reasons for any remaining differences.

IV. Use of sampling in population and housing censuses

1.408. The potential role of sampling in population and/or housng censuses is extensive. On the one hand, sampling can be an integral part of the planning, data collection and operations, analysis and evaluation of the census. On the other hand, the census may serve as a sampling frame for subsequent sample surveys or survey programmes.

[10] Statistics variables can be derived using one or more administrative variables from different data sources.
[11] For example, information that exists in other registers or in different surveys.

1.409. Important aspects of the use of sampling in connection with the census are set forth below in three sections: the first on features of acceptable sampling operations, the second on sampling as an integral part of the census and the third on the census as a frame for subsequent sample surveys.

A. Features of acceptable sampling operations

1. Accuracy and precision

1.410. The use of sampling in a census entails an awareness of the precision desired in sample estimates. The higher the levels of precision or the smaller the domain of estimation, the larger and/or more complex, and hence the more expensive, the sample. A distinction is to be made between the precision of a sample estimate and its accuracy. Precision can be measured by the standard error (which gives a measure of the error due to sampling compared with a complete enumeration under the same general conditions of inquiry), while accuracy is measured by the difference between the true value (which is generally unknown) and that obtained from an inquiry, whether on a sample or complete enumeration basis.

1.411. Sampling methods employed in census taking, with the exception of pilot tests, should make use of probability samples as opposed to judgemental, purposive or other non-scientific methods. For the successful execution of a probability-based sampling plan, it is essential that scientifically designed selection procedures be strictly followed. The sampling procedures must be such that a known positive probability of selection can be assigned to every unit in the population. The inverse of these probabilities must be calculable so that they can be used to estimate population values and to calculate the measure of precision of the estimates (in other words, their sampling error). Selection procedures must be faithful to the design so that deviations from prescribed standards or instructions are minimal.

1.412. Of course, estimated results based on samples are subject to sampling errors in addition to various types of non-sampling errors that are also present in a complete enumeration. The smaller scale of a sample operation may make it possible, nevertheless, to employ interviewers of higher calibre, to devise and pose questions of greater detail and to minimize response errors. As a result, non-sampling errors, which affect the accuracy of the estimates, are likely to be fewer in a well-executed sample than in a complete enumeration.

1.413. Whenever sampling is used in the census data collection, provision should be made for computing estimates of sampling error (variances), at least for the major items of interest. While a variety of techniques can be employed to estimate variances, the particular technique adopted should be one that reflects the actual sample design used.

2. Census resources

1.414. Effective planning of sample operations consists to a large extent in making judicious use of whatever expert knowledge and equipment are available in a particular country. Specific sample plans aimed at the same objective may vary from country to country, depending on the quality and quantity of census resources. In planning a sample operation as part of the census effort, it is important to bear in mind considerations of cost and competent direction.

1.415. The question of cost in sampling is of crucial significance and cost may be the reason why it was decided not to collect the same information through a complete enumeration in the first place. Numerous factors govern the cost of sampling and it is essential that these be fully weighed before a decision is made to associate a sample plan with a complete count. One important factor, for instance, is the size and complexity of the sample, which in turn is governed by the objectives of the survey and the procedures that are regarded as most efficient.

1.416. Sample operations should be conducted under the direction of a competent statistician who is conversant with the theory of sampling and of statistical analysis from sample data, and the practical operations of carrying out sample surveys in the field. The advice of such a sampling statistician is indispensable at all stages of the sample operations from planning and sample design to estimation and calculation of variance.

1.417. In order to ensure that the sample is selected strictly according to the design and to avoid any possibility of bias in sample selection, it is strongly recommended that the actual selection of the sample units should be carried out either in the central office or in regional offices under the direct supervision of a sampling statistician.

B. Sampling as an integral part of the census

1.418. Depending on the types of problems to be tackled, a country may consider applying sampling methods in one or more of the following phases of a population census: tests of census procedures, data collection for (usually) a subset of topics in addition to those for which universal coverage is required, post-enumeration field checks, quality assurance of data-processing, advance tabulation of selected topics, and final processing and tabulation. Each phase is discussed below.

1. Tests of census procedures

1.419. Planning the various phases of a census often involves choosing among several alternative procedures. Tests conducted on a sample basis provide the best means of determining which alternative to use. The results of such tests facilitate a more desirable allocation of available census resources than is possible otherwise.

1.420. The nature and extent of census testing depend on the information that is available from previous censuses or other sources. If, for example, prior housing statistics are lacking in a country, a pilot survey may be called for to assess in advance the practical problems that will be involved in including specific housing topics in the census.

1.421. When carrying out census tests, probability samples are not usually necessary. Since the purpose of most census pilot and pre-tests is to judge the operational feasibility of a proposed course of action for the main census rather than make population estimates, purposive samples can usually be used for such tests. Purposive selection of one or a few geographical areas is generally preferable for such feasibility testing. Purposive samples are also particularly useful when it is necessary to test census questionnaires and methods in areas with particularly difficult conditions. On the other hand, when overall quantitative measures are needed for comparing efficiencies of different procedures (for instance, in examining the anticipated response errors arising from different systems of enumeration), random sampling procedures must be used.

2. Enumeration of topics in addition to those for which universal coverage is required

1.422. The expanded needs in most countries for extensive and reliable demographic data have made the use of sampling a cost-effective part of census taking. Sampling is increasingly being used to broaden the scope of the census through the asking of a number of questions of only a sample of the population and households. This use of sampling makes it feasible to obtain urgently needed data of acceptable precision when factors of timing and cost would make it impractical to obtain such data on a complete-count basis.

1.423. It is important to bear in mind, however, that national legal requirements may make it mandatory to collect certain information on a complete-count basis. Legislation in many countries prescribes complete population enumerations at particular times or makes certain political or administrative dispositions dependent on particular results from a complete enumeration. For example, the apportionment of seats in the legislature among the civil divisions of a country often depends on the number of persons actually enumerated in each division. The data needed for this and similar purposes may not be collected by sampling.

1.424. Census information that is collected for only a sample of the population and/or housing units is usually obtained by one of two different methods. The first pre-designates a systematic subset of census households to receive a so-called long form, or the census form that contains the detailed questions on all topics. Depending on the sample requirements which, in turn, take account of considerations of cost and precision, the systematic subset that is designated for the long form may represent, for example, 1 in 4, or 1 in 5, or 1 in 10 of the census households. Under such a sampling scheme, all other households in the census will receive a short form containing only those questions intended for universal coverage. If countries choose this option, it is recommended that the pre-designation of the sample households that are to receive the long form be carried out at a central location by

supervisory statistical staff, since it has been shown that when the enumerators themselves actually identify the sample households the results are often biased.

1.425. The second method of sampling often used involves designating a sample of enumeration areas to receive the long form. In this approach, all households in the designated enumeration areas receive the long form and all households in the remaining enumeration areas receive the short form. The advantage of the first method over the second is that the sampling precision of results is greater in the former because clustering effects increase the sampling variance when whole enumeration areas are used as sampling units. On the other hand, the advantage of the second method is that different enumerator staffs may be trained more easily, since one set of enumerators can be trained only for the long form and the other set only for the short form.

1.426. It is important to make certain that asking questions that are not asked of all persons does not give rise to legal, administrative or even political issues, since census information is required under statute and often with penalty for refusal.

1.427. The suitability of particular questions for a sample enumeration depends on the precision with which results are needed for small areas, and small population groups, and on the enumeration costs involved.

3. Post-enumeration surveys and field checks

1.428. As discussed in the section on the evaluation of census results, it is universally recognized that census taking is not perfect and that errors can and do occur. A highly useful method of evaluating the census results discussed in that section is the use of post-enumeration evaluation surveys (PES). An independent quality check such as a PES can be critical in validating the census count. Whenever a PES is utilized for census evaluation, it is important of course that the design of the PES be based upon sound probability sampling methods.

1.429. The sample design for a PES must duly take account of the measurement objectives of the evaluation study. These usually include the need to estimate census undercoverage with a certain degree of reliability. In addition, the estimates of undercoverage may be wanted for geographical areas such as provinces or States, and large cities, for urban rural comparisons and so forth. Such requirements also greatly affect the sample design of a PES, as the necessary sample size is increased substantially when estimates of subnational coverage (or undercoverage) are wanted.:

4. Quality assurance and improvement programmes

1.430. As mentioned earlier, sampling can be used effectively for measuring and controlling the quality of many phases of census operations (see paras. 1.228-1.277). The quality assurance measures start with pre-enumeration (designing questionnaires and pilot tests), and continue through enumeration and post-enumeration. Under post-enumeration this includes, in particular, the editing and coding of questionnaires, data entry and tabulation. Even in a country of medium population size, these operations involve millions of questionnaires.

1.431. Every effort should be made to keep operational features as simple as possible. In general, a systematic pattern of selection with random starts is preferable to a random pattern. Measures of quality must be adaptable to simple record-keeping systems.

5. Advance tabulation of selected topics

1.432. A complete national census is a huge undertaking and several months, or even years, may elapse before some of the tabulations are published. It is therefore natural that some countries, particularly those with very large populations, should consider advance, provisional tabulations as a way to ensure that key data are available and are disseminated in a timely manner. Sampling can be availed to serve this need in countries that decide to prepare advance tabulations.

1.433. Preparing advance tabulations through sampling has certain disadvantages, however. For the final results to be given, the results tabulated for the sample units have to be integrated with those tabulated for the non-sample units. These operations may increase the total tabulation time of the census and its cost. Precautions are necessary in order to minimize the delay that may be caused in the preparation of the final results. Moreover, issues concerning the differences between the advance tabulations (which are *estimates* based on a sample) and the final tabulations (which for some topics may be complete counts, while for others estimates based on the long-form sample) must be resolved to the satisfaction, and with regard to the comprehension, of users. Finally, the need for an extensive set of advanced tabulations has been reduced in recent years because the widespread use of microcomputers has reduced the time that was being taken to process the census in many countries. In these circumstances, advanced tabulations programmes are likely to be needed only by very large countries that anticipate extended data-processing operations.

1.434. If sampling has been used as an integral part of a complete enumeration to secure information for a subset of topics, as described above, the same sample of units (persons, households or enumeration areas) can also provide a sample for advance tabulations of the census proper. Such a sampling scheme, if it is devised efficiently, with a view to securing additional census information by small administrative units, may offer excellent opportunities for conveniently obtaining advance tabulations for the same administrative units.

1.435. Even when no sampling has been used in the actual enumeration, a sample design for advance tabulations may be comparatively simple to achieve because the complete census returns provide a sampling frame which can then be used to select the sample for the advance results.

6. Final processing and tabulation

1.436. The principal limitations of complete processing and tabulation of all the information collected in a population census and/or housing census are the length of time it takes and the costs. Consequently, a country may decide to use processing and tabulation programmes that provide complete tabulation of a set of core items, such as those on the short form (for countries that use sampling for long-form items), while certain other characteristics are processed and tabulated only on a sample basis. In addition, countries should keep in touch with the latest technology to be used for data processing and tabulation, which may make it far more feasible to process the complete information, which is always the preferable option.

1.437. In considering the advisability of using sampling in connection with the final processing operations, the following considerations may also be taken into account. There are certain population and housing characteristics about which information is needed only by large areas and for the country as a whole. Sampling makes it possible to obtain detailed tabulations for large areas, with reasonably small sampling errors, at a much reduced cost and in a shorter time than that needed for tabulations on a complete basis. However, since one of the purposes of a census is to serve local interests, the feasibility of sampling is determined to some extent by the size of the smallest localities for which separate tabulations can be reliably produced.

C. The census as a basis for subsequent sample surveys or survey programmes

1.438. An essential ingredient of probability sample design is the existence of a complete, accurate and up-to-date sampling frame. A sampling frame is a list of all (or most) of the N units in the universe. A sampling frame may be a list of small areas. It may also be a list of structures, households or persons. The census can be used to construct either type of frame, or both; indeed, most countries do use their census for such purposes. The census frame is almost always the departure point for the design of a household sample survey. It is important to note that an old census - even one that, in rapidly changing or growing countries, is one or two years old - may be unsuitable as a frame. In such cases, it is essential to update the census frame with current fieldwork before using it as a frame for a household sample survey.

1.439. It is important to give careful consideration to the construction of a census for subsequent use as a survey sample frame when the census is in the planning stage. The above-mentioned requirements - accuracy, completeness and up-to-dateness - must be addressed. This means, for example, that care must be taken to ensure that the entire country is divided into enumeration areas (EAs) without any omissions or overlaps, i.e. all land area belongs to one and only one EA. In terms of their size, the EAs are important not only for the census itself but also for later uses as

a potential stage of sampling for surveys; this feature should therefore also be given due consideration by census planners.

1.440. Maps and prior census information concerning small areas are very important for devising a good sample plan. The maps are particularly valuable if they unambiguously indicate boundaries of small areas that can be used as primary or secondary sampling units. Population and household counts for the enumeration areas, taken from the census, are also a highly useful ingredient for post-census sample survey design planning. This information is often used to establish measures of size for the selection of first- or second-stage sampling units, or to help in various stratification schemes. Early developments in sampling theory and methods concentrated on efficient designs and associated estimation techniques for population totals or means. In consequence, it is generally believed that while censuses covering total population and housing provide statistical information on a uniform basis for small areas and subgroups of the population, large sample sizes may have to be considered to produce similar results for the long-form topics.

1.441. More recently, however, the methods for analysis of survey data that take into account the complexity of the sampling design (both sampling and non-sampling errors) have developed rapidly. Therefore, even though sample surveys used alone cannot provide data for small areas or small population groups, they can be used in combination with a census on specific topics. For instance, aggregates of variables recorded on every individual in the population, which are often used for stratification of enumeration areas, may in turn be used as calibrator or independent variables when models are fitted and used in estimation of aggregates of variables recorded for samples only, and for small areas not in the sample. Information users, however, must be made aware whenever results obtained in this fashion are published. Related techniques have been used in some census operations when checking information for internal coherence and in some approaches for imputation of missing or incoherent information.

V. Units, place and time of enumeration for population and housing censuses

A. Units of enumeration

1.442. Since individual enumeration is an essential feature of a population and housing census, clarity about the unit of enumeration is an essential element of census planning. In the case of the population census, the primary unit of enumeration is the person. There are two general frameworks within which individuals are identified: (a) households and (b) institutions, as a subset of collective living quarters. The household is a general framework within which most individuals are identified, since the majority of the population live in households, and the household is also a unit of enumeration in its own right. Because the household is also a unit of enumeration for the housing census, careful identification as a preliminary step in the enumeration can facilitate the efficient collection of the data and the control of its completeness in both types of census.

1.443. As mentioned above, the second framework within which individuals are identified comprises "institutions", as a subset of collective living quarters. In addition to persons identified within households, there are persons living in institutions who are not members of a household. This group constitutes the "institutional population", which is also investigated in population censuses.

1.444. For the housing census, the household is one of the three units of enumeration; the other two units are living quarters (in other words, housing units and collective living quarters) and buildings. It is important to bear in mind that, in conceptual terms, these three units are clearly distinguishable. There is not necessarily an identity or exact correspondence among these concepts nor are the terms themselves interchangeable. Several households may live together in one set of living quarters and one household may occupy more than one set of living quarters. Similarly, several sets of living quarters may together occupy one building and one set of living quarters may occupy more than one building.

1.445. It is recognized that there may be difficulty in some countries in maintaining independent concepts of "household" and of "housing unit".[1] However, the advantages in terms of the usefulness of the data that result from preserving separate concepts usually outweigh the additional effort required in maintaining them.

1.446. In carrying out a census, it is essential that the units of enumeration be clearly defined and that the definitions be included in manuals of instruction for the enumeration and, to provide appropriate guidance for users of the resulting statistical information, in census reports. In order to reduce the possibility of difficulties in applying the definitions recommended below, countries may find it necessary to expand the definitions and to illustrate them in terms of national conditions and circumstances. Post-enumeration field checks can provide a useful means of determining to what extent the national definitions of the units of enumeration have been applied in the field and the consequent effects on census results.

1. Person

1.447. For census purposes, the term **"**person**"** denotes each individual falling within the scope of census. As emphasized above (para. 1.442), a person can be identified as belonging to the household population (that is to say, the population living in households) or to the institutional population (that is to say, the population living in institutions, as a subset of collective living quarters) as defined in paragraph 1.454 below. Although each person must be included in the count of the population, there will be some variation in regard to the persons for whom information is collected on different topics. The variations usually depend on the person's age (for example questions relating to economic activity in which case the age boundary may be driven by national legislation), sex (for example, questions relating to children born) and/or relationship to the head or other reference member of the household. It may be recommended that information on a particular topic should be investigated for less than the total population, and the group of persons for which a given topic should be investigated is indicated below under the definitions and specifications of such topics presented in part two, chapter VI, section C. In addition, each tabulation presented in annex I is accompanied by a description of the population to be included in the tabulation. Similarly, the scope of the census should clearly indicate the persons to be covered and those to be left out.

2. Household

1.448. The concept of household is based on the arrangements made by persons, individually or in groups, for providing themselves with food and other essentials for living. A household may be either (a) a one-person household, that is to say, a person who makes provision for his or her own food and other essentials for living without combining with any other person to form a multi-person household or (b) a multi-person household, that is to say, a group of two or more persons living together who make common provision for food and other essentials for living. The persons in the group may pool their resources and may have a common budget; they may be related or unrelated persons or constitute a combination of persons both related and unrelated.

1.449. The concept of household provided in paragraph 1.448 is known as the "housekeeping concept". It does not assume that the number of households and housing units are or should be equal. A housing unit, as defined in paragraph 2.418., is a separate and independent place of abode that is intended for habitation by one household, but that may be occupied by more than one household or by a part of a household (for example, two nuclear households that share one housing unit for economic reasons or one household in a polygamous society routinely occupying two or more housing units).

1.450. Some countries use a concept different from the housekeeping concept described in the previous paragraph, namely, the "household-dwelling" concept, which regards all persons living in a housing unit as belonging to the same household. According to this concept, there is one household per occupied housing unit. Therefore, the number of occupied housing units and the number of households occupying them are equal and the locations of the housing units and households are identical. However, this concept can obscure information on living arrangements, such as doubling up, that is relevant for evaluating housing needs.

[1] For further discussion on the concepts of households and housing units, see paragraphs 1.448 and 1.451; also, for the definition of "housing unit", see para. 2.418.

1.451. Households usually occupy the whole or a part of, or more than, one housing unit but they may also be found in camps, boarding houses or hotels or as administrative personnel in institutions, or they may be homeless. Households consisting of extended families that make common provision for food, or of potentially separate households with a common head, resulting from polygamous unions, or households with vacation or other second homes may occupy more than one housing unit. For more discussion of household occupancy, see paragraphs 2.463-2.466.

1.452. A household may also consist of one or more homeless people. The definition of the homeless can vary from country to country because homelessness is essentially a cultural definition based on concepts such as "adequate housing", "minimum community housing standard", or "security of tenure" (see para. 2.536-2.539) which can be perceived in different ways by different communities. The following two categories or degrees of homelessness are recommended:

(a) Primary homelessness (or rooflessness). This category includes persons living in streets or without a shelter that would fall within the scope of living quarters;

(b) Secondary homelessness. This category may include the following groups:

(i) Persons with no place of usual residence who move frequently between various types of accommodation (including dwellings, shelters or other living quarters);

(ii) Persons usually resident in long-term (also called "transitional") shelters or similar arrangements for the homeless.

These definitions should be supported by a data collection strategy that ensures, for example, that dwellings are properly identified as shelters and not households.

1.453. For some topics investigated in housing censuses, the household may serve more efficiently than living quarters as the unit of enumeration. For example, tenure, if investigated in the census, should be collected with reference to households rather than living quarters. Information about household possessions that are normally included as part of the equipment of living quarters (radio and television receivers, for example) should be collected with reference to households. Information on rent, an item of significance in relation to both living quarters and households, would of necessity be collected in relation to the household.

3. Institutional population

1.454. As emphasized in paragraph 1.442, institutions represent the second general framework within which persons, as major units of enumeration, are identified. The institutional population comprises persons who are not members of households. These include persons living in military installations, correctional and penal institutions, dormitories of schools and universities, religious institutions, hospitals and so forth.[2] Personnel responsible for the running of an institution and not living in dormitories or similar accommodations should be excluded from the institutional population.

1.455. Persons living in hotels or boarding houses are not part of the institutional population and should be distinguished as members of one- or multi-person households, on the basis of the arrangements that they make for providing themselves with the essentials for living.

4.Building

1.458. The building is regarded as an indirect but important unit of enumeration for housing censuses since the information concerning the building (building type, material of construction and certain other characteristics) is required for proper description of the living quarters located within the building and for the formulation of housing programmes. In a housing census, the questions on building characteristics are normally framed in terms of the

[2] For more detailed definition and specifications of institutions as a subset of collective living quarters, see paras. 2.444-2.454.

building in which the living quarters enumerated are located, and the information is recorded for each of the housing units or other living quarters located within it.

1.459. A building is any independent free-standing structure comprising one or more rooms[3] or other spaces, covered by a roof and usually enclosed within external walls or dividing walls[4] that extend from the foundations to the roof. However, in tropical areas, a building may consist of a roof with supports only, that is to say, one without constructed walls; in some cases, a roofless structure consisting of a space enclosed by walls may be considered a building.[5]

1.469.In some countries, it may be appropriate to use the "compound" as a unit of enumeration, either in addition to the building or as a substitute for it. In some areas of the world, living quarters are traditionally located within compounds and the grouping of living quarters in this way may have certain economic and social implications that it would be useful to study. In such cases it may be appropriate, during the census, to identify compounds and to record information suitable for linking them to the living quarters located within them.

5. Living quarters

1.456. The principal units of enumeration in a census of housing are living quarters. Only by precise recognition of these identities, data that will provide a meaningful description of the housing situation and a suitable basis for the formulation of housing programmes and policies can be obtained.

1.457. Living quarters are structurally separate and independent places of abode . They may (a) have been constructed, built, converted or arranged for human habitation, provided that they are not at the time of the census used wholly for other purposes and that, in the case of improvised housing units and collective living quarters, they are occupied or (b) although not intended for habitation, actually be in use for such a purpose at the time of the census.[6]

B. Place of enumeration

1. Concepts relating to place of enumeration

1460a. In the context of population census, a country may wish to enumerate all persons present in the territory and/or supposedly belonging to the population of interest. *Population to be enumerated* is the group of persons who the country decides should be covered by the census regardless of their later inclusion in a population count.

1460b. The place of enumeration would be either the place where the person is found or the place of usual residence of the person at the census reference moment. It should be ensured that each person should have only one place of enumeration. Countries should document the definition of place of enumeration that they have adopted for their census and also provide explicit instructions on how this definition should be applied at the time of enumeration to enumerators for use during an interview or to respondents when filling in self-administered questionnaires.

1.461. In general, “usual residence” is defined for census purposes as the place at which the person lives at the time of the census, and has been there for some time or intends to stay there for some time.

[3] For the definition of "rooms", see para. 2.472.
[4] The term "dividing walls" refers to the walls of adjoining buildings (for example, of row houses) that have been constructed so as to be contiguous.
[5] For a more detailed discussion of the definition of "building" and related concepts, see paras. 2.511-2.513.
[6] For a more detailed discussion of the definition of "living quarters" and of the concepts of separateness and independence as used in the definition, see paras. 2.419-2.420.

1.462. Generally, most individuals enumerated have not moved for some time and thus defining their place of usual residence is clear. For others, the application of the definition can lead to many interpretations, particularly if the person has moved often.

1.463. It is recommended that countries apply a threshold of 12 months when considering place of usual residence according to one of the following two criteria:

(a) The place at which the person has lived continuously for most of the last 12 months (that is, for at least six months and one day), not including temporary absences for holidays or work assignments, or intends to live for at least six months;

(b) The place at which the person has lived continuously for at least the last 12 months, not including temporary absences for holidays or work assignments, or intends to live for at least 12 months.[7]

1.464. Persons who move frequently and do not have a place of usual residence should be enumerated at the place where they are found at the time of the census.

1.465. Regardless of the criteria used to define the 12-month period, countries should ensure that each person should have one and only one place of usual residence..

1.466. There are various population groups for which some uncertainty may arise about their inclusion in the usual resident population. The following persons need to be consider in the usual residence population: :

(a) Persons found at the moment of the enumeration to whom the concept of usual residence does not apply.
(b) National military, naval and diplomatic personnel and their families, located outside the country.
(c) Foreign persons working for international organisations (not including foreign diplomats or military forces), provided that they meet the criteria for the usual residence in the country.
(d) Merchant seamen and fishermen usually resident in the country but at sea at the time of the census (including those who have no place of residence other than their quarters aboard ship).
(e) Persons who may be illegal, irregular or undocumented migrants, as well as asylum seekers and persons who have applied for or been granted refugee status or similar types of international protections, provided that they meet the criteria for the usual residence in the country.
(f) Persons who cross a frontier daily of weekly to work or study in another country, provided that they meet the criteria for the usual residence in the country.
(g) Children born in the twelve months before the census reference time and whose families are usually resident in the country at the census reference time.
(h) Persons of minor age studying abroad for one year or more to attain the primary secondary level of education, regardless of the frequency of return to the family home located within the country. If the person is also working abroad, the same rules for cross-border workers apply.
(i) Persons who regularly live in more than one country during a year, if they are found in the country at the moment of the enumeration.

On the other hand, the following group of persons need to be consider for being excluding from usual resident population:

[7] This approach is also recommended in the Economic Commission for Europe and Statistical Office of the European Communities, *Conference of European Statisticians recommendations for the 2010 censuses of population and housing*. United Nations (New York and Geneva, 2006). It is also consistent with what is recommended in the *Recommendations on Statistics of International Migration, Revision 1,* Statistical Papers, No. 58, Rev. 1(United Nations publication, Sales No. E.98.XVII.14).

(a) Foreign military, naval and diplomatic personnel and their families, located in the country, regardless of their place of usual residence.
(b) Persons of minor age attending the primary or secondary level of education whose family home is located abroad, regardless of the duration of their stay. However, if these persons are also working in the country, then the identification of the place of usual residence follows the same rules for cross-border workers.
(c) Third level students whose stay abroad is one year or more.
(d) Persons who regularly live in more than one country during a year, if they are not found in the country at the moment of the enumerations

1.467. In some situations, the concept of usual residence may be referred to as though it is synonymous with the concept of de jure residence. The term “de jure” carries with it a requirement that the person’s residence at that place has a basis in the legal system applicable to that place. In turn this implies that people without such a legal basis should not be enumerated in that area. It is not recommended that censuses of population and housing enumerate only those people with a legal right to be in a place but rather, as described in section 2 below, should include either all those present at the place on census night or all those whose usual residence on census night was at the place.

1.468. A further term which has recently come into use in literature is the “floating population”. For census purposes this term should be defined as referring to those people usually resident in an area without a legal basis for their residence. Thus the term might include, depending on the circumstances of the country concerned, people from rural areas who have moved to a city for employment purposes without complying with rules for permits to do so, and people who reside in a city while having an official address elsewhere in the country.

2. Operational issues relating to place of residence and place of enumeration

1.469. In a population census, information about each person can be collected and entered in the census questionnaire either where he or she is (or was) present on the day of the census or at his or her usual residence.

1.470. In compiling the census results by geographical areas, however, each person who is part of a household can be included in either (a) the household (and hence the geographical area) where the person was present on the day of the census or (b) the household (and the geographical area) where he or she usually resides. The same should apply for the institutional population. This allocation is not necessarily dependent upon the place at which information was collected for the individual but it can be simplified by the proper choice of a place of enumeration.

1.471. If a "present-in-area" population distribution is wanted, it is logical to enumerate each person at the place where he or she is (or was) present at the time of the census. If a distribution by usual residence only is required, it is more satisfactory to collect the information about each person at the person's place of usual residence. It should be noted, however, that it is not always possible to collect information about each individual at his or her usual residence, as, for example, when an entire household is away from its usual residence at the time of the census. Some provision must therefore be made for collecting information about such persons at the place where they are found at the time of the census.

1.472. With the growing need for information on households and families and on internal migration, it is becoming increasingly desirable to prepare tabulations on the basis of usual residence rather than on place where present, since the latter is often temporary and so is not useful for the investigation of the above-mentioned topics. It is comparatively simple to enumerate each person where present on the day of the census and thus to obtain a present-in-area population distribution of the population. However, a usual-residence distribution of the population is likely to be more useful for presentation and analysis of the resulting information than that of the population present-in-area during the enumeration.

1.473. If it is also desired to obtain information on both the usually resident population and the present-in-area population, then either each person present in each household or institution on the census day or each person present and each usual resident temporarily absent can be enumerated at the appropriate household or institution. A clear distinction must then be made in the questionnaire, as applicable, among (a) persons usually resident and present on the day of the census, (b) persons usually resident but temporarily absent on the day of the census and (c) persons not usually resident but temporarily present on the day of the census.

1.474. Depending on the categories of persons enumerated at any given place, information may then be collected on the usual residence (address) of those only temporarily present and on the place (address) at which each temporarily absent person can be found. This information can be used for the purpose of allocating persons to the household (or institution) and geographical area within which they are to be counted and of checking to be certain that no person is counted twice (namely, at both the usual residence and the place where present). The procedures to be followed at the enumeration and through the subsequent allocation of persons must, however, be very carefully planned and strictly adhered to if the allocation is to be accurate.

1.475. With the exception of mobile housing units (see discussion in para. 1.477), living quarters and buildings have a fixed location and therefore the place where they are to be enumerated does not have, therefore, to be considered in taking a housing census. Information on households, however, and the persons in households can be collected and entered in the housing census questionnaire either where they are (or were) present on the day of the census or at the usual residence. The procedure followed in the housing census should be governed by that adopted in carrying out the population census if the two censuses are carried out simultaneously. If the housing census is an independent operation, however, the procedure to be followed should be carefully considered since it may have a significant effect on the validity of the results of the housing census.

1.476. Where persons and households are allocated to the place of usual residence, they should also be allocated to the living quarters that they usually occupy. The living quarters that they are actually occupying at the time of the census should be counted as vacant if they are conventional dwellings or they should be excluded from the census if they are non-conventional dwellings.[8]

1.477. Mobile housing units represent a special case as far as the place of enumeration is concerned. They should be enumerated where they are found on the day of the census; however, in accordance with the procedure adopted for the allocation of the population, mobile housing units may also be allocated to the area where the occupants usually reside provided that they are the usual living quarters of the occupants in the area of usual residence. Where they are not the usual living quarters of the occupants in the area of usual residence, the occupants will be allocated to their usual living quarters and the mobile housing unit will be excluded from the census.

C. Enumeration point of time

1.478. One of the essential features of population and housing censuses is that each person and/or each set of living quarters must be enumerated as nearly as possible in respect of the same well-defined point of time. This is usually accomplished by fixing a census "moment" at midnight at the beginning of the census day . This moment is the “census reference moment”.

1.479. For the population census, each person alive up to the census moment is included in a census schedule and counted in the total population, even though the process of completing the schedule does not take place until after the census moment or even after the census day, and the person may have died in the interim. Infants born after the census moment are not to be entered in a schedule or included in the total population, even though they may be living when the other persons in their household are enumerated.

1.480. For the housing census, each set of living quarters that has reached an established stage of completion and is not scheduled for, or in the process of, demolition should be included in a census schedule and counted as a part of the housing inventory even though the process of completing the schedule does not take place until after the census moment or even after the census day, and the living quarters may have been scheduled for demolition in the interim. Living quarters that have attained the prescribed state of completion after the census moment are not to be entered in a schedule (unless special instructions are issued for recording living quarters under construction) nor should they be included in the total number of sets of living quarters.

[8] To be considered as living quarters, non-conventional housing units and collective living quarters are required to be occupied in order to be included in the census.

1.481. Where the amount of time allotted for enumeration in the census is considered to be so long that the population is not likely to be able to supply information as of a single moment in the past, it may be necessary to employ different points of time in the enumeration, even to the extent of using the night before the visit by the enumerator. If such a procedure is followed, it should be clearly explained in the census report and the total duration of the enumeration should be stated. For ease of reference and for the computation of intercensal indices, it is useful to designate a single date in the enumeration period as the official "census date". This date could be, for example, the day by which half of the population was enumerated. This date is the "*census reference (average) day"* or, if reference is made to a period of time, the "*census reference period*". Another method could be to canvas the entire population before the census moment, and revisit every household within a fixed number of days immediately after the census moment to collect data on any changes that have occurred with reference to the census moment.

D. Time reference period for data on the characteristics of the population and of living quarters

1.482. The data collected about the characteristics of the population and of living quarters should be pertinent to a well-defined reference period. The time-reference period need not, however, be the same for all of the data collected. For most of the data, it will be the census moment or the census day; in some instances (as is the case for current economic characteristics and rental arrangements), however, it may be a brief period just prior to the census or (as is the case for fertility questions, usual economic activity and information on the period of construction of the building in which living quarters are located) a longer period of time.

Part II - Population and Housing Census Topics

CHAPTER I. Population census topics

A. Factors determining the selection of topics

[Note; The format and content of this section should be consistent with that in the Housing Topics chapter. I have rearranged the text here accordingly

2.1 In line with the overall approach to revision 2 of *Principles and Recommendations for Population and Housing Censuses*, the selection of census topics is based on the outputs expected to be produced by the census. Therefore, the first step involves clear identification of expected outputs based on users' requirements for data; the core and additional topics are then decided on that basis. For each of the core topics there is a recommended tabulation. It is recommended that countries collect data on the core topics and also produce the recommended tabulation **[Note: This reference has been retained for the time being though it is not yet confirmed that the 3rd revision will include recommended tabulations as before]** as this would improve the international harmonization and comparability of statistics through the use of common concepts, definitions and classifications. Use of an agreed international approach would also enhance the capacity of countries to generate statistics for monitoring the socio-economic situation of their populations, including for the provision of data for the internationally agreed development goals.

2.1a The topics to be covered in the census (that is, the subjects regarding which information is to be sought for each individual or household) should, however, be determined upon balanced consideration of:

(a) the needs of the broad range of data users in the country at both the national and local area level;
(b) the achievement of the maximum degree of international comparability, both within regions and on a worldwide basis;
(c) the willingness and ability of the public to give accurate information on the topics;
(d) the technical competence of the enumerators in regard to obtaining information on the topics or the availability of relevant information held in administrative data sources; and
(e) the total national resources available for conducting the census.

2.1b Such a balanced consideration will need to take into account the advantages and limitations of alternative methods of obtaining data on a given topic within the context of an integrated national programme for gathering demographic and related socio-economic statistics (see paras. 1.20 - 1.57 in part one above).

2.2 In selecting the population topics, regard should also be given to the usefulness of historical continuity which provides the opportunity for comparison of changes over a period of time. Census takers should avoid, however, collecting information that is no longer required. Information should not be collected simply because it was traditionally collected in the past, bearing in mind changes in the socio-economic circumstances of the country. It becomes necessary, therefore, in consultation with a broad range of users of census data, to review periodically the value of even long-standing topics and to re-evaluate the need for their continued collection, particularly in the light of new data needs and alternative data sources that may have become available for investigating topics hitherto covered in the population census. Each of the four factors that need to be taken into account in reaching a final decision on census content are briefly reviewed in the following paragraphs.

1. Priority of national needs

2.3 Prime importance should be given to the fact that population censuses should be designed to meet national needs. In defining national data needs for population census data, the full range of national uses (for example, policy, administration and research) and national users (for example, national and local government agencies, those in the private sector, and academic and other researchers) should be considered. Each country's decision with regard to the topics to be covered should depend upon a balanced appraisal of how urgently the data are needed and

whether the information could be equally well or better obtained from other sources. Global and regional census recommendations can help in this appraisal by providing information about standard census topics and related definitions and concepts based on a wide range of national census experience. **[Note: This para should be consistent in its messages with the equivalent para in the Housing Chapter. Therefore replace with the following]**

2.3a The priority of designing a population census should be to meet national needs. Should there be any conflict between such national needs and regional or global recommendations, national needs should take precedence followed by regional recommendations and finally by global recommendations. The prime consideration is that the census should provide information on those topics that are of greatest value to the country, with questions framed so as to elicit data of maximum utility. Experience has shown that national needs will best be served if the census includes topics generally recognized as being of basic value and defined in accordance with regional and global standards. It is recognised however that counties that rely more on administrative records as their prime data source may be more limited in the precise detail of the information that can be collected on particular topics.

2.3b Many countries may find it necessary to include in the census, topics of national or local interest in addition to the topics included in these recommendations. Labour force or household survey data may supplement census data so to obtain information on topics that cannot be included in the census for whatever reason. It is possible that some countries may omit from the census certain recommended topics either because there is not a need to collect the data or because there are legal barriers or particular sensitivities in doing so, as for example may be the case for topics such as fertility, ethnicity and religion.

2. Importance of international comparability

2.4 The desirability of achieving regional and worldwide comparability should be another major consideration in the selection and formulation of topics ~~for~~ to be included in the census. National and international objectives are usually compatible, however, since broad studies of countries' experiences and practices are the basis of international recommendations. Furthermore, the analysis of census data for national purposes will often be facilitated if, ~~by~~ through the use of international recommendations, it is possible to compare the data with those of other countries on the basis of consistent concepts, definitions and classifications.

2.5 If the particular circumstances within a country require a departure from international standards, every effort should be made to explain these departures in the census publications and to indicate how the national presentation can be adapted to the international standards.

3. Suitability of topics

2.6 The topics investigated should be such that the respondents will be willing and able to provide adequate information on them. A pre-requisite for the inclusion of topics in the census should be the willingness and ability of respondents to provide accurate information on them or the availability of such information from alternative data sources. Those topics, for example, on which information is to be obtained through direct observation by an enumerator should be within his or her technical competence. It may be necessary to avoid topics that are likely to arouse fear, local prejudice or superstition or which might be used to deliberately promote political or sectarian causes, or to avoid questions that are too complicated and difficult for the average respondent or enumerator to answer easily. The exact phrasing of any one question so constructed to obtain the most reliable responses will, of necessity, depend on national circumstances and, as described in part one of these recommendation, should be well tested prior to the census (see paras 1.186, 1.193 and 1.194 above). **[Note: This is consistent with the equivalent para in the Housing Chapter.]** The inclusion of potentially sensitive topics that are likely to have a detrimental affect on response rates should also be avoided.

4. Resources available

2.7 The selection of topics should be carefully considered in relation to the total resources available for the census. An efficient collection of accurate data for a limited number of topics, followed by prompt tabulation and publication, is more useful than the collection of data for an overambitious list of topics, which cannot be properly processed and disseminated in a timely, reliable and cost-effective manner. In balancing the need for data against

resources available, the extent to which questions can be pre-coded is yet another consideration. This may be an important factor in determining whether or not it is economically feasible to include certain topics in the census

B. List of topics

2.8 The list of topics included in these recommendations for population censuses are based on the global and regional census experience of the last several decades. The topics included here are, with some minor revisions, generally the same as those included in the previous United Nations population census recommendations.[97] However the concepts and definitions for some of the topics relating to economic characteristics have been substantially revised to reflect the more recent recommendations of the International Conference of Labour Statisticians [ref]. **[Note: We will also want to note here any significant differences in the description of the Population count in section C if the new Eurostat proposals are adopted.]**

2.9 It should be stressed that no country should attempt to cover all the topics included in the list of population topics (see para. 2.16). Rather, countries will need to make their selection of topics in the light of the considerations discussed in paragraphs 2.1-2.7 above, bearing in mind any regional recommendations currently pertaining to census topics. In using the classifications of different topics presented in part two of the *Principles and Recommendations for Population and Housing Censuses,* it is necessary to outline that all the one- and two-digit classification levels are recommended, while those at the three-digit level are incorporated for illustrative and guidance purposes only.

2.10 Evolving census experience over the past several decades globally and in the regions has demonstrated that a set of topics exist on which there is considerable agreement in regard both to their importance and to the feasibility of collecting the data for them in a census. Data on those within this set that are likely to present difficulties in terms of data collection or processing are probably best collected through separate surveys of a sample of the population.~~[~~**Note: Not sure that this is logical. I would not agree that difficulties in data collection are a rationale for sampling. The prime factor is one of costs. Such difficulties as described here will occur regardless of the size of the enumerated population].** The exceptions to this consensus occur, at one extreme, among the countries with the most developed statistical systems, where adequate data on a number of the topics listed, including some of the core ones, are available from non-census sources; and, at the other, among the countries in which data-collection opportunities are limited and it is felt that advantage must be taken of the possibilities offered by the census to investigate topics that, under more ideal circumstances, might be investigated more suitably by other means. **[Note: There is no equivalent to this sentence in the Housing chapter.]**

2.11 Although the set of topics covered in these recommendations is quite comprehensive in terms of those generally considered suitable for inclusion in a population census, it is also recognized that a few countries may find it necessary to include one or more additional topics on which information is of particular national or local importance. However, before the final decision is made to include any such additional topics, their suitability should be carefully tested.

2.12 To assist countries in using the present publication and in determining their own priorities, lists of recommended population topics are summarized in paragraph 2.16, with the core topics shown in boldface. These core topics correspond to those that were included as "priority topics" in the majority of the regional recommendations in previous census decades.

2.13 The topics listed in paragraph 2.16 are grouped under eight headings: "Geographical and internal migration characteristics", "International migration characteristics", "Household and family characteristics", "Demographic and social characteristics", Fertility and mortality", "Educational characteristics", "Economic characteristics", and "Agriculture".

[97] *Principles and Recommendations for Population and Housing Censuses Revision 2,* Statistical Papers No. 67/Rev2 (United Nations publication, Sales No. E.07.XVII.8).

2.14 Within each heading, a distinction is made between topics collected directly (those that appear in the census schedule or questionnaire), and derived topics. Although data for the derived topics also come from information in the questionnaire, they do not necessarily come from replies to a specific question. "Total population", for example, is derived from a count of the persons entered in the questionnaires as persons present or resident in each geographical unit. Such derived topics may perhaps be more correctly considered as tabulation components, but they are listed as topics in order to emphasize the fact that the questionnaire must in some way yield this information.

[Note: There is no equivalent to paragraph 2.11-2.14 in the Housing chapter.]

2.15 The paragraph numbers in parentheses after each entry in paragraph 2.16 refer either to the paragraphs in which the group of topics as a whole is discussed in section D below or to the paragraphs in which the definition and specifications of individual topics are discussed.

2.16 In the following list of population census topics, core topics are shown in bold and are represented by ♦ for topics that are collected directly, and by □ for those that are derived. Additional topics are represented by ○.

Table 1 - List of population census topics

1. Geographical and internal migration characteristics (paras. 2.44-2.88)		
(a)	**Place of usual residence** (paras. 2.46-2.51)	♦
(b)	**Place where present at time of census** (paras. 2.52-2.56)	♦
(c)	**Place of birth** (paras. 2.57-2.63)	♦
(d)	**Duration of residence** (paras. 2.64-2.66)	♦
(e)	**Place of previous residence** (paras. 2.67-2.68)	♦
(f)	**Place of residence at a specified date in the past** (paras. 2.69-2.70)	♦
(g)	**Total population** (paras. 2.71-2.77)	□
(h)	**Locality** (paras. 2.78-2.80)	□
(i)	**Urban and rural** (paras. 2.81-2.88)	□
2. International migration characteristics (paras. 2.89-2.106)		
(a)	**Country of birth** (paras. 2.93-2.96)	♦
(b)	**Country of citizenship** (paras. 2.97-2.99)	♦
(c)	**Acquisition of citizenship** (paras. 2.100-2.102	○
(d)	**Year or period of arrival** (paras. 2.103-2.106)	♦
3. Household and family characteristics (paras. 2.107-2.132)		
(a)	**Relationship to the reference person of household** (paras. 2.114-2.123)	♦
(b)	Household and family composition (paras. 2.124-2.131)	□
(c)	Household and family status (para.2.132)	○
4. Demographic and social characteristics (paras. 2.133-2.167)		
(a)	**Sex** (para. 2.134)	♦
(b)	**Age** (paras. 2.135-2.143)	♦
(c)	**Marital status** (paras. 2.144-2.151)	♦
(e)	Religion (paras. 2.152-2.155)	○
(f)	Language (paras. 2.156-2.159)	○
(g)	Ethnicity (paras. 2.160-2.162)	○
(h)	Indigenous peoples 2.163-2.167)	○

(i)	**Disability status** (paras. 2.350-2.380)	♦
5. Fertility and mortality (paras. 2.168-2.201)		
(a)	**Children ever born alive** (paras. 2.180-2.185)	♦
(b)	**Children living** (paras. 2.186-2.187)	♦
(c)	**Date of birth of last child born alive** (paras. 2.188-2.191)	♦
(d)	Births in the past 12 months (para. 2.189)	□
(e)	Deaths among children born in the past 12 months (para. 2.191)	□
(f)	Age, date or duration of first marriage (para. 2.192)	○
(g)	Age of mother at birth of first child born alive (para. 2.193)	○
(h)	**Household deaths in the past 12 months** (paras. 2.194-2.198)	♦
(i)	Maternal or paternal orphanhood (paras. 2.199-2.201)	○
6. Educational characteristics (paras. 2.202-2.230)		
(a)	**Literacy** (paras. 2.202-2.208)	♦
(b)	**School attendance** (paras. 2.209-2.214)	♦
(c)	**Educational attainment** (paras. 2.215-2.222)	♦
(d)	Field of education and educational qualifications (paras. 2.223-2.230)	○
7. Economic characteristics (paras. xxx)		
(c)	**Labour force status** (paras. xxx)	♦
(e)	**Status in employment** (paras. xxx)	♦
(f)	**Occupation** (paras. xxx)	♦
(g)	**Industry** (paras. xxx)	♦
(h)	Place of work (paras. xxx)	○
(i)	Institutional sector of employment (paras. xxx)	○
(j)	Employment in the informal sector (paras. xxx)	○
(k)	Informal employment (paras. xxx)	○
(l)	Time worked (paras. xxx)	○
(m)	Time-related underemployment (paras. xxx)	○
(o)	Persons in own-use production of goods (paras. xxx)	○
(p)	Persons in unpaid trainee work (paras. xxx)	○
(q)	Income (paras. xxx)	○
8. Agriculture (paras. xxx)		
(b)	Own-account agriculture production (paras. xxx)	○
(c)	Characteristics of all agricultural jobs during the last year (paras. xxx)	○
Legend: ♦ Core topic, collected directly □ Core topic, derived ○ Additional topic		

C. Population count

2.17 The main objective of a population census is to provide a reliable basis for an accurate count of the population of a country at a point in time. An accurate population count is essential for the efficient planning and

delivery of services, distribution of resources, defining of boundaries for electoral representation, policy development and a wide range of other administrative and statistical purposes.

2.17a The '*population count*' or '*population base*' is the population used for the compilation of aggregated data for statistical purposes. This may be a subset from or the whole of the population to be enumerated. A country may have one or more population bases, all derived from the enumerated population, among which should always be included the population base used for international comparisons purposes.

2.18 Countries are most interested in the count and distribution of usual residents because usual residence is generally the best indication of where people will demand and consume services, and a count of usual residents is therefore most relevant for planning and policy purposes.

2.19 Some countries will supplement the population count from their census with information from other sources, for example on usual residents temporarily outside the country at the time of the census, to produce population estimates. Other countries will rely solely on the population count from the population census. **[Note: Consider deleting this as it may create confusion between different exercises.]**

2.20 Information about each person can be collected and entered in the census questionnaire either where he or she is (or was) present on the day of the census or at his or her usual residence. Paragraphs 1.461.-1.477 describe the place of enumeration basis for the census. **[Note: We should now also reflect the use, in some countries, of registers (rather than questionnaires) as the basis of determining the count of residents.]**

2.21 Population counts may be required on a population present, usual resident population, or other population bases such as a service population. The choice of population count(s) required will depend on national circumstances; some countries will require more than one. The information collected about each person by the census will need to enable the required population count(s) to be derived. In some cases, for regional comparison purposes, the population count based on the concept of usual residence might need to be produced.

2.22 The aim of the census is to achieve a full and unduplicated coverage of the population. In practice, countries face a range of challenges in enumerating the population at the place they decide (where present on census day or where usually resident), and in producing the population count(s) they require. Many of these challenges relate to the difficult-to-enumerate groups of the population and persons for whom usual residence is not easily defined. The latter present an increasing problem as populations become more mobile (nationally and globally) and household and family structures less stable.

2.23 In developing strategies for enumerating the population and collecting information to support the required population counts, it is important to consider consistency with the standards for international migration statistics described in paragraphs 2.89-2.92.

1. Population present count

2.24 A population present count is the simplest form of population count from a population census. In a questionnaire-based census where no reference is made to usual residence people are enumerated at the place where they are found, usually the dwelling where they spend census night. Foreign residents who are in the country at the time of the census will be included but usual residents of the country who are absent at that time will be excluded. **[Note: Deleted because this is not necessarily the case, but is dependent on what we define as a 'migration' flow. Usual residents temporarily absent or outside the country will not be counted in a de facto census, but nor will they be included as a migrant on their return to their usual place of residence.]**

2.25 A population present count removes complications associated with the application of the concept of place of usual residence, and can reduce the incidence of double counting or missing people by the census if the enumeration is carried out in a single day or reference can be made to the same census moment for the whole population. Apart from these benefits of simplicity, a population present count offers a cost advantage because the census does not need to collect additional information about usual residents not at their usual residence at the time of the census.

2.26 The major disadvantage of a population present count is that it does not enable a full count of usual residents to be derived, and may not provide a true geographic distribution of usual residents for effective planning and policy purposes.

2.27 A population present count may be a good proxy for a count and distribution of usual residents, particularly if nearly all the population will be at their usual residence at the time of the census, or if the characteristics of those persons present are very similar to the characteristics of usual residents. However, in many countries significant numbers of people will not be at their usual residence at the time of the census, and the characteristics of absent usual residents will be different from non-residents present, so that a population present count is not a good proxy for a count of usual residents. Large seasonal movements of people due to weather changes, employment, holidays and other factors can add to this problem. The ability to produce accurate information on families and households is also reduced to the extent that persons are not enumerated with their families or households.

2.28 To produce a population present count, information is required on all persons present and the address where they are enumerated. It is also very useful to collect information to identify those persons present who are not at their usual residence and those persons who are not usual residents of the country.

2.29 Ideally a population present count should include all the persons present at the census reference moment, regardless of the difficulty of their enumeration. For some of these groups the concept of 'at the time of the census' may need to be extended to allow the enumeration to take place. When, however, the enumeration is extended over a period of time, the risk of either overcount or undercount may increase. In fact, persons who are at multiple locations during this extended period may be counted at more than one location, or alternatively they may not be counted at any location. Those risks increase further when reference is made to a *census period* rather than to a *census moment*.

2. Usual resident population count

2.30 Countries increasingly prefer a usual resident population count because this count offers better information for planning and policy purposes on the demand for services, households, families and internal migration.

2.31. A **usual resident population count** is a count of all usual residents of a country at the time of the census. Although countries will determine the definition of a usual resident according to their own particular circumstances, it is recommended that in defining a usual resident and the place of usual residence, countries apply the definition contained in para. 1.463. Usual residents may or may not, have citizenship of the country, and they may also include undocumented persons, applicants for asylum or refugees. Usual residents then may include foreigners who reside (legally or illegally), or intend to reside, in the country continuously for either most of the last 12 months or for 12 months or more, depending on the definition of place of usual residence that is adopted by the country. Persons who may consider themselves usual residents of a country because of citizenship or family ties, but were absent from the country for either most of the last 12 months, or for 12 months or more, depending on the definition adopted, should be excluded. Conversely, persons who are normally resident in the country but who are temporarily absent should be included in the usually resident population. Countries applying a different definition of a usual resident for national purposes should produce a usual resident population count using the recommended 12- month definition for the purposes of international comparability.

2.32 A usual resident count provides a better count of the permanent population of a country for long-term planning and policy purposes, and a better distribution of the resident population within the country for planning and service delivery purposes at sub-national geographic levels.

2.33 To achieve a usual resident count, the population can be enumerated either on a "place where present" basis or on a "where usually resident" basis, as described in paragraphs 1.469-1.477. **[Note: Generally a count of usual residents can only be derived from a de facto census if information is collected on the place of usual residence. I am not sure that paras 1.469-1.477 make this clear, though paras 2.35 and 2.45 below do.]**

2.35 To produce a usual resident population count, information is required on all usual residents and the address of their usual residence, with sufficient detail to generate usual residence at the lowest geographic area level required for tabulation. If the census is taken on a population present basis, then the information collected needs to differentiate clearly between persons enumerated at their usual residence, persons usually resident who were elsewhere at the time of the census, and persons present who are usually resident elsewhere. Information should also be collected to identify those persons who are not usual residents of the country. If, however, the census is taken on a usual residence basis, then information about all usual residents needs to be collected at their usual residence, regardless of whether they are present at the time of the census or not, to ensure full coverage.

2.36 There are difficulties in obtaining information from those usual residents who are absent from the country at the time of the census, particularly where no other person is present at the place of usual residence at the time of the census to provide information about those people. Estimates or imputations of the number and characteristics of these usual residents not enumerated by the census will be used by some countries to supplement the census population count.

2.37 There can be challenges in applying the concept of a 'usual resident' if a person is considered to have more than one residence, sometimes in different countries. This is particularly so for people who may spend parts of the time in communal establishments or institutions, such as schools, military camps, etc. There may also be those who do not consider themselves to have a usual residence at all, such as nomadic peoples or persons sleeping rough. In such cases place of usual resident can be considered to be the place where they are enumerated. Countries will need to develop appropriate operational rules for resolving cases where it is not clear whether a person is a usual resident of the country, or where the usual residence of the person within the country is not clear.

2.37a There are population groups for which some uncertainty may arise in defining their place of usual residence within the country. The recommended conventional treatment of these cases is as follows:

a) Persons who work away from home during the week and who return to the family home at week-ends should consider the family home as their place of usual residence.
b) Persons of minor age in primary and secondary education who are away from home during the school term should consider their family home as their place of usual residence.
c) Students in tertiary education who are away from home while at college or university should consider their term-time address as their place of usual residence regardless of whether this is an institution (such as a boarding school) or a private residence.
d) The institution should be taken as the place of usual residence of all inmates who at the time of the census have spent, or are likely to spend, six months or more in the relevant institution. Examples of inmates of institutions include patients in hospitals or hospices, old persons in nursing homes or convalescent homes, prisoners and those in juvenile detention centres.
e) Where a person regularly lives in more than one residence within the country during the year, the one where he/she spends the majority of the week or year before the census should be taken as his/her place of usual residence. These persons are not considered to be persons with no usual residence.
f) For the (national) military, naval and diplomatic personnel and their families located outside the country the following classification rules should be applied:
    1. If they are residing abroad for less than 12 months and they are intending to return to the place of departure, they should be allocated within the country in accordance with the rules for usual residence. In particular, they could be allocated to (by decreasing order of priority):
        - The family home address within the country, if any.
        - The duty station within the country to which they were attached before leaving.

    2. If they are residing abroad for at least 12 months or if they are not intending to return to the place of departure (although returning in the country within a 12-month period), they should be attributed to a 'virtual region' (extra-region) of the country of departure.
g) The place of enumeration should be taken as the place of usual residence of homeless or roofless persons, nomads, vagrants and persons with no concept of usual residence.
h) A child who alternates between two households within the country (for instance after his or her parents have divorced) should consider the household where he or she spends the majority of the year before the census as

his or her place of usual residence. Where an equal amount of time is spent with both parents, the place of usual residence should be the same of the parent/household with whom the child is at the census reference time.

3. Service population count

2.38. A **service population count** may be required if a population present count or usual resident population count does not accurately represent the demand for, or provision of, services in a country or part of a country. Service populations are relevant where a significant proportion of the population providing or using services in an area are not usual residents of that area. Types of service population counts include daytime populations, workplace populations and visitor populations. In some countries there may also be an interest in foreign service populations, consisting of foreign residents who cross the border regularly to provide or consume services. This is particularly important in the planning and provision of transport services.

2.39. A service population count may include some or all of the difficult to enumerate groups depending on the type of service population required. For example, daytime service populations may include civilian foreigners who cross the border daily to work or consume services in the country.

2.40. To produce a service population count, in addition to an estimate of usual residents, information is required about where people provide or demand services. For seasonal populations (holiday, resort), information is needed on the destination and timing of seasonal trips. Some countries will produce service population counts by supplementing the population present count or usual resident population count with information from other sources, such as visitor information from hotels and resorts, to produce visitor populations. Alternatively, additional information may be collected by the census.

4. Difficult to enumerate groups

2.41 The following difficult to enumerate groups are relevant to the production of any population count:

(a) *Nomads and persons living in areas to which access is difficult.* Making contact with these groups to enumerate them can be difficult, particularly as part of a point in time count. Enumeration may need to be done at a different time, over an extended period, or by using alternative methods to enable contact with these groups. For example, countries might consider asking those who provide services to these groups to assist with their enumeration. Seasonal movements may be identified in advance and this information can be used by collectors to enable contact. There needs to be planning and consultation, particularly with influential members of these groups, prior to the census to organize for their enumeration. Communication publicizing the benefits of the census, and engaging appropriate leaders in support of the census may assist coverage. Awareness of cultural issues relevant to specific groups should also be considered in developing enumeration strategies;

(b) *Civilian residents temporarily absent from the country*. As these persons will be absent from the country at the time of the census, they will be excluded from a population present count. Countries may collect information on these people from another family or household member present at the time of the census, but where a complete family or household is outside the country at the time of the census, it may not be possible for the census to collect information about these people. Estimates for usual residents temporality absent from the country based on other sources may be required to produce reliable estimates of usual residents for planning and policy purposes;

(c) *Civilian foreigners who do not cross a frontier daily and are in the country temporarily, including, undocumented persons, or transients on ships in harbour at the time of the census.* These groups may be in the country at the time of the census and therefore form part of the population present count. It is important to include these groups in the population count if their demand for services is to be considered for planning and policy development purposes. However, these groups may prefer not be counted, either because they fear ramifications from being counted or they do not identify themselves as part of the population for the

country. Language and communication may present challenges. Countries need to develop strategies, appropriate for their context, to include these groups in their enumeration;

(d) Refugees. Refugee populations in camps should be enumerated and their numbers presented separately, allowing calculation of country population excluding refugees, when such population count is required for non-demographic purposes;

(e) Military, naval and diplomatic personnel and their families located outside the country and foreign military, naval and diplomatic personnel and their families located in the country. Apart from the difficulties mentioned in (b) and (c) that are common to groups who are absent from their own country, enumeration of these groups is subject to diplomatic protocols. Detailed counts and characteristics of these groups may be considered sensitive on security grounds in some countries. Counts of these groups may be available from administrative records;

(f) Civilian foreigners who cross a frontier daily to work in the country. This group should be excluded from a usual resident population count. The practice of counting people where they spend census night removes much ambiguity and reduces possible duplication. The difficulty then is trying to include them in a service population if countries want to consider this group in policy development and in planning service delivery;

(g) Civilian residents who cross a frontier daily to work in another country. These persons are usual residents of the country and should be included in the population count;

(h) Merchant seamen and fishermen resident in the country but at sea at the time of the census (including those who have no place of residence other than their quarters aboard ship). Identifying that the ship will be at sea at the time of the census may be problematic, so countries will need to develop strategies to ensure inclusion of this group in the population count. This may include providing this group with census forms before their ship goes to sea or enumerating the ship before the time of the census.

(i) Homeless or roofless persons, nomads, vagrants and persons with no concept of usual residence. These should be included in the population count, and the census office should work with local government agencies, charities and other supporting bodies that provide support for this population group to identify the best method of collecting census information from these people.

5. Population subgroups for which counts are required

2.42 Accurate population counts, required for the efficient planning and delivery of services, distribution of resources, defining of boundaries for electoral representation, policy development and the design and analysis of household surveys, are required for various population subgroups within a country. These subgroups are typically based on geography, age and sex. There may also be a need to identify other populations such as the school population, working population, indigenous population or disadvantaged populations to enable more informed policy formation and better targeted service provision. A range of characteristics will be required to identify these populations and population subgroups, depending on the services being planned, the resources to be distributed and so on. The need for population counts for particular subgroups will determine the questions asked in the census.

D. Definitions and specifications of topics

2.43 The present section contains the recommended definitions and specifications of all topics presented in the order in which they appear in paragraph 2.16 above. It is important that census data be accompanied by the definitions used in carrying out the census. It is also important that any changes in definitions that have been made since the previous census are reported in the metadata and, if possible, accompanied by estimates of the effect of such changes on the relevant data, in order to ensure that users will not confuse valid changes over a period of time with increases or decreases resulting from changed definitions.

1. Geographical and internal migration characteristics

2.44 It should be noted that "place of usual residence" and "place where present at time of census" may be considered alternative topics when countries do not have the resources to investigate both topics for general census purposes. Some countries, however, will want to investigate both topics for general purposes. The relationship between the two topics and their further relationship to the topic of "place of enumeration" are set out in chapter IV (see paras. 1.469-1.477).

2.45 It is recommended that countries investigating only "place where present at time of census" for general purposes should also obtain information on "place of usual residence" for all persons who do not usually reside in the household where they were enumerated, to be used in connection with the information on "place of birth", "duration of residence", "place of previous residence" and/or "place of residence at a specified date in the past" ~~in~~ for the purposes of determining internal migration status. If, in the compilation of the population of geographical units, persons are allocated to the place where they were present at the time of the census, information on the four above-mentioned migration characteristics will be irrelevant for persons who were only visiting, or transient in, the place at which they were present. Since such persons must, in any case, be identified in the questionnaire as non-residents so that they will not be erroneously classified as recent in-migrants, information on place of usual residence should be collected which will make it possible to include the entire population in the tabulation of internal migration characteristics.

(a) Place of usual residence (core topic)

Recommended tabulations: all population tabulations

2.46 Information on the number of people usually residing in an area is basic to most informed decision-making about the area, whether it be a country, an urban agglomeration or a civil division. The number of residents determines the levels of most services required in an area.

2.47 The **place of usual residence** may be the same as, or different from, the place where the enumerated person was present at the time of the census and/or his or her legal residence. For a definition of place of usual residence, see paragraphs 1.461-1.463.

2.48. Although most persons will have no difficulty in stating their place of usual residence, some confusion is bound to arise in a number of situations where persons have more than one residential address. These cases might include persons who maintain two or more residences, students living at school, members of the armed forces living at a military installation but still maintaining private living quarters away from the installation, and persons who sleep away from their homes during the working week but return home for several days at the end of each week (see also para. 1.466). In some other circumstances referring to the person's intentions for the future may assist the determination of the place of usual residence.

2.49. Problems may also arise with persons who have (a) been residing at the place where they are enumerated for some time, perhaps for more than half of the preceding 12 months, but do not consider themselves to be residents of that place because they intend to return to their previous residence at some future time, or (b) left the country temporarily but are expected to return after some time longer than 12 months from the departure. In such instances, clearly stated time limits of presence in or absence from a particular place must be based upon the 12-month limit and used to determine whether or not the person is usually resident there.
[Note: The 12-month criterion is necessary for determining whether or not a person is usually resident in the country (so that there is international comparability for migration purposes), but less so for place of usual residence within the country for measuring internal migration, where a 6-month rule might be more appropriate as it will refer more closely to the concept of 'most of the time'.]

2.50. If each person is to be entered in the questionnaire only at his or her place of usual residence, the topic need not be investigated separately for each person, because the information will be available from the location information entered for the questionnaire as a whole.

2.51. Information on the place of usual residence should be collected in enough detail to enable tabulations to be made for the smallest geographical subdivisions required by the tabulation plan and to meet the requirements of the database within the cost limits and operational procedures required to code to a fine degree of detail.

(b) Place where present at time of census (core topic)

Recommended tabulations: all population tabulations

2.52. In cases where the census is taken on the basis of "place where counted" this topic may fulfil some of the functions of place of usual residence.

2.53. The **place where present at the time** of the census is, in theory, the geographical place at which each person was present on the day of the census, whether or not this was his or her place of usual residence. In practice, the concept is generally applied to the place where the person spent the night preceding the census day, because many persons may not be physically present at the place of enumeration during most of the day.

2.54. As mentioned in chapter V (see paras. 1.471-1.472), the concept is sometimes further extended to apply to the night preceding the day of actual enumeration in cases where the enumeration extends over a long period of time and persons are not likely to be able to supply information relating to a single moment in the past. Other departures from the definition may be necessary to deal with individual cases, such as persons travelling during the entire night or day of the census and persons who spent the night at work.

2.55. If each person is to be entered in the questionnaire only at the place where he or she was present at the time of the census, the topic need not be investigated separately for each person, because the information will be available from the location information recorded for the questionnaire as a whole.

2.56. Information on the place where each person was present should be collected in enough detail to enable tabulation to be made for the smallest geographical subdivisions required by the tabulation plan and to meet the requirement of the database.

[Note: We should perhaps acknowledge that for countries that collect information from administrative data sources, the concept of 'present at the time of the census' will not, in any case be relevant.]

(c) Place of birth (core topic)

Recommended tabulation: 1.4-R

2.57. Information on the place of birth is a major input to development of policies relating to migration and the related issues of service delivery to migrants. For the purposes of measuring internal migration, migrants are defined as those persons who usually are residing in a civil division of the country at the time of the census, but were previously resident outside that division. That is, movements within the civil division should not be regarded as being migratory.

2.58. The **place of birth** for those persons born within the country is the civil division in which the person was born; for those born in other countries, it is the country of birth. For persons born in the country (the native-born population), the concept of place of birth usually refers to the geographical unit where the mother of the individual resided at the time of the person's birth. In some countries, however, the place of birth is defined as the geographical unit in which the birth actually occurred. Either concept can be used depending on the information needs of the country; but each country should explain the definitions it uses in both in the census enumerator instructions and in the census reports to aid the interpretation of the data.

2.59. The collection of information distinguishing between the native-born population and those born elsewhere (foreign-born) is necessary where any inquiry on place of birth is made. Even countries where the proportion of foreign-born population is insignificant, and who may only be interested in information on the place of birth of the native-born population, must first separate the native-born from the foreign-born population. It is therefore recommended that place of birth be asked of all persons. In countries that combine the questions on place of birth and country of birth (where the latter is used to measure international migration), the guidance on the country of birth (see paras 2.93-2.96) should apply.

2.60. Information on the place of birth of the native population is usually used primarily for the investigation of internal migration. For countries that have been recently formed from parts of previously separate entities, however, such information may be of use in assessing the relative size of the population segments from each of those entities and their distribution throughout the country.

2.60b Information on whether or not a person is "born in the country" captures the population according to the boundaries at the time of the census. Using the "born in country" concept would account for individuals who may have been affected by changes to a countries boundary.

2.61. For the purposes of measuring internal migration, it is usually sufficient to collect information only on the major civil division (state, province or department, for example) in which the place of birth is located. If desired, more detailed information on the subdivision of a specific locality can be collected and used for accurate coding of the major division or for presenting data for smaller areas.

2.62. However, for more detailed studies of internal migration, data on the place of birth of the native population even in terms of major civil divisions may not be adequate. For better understanding of the movements of people since birth it ~~is~~ may be necessary to collect information at the smallest possible geographic level, bearing in mind that:

(a) the boundaries of administrative units such as cities and other civil divisions will change over time, which may give rise to ambiguity in data reported; and

(b) the costs of coding the reported data to these smaller units may be prohibitive especially where there are many units and the population is highly mobile.

To overcome the first problem, to the extent possible, both national and sub-national boundaries should refer to the boundaries applying at the time of the census. Countries must address the second problem in the light of their own circumstances, bearing in mind the reduced value of place of birth as a measurement of internal migration in a very mobile population.

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2.63. It is recommended that, for the study of internal migration, the data on place of birth be supplemented by information collected on duration of residence (see paras. 2.64 to 2.66) and place of previous residence (see paras. 2.67 and 2.68) or of residence at a specified date in the past (see paras. 2.69 and 2.70).

(d) Duration of residence (core topic)

Recommended tabulation: 1.5-R, 1.6a-R

2.64. The **duration of residence** is the interval of time up to the date of the census, expressed in complete years, during which each person has lived in (a) the locality that is his or her usual residence at the time of the census or (b) the major or smaller civil division in which that locality is situated.

2.65. In collecting information on duration of residence, it should be made clear that the interest is in length of residence in the major or smaller civil division, or the locality, but not in the particular housing unit.

[Note: 'and' has been replaced with 'or' in both these paras since it is not envisaged that two 'durations of residence' be captured, which might be the case otherwise.]

2.66. Data on the duration of residence have only limited value in themselves because they do not provide information on the place of origin of in-migrants. Therefore, when the topic is investigated, the place of previous residence should also be investigated, if at all possible, so that the data can be cross-classified. **[Note: The presumption from this is that duration of residence relates to the most recent move to the current place of usual residence. We need to make this specifically clear, particularly in the case of return migrants.]**

(e) Place of previous residence (core topic)

Recommended tabulation: 1.6a-R

2.67. The **place of previous residence** is the major or smaller civil division, or the foreign country, in which the individual resided immediately prior to migrating into the civil division of present usual residence.

2.68. Data on the place of previous residence have only limited value in themselves because they do not provide information on the time of in-migration. Therefore, when the topic is investigated included in the census, the duration of residence (see paras 2.64.2.66) should also be included so that the data can be cross-classified. Alternatively, countries may choose to include a question on place of residence as a specified date in the past (see paras 2.69-2.70 below).

(f) Place of residence at a specified date in the past (core topic)

Recommended tabulation: 1.6b-R

2.69. The **place of residence at a specified date in the past** is the major or smaller division, or the foreign country, in which the individual resided at a specified date preceding the census. The reference date chosen should be that most useful for national purposes. In most cases, this has been deemed to be one year or five years preceding the census (or both of these time frames in cases where internal migration is of particular importance to users and resources are sufficient to code the data).

2.69a The former reference date provides information for statistics of both recent internal and international migration during a single year, while the latter may be more appropriate for collecting data for more longer-term analysis of migration. When selecting the reference date the ability of individuals to recall with accuracy their usual residence one year or five years earlier than the census date should be considered. For countries conducting quinquennial censuses, the date of five years earlier can be readily tied in, for most persons, with the time of the previous census, but it should be noted that a one-year recall is likely to result in more accurate information than a five-year recall.

2.69b. Some countries, however, may wish to use a different time reference than either one year or five years preceding the census because these intervals may present recall difficulties. In such circumstances the time reference should ~~to~~ be one that can be associated with the occurrence of an important event that most people will remember.

2.69c. For foreign-born persons, the collection of information on year of first or last arrival in the country is recommended (see "International migration characteristics", paras. 2.89 – 2.106).

2.70. However, no matter what previous date is used, provision must be made for the treatment of infants and young children who are resident at the time of the census but were not yet born at the earlier date. Tabulations of the data should indicate the nature of the treatment of this group.

(g) Total population (core topic)

Recommended tabulations: all population tabulations

2.71. For census purposes, the **total population** of the country consists of all the persons falling within the scope of the census. In the broadest sense, the total may comprise either all usual residents of the country or all persons present in the country at the time of the census. The total of all usual residents is generally referred to as the de jure population and the total of all persons present as the de facto population.

2.72. In practice, however, countries do not usually achieve either type of count, because one or more groups of the population are included or excluded, depending on national circumstances. The general term used to describe the total might imply a treatment opposite to the one given to any of these groups. It is recommended, therefore, that each country describe in detail the figure accepted officially as the total, rather than simply label it as 'de jure' or 'de facto'.

2.73. The description should show clearly whether each group listed below was or was not included in the total. If the group was enumerated and identified as a separate group (see para 1.41), its magnitude should be given; if it was not enumerated, an estimate of its size and the method of estimation should be given, if possible. If any group is not represented at all in the population, this fact should be stated and the magnitude of the group should be shown as "zero". This may occur particularly with groups (a), (b, (d) and (n) described below (see also para. 2.41-2.42 for more information).

2.74. The groups to be considered are:

(a) Nomads;
(b) Persons living in areas to which access is difficult;
(c) Military, naval and diplomatic personnel and their families located outside the country;
(d) Merchant seamen and fishermen resident in the country but at sea at the time of the census (including those who have no place of residence other than their quarters aboard ship);
(e) Civilian residents temporarily in another country as seasonal workers;
(f) Civilian residents who cross a frontier daily to work in another country;
(g) Civilian residents other than those in groups (c), (e) or (f) who are working in another country;
(h) Civilian residents other than those in groups (c), (d), (e) (f) or (g) who are temporarily absent from the country;
(i) Foreign military, naval and diplomatic personnel and their families located in the country;
(j) Civilian foreigners temporarily in the country as seasonal workers;
(k) Civilian foreigners who cross a frontier daily to work in the country;
(l) Civilian foreigners other than those in groups (i), (j) or (k) who are working in the country;
(m) Civilian foreigners other than those in groups (i), (j), (k) or (l) who are in the country temporarily;
(n) Refugees in camps;
(o) Transients on ships in harbour at the time of the census.

2.75. In the case of groups (h) and (m), it is recommended that an indication be given of the criteria used in determining that presence in, or absence from, the country is temporary.

2.76. In those countries where the total population figure has been corrected for under-enumeration or over-enumeration, both the enumerated figure and the estimated corrected population figure should be shown and described. Where possible, the detailed tabulations should be consistent with the corrected population figures. However, where this is not possible, if, for example, the costs of the methodology for undertaking these corrections are prohibitive, the detailed tabulations will, of necessity, be based only on the actual enumerated population.

2.77. The population of each geographical unit of the country, like the total population of the country (see para. 2.71), may comprise either all usual residents of the unit (see para. 2.47) or all persons present in the unit at the time of the census (see paras. 2.52 and 2.53).

[Note: This section on 'Total population' to be moved to Section C as a separate population count]

(h) Locality (core topic)

Recommended tabulations: all population tabulations

2.78. For census purposes, a **locality** should be defined as a distinct population cluster (also designated as inhabited place, populated centre, settlement and so forth) in which the inhabitants live in neighbouring or contiguous sets of living quarters and that has a name or a locally recognized status. It thus includes fishing hamlets, mining camps, ranches, farms, market towns, villages, towns, cities and many other population clusters that meet the criteria specified above. Any departure from this definition should be explained in the census report as an aid to the interpretation of the data.

2.79. Localities as defined above should not be confused with the smallest civil divisions of a country. In some cases, the two may coincide. In others, however, even the smallest civil division may contain two or more localities. On the other hand, some large cities or towns may contain two or more civil divisions, which should be considered as sub-divisions of a single locality rather than separate localities.

2.80. A large locality (that is to say, a city or a town) is often part of an urban agglomeration, which may comprise the city or town proper together with a suburban fringe or heavily populated area lying outside, but adjacent to, its boundaries. The urban agglomeration is therefore not coterminous with the locality but is an additional geographical unit, which may include more than one locality. In some cases, a single large urban agglomeration may comprise several cities or towns and their suburban fringes. The components of such large agglomerations should be specified in the census results.

(i) Urban and rural (core topic)

Recommended tabulations: all population tabulations

2.81. Because of national differences in the characteristics that distinguish urban from rural areas, the distinction between the urban and the rural population is not yet amenable to a single definition that would be applicable to all countries or even, for the most part, to the countries within a region. Where there are no regional recommendations on the matter, countries must establish their own definitions in accordance with their own needs.

2.82. The traditional distinction between urban and rural areas within a country has been based on the assumption that urban areas, no matter how they are defined, provide a different way of life and usually a higher standard of living than are found in rural areas. In many developed countries this distinction has become blurred, and the principal difference between urban and rural areas in terms of the living standards tends to be the degree of population concentration or density. On the other hand, the differences between urban and rural ways of life and standards of living remain significant in developing countries, but even here rapid urbanization in these countries has created a great need for information related to different sizes of urban areas.

2.83. Hence, although the traditional urban-rural dichotomy is still needed, classification by size of locality can usefully supplement the dichotomy or even replace it where the major concern is with characteristics related only to density along the continuum from the most sparsely settled areas to the most densely built-up localities.

2.84. Population density may not, however, be a sufficient criterion in many countries, particularly where there are large localities that are still characterized by a truly rural way of life. Such countries will find it necessary to use additional criteria in developing classifications that are more distinctive than a simple urban rural differentiation. Some of the additional criteria that may be useful are the percentage of the economically active population employed in agriculture, the general availability of electricity and/or piped water in living quarters and the ease of access to medical care, schools and recreation facilities. For certain countries where such facilities are available in

some areas that are still rural (where agriculture is the predominant source of employment), it might be necessary to adopt different criteria in different parts of the country. Care should be taken, however, to ensure that the definition used does not become too complicated for application to the census and for understanding the census results.

2.85. Even in the industrialized countries, it may be considered appropriate to distinguish between agricultural localities, market towns, industrial centres, service centres and so forth, within size-categories of localities.

2.86. Even where size is not used as a criterion, the urban/rural classification should be applied to the locality for national purposes as well as for international comparability. If it is not possible to use the locality, the smallest administrative unit of the country should be used.

2.87. Some of the information required for classification may be provided by the census results themselves, while other information may be obtained from external sources. The use of information provided by the census (as, for example, the size-class of the locality or the percentage of the population employed in agriculture), whether alone or in conjunction with information from other sources, means that the classification will not be available until the relevant census results have been tabulated. If, however, the census plans call for the investigation of a smaller number of topics in rural areas than in urban areas or for a greater use of sampling in rural areas, the classification must be available before the enumeration takes place. In these cases, reliance must be placed on external sources of information, even if only to bring up to date any urban-rural classification that was prepared at an earlier date.

2.88. The usefulness of housing census data (for example, the availability of electricity and/or piped water) collected simultaneously with, or not too long before, the population census should be kept in mind. Images obtained by remote sensing may be of use in the demarcation or boundaries of urban areas when density of habitation is a criterion. For assembling information from more than one source, the importance of a well-developed system of geocoding should not be overlooked.

2. International migration characteristics

2.89. Interest in the movement of people across national boundaries, namely, international migration, has steadily grown among countries concomitant with the increase in international migration. The present section on international migration supplements and expands the topic "geographical and internal migration characteristics", which is covered above. Definitions of international migration and specific ways of applying them in population censuses, consistent with the United Nations *Recommendations on Statistics of International Migration, Revision 1,*[98] are presented in this section.

2.90. The revised United Nations *Recommendations on Statistics of International Migration* deals with both international migration flows and international migrant stock, and identifies population censuses as being the main source for collecting data on international migrants and their characteristics. This section is concerned chiefly with the topic of international migrant stock as derived from population censuses.

2.91. In the *Recommendations on Statistics of International Migration* (para. 187), the stock of international migrants present in a country is defined as "the set of persons who have ever changed their country of usual residence, that is to say, persons who have spent at least a year of their lives in a country other than the one in which they live at the time the data are gathered". However, given that this information can be difficult to obtain, it is often approximated by other population groups such as persons born abroad or persons whose country of citizenship differs from that of the country they reside in.

2.92. Consequently, for the study of international migration, census recommendations tend to focus on two sub-groups of the population: the foreign-born population and the foreign citizens living in the country of enumeration. In order to identify members of those groups, two items must be recorded in the census: (a) the country of birth, and

[98] Statistical Papers, No. 58 (United Nations publication, Sales No. E.98.XVII.14).

(b) the country of citizenship. In addition, it is important to record the year of arrival in the country of enumeration so as to establish the length of stay of international migrants residing in the country.

(a) Country of birth (core topic)

Recommended tabulations: 2.1-R, 2.2-R, 2.3-R

2.93. **Country of birth** is the country in which the person was born. The concept of county of birth usually refers to the country where the mother of the individual resided at the time of the person's birth. In some countries, however, country of birth is defined as the country in which the birth actually took place. Either concept can be used depending on the information needs of the country; each country should explain which definition it used in the census. It should be noted that the country of birth of a person is not necessarily the same as his or her country of citizenship, which is a separate census topic dealt with below. It is recommended that country of birth be asked of all persons to distinguish the native-born from the foreign-born population. The collection of this information is necessary even in countries where the proportion of foreign-born population is small. For the foreign-born population, the collection of information on the specific country of birth is recommended so as to permit the classification of the foreign-born population by country of birth. For respondents who are born outside of the country of enumeration and cannot identify their country of birth, at least the continent or region where that country is located should be ascertained.

2.94. For purposes of both internal consistency and international comparability, it is recommended that information on the country of birth be recorded according to national boundaries existing at the time of the census. Thus, persons who have remained in the territory where they were born, but whose "country of birth" may have changed because of boundary changes, should be counted as foreign-born. Information on the year of arrival in the country (see paragraph 2.104 below) can be used to identify persons who owe their status of foreign-born to changes in national boundaries. It is essential that the coding of information on the country of birth be done in sufficient detail to allow for the identification of all relevant countries of birth.

2.94a. For purposes of coding, it is recommended that countries use the numerical coding system presented in *Standard Country or Area Codes for Statistical Use*[99]. The use of standard codes for classification of the foreign-born population according to the country of birth will enhance the usefulness of such data, including an international exchange of foreign-born population statistics among countries. If countries decide to combine countries into broad groups, it is recommended that the standard regional and sub-regional classifications identified in the above-mentioned publication be adopted.

2.95. Countries with a significant number of international migrants may wish to collect information on the country of birth of parents. Information on the country of birth of parents (both father and mother), in which case the information should be asked of all respondents following the same guidelines given for country of birth. The decision to collect and disseminate information on country of birth of parents in a census is dependent upon a number of considerations and national circumstances, including for example the suitability and sensitivity of asking such a question that relates to persons who may not be in the country in which the census is taking place.

2.96. Information on the country of birth of parents can be used, in combination with information on the country of birth of the enumerated person, to identify native-born children of the foreign-born population (that is, the so-called second generation) as well as studying the integration processes and outcomes of migrants and their descendants. Moreover, in countries that have experienced return migration, information from this topic allows the identification of foreign-born children of native-born parents.

[99] United Nations, *Standard Country or Area Codes for Statistical Use*, http://unstats.un.org/unsd/methods/m49/m49.htm.

(b) Country of citizenship (core topic)

Recommended tabulation: 2.3-R

2.97. **Citizenship** is defined as the particular legal bond between an individual and his/her State, acquired by birth, naturalization, marriage or some other mechanism. A citizen is a legal national of the country of enumeration; a foreign citizen is a non-national of the country (that is, a citizen of another country). Because the country of citizenship is not necessarily identical to the country of birth, both items should be collected in a census.

2.98. Information on the country of citizenship is particularly important for foreign citizens. It is important to record country of citizenship as such and not to use another concept to indicate citizenship, since some of those concepts may also be used to designate ethnic groups.

2.98a. It is essential that the coding of information on country of citizenship be done in sufficient detail to allow for the individual identification of all countries of citizenship that are represented among the foreign population in the country. For purposes of coding, it is recommended that countries use the numerical coding system presented in *Standard Country or Area Codes for Statistical Use*. The use of standard codes for classification of the foreign population by country of citizenship will enhance the usefulness of such data and permit an international exchange of information among countries on their foreign populations. If countries decide to combine countries of citizenship into broad groups, it is recommended that the standard regional and sub-regional classifications identified in the above-mentioned publication be adopted. The category 'stateless' should also be listed.

2.99. In cases where people have more than one citizenship and where this information is useful for decision-making, details may be collected on whether the person holds one or multiple citizenship. If this information is to be published, should be taken to explain how the possibility of people being included in the table more than once affects the marginal totals on the table. Usually, however, it may be more practicable for tabulations by citizenship to refer to one citizenship only. Thus, persons with multiple citizenships should be allocated to a single 'primary' citizenship, for example by giving precedence to the citizenship of the 'home' country.

(c) Acquisition of citizenship

2.100. In addition to collecting information on citizenship, for countries where the population includes a significant proportion of naturalized citizens it may be important to collect information on the method of acquisition of citizenship so as to enable the classification of the population into (a) citizens by birth, (b) citizens by naturalization whether by declaration, option, marriage or other means, and (c) citizens of another country. In such countries it may also be useful to ask questions on previous citizenship and year of naturalization.

2.101. The reliability of reported citizenship may be doubtful in the case of persons whose citizenship has recently changed as a result of territorial changes, or among the population of some newly independent countries where the concept of citizenship may have only recently become important. Clear guidelines issued by the national statistical authority can help improve the quality of the data collected. As an aid to the analysis and interpretation of the results, notes on the likelihood of these and other possible causes of misstatement should accompany tabulations based on citizenship.

2.102. Enumeration and processing instructions should provide clear guidance on the treatment of stateless persons, persons with dual nationality, persons in the process of naturalization and any other groups with ambiguous citizenship. The treatment of these groups should be described in the census reports and included in the metadata for accompanying tabulations.

(d) Year or period of arrival in the country (core topic)

Recommended tabulation: 2.2-R, 2.4-R

2.103. **Year or period of arrival in the country** refers to the calendar year and month of arrival of a foreign-born person to the country of enumeration. This information enables the calculation of the number of completed years

between the time of arrival in the country and the time of inquiry, usually the census date. Information on the month and year of arrival also provides the flexibility of classifying foreign-born persons by period of arrival in terms of any pre-specified period, such as 1975-1979, 1980-1984 and so forth. It is thus recommended that the period of arrival be shown, in any tabulation in which the variable appears, in terms of the actual year of arrival.

[Note: Should this information be collected from all respondents?]

2.104. It is possible to collect information on either the date of first arrival in the country or the date of the most recent arrival in the country. Each has its own advantages and disadvantages. In making the choice of which information to collect, countries should be guided first and foremost by their policy and user needs.

2.104a. Information on time since arrival can also be collected by asking how many years have elapsed since the time of arrival, instead of in what calendar year and month the person arrived. However, use of such a question is not recommended because it is likely to yield less accurate information.

2.105. Note that information on the year and month of arrival is focused mainly on persons born outside ~~of~~ the country of enumeration, that is to say, persons who must have arrived in that country at some time after their birth. However, it should be noted that the phenomenon of "international return migration" is becoming increasingly common, and countries have population groups that maintain links to other countries, migrating to or from another country at different life stages (for example, as students or pensioners), may have an interest in collecting information on returning migrants: in this case, the question on year and month of arrival could also be asked of native-born respondents who have ever lived in another country. In addition, it might also be important to collect information on previous country of residence for persons who have ever lived abroad.

3. Household and family characteristics

2.107. In considering the topics related to household characteristics, it is important to be aware of the differences between the concepts of household and family as used herein.

2.108. A **household** may be either:

(a) A one-person household, that is to say, a person who makes provision for his or her own food or other essentials for living without combining with any other person to form part of a multi-person household;
or
(b) A multi-person household, that is to say, a group of two or more persons living together who make common provision for food or other essentials for living. The persons in the group may pool their resources and have a common budget; they may be related or unrelated persons or a combination of persons both related and unrelated. This arrangement exemplifies the "housekeeping" concept.

Some countries use a concept different from the housekeeping concept, namely, the "household-dwelling" concept, which regards all persons living in a housing unit as belonging to the same household. According to this concept, there is one household per occupied housing unit. Therefore, the number of occupied housing units and the number of households occupying them are equal and the locations of the housing units and households are identical. Countries should specify in their census reports whether they used the "housekeeping" or the "household-dwelling" concept of a private household.

2.109. A household may be located in a housing unit (see para. 2.418) or in a set of collective living quarters such as a boarding house, a hotel or a camp, or may comprise the administrative personnel in an institution. **[Note: It is difficult to regard any 'household' as being homeless using either the housekeeping or household-dwelling concepts. The 'primary' homeless (that is roofless or persons sleeping rough) are usually regarded as persons living in neither private households nor collective living quarters. The 'secondary' homeless (the rootless, or persons with no fixed place of usual residence) are usually regarded as being part of the household (either private or institutional) where they happen to be present at the time of the census, and thus are not 'homeless'. Thus the last sentence should be deleted.] [Note: There may be a need, however, to expand on the**

concepts of, and difficulty of enumerating, households living in accommodation located within institutions, and the needs for countries to identify these separately.]

2.110. The family within the household, a concept of particular interest, is defined as those members of the household who are related, to a specified degree, through blood, adoption or marriage. The degree of relationship used in determining the limits of the family in this sense is dependent upon the uses to which the data are to be put and so cannot be established for worldwide use. See paragraph 2.125 for a definition of the family nucleus.

2.111. Although in practice most households are composed of a single family consisting of a married couple without children or of one or both parents and their children, it should not be assumed that this identity always exists; census tabulations should therefore clearly indicate whether they relate to households or to families within households.

2.112. From the definitions of "household" and "family", it is clear that these are different concepts that cannot be used interchangeably in the same census. The differences between the household and the family are that:

> a household may consist of only one person but a family must contain at least two members, and the members of a multi-person household need not be related to each other, while the members of a family must always be related.

2.112a. A household can contain more than one family, or one or more families together with one or more non-related persons, or it can consist entirely of non-related persons. A family typically will not comprise more than one household. However, the existence of polygamous families in some countries, as well as shared child custody and support arrangements in others, means that individual countries should decide how best to derive and report data on families.

2.113. It is recommended that the household be used as the unit of enumeration (as defined in paras. 1.448 - 1.452) and that the family be a derived topic only. The place of usual residence is recommended as the basis for assigning persons to households where they normally reside. Where the de facto approach is used as the method of enumeration (see paras. 1.469-1.477), household lists should, where feasible, also include usual residents temporarily absent. The place of usual residence is where a person usually resides and it may or may not be the person's current or legal residence. The latter terms are usually defined in the laws of most countries and need not correspond to the concept of place of usual residence which, as employed in the census, is based on conventional usage. In published reports, countries should indicate whether or not household information refers to usual residents and also what the time limits are in respect of being included or excluded as a usual resident. For a more detailed discussion and the difficulty of collecting information on place of usual residence, see paragraphs 2.46-2.51.

(a) Relationship to the reference person of household (core topic)

Recommended tabulations: 3.1-A, 3.2-A, 3.3-A

2.114. In identifying the members of a household (as defined in paras 2.108 and 2.109), it is useful to identify first the household reference person or household head and then the remaining members of the household according to their relationship to the reference person or head. Countries may use the term they deem most appropriate to identify this person (household reference person, head of household, householder, among others) as long as the person so identified is used solely to determine relationships between household members. It is recommended that each country present, in published reports, the concepts and definitions that are used.

2.115. With respect to selecting the household reference person, it is important to specify criteria for choosing that person in relation to whom household members would be best distinguished, especially in polygamous, multi-family and other households, such as those composed only of siblings without a parent and those composed entirely of unrelated persons. This information should be included in training materials and instructions to enumerators.

2.116. The traditional notion of head of household assumes that most households are family households (in other words, that they consist entirely, except possibly for domestic servants, of persons related by blood, marriage or adoption) and that one person in such family households has primary authority and responsibility for household affairs and is, in the majority of cases, its chief economic support. This person is then designated as the head of household.

2.117. Where spouses consider themselves to be equal in household authority and responsibility and may share the economic support of the household, the concept of head of household is no longer considered valid even for family households. In order for the relationship among members of the household to be determined under these circumstances, it is essential that either:

(a) the members of the household designate one among them as a reference member with no implication of headship; or
)b) provision be made for designation of joint headship where desired.

In any case, it is important that clear instructions be provided in the census as to how this situation is to be handled.

2.118. Even in the many countries where the traditional concept of head of household is still relevant, it is important to recognize that the procedures followed in applying the concept may distort the true picture, particularly with regard to female heads of households. The most common assumption that can distort the facts is that no woman can be the head of any household that also contains an adult male. Enumerators and even respondents may simply take such an assumption for granted.

2.119. This common sex-based stereotype often reflects circumstances that may have been true in the past but are true no longer, insofar as the household and economic roles of women continue to change. It is therefore important that clear instructions be provided as to who is to be treated as the head of the household so as to avoid the complications of enumerator or respondent preconceptions on the subject and the bias that such preconceptions may create. The procedure to follow in identifying a head when the members of the household are unable to do so should be clear and unambiguous and should avoid sex-based bias.
[Note: Ideally, this concept should be defined uniformly, but this may be difficult to apply in some countries. Therefore, where alternative definitions are used, this should be made explicitly in the census questionnaire or in the tabulated census results.]

2.119a. The selection of the one reference person in a household to whom all other persons in the household report, or designate, their relationship requires careful consideration. In the past the person considered to be the 'head of the household' was generally used as the reference person, but this concept is no longer considered appropriate in many countries. It has also sometimes been proposed that the person designated as the reference person should be the oldest person in the household or the one who contributes the most income. However, given that the primary purpose of the question is to assign family status and to assign individuals into families, both of these approaches have weaknesses. The automatic selection of the oldest person may be undesirable because in multi-generational households many explicit kin relationships can be reported where the reference person is selected from the middle generation. Similarly, the selection of the person with the highest income may be a person who will not solicit the broadest range of explicit kin relationships. Given below is some guidance on the selection of the reference person, which will yield some explicit kin relationships:

(a) Either the husband or the wife of a married couple living in the household (preferably from the middle generation in a multi-generational household);
(b) Either partner of a consensual union couple living in the household where there is no married couple present (where applicable);
(c) The parent, where one parent lives with his or her sons or daughters of any age; or
(d) Where none of the above conditions apply, any adult member of the household may be selected.

Note that these categories are neither comprehensive nor mutually exclusive.

2.120. After identification of the reference member of the household, each of the remaining members of the household should be distinguished in relation to that person, as appropriate, as one of the following:

(a) spouse,
(b) partner in consensual union (cohabiting partner), where applicable,
(c) child,
(d) spouse of child,
(e) grandchild or great-grandchild,
(f) parent (or parent of spouse),
(g) other relative,
(h) domestic employee or
(i) other person not related to the head or other reference member.

Where this classification is considered too detailed for successful collection of the information, categories (f) and (g) may be consolidated as "Other relative" and (h) and (i) can be consolidated as "Other unrelated person".

2.121. As an aid to the identification of family nuclei (as defined in paragraphs. 2.125-2.127) within the household, it might be helpful if persons were recorded in the census form to the extent possible in the order of nuclear relationship. Thus, the first person entered after the head or other reference person would be the spouse of that person, followed by unmarried children and then by married children, their spouses and children. For polygamous households, the order of entry could be such that each wife and her unmarried children appeared in succession.

2.122. For estimating fertility by the *own children* method (see para. 2.171), the natural mother of each child under 15 years of age should be identified if she appears in the same questionnaire as her child. One way of doing this is to provide the line number of the mother alongside that of the child, if both are living in the same household. The information is not relevant for stepchildren, adopted children or foster children under permanent or temporary care.

2.123. In order to meet increased data needs on households and families, countries may wish, while conducting their population censuses, to collect more detailed information on relationships. In households where the relationship structure is complex, including those with foster children, obtaining accurate information on the relationships between household members may be difficult. Some countries may supplement information on relationship to the head of household with information on direct relationships between household members by, for instance, relating a child to its parents even when neither parent is the head of household. Enumerators should be encouraged to probe for a clear relationship (such as child, niece, aunt and so forth). The recording of non-specific responses such as "relative" should be avoided. It is recommended that specific guidance be provided on acceptable responses, that relationships be specified completely in the census questionnaire, and that any pre-coded categories used should be sufficiently detailed to produce desired outputs.

(b) Household and family composition (core topic)

Recommended tabulations: 3.3-A

2.124. Household and family composition can be examined from different points of view, but for census purposes it is recommended that the primary aspect considered should be that of the family nucleus.

2.125. A **family nucleus** is of one of the following types (each of which must consist of persons living in the same household):
(a) A married couple without children;
(b) A married couple with one or more unmarried children;
(c) A father with one or more unmarried children;

(d) A mother with one or more unmarried children.[100]

Couples living in consensual unions may, where appropriate, be regarded as constituting a family nucleus.

2.126. The concept of family nucleus as defined above limits relationships between children and adults to direct (first-degree) relationships, that is to say, between parents and children. In some countries, numbers of skip generation households, that is to say, households consisting of grandparent(s) and one or more grandchild(ren) with no parent of those grandchild(ren) present, are considerable. Therefore, countries may include such skip-generation households in their family nucleus definition, and the census report should clearly state whether or not skip-generation households are included in the family nucleus definition.

2.127. The family nucleus is identified from the answers to the question on relationship to the reference member of the household, supplemented where necessary by information on name and marital status. The identification of offspring and their mother and the order in which persons are entered in the questionnaire may be of additional assistance in this respect. The identification of family nuclei is likely to be more complete in de jure than in de facto enumerations, because the latter do not take account of temporarily absent household members who may constitute part of a nucleus.

2.128. For census purposes, a child is any unmarried individual, regardless of age, who lives with his or her parent(s) and has no children in the same household. Consequently, the definition of a child is primarily a function of an individual's relationship to other household members, regardless of age. In accordance with the above definition, a household consisting of a married couple with two never-married children, divorced son, and a married daughter and her husband, would be considered to be composed of two family nuclei, with the divorced child being regarded as a member of the parents' family and the married daughter and son-in-law as a second family. As used here, the term "child" does not imply dependency, but rather is used to capture household living arrangements of persons who are in a parent-child relationship. Countries need to be clear in their metadata how they treat foster and adopted children.

2.129. The family nucleus does not include all family types, such as brothers or sisters living together without their offspring or parents, or an aunt living with a niece who has no child. It also excludes the case of a related person living with a family nucleus as defined above, for example, a widowed parent living with her married son and his family. The family nucleus approach does not, therefore, provide information on all types of families. Countries may extend the investigation of families beyond that of the family nucleus, in accordance with their own interests.

2.130. Households should be classified by type according to the number of family nuclei they contain and the relationship, if any, between the family nuclei and the other members of the household. The relationship should be through blood, adoption or marriage, to whatever degree is considered pertinent by the country (see para. 2.123). Given the complexity of this item, it is important that information on relationship to the household reference person be properly processed. The types of household to be distinguished could be:

(a) One-person household;
(b) *Nuclear household*, defined as a household consisting entirely of a single family nucleus. It may be classified into:
(i) Married-couple family:
a. With child(ren);
b. Without child(ren);

(ii) Partner in consensual union (cohabiting partner):
a. With child(ren);
b. Without child(ren);

[100] In countries where a different definition of family nucleus is used, it should be clearly stated in the census report.

(iii) Father with child(ren);

(vi) Mother with child(ren);

(c) *Extended household*, defined as a household consisting of any one of the following: [101]

(i) A single family nucleus and other persons related to the nucleus, for example, a father with child(ren) and other relative(s) or a married couple with other relative(s) only;

(ii) Two or more family nuclei related to each other without any other persons, for example, two or more married couples with (or without) child(ren) only;

(iii) Two or more family nuclei related to each other plus other persons related to at least one of the nuclei, for example, two or more married couples with other relative(s) only;

(iv) Two or more persons related to each other, none of whom constitute a family nucleus;

(d) *Composite household*, defined as a household consisting of any of the following: [102]

(i) A single family nucleus plus other persons, some of whom are related to the nucleus and some of whom are not, for example, mother with child(ren) and other relatives and non-relatives;

(ii) A single family nucleus plus other persons, none of whom is related to the nucleus, for example, father with child(ren) and non-relatives);

(iii) Two or more family nuclei related to each other plus other persons, some of whom are related to at least one of the nuclei and some of whom are not related to any of the nuclei, for example, two or more couples with other relatives and non-relatives only;

(iv) Two or more family nuclei related to each other plus other persons, none of whom is related to any of the nuclei, for example, two or more married couples one or more of which with child(ren) and non-relatives;

(v) Two or more family nuclei not related to each other, with or without any other persons;

(vi) Two or more persons related to each other but none of whom constitute a family nucleus, plus other unrelated persons;

(vii) Non-related persons only;

(e) Other;

(f) Unknown or not stated

[Note: It would be helpful to provide an example of what might constitute an 'other' type of family. Also, where a recommended classification includes an 'unknown' or 'not stated' category this should always be distinct from, and not grouped with, any 'other' category.]

2.131. In the census tabulations, all countries should at least distinguish between one-person, nuclear, extended and composite households. Where feasible, some or all of the subcategories shown above should also be distinguished, although countries may find it appropriate to modify the classification according to national circumstances. For example, in countries where almost all households contain only one family nucleus at most, the distinction between nuclear, extended and composite households may be applied only to households containing one

[101] The subdivisions in this category should be modified to suit national circumstances.
[102] The subdivisions in this category should be modified to suit national circumstances.

nucleus or no nucleus; multinuclear households may then be shown as an additional category without any further classification by type. In countries where multinuclear households are comparatively common, further breakdowns of extended and composite households, distinguishing between those with three, four or more family nuclei, may be helpful.

(c) Household and family status

2.132. For purposes of determining household and family status and identifying how a person relates to other household or family members, persons may be classified according to their position in the household or family nucleus. Classifying persons according to household and family status has uses in social and demographic research and policy formulation. Census data could be presented according to both household and family status for a variety of purposes. Although status itself is based on information derived from responses to the item on relationship to the head or other reference member of the household and other items, the classification of persons by their household and family status is a relatively new approach: it is a different approach from the traditional one of classifying household members solely according to their relationship to the head or reference person. **[Note: Is it valid to continue saying that this approach is 'new'?]** The following household and family status classifications illustrate how such an approach may be used.[103] Care should be taken at the planning stages to relate this item to the classification of households by type as recommended in paragraph 2.130.

Persons are classified by household status as:

1 Person in a household with at least one family nucleus
- 1.1 Husband
- 1.2 Wife
- 1.3 Partner in consensual union (cohabiting partner)
- 1.4 Lone mother[104]
- 1.5 Lone father[105]
- 1.6 Child living with both parents
- 1.7 Child living with lone mother
- 1.8 Child living with lone father
- 1.9 Not a member of a family nucleus
  - 1.9.1 Living with relatives
  - 1.9.2 Living with non-relatives

[Note: While there are separate categories for male and female in 1.1 and 1.2 , there is not an equivalent split for category 1.3. Thus we should either have separate categories for male and females cohabiting partners or have a single 'Married spouse' category by combining 1.1 and 1.2.]

2 Person in a household with no family nucleus
- 2.1 Living alone
- 2.2 Living with others[106]
  - 2.2.1 Living with sibling(s)
  - 2.2.2 Living with other relatives
  - 2.2.3 Living with non-relatives

[Note: This classification assumes that all persons are living in 'households'. Perhaps there should be an additional split between persons in households and persons not in households or should explain that this classification applies only to persons in private households.]

[103] To date, only the population and housing census recommendations for the Economic Commission for Europe region contain household and family status classifications.
[104] Person living with children, without spouse.
[105] Person living with children, without spouse.
[106] The subdivisions in this category should be modified to suit national circumstances.

Persons are classified by family status as:[107]

1 Spouse
- 1.1 Husband
  - 1.1.1 With child(ren)
  - 1.1.2 Without child
- 1.2 Wife
  - 1.2.1 With child(ren)
  - 1.2.2 Without child

2 Lone parent
- 2.1 Male
- 2.2 Female

3 Child
- 3.1 With both parents
- 3.2 With lone parent
  - 3.2.1 With lone father
  - 3.2.2 With lone mother

4 Not member of a family nucleus
- 4.1 Relative of husband or wife
  - 4.1.1 Parent of husband or wife
  - 4.1.2 Sibling of husband or wife
  - 4.1.3 Other relative of husband or wife
- 4.2 Non-relative

4. Demographic and social characteristics

2.133. Sex and age are considered to be the most basic of all demographic variables. Of all the topics included in population censuses, *sex* and *age* are more frequently cross-classified with other characteristics of the population than are any other topics. Apart from the importance of the sex-age structure of the population in itself, accurate information on the two topics is fundamental to the great majority of the census tabulations. A very important use of census data on the sex and age composition of the population is the evaluation of the data especially with respect to coverage. The variables are therefore very crucial and it is important that this information be reported in respect of every person for whom census information has been collected. It is therefore recommended that where this information is incomplete it should be edited for census purposes rather than being reported as 'not stated'. Possible difficulties in securing accurate age data are often not recognized because the topic appears to be a simple one. The difficulties associated with this topic are therefore highlighted in paragraphs 2.135-2.143 below.

(a) Sex (core topic)

Recommended tabulations: all population tabulations except 3.3-A

2.134. The sex (male or female) of every individual should be recorded on the census questionnaire for those countries that collect their census information in this way. The disaggregation of data by sex is a fundamental requirement for gender statistics. For many socio-economic and demographic characteristics that could be collected through a census, such as education, economic activity, marital status, migration, disability and living arrangements, there are generally variations by sex. The successful planning and implementation of gender-sensitive policies and programmes requires the disaggregation of data by sex to reflect problems, issues and questions related to both men and women in society. Sex, together with age, represents the most basic type of demographic information collected about individuals in censuses and surveys, as well as through administrative recording systems, and the cross-

[107] The subdivisions in this category should be modified to suit national circumstances.

classification of these data with other characteristics forms the basis of most analyses of the social and demographic characteristics of the population as it provides the context within which all other information is placed.

(b) Age (core topic)

Recommended tabulations: 1.4-A, 1.5-A, 2.1-A, 2.2-A, 2.3-A, 3.2-A, 4.1-A, 4.2-A, 5.1-A, 5.2-A, 5.3-A, 5.4-A, 6.1-A, 6.2-A, 6.3-A, 7.1-A, 7.2-A, 7.3-A, 7.4-A, 7.8-A, 8.1-A, 8.2-A, 8.3-A

2.135. **Age** is the interval of time between the date of birth and the date of the census, expressed in completed solar years. Every effort should be made to ascertain the precise and accurate age of each person, particularly of children and older persons.

2.136. Information on age may be secured either by obtaining the date (year, month and day) of birth or by asking directly for age at the person's last birthday.

2.137. The first method yields more precise information and should be used whenever circumstances permit. It also allows for the calculation of age at reference dates other than census day for the purposes, for example, of deriving annual census-based mid- or end- year population estimates. If neither the exact day nor even the month of birth is known, an indication of the season of the year can be substituted if this information can be easily recorded. The question on date of birth is appropriate wherever people know their birth date, whether in accordance with the solar calendar or a lunar calendar, or whether years are numbered or identified in traditional folk culture by names within a regular cycle. It is extremely important, however, that there should be a clear understanding between the enumerator and the respondent about which calendar system the date of birth is based on. If there is a possibility that some respondents will reply with reference to a calendar system different than that of other respondents, provision must be made in the questionnaire for noting the calendar system that has been used. It is not advisable for the enumerator to attempt to convert the date from one system to another. The necessary conversion can be best carried out as part of the data editing work.

2.138a. Where census statistics is taken from administrative data sources, date of birth is usually more accurately recorded.

2.138. The direct question on age is likely to yield less accurate responses for a number of reasons. Even if all responses are based on the same method of reckoning age, there is the possibility of a misunderstanding on the part of the respondent as to whether the age wanted is that at the last birthday, the next birthday or the nearest birthday. In addition, rounding to the nearest age ending in zero or five, estimates not identified as such and deliberate misstatements can occur with comparative ease. Difficulties may arise in the reporting or in the recording of the information for children under one year of age, which may be given erroneously as "one year of age" rather than "zero years of age". These difficulties may be mitigated by collecting information on the date of birth of all children reported as "one year of age", while using only the direct age question for the remainder of the population. Another possible approach is to obtain age in completed months for children under one year of age. This method, however, can give rise to another type of recording error, that is to say, the substitution of years for months, so that a three-month-old child, for example, might be entered in the questionnaire as being three years of age.

2.138a. Some countries have made improvements in the quality of age data by asking both questions on age and date of birth.

2.139. An additional complication may occur with the use of the direct question if more than one method of calculating age is in use in the country. In some countries, certain segments of the population may use an old traditional method whereby persons are considered to be one year of age at the time of birth and everyone advances one year in age at the same fixed date each year. Other segments of the population in the same countries may use the Western method, in which a person is not regarded as being one year of age until 12 months after the date of birth, and advances one year in age every succeeding 12 months. If there is a risk of different methods of age calculation being used by respondents, provision must be made to ensure that the method used in each case is clearly indicated in the questionnaire and that the conversion is left to the data editing stage.

2.140. In spite of its drawbacks, the direct question on age is the only one that should be used when people cannot provide even a birth year. As regards persons for whom information on age is unavailable or appears to be unreliable, an estimated age may have to be recorded. This may occur in isolated cases in societies where knowledge of age is widespread or in general in cultures where there is little awareness of individual age and no interest in it. In the latter circumstances, criteria for making estimates should be provided in the instructions for the enumerators.

2.141. One of the techniques that have been used to aid enumerators consists in providing them with calendars of historic events of national or local significance to be used either in probing questions or in identifying the earliest event the respondent recalls. Another technique consists in pre-identifying locally recognized age cohorts in the population and then asking about membership in the cohorts. Enumerators may also ask if the person in question was born before or after other persons whose ages have been roughly determined. Furthermore, use can be made of age norms for weaning, talking, marriage and so forth. Whatever techniques are used, enumerators should be impressed with the importance of securing age data that are as accurate as possible within the amount of time that they can devote to the topic.

2.142. In view of the possible difficulties in the collection of age data, census tests should be used, as appropriate, to determine the difference in results with the use of a question on age as compared with a question on date of birth, what calendar and/or method of age reckoning most people use, and in what parts of the country age will have to be estimated for the majority of the population and what techniques to use as an aid in estimation. Testing of the calendar and/or method of age reckoning that most people use is particularly important where an official change from one calendar and/or method of reckoning to another calendar and/or method has taken place recently enough so that the new calendar and/or method of reckoning may not yet be in popular use among some or all of the population.

2.143. Enumerators who are likely to be called upon to estimate age in a substantial number of cases should be given training in the applicable techniques as part of their general training.

2.143a. As noted in paragraph 2.133 it is recommended that where this information is incomplete it should be derived or imputed for census purposes rather than being reported as ‘not stated’.

(c) Marital status (core topic)

2.143b. Despite the changing nature of marriage, marital status remains a useful demographic variable. The direct relationship between marriage and with fertility is still recognized as is the indirect relationship with other demographic, social and economic characteristics. Numerous variations exist in many countries but it is important that marriage be defined in terms of the laws and customs of individual countries.

Recommended tabulations: 3.1-A, 4.2-A

2.144. **Marital status** is the personal status of each individual in relation to the marriage laws or customs of the country. The categories of marital status to be identified should at least include the following:

(a) Single (in other words, never married);
(b) Married;
(c) Married, but separated.
(d) Widowed and not remarried;
(e) Divorced and not remarried;

[Note: Categories have been re-ordered]

2.145. In some countries, category (b) may require a subcategory of persons who are contractually married but not yet living as man and wife. In all countries, category (c) should comprise both the legally and the de facto separated, who may be shown as separate subcategories if desired.

2.146. In some countries, it will be necessary to take into account customary unions, such as registered partnerships and consensual unions, which are legal and binding under law. In countries with legal provision for registered/legal partnership (for opposite-sex couples and/or same-sex couples) or where same-sex couples can legally marry, sub-categories may either be included in the category (b) Married or in a legally registered partnership, namely (b)(i) 'Opposite-sex marriage/partnership', (b)(ii) 'Same-sex marriage/partnership'.

2.147. The treatment of persons whose only or latest marriage has been annulled is dependent upon the relative size of this group in the country. Where its size is substantial, the group should constitute an additional category; if its size is insignificant, the individuals in the group should be classified according to their marital status before the (annulled) marriage took place.

2.148. At times countries have experienced difficulties in distinguishing between (a) formal marriages and de facto unions and (b) persons legally separated and those legally divorced. If either of these circumstances necessitates a departure from the recommended classification of marital status, the composition of each category shown in the tabulations should be clearly stated.

2.149. If complete information on marital status is needed, then this information should be collected and tabulated for persons of all ages, irrespective of the national minimum legal age, or the customary age for marriage, because the population may include persons who were married in another country with a different minimum marriage age; in most countries, there are also likely to be persons who were permitted to marry below the legal minimum age because of special circumstances. In order to permit international comparisons of data on marital status, however, any tabulations of marital status not cross-classified by detailed age should at least distinguish between persons under 15 years of age and those 15 years of age and over.

2.150. The collection of additional information related to customs in particular countries (such as concubinage, polygamous or polyandrous marital status, inheritance of widows, and so on) may be useful in meeting national needs. For example, at times countries may wish to collect data on the number of spouses of each married person. Modifications of the tabulations to take account of such information should be made within the framework of the basic classification in order to maintain international comparability as far as possible.

2.151. The concept of marital status and the marital status categories described above should not be confused with the concept of de facto union status which describes extralegal unions (including some consensual unions) of varying degrees of stability common in some countries. It should be recognized also that these marital status categories do not adequately describe the prevalence of formal legal marriage combined with the relatively stable de facto union which may exist outside the marriage. Information on these relationships is very useful in studies of fertility, but it is not possible to provide an international recommendation on this matter because of the different circumstances prevailing among countries. It is suggested, however, that countries wishing to investigate these relationships should consider the possibility of collecting separate data for each person, on de facto unions and on the duration of each type of union (see para. 2.192). Information on these relationships can also be derived from information collected on the relationship to head/reference person and/or other persons in the household, in order to distinguish between people who are living in either a consensual union or marriage, and those that are not.

(d) Ethno-cultural characteristics

2.151a Countries with a culturally diverse population may wish to collect information on the ethnic identity (or composition) of the population, on mother tongue, the knowledge and practice of languages as well as on religious communities and denominations. They are all characteristics which allow people the flexibility to express their ethno-cultural identity in the way that they choose. Data on such ethno-cultural characteristics of the population are of increasing relevance to countries in the context of migration, integration and minority policies.

2.151b Ethno-cultural characteristics have generally a subjective dimension as there is often no common understanding as to what 'characteristic' or 'concept' is really being measured in a particular census. Moreover, different countries will adopt different concepts. The ethno-cultural characteristics can also be politically sensitive and may apply to very small, yet identifiable population sub-groups. The free and open declaration of the respondents is therefore of essential importance. Members of certain minority groups may be particularly vulnerable

to discrimination on the grounds of ethnic group or religion. Special care, therefore, may be required in census procedures and outputs relating to ethnic group and religion in order to demonstrate to respondents that appropriate data protection and disclosure control measures are in place. In some cases, countries may even wish to collect such data on a voluntary basis if this is permitted by national legislation.

(e) Religion

2.152. For census purposes, **religion** may be defined as either:

(a) Religious or spiritual belief of preference, regardless of whether or not this belief is represented by an organized group;

or

(b) Affiliation with an organized group having specific religious or spiritual tenets.

Each country that investigates religion in its census should use the definition most appropriate to its needs and should set out as part of the metadata in the census publication, the definition that has been used.

2.153. The decision to collect and disseminate information on religion in a national census is dependent upon a number of considerations and national circumstances, including, for example, the national needs for such data, and the suitability and sensitivity of asking a religion question in a country's census. Owing to the sensitive nature of a question on religion, special care may be required to demonstrate to respondents that appropriate data protection and disclosure control measures are in place. It is important that the responding public be informed of the potential uses and needs for this information.

2.154. The amount of detail collected on this topic is dependent upon the requirements of the country. It may, for example, be sufficient to inquire only about the religion of each person; on the other hand, respondents may be asked to specify, if relevant, the particular sect to which they adhere within a religion. In countries where a large number of sects and or denominations exist there will be implications for space on any census questionnaire and implications for data capture, especially in cases where 'write in' responses are required. In an effort to ensure international comparability as far as possible, it is recommended that religion/religious affiliation should be measured directly by a question which asks "What is your religion?" rather than use of a filter question which asks for example "Are you religious?", and if so "What is your religion?" Response categories should include 'No religion/religious affiliation' together with a 'Religious but prefer no to disclose' or 'Not stated' category, in effect making responses to such a question voluntary.

2.155. For the benefit of users of the data who may not be familiar with all of the religions or sects within the country, as well as for purposes of international comparability, the classifications of the data should show each sect as a subcategory of the religion of which it forms a part. A brief statement of the tenets of religions or sects that are not likely to be known beyond the country or region would also be helpful.

(f) Language

2.156. There are four types of language data that can be collected in a census, namely:

(a) Mother tongue, defined as the language usually spoken in the individual's home in his or her early childhood;

(b) Main language, defined as the language that the person commends best;

(c) Usual language, defined as the language currently spoken, or most often spoken, by the individual in his or her present home;

(d) Ability to speak one or more designated languages, including the country's official language(s).

2.157. Each of these types of information serves a very different analytical purpose. Each country should decide which, if any, of these types of information is applicable to its own needs. International comparability of tabulations is not a major factor in determining the form of the data to be collected on this topic.

2.158. In compiling data on the usual language or on the mother tongue, it is desirable to show each language that is numerically important in the country and not merely the dominant language.

2.159. Information on language (including any sign language) should be collected for all persons. In the tabulated results, the criterion for determining language for children not yet able to speak should be clearly indicated.

(g) Ethnicity

2.160. The decision to collect and disseminate information on ethnic or national groups of a population in a census is dependent upon a number of considerations and national circumstances, including, for example, the national needs for such data, and the suitability and sensitivity of asking ethnicity questions in a country's census. Owing to the sensitive nature of questions on ethnicity, special care may be required to demonstrate to respondents that appropriate data protection and disclosure control measures are in place. It is important that the responding public be informed of the potential uses and need for data pertaining to ethnicity, as this improves public support for the census exercise. Data on ethnicity provide information on the diversity of a population and can serve to identify subgroups of a population. Some areas of study that rely on such data include demographic trends, employment practices and opportunities, income distributions, educational levels, migration patterns and trends, family composition and structure, social support networks, and health conditions of a population.

2.161. Broadly defined, **ethnicity** is based on a shared understanding of history and territorial origins (regional and national) of an ethnic group or community, as well as on particular cultural characteristics such as language and/or religion. Respondents' understanding or views about ethnicity, awareness of their family background, the number of generations they have spent in a country, and the length of time since immigration are all possible factors affecting the reporting of ethnicity in a census. Ethnicity is multidimensional and is more a process than a static concept, and so ethnic classification should be treated with movable boundaries.

2.162. Ethnicity can be measured using a variety of concepts, including ethnic ancestry or origin, ethnic identity, cultural origins, nationality, race, colour, minority status, tribe, language, religion or various combinations of these concepts. Because of the interpretative difficulties that may occur with measuring ethnicity in a census, it is important that, where such an investigation is undertaken, the basic criteria used to measure the concept are clearly explained to respondents and in the dissemination of the resulting data. The method and the format of the question used to measure ethnicity can influence the choices that respondents make regarding their ethnic backgrounds and current ethnic identification. The subjective nature of the term (not to mention increasing intermarriage among various groups in some countries, for example) requires that information on ethnicity be acquired through self-declaration of a respondent and also that respondents have the option of indicating multiple ethnic affiliations. Data on ethnicity should not be derived from information on country of citizenship or country of birth. The classification of ethnic groups also requires the inclusion of the finest levels of ethnic groups, self-perceived groups, regional and local groups, as well as groups that are not usually considered to be ethnic groups, such as religious groups and those based on nationality. Countries collecting data on ethnicity should note that the pre-coding or the pre-classification of ethnic groups at the time of data capture may have a tendency to lose detailed information on the diversity of a population unless space to record write-in, free-form responses is provided.

2.162a Respondents should be free to indicate more than one ethnic affiliation or a combination of ethnic affiliations if they wish so. Countries should explain in the census instructions and the census documentation how the ethnicity of children from mixed couples is to be reported (for example, explicit instructions to allow respondents to provide multiple responses and/or to allow for responses such as bi-racial). Also, to guarantee the free self-declaration of ethnicity, respondents should be allowed to indicate 'None' or 'Not declared'.

2.162b Because the ethno-cultural composition of a country can vary widely from country to country and due to the diversity in the approach and the various criteria for establishing ethnicity, it is recognized that there is no single definition or classification that could be recommended that would be applicable to all countries. However, countries should document the basic criteria and classification procedures for ethnicity and inform the data users about the concepts on which they are based.

(h) Indigenous peoples

2.163. Facilitating the collection of data on indigenous peoples for national and international needs can serve to improve socio-economic and active participation of indigenous peoples in the development process for many countries. The sensitive nature of questions pertaining to the indigenous population requires care in assuring the public that the appropriate disclosure and data protection methods are being enforced. The responding public should be informed on the potential uses and need for such data to improve public support for the census exercise.

2.164. Dissemination of census data pertaining to indigenous peoples contributes to research in areas such as the socio-economic conditions of the indigenous population, trends, causes for inequities, and the effectiveness of existing policies and programmes. Availability of these data can also assist indigenous communities in assessing their conditions of living and give them the information they need to participate and advocate in the development of programmes and policies affecting their communities, such as those impacting health systems, models of economic production, environmental management and social organization. In addition, the development of indicators relevant to the indigenous population and the measurement of such indicators in the data-collection process can be used to monitor the human development of indigenous populations.

2.165. Generally, **indigenous peoples** of a particular country are social groups with an identity that is distinct from the social and cultural identity of the dominant society in that country. Questions on indigenous identity should abide by the principle of self-identification. It is important that, where such an investigation is undertaken, multiple criteria are developed to accurately capture identity and socio-economic conditions of indigenous peoples. Defining the indigenous population can be done in many ways, such as through a question on ethnic origin (that is to say, ancestry) and/or on indigenous identity. Identifying the indigenous community also requires recognition of the diversity in this subpopulation, including nomadic, semi-nomadic and migrating peoples, peoples in transition, displaced persons, indigenous peoples in urban areas, and particularly vulnerable sects. It is important to point out that there is no single term among countries to describe the indigenous population. Consequently, countries tend to use their own national concepts to identify the indigenous population. For example, in Australia the terms “aboriginal” or “Torres Strait Islander” are used, while in New Zealand the term “Maori” is used.

2.166. Differing national contexts also imply that enumerating the indigenous population can be done in multiple ways, for example, by way of specific questions on the census form, with specialized questionnaires for the indigenous population, and/or with follow-up or complementary surveys. In Canada, for example, identification of the indigenous population comes from not only its national census, but also a post-censal survey. In Australia, in addition to the national census, there is the National Aboriginal and Torres Strait Islander survey, while in Argentina there is a complementary survey after the census targeting indigenous peoples. In addition to a general census, Paraguay also administers a specific census in the same year to identify the indigenous population.

2.167. Involvement of the indigenous community in the data development and data-collection processes provides the arena for capacity-building and helps to ensure the relevance and accuracy of the data collection on indigenous peoples. Using local indigenous languages, employing local indigenous people (as interpreters, for example), and training and building the capacity of local indigenous people in data-collection processes can facilitate the collection and dissemination of this information. Non-indigenous professionals and technicians should also be informed of the culture and practices of indigenous peoples.

(i) Disability characteristics

2.350. A census can provide valuable information on disability in a country. For countries that do not have regular special population-based disability surveys or disability modules in ongoing surveys, the census can be the only source of information on the frequency and distribution of disability and functioning in the population at national, regional and local levels. Countries that have a registration system providing regular data on persons with the most severe types of impairments may use the census to complement these data with information related to selected aspects of the broader concept of disability and functioning based on the International Classification of Functioning Disability and Health as described below. Census data can be utilized for general planning programmes and services (prevention and rehabilitation), monitoring selected aspects of disability trends in the country, evaluation of national

programmes and services concerning the equalization of opportunities, and for international comparison of selected aspects of disability prevalence in countries.

(j) Disability status (core topic)

Recommended tabulations: 8.1-A, 8.2-A, 8.3-A

2.351. **Disability status** characterizes the population into those with and without a disability. The International Classification of Functioning, Disability and Health defines disability as "an umbrella term for impairments, activity limitations and participation restrictions. It denotes the negative aspects of the interaction between an individual (with a health condition) and that individual's contextual factors (environmental and personal factors)." For the purpose of determining disability status using census data, persons with disabilities are defined as those persons who are at greater risk than the general population for of experiencing restrictions in performing specific tasks or participating in role activities. This group would include persons who experience limitations in basic activity functioning, such as walking or hearing, even if such limitations were ameliorated by the use of assistive devices, a supportive environment or plentiful resources. Such persons may not experience limitations in the specifically measured tasks, such as bathing or dressing, or participation activities, such as working or going to church shopping, because the necessary adaptations have been made at the person or environmental levels. These persons would still, however, be considered to be at greater risk for of restrictions in activities and/or participation than the general population because of the presence of limitations in basic activity functioning, and because the absence of the current level of accommodation would jeopardize their current levels of participation.

2.352. It is recommended that the following four domains be considered essential in determining disability status in a way that can be reasonably measured using a census and that would be appropriate for international comparison:

(a) Walking;
(b) Seeing;
(c) Hearing;
(d) Cognition.

A comprehensive measure to determine disability would include the following six domains of functioning (see para. 2.367).
(a) Walking;
(b) Seeing;
(c) Hearing;
(d) Cognition
(e) Self-care
(f) Communication

2.352a. It is, however, recommended, that the first four domains be considered as essential in determining disability. But if countries wish then the last two might also be considered.

(k) Disability framework and terminology

2.353. In 2001 the World Health Organization (WHO) issued the International Classification of Functioning, Disability and Health (ICF)[108] which is the successor of the International Classification of Impairments, Disabilities and Handicaps (ICIDH), issued in 1980.[109] ICF is a classification system offering a conceptual framework with terminology and definitions of the terms, and classifications of the contextual components associated with disability including both participation and environmental factors.

[108] Geneva, World Health Organization, 2001.
[109] Geneva, World Health Organization, 1980.

2.354. ICF distinguishes multiple dimensions that can be used to monitor the situation of individuals with disability. The system is divided into two parts each with two components;

(1.0) Functioning and disability, which include the components:
  (1.1) Body functions and body structures (impairments)
  (1.2) Activities (limitations) and participation (restrictions)
(2.0) Contextual factors which include the components:
  (2.1) Environmental factors
  (2.2) Personal factors

2.355. ICF provides classification schemes for all these elements except for personal factors.

(l) Interactions between components of the International Classification of **Functioning, Disability and Health**

2.356. The interactions between the parts and components of ICF are shown in Figure 6 below.

2.357. The main structure of the classification is reported in annex 1. **[Note: Run this paragraph on from 2.356]**[Note: The Working group has not yet made any revisions to annex]

(l) Use of the census to measure disability at the aggregate level

2.358. A census format offers only limited space and time for questions on any one topic such as disability. Since ICF offers several dimensions for use to develop a census measure, it is best to focus on a few of those dimensions, leaving the remaining dimensions for use in more extensive household surveys. Short sets of disability questions, which can be included in censuses and extended sets to be recommended for inclusion in population-based surveys have been developed and tested.[110] The aim of the recommended sets is to improve comparability of disability and functioning data across countries.

2.359. The World Programme of Action concerning Disabled Persons[111] provides a valuable guide for conceptualizing the uses of data on disability. The three major goals of the World Programme of Action are equalization of opportunities, rehabilitation and prevention.

2.360. Three major classes of purposes for measuring disability in a census are:

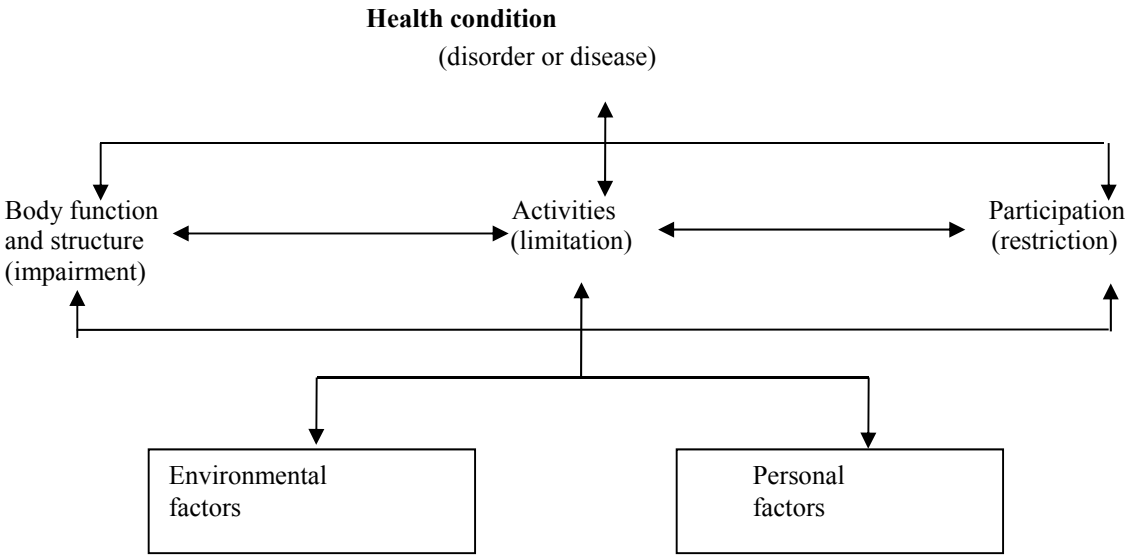
(a) To provide services, including the development of specific programs and policies for service provision and the evaluation of these programs and services. The provision of services at the population level includes, but is not limited to, addressing needs for housing, transportation, assistive technology, vocational or educational rehabilitation, and long-term care;

(b) To monitor the level of functioning in the population. This includes estimating rates and analysing trends. The level of functioning in the population is considered a primary health and social indicator, which characterizes the status of the population in a society;

(c) To assess equalization of opportunities. This involves monitoring and evaluating outcomes of anti-discrimination laws and policies, and service and rehabilitation programmes designed to improve and equalize the participation of persons with disabilities in all aspects of life.

[110] The Washington Group on Disability Statistics, a United Nations City Group which focuses on proposing international measures of disability has developed these questions. See www.cdc.gov/nchs/washington_group.htm for updates on the questions.
[111] The World Programme of Action concerning Disabled Persons was adopted by the United Nations General Assembly at its 37th regular session on 3 December 1982, by its resolution 37/52.

Figure 3. Interactions between the components of ICF



2.361. The intent of these purposes for measurement is consistent with that of the World Programme of Action, concerning Disabled Persons (WPA) **[new ref]** which provides a valuable guide for conceptualizing the uses of data on disability. The WPA outlines three major goals for policy formulation and programme planning, internationally: equalization of opportunities, rehabilitation, and prevention. The common goal is to promote the participation of persons with disabilities in all aspects of life by preventing the onset and consequences of impairments, promoting optimal levels of functioning and equalizing opportunities for participation.

2.362. The assessment of equalization of opportunity is the purpose that can be best achieved in a census. It is this assessment that is considered when determining disability status.

2.363. The definition of disability status (see para. 2.351) requires that disability be defined in terms of limitations in basic activity functioning that would place a person at greater risk than the general public of restricted performance ~~of~~ or participation in the organized activities (such as educational attendance or work participation) While assessment of equalization of opportunities might seem to require measurement of both activities and participation, such an approach does not help to identify changes in the level of participation in the population in response to changes in opportunities. It only reflects the circumstances of those who because of unfriendly environments or lack of assistive devices are experiencing restrictions in participation. Approaching the assessment of equalization of opportunity by recognizing the link between a basic level of activity and subsequent participation can reduce some of the methodological challenges.

2.364. Disentangling the conceptual dimensions of basic activity limitations that result from impairment, from the more complex activities associated with participation provides the opportunity to determine the intervening mechanisms that facilitate or interfere with performance of tasks and organized activity. At the analysis stage, people who are identified with and without disabilities on the basis of their ability to perform basic activities can be compared in relation to their participation in organized activities (such as school and work). This comparison can assess the level of equalization of opportunities. The separation between activities and performance differentiates approaches for the purpose of monitoring functioning in the population and for the purpose of assessing equalization of opportunity. When assessing opportunity equalization, *the connection between the conceptual elements is made during analysis*, whereas for monitoring functioning *the connection is done during data collection*.

2.365. Within the framework of the ICF model and its four major dimensions (body structure and function, activity, participation and environment), an activity-oriented set of questions, located at the simplest and most basic level, should be used to capture the basic activity elements required for a good measure for analysis in conjunction with data on participation restrictions.

2.366. Given the complexity of disability definition and measurement, and, in certain cultures, the sensitivity attached to people identifying as having a disability, it is recommended that several functional activity domains be defined whereby people can respond to questions about their difficulty in performing those activities rather than enquire directly whether or not they have a particular disability.

(i) *Essential domains*

2.367. It is suggested that only those domains that have satisfied a set of selection criteria be eligible for inclusion in a short set of questions recommended for use in censuses. Criteria for inclusion include cross-population or cross-cultural comparability, suitability for self-reporting and space on the census form. Other suggested criteria include the importance of the domain in terms of public health problems. Based on these criteria, four basic domains are considered to be essential: walking, seeing, hearing and cognition. In addition, if space permits, two other domains have been identified for possible inclusion: self-care and communication.

2.368. *Walking* fulfils the criteria of cross-cultural applicability and space requirements for comparable data since walking is a good indicator of a central physical function and is a major cause of limitation in participation. It is also a basic area of activity functioning that can be self-reported.

2.369. While *seeing* also represents a public health problem, self-reporting of seeing limitation is more problematic, particularly when individuals use glasses to correct visual impairments. Similar difficulties are associated with asking about *hearing* activity. The most direct way to deal with assistive devices like glasses and hearing aids without contributing to confusion over answering such questions is to ask the questions about difficulty hearing or seeing without any devices or assistance.

2.370. However, devices, such as glasses, provide almost complete accommodation for large proportions of those with impaired functioning and the numbers with the impairment can be very high. It is often argued that asking about seeing without the use of glasses greatly increases the number of persons with disabilities and makes the group too heterogeneous, that is, the group would include persons at very little risk of participation problems along with those at great risk. An alternative is to ask questions on difficulty seeing/hearing even with the use of glasses/hearing aids if they are usually worn.

2.371. Of the four essential domains, *cognition* is the most difficult to operationalize. Cognition includes many functions such as remembering, concentrating, decision-making, understanding spoken and written language, finding one's way or following a map, doing mathematical calculations, reading and thinking. Deciding on a cross-culturally similar function that would represent even one aspect of cognition is difficult. However, remembering and concentrating or making decisions would probably serve the cultural compatibility aspects the best. Reading and doing mathematical calculations or other learned capacities are very dependent on educational systems within a culture.

(ii) Additional domains

2.371a. In additional to the four essential domains, two other have been identified for possible inclusion: self-care and communication. The self-care domain is intended identify persons who have some problems with taking care of themselves independently. Washing and dressing represent self-care tasks that occur on a daily basis and are considered to be basic activities.

2.371b. The purpose of the communication domain is to identify persons who have some problems with talking, listening or understanding speech such that it contributes to difficulty in doing their daily activities. Two aspects of communication are considered: understanding others (receptive communication) and being understood by others

(expressive communication). Communicating (understanding/been understood) refers to the exchange of information or ideas between two people through the use of language. They may use their voices for their exchange or make signs or write the information they want to exchange.

2.372. Beyond the six domains identified above, there are further physical functioning domains that could be included in a set of census questions depending on the space available, such as upper body functioning of the arms, hands and fingers. Another domain that could be incorporated is psychological functioning. While identifying problems with psychological functioning in the population is a very important element of measuring disability for the stated objective, questions that attempt to represent mental/psychological functioning would run into difficulty because of the levels of stigmatization of such problems within a culture. This could jeopardize the whole set of questions.

(iii) Census questions

2.373. It is recommended that special attention be paid in designing census questions to measure disability. The wording and the construct of questions greatly affect the precision in identifying people with disabilities. Each domain should be asked through a separate question.[112] The language used should be clear, unambiguous and simple. Negative terms should always be avoided. The disability questions should be addressed to each single household member and general questions on the presence of persons with disabilities in the household should be avoided. If necessary, a proxy respondent can be used to report for the family member who is incapacitated. The important thing is to account for each family member individually rather than ask a blanket question. Scaled response categories can also improve the reporting of disability. The census questions on disability endorsed by the Washington Group include four response categories

(a) No (meaning no difficulty at all);
(b) Yes – some difficulty
(c) Yes – a lot of difficulty;
(d) Cannot do [the activity] at all)

and disability prevalence is determined based on any response that is "a lot of difficulty" or "cannot do at all" for any of the questions.

2.374. The information that results from measuring disability status (see para. 2.351) is expected to:

(a) Represent a large proportion, but not all persons with limitation in basic activity functioning in any one country (only the use of a wider set of domains would potentially cover close to all such persons, but as stated this would not be possible in a census context);

(b) Represent the most commonly occurring basic activity limitations within any country;

(c) Capture persons with similar problems across countries.

2.375. The questions identify the population with limitations in basic activities that have the potential to limit independent participation in society. The intended use of these data would be to compare levels of participation in employment, education, or family life for those with disability as measured by the question set versus those without disability to see if persons with disability have achieved social inclusion. In addition, the data could be used to monitor prevalence trends for persons with limitations in the particular basic activity domains selected. It would not represent the total population with limitations nor would it necessarily represent the 'true' population with disability, which would require measuring limitation in all domains.

[112] When domains are combined, such as asking a question about seeing or hearing, respondents frequently are confused and think they need to have difficulty in both domains in order to answer yes. In addition, having the numbers with specific limitations is useful for both internal planning and for cross-national comparisons.

2.376. Because disability is a complex concept, it is necessary to adopt an explicit definition based on the ICF domains used when developing census or survey questions that will be used to identify disability status. The recommended set of questions for censuses is based on such an explicit definition (as described above). It is essential that estimates or tabulations based on the recommended set be accompanied by information on how disability is defined and how the questions are asked. This information should be included as part of the metadata associated with the questions and data set and it should be included as a footnote to tables that include these estimates.

(m) Use of census to screen for disability and follow-up with other surveys

2.377. Countries that are planning specialized surveys on disability may want to use the census to develop a sampling frame for these surveys and include a screening instrument to identify persons who will be interviewed subsequently. The definitions and the instruments used for this purpose are very different from the ones used to assess equal opportunities. The main purpose of a screening is to be the most inclusive as possible in order to identify the largest group of people who could be further studied. The screening question should be designed so that false negatives[113] are minimized, while false positives[114] should be less of a concern.

2.378. Within the framework of ICF, the census screening may include all of the three main dimensions of body structure and function, activity, and participation. This will allow for keeping a broad approach to the follow-up survey where the different aspects of disability can be better studied.

2.379. The same recommendations highlighted in paragraphs 2.373-2.376 should also be considered when a screening module is designed.

2.380. Before embarking on using the census to develop a frame for a follow-up survey, it is important that the legal implications of using the census data for this purpose are fully considered. Respondents should be informed that the data may be used for follow-up studies and national authorities responsible for ensuring the privacy rights of the population may need to be consulted in order to obtain their approval.

[113] Persons who have disabilities but are not identified in the census as having disabilities.
[114] Persons who are identified with disabilities in the census but in reality do not have disabilities (as assessed in the largest instrument used in the follow-up survey).

5. Fertility and mortality

2.168. The investigation of fertility and mortality in population censuses is particularly important in countries lacking a timely and reliable system of vital statistics because of the opportunity the data provide for estimating vital rates that would not otherwise be available. Even in countries with complete birth and death registration, some of the topics (such as "children born alive", "children living", "age at marriage or union" and "age at first birth") are equally appropriate because they provide data that are not easily available from registration data but are necessary for the computation of cohort and period fertility tables. The census provides an opportunity to collect data for estimating fertility and mortality at national and sub-national levels in a cost-effective manner. The inclusion of these topics in population censuses for the purpose of estimating fertility and mortality rates and other related indicators is both prudent and cost-effective, particularly in countries where civil registration and vital statistics systems are weak, and costs of conducting large periodic demographic surveys are high. Nevertheless, it is important to note that census information is a poor substitute for complete and reliable vital registration data. If countries desire accurate and detailed estimates of fertility and mortality, they must establish, and need to maintain, civil registration systems and ensure their universal coverage.

2.169. To obtain information on fertility, information may be collected on "children ever born", "date of last child born alive" and "age of mother at birth of first child born alive". In addition, questions on age, date or duration of marriage/union may improve fertility estimates based on children ever born (see para. 2.192). For the collection of reliable data, some of the topics may require a series of probing questions that, because they are time-consuming, are more suitable for use in sample surveys than in censuses.

2.170. The universe for which data should be collected for each of the topics included in this section consists of women 15 years of age[115] and over regardless of marital status, and information should be collected from all such women unless from a cultural standpoint it is not acceptable to attempt to collect information on childbearing from never-married women. In countries that do not use the data for women 50 years of age and over, it may be appropriate to limit data collection to women under the age of 50, allowing more concentrated effort on data collection for such women.

2.171. In addition to the topics indicated above that are used to estimate fertility, another useful topic that allows the estimation of fertility is the "own children" method[116] and birth history reconstruction.[117] The application of these methods requires the identification of the "natural mother" of each child in the household when the natural mother appears in the same questionnaire as the child. In cases where it is difficult to ascertain the identity of the natural mother, one may use as a proxy the relationship to head of household or to reference person of household (see para. 2.114), or children living (see paras. 2.186-2.187) to establish the identity of the natural mother. In essence, information on the child's age and the mother's age are used to estimate a series of annual fertility rates for years prior to the census. The reliability of the estimates produced depends, among other things, on the proportion of mothers enumerated in the same questionnaire as their own children, the accuracy of age-reporting for both mothers and their children and the accuracy of available estimates of mortality for women and children. In the case of sub-national estimates, the fertility rates may be affected by migration patterns of mothers who leave their children with other family members while they pursue work elsewhere.

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[115] It may be appropriate in some countries to reduce the lower age limit by several years.

[116] For methodological details, see United Nations (2004). *Handbook on the Collection of Fertility and Mortality Data*. Studies in Methods. Series F, No.92, *chap. V, sect. B* (http://unstats.un.org/unsd/publication/SeriesF/SeriesF_92E.pdf), and United Nations (1983). *Manual X: Indirect Techniques for Demographic Estimation*, Population Studies, No. 81 (http://www.un.org/esa/population/publications/Manual_X/Manual_X.htm) , chap. VIII, sect. C, and Cho, L.-J., Retherford, R. D., & Choe, M. K. (1986). *The own-children method of fertility estimation*. Honolulu, HI: Population Institute.

[117] For methodological details, see United Nations (2004). *Handbook on the Collection of Fertility and Mortality Data*. Studies in Methods. Series F, No.92, *chap. V, sect. C* (http://unstats.un.org/unsd/publication/SeriesF/SeriesF_92E.pdf) and Luther, N.Y, Cho, L-J. (1988). Reconstruction of birth histories from census and household survey data. *Population Studies*, 42: 451-472.

2.172. Mortality topics include infant and child mortality, obtained from data on children ever born and children living, and adult mortality, obtained from household deaths in the past 12 months and maternal or paternal orphanhood. The extent to which mortality (particularly infant and child) can be adequately measured from population census data is entirely dependent on the quality of the training of field staff to minimise non-response to questions on maternal and adult mortality the reporting of erroneous information. Enumerator manuals should include the measures that are needed to minimize such errors. Accurate responses to the questions described here are often difficult to obtain, thus resulting in faulty data. Nevertheless, it is often possible to derive useable adjusted estimates from this information.

2.173. As far as possible, efforts should be made to obtain information on fertility, child mortality (or survival) and marriage directly from the woman or mother involved, because she is more likely to recall correctly the details of her fertility, the mortality of her offspring and her marital experiences than any other member of the household. Information on household deaths, by date, sex and age, in the 12-month period prior to the census should be collected from the head of the household (or household reference person). Information on maternal orphanhood and paternal orphanhood should be collected for each person in the household regardless of age. As with fertility, mortality questions may be limited to a survey sample.

2.174. A number of countries have restricted the collection of data from fertility and mortality questions in the census to a sample of enumeration areas,[118] entailing the introduction of more vigorous training and permitting the selection of more suitable field staff. When those items are included in the census, certain precautions to ensure accuracy and completeness should be observed. Every effort should be made to collect all relevant information directly from the woman concerned, because she is much more likely to correctly recall the details of her fertility, the mortality of her offspring and her marital experiences than any other member of the household. To reduce underreporting of events and to improve the accuracy of responses to questions on fertility and mortality, enumerators need to receive specific training on probing questions that highlight common errors and omissions.

2.175. The limitations of the data collected and of the estimates based on them should be made clear in the census reports. Furthermore, since some of the estimation procedures are only suitable for use in certain circumstances, it is important that census data producers consult specialists and/or carefully evaluate the methodologies for estimating the indicators for their appropriateness in a given situation. In general, the data in the basic tabulations resulting from these questions should not be used for the direct calculation of fertility and mortality rates. Reliable estimation of fertility and mortality levels using census data requires adjustment based on methods of demographic analysis.[119]

2.176. As a general guide, only one of the items related to fertility discussed below ("children ever born") is recommended for inclusion in all situations. Even in countries with reliable vital registration of births, census information on this topic can be useful for assessing the completeness of the registration system and for estimating levels of lifetime fertility for older cohorts.

2.177. In countries where vital registration of births and deaths is incomplete or unreliable, it is recommended that a subset of the remaining items should be included as well. Among these, one item ("date of birth of last child born alive") is useful for the indirect estimation of current fertility levels. Two additional items ("children living", and "household deaths in the past 12 months") are especially important, as they allow for the indirect estimation of mortality levels.

2.178. The three remaining items have lower priority: "age, date or duration of first marriage/union"; "age of mother at birth of first child born alive"; and "maternal or paternal orphanhood". However, in situations where a country has included one of these items in consecutive previous censuses, it may be useful to collect comparable

[118] For the use of sampling in the enumeration, see chapter III **[update reference]**.

[119] *Manual X: Indirect Techniques for Demographic Estimation*, Population Studies, No. 81 (United Nations publication, Sales No. E.83.XIII.2); National Academy of Sciences, Committee on Population and Demography, *Collecting Data for the Estimation of Fertility and Mortality*, Report No.6 (Washington D. C., National Academy Press, 1981), p.220; *Handbook of Population and Housing Censuses, Part II*, Studies in Methods, No. 54 (United Nations publication, Sales No. E.91.XVII.9), chaps. III and IV; *Step-by-Step Guide to the Estimation of Child Mortality*, Population Studies, No. 107 (United Nations publication, Sales No. E.89.XIII.9). Moultrie TA, RE Dorrington, AG Hill, K Hill, IM Timæus and B Zaba (eds). *Tools for Demographic Estimation.* Paris: International Union for the Scientific Study of Population. http://demographicestimation.iussp.org/.

information to measure changes over time and because cohort analysis, particularly of the prevalence of orphanhood, can be useful in assessing levels of mortality.

2.179. It is worth emphasizing that all estimates of fertility and mortality derived from census data are approximate and subject to various sorts of error. Therefore, in the absence of complete and reliable civil registration data, it may be desirable to have more than one type of census information on each topic (for example, both household deaths in the past 12 months and maternal or paternal orphanhood for the purpose of estimating adult mortality). Lastly, it should also be born in mind that while fertility surveys can provide data on current fertility, they cannot provide the small area data that the census can. Therefore, a fertility question in the census can still be a priority for many countries.

(a) Children ever born alive (core topic)

Recommended tabulations: 5.1-A

2.180. Information on number of **children born alive** (lifetime fertility) should include all children born alive (that is to say, excluding foetal deaths) during the lifetime of the woman concerned up to the census date. The number recorded should include all live-born children, whether born in or out of marriage, whether born in the present or a prior marriage, or in a de facto union, or whether living or dead at the time of the census. In the event of multiple births (e.g. twins), each child should be counted as individual birth.

2.181. Data on the total number of live-born children should preferably be collected for all women 15 years of age[120] and over, regardless of marital status. If, from a cultural standpoint, it is not acceptable in some countries to attempt to obtain the information for single women, it should be collected at least for all women 15 years of age and over who are or have been married or in a union (in other words, all ever-married or ever cohabiting women), a group that also includes all widowed, divorced and separated women. In either case, the group of women for whom the data have been collected should be clearly described in the census report so as to avoid ambiguity in the analysis of the results. In some countries, there ~~is~~ can be substantial misreporting of ages or dates in the census, which distorts fertility and mortality estimation based on children ever born and children living cross-tabulated by age or years since first birth of the woman.[121]

2.182. In order to improve the completeness of coverage and to assist the respondent in recalling her children ever born alive, it is recommended that a sequence of questions be included in the following order:

(a) "total number of sons ever born alive during the lifetime of the woman";
(b) "total number of sons living (surviving) at the time of the census"; and
(c) "total number of sons born alive who have died before the census date";
and then
(d) "total number of daughters ever born alive during the lifetime of the woman";
(e) "total number of daughters living (surviving) at the time of the census"; and
(f) "total number of daughters born alive who have died before the census date".

The responses to topics (b), (c), (e) and (f) allow for a checking of the responses to (a) and (d). Inconsistencies in the figures, if any, can sometimes be resolved during the interview.

[120] It may be appropriate in some countries to reduce the lower age limit by several years.

[121] The data on children ever born and children surviving at the time of the census become distorted by errors either in the reported number of children ever born and surviving or in the classification of women in particular age/duration-of-marriage groups. Such distributions (biases) result in gross underestimation of fertility and mortality levels, particularly when data are disaggregated for small geographical areas. See United Nations (2004). *Handbook on the Collection of Fertility and Mortality Data*. Studies in Methods. Series F, No.92, (http://unstats.un.org/unsd/publication/SeriesF/SeriesF_92E.pdf). For additional methodological details on the uses of the data, see Moultrie TA, RE Dorrington, AG Hill, K Hill, IM Timæus and B Zaba (eds). *Tools for Demographic Estimation.* Paris: International Union for the Scientific Study of Population. http://demographicestimation.iussp.org.http://demographicestimation.iussp.org.

[Note: There was a comment from Attila Hancioglu (UNICEF):
I am not sure I agree with the sequence of questions recommended here, although I am "survey-subjective". Nevertheless, I do think that "born alive" is the most difficult concept here, and most prone to understatement – compared to the concepts of "living" and "deceased". Starting questions from "born alive" will in some cases condition the answers to the following questions. A better sequencing, I think, is as it is in MICS and DHS surveys, which starts with living children, and then deceased children. The summation of these becomes children born alive, which is then established by asking a check question. If this can be done in a census, it would generate better quality data.
From a cognitive point of view, also, differentiating children ever born by sex at the first question is also problematic, since mothers think of the sex of children in most immediate terms when they are alive, and then when they are deceased.]

2.183. The number of sons and daughters should comprise all children ever born alive whether born of the present or a prior marriage or union[122] and should exclude foetal deaths and adopted children. Also, the number of children, male and female, who are alive at the time of the census should include those living with the mother in the household and those living elsewhere, no matter where the latter may reside and regardless of their age and marital status.

2.184. The collection of data on children ever born specified by sex not only improves accuracy of information but also provides data for indirect estimation of sex differentials in infant and child mortality, in combination with data on children living (surviving) by sex (see para. 2.186). If the information on "children ever born alive by sex" is collected for only a sample of women, the data on "children living by sex" should also be obtained for the same sample.

2.185. Collecting data on the "total number of children ever born alive by sex" is desirable as it may improve the value of the information by providing a check on their quality, such as in ascertaining that sex ratios of births follow an expected pattern and do not behave oddly.

(b) Children living[123] (core topic)

Recommended tabulation: 5.2-A

2.186. Data on **children living**, in conjunction with those on children ever born are used in indirect estimation of infant and child mortality in situations where there are no reliable data from a civil registration.

2.186a. It is expected that improved coverage and quality of data on the total number of children ever born will be achieved if more detailed questions about the current residence of children ever born are asked, in terms of the following:

(a) "Total number of sons living in the household";
(b) "Total number of sons living elsewhere";
(c) "Total number of sons born alive who have died before the census date";
(d) "Total number of daughters living in the household";
(e) "Total number of daughters living elsewhere";
(f) "Total number of daughters born alive who have died before the census date".

[122] As indicated in paragraph 2.146, couples living in consensual unions may, where appropriate, be regarded as married.
[123] For methodological details on the uses of the data, together with data on live-born children, see the publications mentioned in footnote 120.

These questions not only give a more complete and accurate reporting of children ever born alive specified by sex but also increase the questions' suitability for subsequent analysis.

2.187. The identification of the natural mother of each child under 15 years of age in the same household, to be used in the ″ own children" method of estimating fertility (see para 2.171), should be made by asking each woman who reports one or more of her children as being born alive and living in the household to identify these children in the census questionnaire. The section of the questionnaire on "relationship to the head of the household or to the reference person in the household" may be used for identifying the natural mother of each child living in the household.

(c) Date of birth of last child born alive (core topic)

Recommended tabulation: 5.3-A

2.188. Information on date of birth (day, month and year) and sex of the last child born alive is used for estimating current fertility, and data on the sex of the child can also be used to evaluate the sex ratio at birth and to detect potential sex-selective birth omissions, misreporting or coding errors. This information can be useful as a means of deriving both national and sub-national fertility estimates. In countries lacking adequate data from civil registration, sample surveys have become a major source of information for estimating national fertility levels, but surveys usually do not permit the derivation of reliable estimates at sub-national levels.

2.189. At the data processing stage, an estimate of the number of live births during the 12 months immediately preceding the census date can be derived from information on "date of birth of last child born alive." For estimating current age-specific fertility rates and other fertility measures, the data provided by this approach are more accurate than information that may have been collected in earlier censuses from a question on the number of births to a woman during the 12 months immediately preceding the census.[124] Only if a country's population is characterized by low levels of date numeracy should a question on number of births in the last 12 months be asked. In all other cases, the core question on date of last child born alive should be asked. Information on the date of birth of the last child born alive provides the number of women who had at least one live-born child during the 12-month period, not the number of births during the 12-month period. However, generally only a very small proportion of women will have had more than one child in a year and hence that omission will not significantly affect the fertility estimate derived from it.

2.190. The information needs to be collected only for women between 15 and 50 years of age who have reported having at least one live birth during their lifetime. Also, the information should be collected for all the marital or union status categories of women for whom data on children ever born by sex (see para. 2.180) are collected. If the data on children ever born are collected for a sample of women, information on date of birth for the last child born alive should be collected for the same sample.

[124] The approach to calculating fertility rates from these data is described in Moultrie TA. 2013. "Evaluation of data on recent fertility from censuses". In Moultrie TA, RE Dorrington, AG Hill, K Hill, IM Timæus and B Zaba (eds). *Tools for Demographic Estimation.* Paris: International Union for the Scientific Study of Population. http://demographicestimation.iussp.org/content/evaluation-data-recent-fertility-censuses. Accessed 06/11/2013.

(d) Births in the past 12 months

(para. 2.189) [Note: draft text]

(e) Deaths among children born in the past 12 months

(para. 2.191) [Note: draft text]

(f) Age, date or duration of first marriage

2.192. **Date of first marriage** comprises the day, month and year when the first marriage took place. In countries where date of first marriage is difficult to obtain, it is advisable to collect information on age at marriage or on how many years ago the marriage took place (duration of marriage). The information should relate to all marriages such as contractual first marriages and de facto unions, customary marriages and religious marriages.

2.192a. For women who are widowed, separated or divorced at the time of the census, information on the "date of/age at/number of years since dissolution of first marriage" should be collected. Information on dissolution of first marriage (if pertinent) provides data necessary to calculate "duration of first marriage" as a derived topic at the data processing stage. In countries in which duration of marriage is reported more reliably than age, tabulations of children ever born by duration of marriage yield better fertility estimates than those based on data on children born alive classified by age of the woman.[125] Data on duration of marriage can be obtained by subtracting the age at marriage from the current age, or directly from the number of years elapsed since the marriage took place.

(g) Age of mother at birth of (date or time since) first child born alive[126]

2.193. Date of first birth comprises the day, month and year when the woman's first live birth took place. In countries where date of first birth is difficult to obtain, it is advisable to collect information on age of mother at first birth or on how many years ago the first birth took place (time since first birth). In countries in which time since first birth is reported more reliably than age, tabulations of children ever born and children surviving by time since first birth yield more timely child mortality estimates than those based on data on children born alive classified by age of the woman.[127] If the topic is included in the census, information should be obtained for each woman who has had at least one child born alive.

[125] See United Nations (1983). *Manual X: Indirect Techniques for Demographic Estimation*, Population Studies, No. 81 (http://www.un.org/esa/population/publications/Manual_X/Manual_X.htm), chap.) II, sect. D and United Nations (2004). *Handbook on the Collection of Fertility and Mortality Data*.Studies in Methods.Series F, No.92,(http://unstats.un.org/unsd/publication/SeriesF/SeriesF_92E.pdf) chap. V, sect. D.

[126] Ibid., chap. II, ect. B.3.

[127]See Hill K. 2013. "Indirect estimation of child mortality". In Moultrie TA, RE Dorrington, AG Hill, K Hill, IM Timæus and B Zaba (eds). *Tools for Demographic Estimation*. Paris: International Union for the Scientific Study of Population. http://demographicestimation.iussp.org/content/indirect-estimation-child-mortality. Accessed 13/12/2013http://demographicestimation.iussp.org/content/indirect-estimation-child-mortality. Accessed 13/12/2013 and Rajaratnam, J. K., Tran, L. N., Lopez, A. D., & Murray, C. J. L. (2010). Measuring Under-Five Mortality: Validation of New Low-Cost Methods.*PLoS Med*, 7(4), e1000253. doi: 10.1371/journal.pmed.1000253http://demographicestimation.iussp.org/content/indirect-estimation-child-mortality. Accessed 13/12/2013.

(h) Household deaths in the past 12 months[128] (core topic)

Recommended tabulation: 5.4-A

2.194. Information on household deaths in the past 12 months classified by sex of deceased and age at death is used to estimate the level and pattern of mortality in countries that lack satisfactory continuous death statistics from civil registration. In order for estimation derived from this item to be reliable, it is important that all deaths to household members occurring during the 12 months preceding enumeration be reported as completely and as accurately as possible. Typically, reports of deaths in censuses underestimate the overall number of deaths if only because some deaths result in the disintegration of households so that household survivors, if any, may not report their occurrence (in particular, deaths of persons living alone at the time of death are unlikely to be reported). Nevertheless, provided that there are no serious errors in the reporting of age at death, estimates of completeness of death reporting can be derived via indirect estimation and adequate mortality estimates obtained.[129]

2.195. Ideally, information on mortality should be collected for each household in terms of the total number of **deaths in the 12-month period** prior to the census date. For each deceased person reported, name, age, sex, date (day, month, and year) of death should also be collected. Care should be taken to clearly specify the reference period to the respondent so as to avoid errors due to its misinterpretation. For example, a precise reference period could be defined in terms of a festive or historic date for each country.

2.196. When information is collected on household deaths in the previous 12 months (or some other reference period), countries may wish to ask a pair of follow-up questions concerning cause of death. After ascertaining the name, age and sex of the deceased person and date of death, two additional questions could be asked:

(a) Was the death due to an accident, violence, homicide or suicide?, and (b)
(b) If the deceased was a woman aged 15[130] to 49, did the death occur while she was pregnant or during childbirth or during the six weeks after the end of pregnancy?

2.197. Data derived from such questions can help to assess trends in levels, and some causes, of adult mortality. At the data processing stage, reported deaths can be tabulated according to broad categories of cause of death: external, pregnancy-related, other, and unknown. Ignoring the "unknown" responses, both external and pregnancy-related deaths can provide valuable information in countries where no other sources of information to systematically obtain causes of death are available. Of course, such information is approximate and must be interpreted with caution after careful evaluation and often adjustment. Nevertheless, using these simple questions should make it possible to derive some useful information about major trends in mortality that are otherwise difficult to obtain.

2.198. There is no universal agreement about the feasibility of collecting reliable cause-of-death information as part of a population and housing census. More research is needed on both the feasibility and methods of collecting cause-of-death information as part of a national census.

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[128] See United Nations (2004). *Handbook on the Collection of Fertility and Mortality Data*.Studies in Methods. Series F, No.92, (http://unstats.un.org/unsd/publication/SeriesF/SeriesF_92E.pdf). ; *United Nations (2002). Methods for Estimating Adult Mortality. ESA/P/WP.175 (http://www.un.org/esa/population/techcoop/DemEst/methods_adultmort/methods_adultmort.html)*and Dorrington, Rob E..(2013). "The Brass Growth Balance Method".and "The Preston-Coale method"for one census, and "The Generalized Growth Balance Method" and "Synthetic extinct generations methods" upon the availability of deaths from two censuses In T. A. Moultrie, R. E. Dorrington, A. G. Hill, K. Hill, I. M. Timæus& B. Zaba (Eds.), *Tools for Demographic Estimation: International Union for the Scientific Study of Population. http://demographicestimation.iussp.org*

[129] See chapter 4 on methods for data evaluation and adjustment in WHO.(2013). *WHO guidance for measuring maternal mortality from a census*. World Health Organization, Geneva. 73 p., http://www.who.int/reproductivehealth/publications/monitoring/9789241506113/en/index.html(accessed 12 Dec. 2013) and Moultrie, T. A., Dorrington, R. E., Hill, A. G., Hill, K., Timæus, I. M., & Zaba, B. (Eds.). (2013). *Tools for Demographic Estimation*: International Union for the Scientific Study of Population., http://demographicestimation.iussp.org,(accessed 12 Dec. 2013)

[130] It may be appropriate in some countries to reduce the lower age limit by several years.

(i) Maternal or paternal orphanhood[131]

2.199. Some countries may also wish to collect information on maternal or paternal orphanhood in another attempt to ascertain the level and patterns of mortality in the population. Census data from these two topics are intended for indirect estimation of mortality by sex. Estimates are based on the proportion of persons classified by age whose natural mothers or fathers are still alive at the time of the census.

2.200. For the collection of information on orphanhood, two direct questions should be asked, namely:

(a) whether or not the natural mother of the person enumerated in the household is still alive at the time of the census, and
(b) whether or not the natural father of the person enumerated in the household is still alive at the time of the census, regardless of whether or not the mother and father are enumerated in the same household.

The investigation should secure information on biological parents. Thus, care should be taken to exclude adopting and fostering parents. It should be kept in mind, however, that overcounting may occur in the case of parents with more than one surviving child among the respondents, particularly in high fertility societies.

2.201. It is preferable for these questions to be collected from every person in the household regardless of age (not just children under 18, which would makes useless for estimating adult mortality). Not only is this important for estimating mortality at older ages, but also for estimating the extent of age exaggeration at the older ages. Whenever the context allows, the date of death should be collected to help to improve the timing of death, and in other contexts a simple follow-up question about whether the parent was still alive five years ago can help to narrow down the timing of death and to improve adult mortality measurement for recent years by analysing these data as successive cross-sectional inquiries.[132]

6. Educational characteristics

(a) Literacy (core topic)

Recommended tabulation: 6.3-A

2.202. **Literacy** has historically been defined as the ability both to read and to write, distinguished between "literate" and "illiterate" people. A literate person is one who can both read and write, with understanding, a short, simple statement on his or her everyday life. An illiterate person is one who cannot, with understanding, both read and write such a statement. Hence, a person capable of reading and writing only figures and his or her own name should be considered illiterate, as should a person who can read and write only a ritual phrase that has been memorized. However, a more modern understanding referring to literacy as a continuum of skills, a range of levels, of domains of application, and of functionality is now widely accepted.

[131] For methodological details on the uses of the data, see Timæus, I. M. (2013). "Indirect estimation of adult mortality from orphanhood". In T. A. Moultrie, R. E. Dorrington, A. G. Hill, K. Hill, I. M. Timæus& B. Zaba (Eds.), *Tools for Demographic Estimation*: International Union for the Scientific Study of Population. http://demographicestimation.iussp.org/content/orphanhoodand United Nations (2002).*Methods for Estimating Adult Mortality. ESA/P/WP.175.* http://www.un.org/esa/population/techcoop/DemEst/methods_adultmort/methods_adultmort.html

[132] See Timæus, I. M. (2013). "Indirect estimation from orphanhood in multiple inquiries" In T. A. Moultrie, R. E. Dorrington, A. G. Hill, K. Hill, I. M. Timæus& B. Zaba (Eds.), *Tools for Demographic Estimation*: International Union for the Scientific Study of Population. http://demographicestimation.iussp.org/content/orphanhood-multiple-inquiries

2.203. The notion of literacy applies to any language in so far as it exists in written form. In multilingual countries, the census questionnaire may query the languages in which a person can read and write. Such information can be essential for the determination of educational policy. This item would, therefore, be a useful additional subject of inquiry.

2.204. It is preferable that data on literacy be collected for all persons 10 years of age and over. In a number of countries, however, certain persons between 10 and 14 years of age may be about to become literate through schooling. The literacy rate for this age group may be misleading. Therefore, in an international comparison of literacy, data on literacy should be tabulated for all persons 15 years of age and over. Where countries collect the data for younger persons, the tabulations on literacy should at least distinguish between persons under 15 years of age and those 15 years of age and over.

2.205. Straightforward operational criteria and instructions for collecting literacy statistics should be clearly established on the basis of the concept given in paragraph 2.202, and applied during census taking.[133] Accordingly, although data on literacy should be collected so as to distinguish between persons who are literate and those who are illiterate, consideration should be given to distinguishing broad levels of literacy skills. Simple questions with response categories that reflect different levels of literacy skills should be used. In addition, since literacy is an applied skill, it needs to be measured in relation to a particular task, such as reading, with understanding, personal letters and newspapers or magazines, or writing a personal letter or message. Respondents may be able to do so easily, with difficulty or not at all, reflecting the different levels of literacy skills. Reading and writing may be measured separately to simplify the questions.

2.206. It would be preferable to use standardized questions, harmonized across countries to ensure comparability. The United Nations Educational, Scientific and Cultural Organization (UNESCO) has developed a reference database of model questions.[134] In addition, UNESCO recommends that literacy tests should be administered, in order to verify, as well as improve, the quality of literacy data. Nevertheless, administering a literacy test to all household members in the course of enumeration may prove impractical and affect participation, therefore limiting the utility of the results. Instead, administering such a test to a sample of respondents may be considered. **[Note: It should be clarified whether such a sample should be part of the census or a targeted follow-up survey.]** Some countries have regularly used simple self-assessment questions within a census to provide an indication of literacy rates at the small area level. An evaluation of the quality of statistics should be provided with census statistics on literacy.

2.207. The collection and tabulation of statistics on literacy during the population census should not be based on any assumed linkages between literacy, school attendance and educational attainment. In operational terms, this means systematically inquiring about the literacy status of each household member irrespective of school attendance or highest grade or level completed.

2.208. The literacy question currently varies across countries and, as a result, the data based on it are not always internationally comparable. Literacy should not be derived as an educational attainment proxy because although the two are related, there are substantial differences. For example, there are numerous cases where people leave school with only partial literacy skills, or lose them because of a lack of practice. Therefore educational attainment is not a good proxy measure of literacy skills.

(b) School attendance (core topic)

Recommended tabulation: 6.1-A, 6.2-A

[133] Depending on the need for small area data and the circumstances in a country, literacy may best be measured through surveys.
[134] Census offices should consult the latest information on literacy assessment through the UNESCO Institute for Statistics website, www.uis.unesco.org to access an up-to-date source of information and guidance in this area for the census.

2.209. **School attendance** is defined as regular attendance at any regular accredited educational institution or programme, public or private, for organized learning at any level of education at the time of the census or, if the census is taken during the vacation period, at the end of the school year or during the last school year. According to the International Standard Classification of Education (ISCED), education is taken to comprise all institutionalised, intentional and planned activities designed to meet learning needs.[135] Instruction in particular skills which is not part of the recognized educational structure of the country (for example, in-service training courses in factories) is not normally considered "school attendance" for census purposes.

2.210. Information on school attendance should, in principle, be collected for persons of all ages. It relates in particular to the population of official school age, which ranges in general from 5 to 29 years of age but can vary from country to country depending on the national education structure. In the case where data collection is extended to cover attendance in pre-primary education and/or other systematic educational and training programmes organized for adults in productive and service enterprises (such as the in-service training courses mentioned in paragraph 2.209), community-based organizations and other non-educational institutions, the age range may be adjusted as appropriate.

2.211. Data on school attendance should be cross-classified with data on educational attainment, according to the person's current level and grade (see para. 2.215). This cross-classification can provide useful information on the correspondence between age and level or grade of educational attainment for persons attending school.

2.212. The issue surrounding the number of out-of-school children has grown in importance within the last decade, particularly within the context of the current UNESCO Education for All target with regard to achieving universal primary education. **[Note: The target year for Education for All is 2015 and the new goals may be defined for the post-2015 period.]** The census offers an opportunity to measure the number of "out-of-school" or "ever-in-school" children (reciprocal of attendance). There is a difference between "attending school" and "enrolled in school" thus results from censuses and administrative data may differ. The UNESCO Institute for Statistics and the United Nations Children's Fund (UNICEF) are jointly working on efforts to better measure the number of out-of-school children in the world.

2.213. School attendance is complementary to, but must be distinguished from, "school enrolment" which typically is obtained from administrative data. A child can be enrolled in school but not necessarily be attending. It is recommended that these concepts be clearly defined so that countries can determine which variable they wish to collect via the census. **[Note: To some degree this repeats parts of what is stated in para 2.212]**

2.214. It is also recommended that Member States consider the need for internationally harmonized question(s) in order to measure school attendance and school enrolment.

2.214a. For purposes of international comparison, data on school attendance should be presented by the ISCED-P[136] levels listed at para 2.219 below, which are used for the classification of education programmes in ISCED 2011. Correspondence between a national education system and ISCED can be established through mapping of national education programmes to the ISCED classification.[137]

(c) Educational attainment (core topic)

Recommended tabulations: 6.1-A, 7.1-A, 8.2-A

[135] UNESCO Institute for Statistics (UIS). 2012. *International Standard Classification of Education: ISCED 2011*. Montreal: UIS. http://www.uis.unesco.org/Education/Documents/isced-2011-en.pdf.

[136] Please note that the list of ISCED levels is not the same as that in paragraph 2.219 because ISCED 0 means "early childhood education" when used for the classification of education programmes (ISCED-P) but "less than primary education" when used for the classification of educational attainment (ISCED-A). See paragraph 98 of ISCED 2011 for an explanation of ISCED-P and ISCED-A levels.

[137] The UNESCO Institute for Statistics maintains a database with ISCED mappings at http://www.uis.unesco.org/ISCED.

2.215. The recommendations on "educational attainment" (see para. 2.216) and "educational qualifications" (see para. 2.229) make use of categories of the 2011 revision of ISCED, issued by UNESCO.[138] In accordance with national conditions and requirements, many countries can continue to apply national classifications of levels and grades of education and of fields of education in collecting and tabulating statistics from population censuses. Special attention needs to be paid to establishing appropriate level-grade equivalence for persons who have received education under a different or foreign educational system. These national classifications, however, should be able to be converted or mapped to the ISCED 2011 classification system, this typically being achieved during post-census processing.

2.216. **Educational attainment** is defined as the highest ISCED level successfully completed by an individual. Educational attainment is usually measured with respect to the highest education programme successfully completed, which is typically certified by a recognised qualification. Some countries may also find it useful to present data on educational attainment in terms of highest grade completed. For international purposes, a "grade" is a specific stage of instruction usually covered in the course of an academic year. Information on educational attainment should preferably be collected for all persons 5 years of age and over.

2.217. To produce statistics on educational attainment, a classification is needed that indicates the qualifications certifying the successful completion of primary, secondary and post-secondary education. Since the educational structure may have changed over time, it is necessary to make provisions for persons educated at a time when the national educational system differed from that in place at the time of the census. In addition to focusing attention on the collection of educational attainment data, enumerator instructions, coding and data processing need to be designed in a way that will take account of any changes in the educational system of a country over the years and of those educated in another country, as well as those educated in the current system.

2.218. Information collected on the highest level of education successfully completed by each individual, typically certified by a recognised qualification, facilitates flexible regrouping of the data according to various kinds of aggregation. Recognised intermediate qualifications are classified at a lower level than the programme itself. Information on intermediate qualifications or on the highest grade completed can be used to distinguish between persons who did and persons who did not complete each level of education.

2.219. For international comparison, data from the population census are needed for three levels of education: primary, secondary, and post-secondary. To the extent possible, countries can classify statistics on educational attainment by individual ISCED levels as given below (or by their equivalent as set forth according to the national classification of levels of education):

ISCED level 0: Pre-primary education
ISCED level 1: Primary education
ISCED level 2: Lower secondary education
ISCED level 3: Upper secondary education
ISCED level 4: Post-secondary non-tertiary education
ISCED level 5: Short-cycle tertiary education
ISCED level 6: Bachelor's degree or equivalent level
ISCED level 7: Master's degree or equivalent level
ISCED level 8: Doctoral degree or equivalent level

2.219a. For the classification of educational attainment, ISCED level 0 has a different meaning in ISCED 2011 than for the classification of education programmes: it means not having successfully completed ISCED level 1. This includes individuals who have never attended an education programme, who have attended some early childhood education (defined as ISCED level 0 in the classification of education programmes), or who have attended some primary education but have not successfully completed ISCED level 1. Any differences between national and

[138] UNESCO Institute for Statistics (UIS). 2012. International Standard Classification of Education: ISCED 2011. Montreal: UIS. http://www.uis.unesco.org/Education/Documents/isced-2011-en.pdf.

international definitions and classifications of education should be explained in the census publications in order to facilitate comparison and analysis.

2.220. Countries could consider asking a question which captures levels of education not successfully completed should this be of interest to policy makers or other users. This could be in the form of a direct question asking if a person has some education at the relevant level or via a question asking the last grade/year completed from any given level of education.

2.221. Data on school attendance, educational attainment and literacy status should be collected and tabulated separately and independently of each other, without (as elaborated in paragraph 2.207) any assumption of linkages between them.

2.222. In order to ensure continued and improved international comparability of census data by level of education, it is recommended that countries continue to ensure that the educational attainment variable is able to be mapped into the ISCED 2011classification. This is typically achieved in post-census processing.

(d) Field of education and educational qualifications

(i) Field of education and training

2.223. Information on persons by level of education and field of education and training is important for examining the match between the supply and demand for qualified workers with specific specializations within the labour market. It is equally important for planning and regulating the production capacities of different levels, types and branches of educational institutions and training programmes.

2.224. A question on field of education and training needs to be addressed to persons 15 years of age and over who attended at least one grade in secondary education or who attended other organized educational and training programmes at equivalent levels.

2.225. The ISCED Fields of Education and Training 2013 (ISCED-F[139]) distinguishes between broad fields (two-digit codes), narrow fields (three-digit codes) and detailed fields (four-digit codes) of education and training.[140] The broad and narrow fields are listed here:

Code

- 00 Generic programmes and qualifications
  - 001 Basic programmes and qualifications
  - 002 Literacy and numeracy
  - 003 Personal skills and development
- 01 Education
  - 011 Education
- 02 Arts and humanities
  - 021 Arts
  - 022 Humanities (except languages)
  - 023 Languages
- 03 Social sciences, journalism and information
  - 031 Social and behavioural sciences

[139] ISCED-F was adopted by the UNESCO General Conference in November 2013 and will be published by UNESCO in 2014. The proposal that was presented to the General Conference is available at http://www.uis.unesco.org/Education/Pages/international-standard-classification-of-education.aspx.

[140] [To add: Reference to full text of *International Standard Classification of Education: Fields of Education and Training 2013*, to be published by UNESCO in 2014.]

032 Journalism and information
04 Business, administration and law
041 Business and administration
042 Law
05 Natural sciences, mathematics and statistics
051 Biological and related sciences
052 Environment
053 Physical sciences
054 Mathematics and statistics
06 Information and Communication Technologies
061 Information and Communication Technologies
07 Engineering, manufacturing and construction
071 Engineering and engineering trades
072 Manufacturing and processing
073 Architecture and construction
08 Agriculture, forestry, fisheries and veterinary
081 Agriculture
082 Forestry
083 Fisheries
084 Veterinary
09 Health and welfare
091 Health
092 Welfare
10 Services
101 Personal services
102 Hygiene and occupational health services
103 Security services
104 Transport services
99 999 Unknown

2.226. Countries may wish to consider collecting data on detailed fields of education and training, not only on the broad and narrow fields. For this, countries should make use of the classification and coding of fields of education and training of ISCED.

2.227. Countries coding field of education and training according to a national classification should establish correspondence with ISCED, either through double-coding or through conversion from the detailed national classification to ISCED. A problem may arise in identifying the exact field(s) of education and training of persons with interdisciplinary or multidisciplinary fields of specialization. In these cases it is recommended that countries follow the procedure of identifying the major or principal field of education and training of those with multidisciplinary specialization.

2.228. In order to ensure continued and improved international comparability of census data by field of education and training, it is recommended that the classification structure for the fields of education and training continue to be based on the most recent version of ISCED.

(ii) Educational qualifications

2.229. **Educational qualification** is the official confirmation, usually in the form of a document, certifying the successful completion of an education programme or a stage of a programme. Qualifications can be obtained

through: i) successful completion of a full education programme; ii) successful completion of a stage of an education programme (intermediate qualifications); or iii) validation of acquired knowledge, skills and competencies, independent of participation in an education programme.

2.230. According to national needs, information on qualifications may be collected from persons who have reached a certain minimum age or level of educational attainment. Such information should refer to the title of the highest certificate, diploma or degree received.

7. Economic characteristics

(a) Introduction

2.231. Statistics on the economic characteristics of persons are needed from population censuses for many reasons. Information on the productive activities of persons is vital to establish a comprehensive picture of the economic structure of a country, and the work patterns, labour market participation, and extent of labour underutilization of its population. This information, when combined with other personal, household and dwelling characteristics collected in the census, enable assessments of the socioeconomic situation of persons and households, which are essential to inform the formulation and planning of a wide range of economic and social policies and programmes related to employment creation, poverty reduction, work-life balance, vocational education and training, provision of social security and other social benefits, gender justice and social inclusion, civic participation, etc.

2.232. Such statistics can be obtained from other sources, such as a household-based labour force survey or administrative records, but these have certain limitations. Data obtained from sample surveys are constrained by sample precision and rarely provide reliable estimates for small areas, rare population groups, or for finely classified groups of industries and occupations. Household surveys, especially labour force surveys, have greater scope for generating a broad range of quality statistics on economic characteristics at aggregate levels, such as national and broad regional groupings. By contrast, population censuses provide certain core statistics at the lowest levels of aggregation, for small population groups and for the most detailed occupation and industry groups. Administrative records may not have the same quality of occupational and industry coding nor the same comprehensiveness in population coverage as a population census, and generally exclude productive activities that are informal and/or unpaid.

2.234. The population census provides benchmark information on economic characteristics to which statistics from other sources can be related. Censuses likewise provide the sample frames for most household-based surveys, including labour force surveys. In countries with a limited or infrequent household survey programme, the population census may represent the main or only source of information on the economic characteristics of the population.

2.235. The population census also serves as basis to evaluate sample survey results. Results from different sources, however, will generally differ to some extent. Problems in reconciling figures obtained from various sources may arise owing to differences in scope and coverage, concepts and definitions, classifications, statistical units, reference periods, precision, measurement errors and so on. To reduce such discrepancies, it is important that consistency across sources be promoted to the extent possible. When presenting census results, it is also suggested that any differences be highlighted and explained in footnotes to tables, in metadata as well as in textual analysis so that users are assisted to the extent possible in their work and the public has a better understanding of the use of these statistics.

2.235a. In deciding which topics relating to the economic characteristics of the population to include in the population census, countries will need to assess the existence of other sources of the statistics and their complementary uses. The aim should be to cover the core topics needed as benchmark information, for the preparation of sample frames, and to provide essential statistics for small areas and small population groups, and for detailed occupation and industry groups, as relevant in the national context.

2.236. International resolutions and guidelines to produce statistics relating to the economic characteristics of the population are adopted by the International Conference of Labour Statisticians (ICLS) and endorsed by the Governing Body of the International Labour Organization (ILO)[141]. Recommendations on topics amenable for inclusion in population censuses are discussed in general below. The complete labour statistics standards in force at the time the present set of population census recommendations was approved are available at: http://www.ilo.org/global/statistics-and-databases/standards-and-guidelines/lang--en/index.htm and published in: *Current International Recommendations on Labour Statistics* (ILO, 2014 - Forthcoming). More detailed operational guidelines are provided in the *Handbook on Measuring the Economically Active Population and related characteristics in Population Censuses*. **[ref numbers]**

Box 1 New international recommendations concerning statistics of work, employment and labour underutilization

In October 2013, the Nineteenth International Conference of Labour Statisticians (ICLS) adopted the *Resolution concerning statistics of work, employment and labour underutilization*.[142] This Resolution replaced the previous international recommendations relating to the measurement of the economically active population, employment, unemployment and underemployment dating from 1982 (13th ICLS) and related guidelines.

These new standards introduced a number of important revisions, among which are: a conceptual framework for work statistics consistent with the System of National Accounts; guidelines for separately measuring different forms of work, including a more targeted definition of employment, and for expanding the range of measures of labour underutilization beyond the traditional unemployment. New terminology was also introduced, as relevant, and terms considered to be out-of-date, particularly "economically active/inactive" were replaced with "labour force/outside the labour force."

Important elements from the previous standards essential to the internal consistency of the statistics remained unchanged. The refinements to the definition of employment and new measures of underutilization may result, however, in breaks in the historical series of statistics of the economically active population, employment, unemployment and underemployment.

Countries are encouraged to develop their statistical system so as to cover work statistics, including statistics on the labour force, based on their specific national needs and resources. In the case of the measures affected by the 19th ICLS Resolution, the recommendations would ideally be substituted, when feasible for national statistical systems, with those corresponding to those outlined therein. Of utmost importance is the need to involve the institutions and persons responsible for planning and managing the production of statistics on the economic characteristics of the population, to consider a strategic and coordinated approach for the adoption of the new statistical framework. Data users will need to be kept well informed of the process, including by widely disseminating the relevant metadata and by maintaining parallel series for a specified period following their implementation.

[141] See http://www.ilo.org/stat

[142] See *Resolution concerning statistics of work, employment and labour underutilization*, adopted by the Nineteenth International Conference of Labour Statisticians (Geneva, October 2013), available at: http://www.ilo.org/global/statistics-and-databases/meetings-and-events/international-conference-of-labour-statisticians/19/WCMS_230304/lang--en/index.htm

(b) Reference work concepts

(i) Work

2.237. Measurement of the economic characteristics of the population is based on the conceptual framework for work statistics (see Box 1). In this framework, *work* is defined as any activity performed by persons of any sex and age to produce goods or to provide services for use by others or for own use.

2.238. The concept of *work* is aligned with the general production boundary as defined in the System of National Accounts 2008 (2008 SNA), enabling full integration between work statistics and production statistics. All *work* or *productive* activities are thus included, irrespective of their formal or informal character or the legality of the activity. Excluded are activities that do not involve producing goods or services (such as begging and stealing), self-care (personal grooming and hygiene), and activities that cannot be performed by another person on one's own behalf (such as sleeping, learning and activities for own recreation).

2.239 *Work* can be performed in any kind of economic unit comprising market units (that is, units producing goods and services mostly for sale at prices that are economically significant), non market units (units producing goods and services mostly for supply to other units without charge or at prices that are not economically significant) and households that produce goods or services for own final use or fixed capital formation by the producers[143].

2.240. The conceptual framework for work statistics identifies five mutually exclusive *forms of work* for separate measurement (see Figures 1). These forms of work are distinguished on the basis of the intended destination of the production (for own final use; or for use by others, i.e. other economic units) and the nature of the transaction (i.e. monetary or non-monetary transactions, and transfers), as follows:

(a) *own-use production work* comprising production of goods and services for own final use;

(b) *employment work* comprising work performed in exchange for pay or profit;

(c) *unpaid trainee work* comprising work performed for others without pay to acquire workplace experience or skills;

(d) *volunteer work* comprising non-compulsory work performed for others without pay;

(m) *other work activities* including unpaid compulsory work performed for others such as community service and work by prisoners, when ordered by a court or similar authority, and unpaid military or alternative civilian service.

2.241. During a given reference period, persons may engage in one or more forms of work in parallel or consecutively, that is, persons may be employed, be volunteering, doing unpaid trainee work and/or producing for own final use, in any combination.

2.242. To meet different objectives, countries may measure the economic characteristics of the population with respect to their participation in one or in several forms of work. In particular, in the population census, measurement of:

(a) *persons in employment* is essential as part of the preparation of labour force statistics that include unemployment and other measures of labour underutilization, needed to assess the labour market

[143] United Nations, *System of National Accounts 2008* (New York, 2008).

participation of the population and to classify the population according to their *labour force status* in a short reference period see paras 2.251- 2.281)

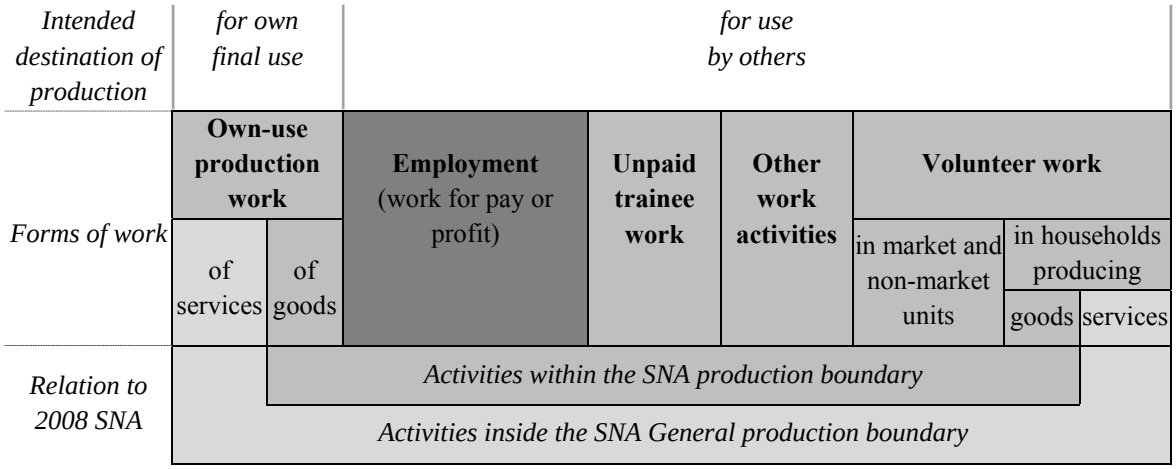
(b) *persons in own-use production of goods* is especially important in countries where particular groups of the population engage in subsistence agriculture, fishing and/or hunting and gathering see para 2.329c), and to enable integration of the population census with any agricultural census (See para 2.381-2.390;

(c) *persons in unpaid trainee work* may be advisable where unpaid apprenticeships, internships and traineeships may be a main mechanism of labour market entry for particular groups such as youths or for specific occupations such as mechanics, tailors, etc, given their likely overall small size in the country and limited availability of alternative statistical sources (see para 2.329i).

(d) Given the need for detailed probing, measurement of participation in *own-use provision of services* and in *volunteer work* is more appropriate through household surveys or, if desired, through the population census by means of a long form applied to a sub-set of the population[144].

2.243. Additional information may also be collected in the population census in order to classify the population according to their *main form of work* based on self-declaration, in a short or long reference period[145].

Figure 1 Forms of work and the System of National Accounts 2008



(ii) Working time

2.244. According to the international statistical standards on the topic, the concept of *working time* comprises the time associated with productive or work activities and the arrangement of this time during a specified reference period[146]. Working time relates to each form of work.

[144] For more details see *Resolution concerning statistics of work, employment and labour underutilization*, adopted by the Nineteenth International Conference of Labour Statisticians (Geneva, 2013), paras. 22(c) and 37-39.
[145] Ibid, para. 17.

2.245. The number of persons engaged in a given form of work provides only a very rough estimate of the volume of work performed, particularly when the work is performed on a part-time, casual or occasional basis. Information on working time is necessary to prepare estimates of the volume of work or labour input for complete national production accounts. In particular, time spent in employment, own use production of goods, unpaid trainee work, and in volunteer work in market and non market units and in households producing goods for their own final use contribute to labour input *within* the 2008 SNA production boundary, the standard for compilation of national production accounts. Time spent in own use provision of services and in volunteer work in households providing services for their own final use contribute to labour input *beyond* the 2008 SNA production boundary but *inside* the general production boundary, necessary for preparation of satellite accounts (see Figure 1).

2.246. Information on working time is also essential to support the design, monitoring and evaluation of economic, social and labour market policies and programmes targeting labour market flexibility, work-life balance, and conditions of work, including situations of underemployment due to insufficient working time (i.e. time related underemployment) and of excessive working time, among others.

2.247. The population census can serve to provide information on two measures of working time in particular: *hours actually worked* and *hours usually worked*. Where the census is the only available data source it may as a minimum incorporate a single question either on *hours actually worked* or on *hours usually worked* for persons in employment (see paras 2.322-2.325a) and for persons in own-use production of goods, as relevant.

(iii) Population coverage and age limits

2.248. Irrespective of the topic coverage, information on the economic characteristics of the population should in principle cover the entire population, regardless of country of origin, citizenship or geographic location of their place of work. In practice, a lower age limit is usually set in accordance with the conditions in the country. Where national programmes of statistics on the working-age population or on child labour exist, the statistics derived from the population census will serve to complement those bodies of statistics. For purposes of compiling statistics on the working-age population, the international standards recommend that countries set the lower age limit taking into consideration the minimum age for employment and exceptions specified in national laws or regulations, or the age of completion of compulsory schooling[147]. For compiling child labour statistics, the relevant international standards identify the target population as all persons in the 5 to 17 years age group[148]. Countries where many children participate in employment or in other forms of work, including in agricultural activities, will need to select an age limit lower than countries where instances of children participating in productive activities are uncommon. Census tabulations of economic characteristics should at least distinguish between persons under 15 years of age and those 15 years of age and over.

2.249. In general, an upper age limit is not recommended, so as to permit comprehensive coverage of work activities of the adult population and to examine transitions between employment and retirement. Many people continue to be engaged in employment and in other forms of work beyond retirement age and the numbers involved are likely to increase as a result of factors associated with the "ageing" of the population. Countries may, however, wish to balance the cost of collecting and processing information relating to the productive activities of elderly persons (those aged 75 years or more) and the additional response burden imposed on them against the significance and reliability of the information provided.

2.250. Information should be given in the census report on the minimum age for data on economic characteristics, the minimum school-leaving age and the typical age for the start of old-age retirement payments.

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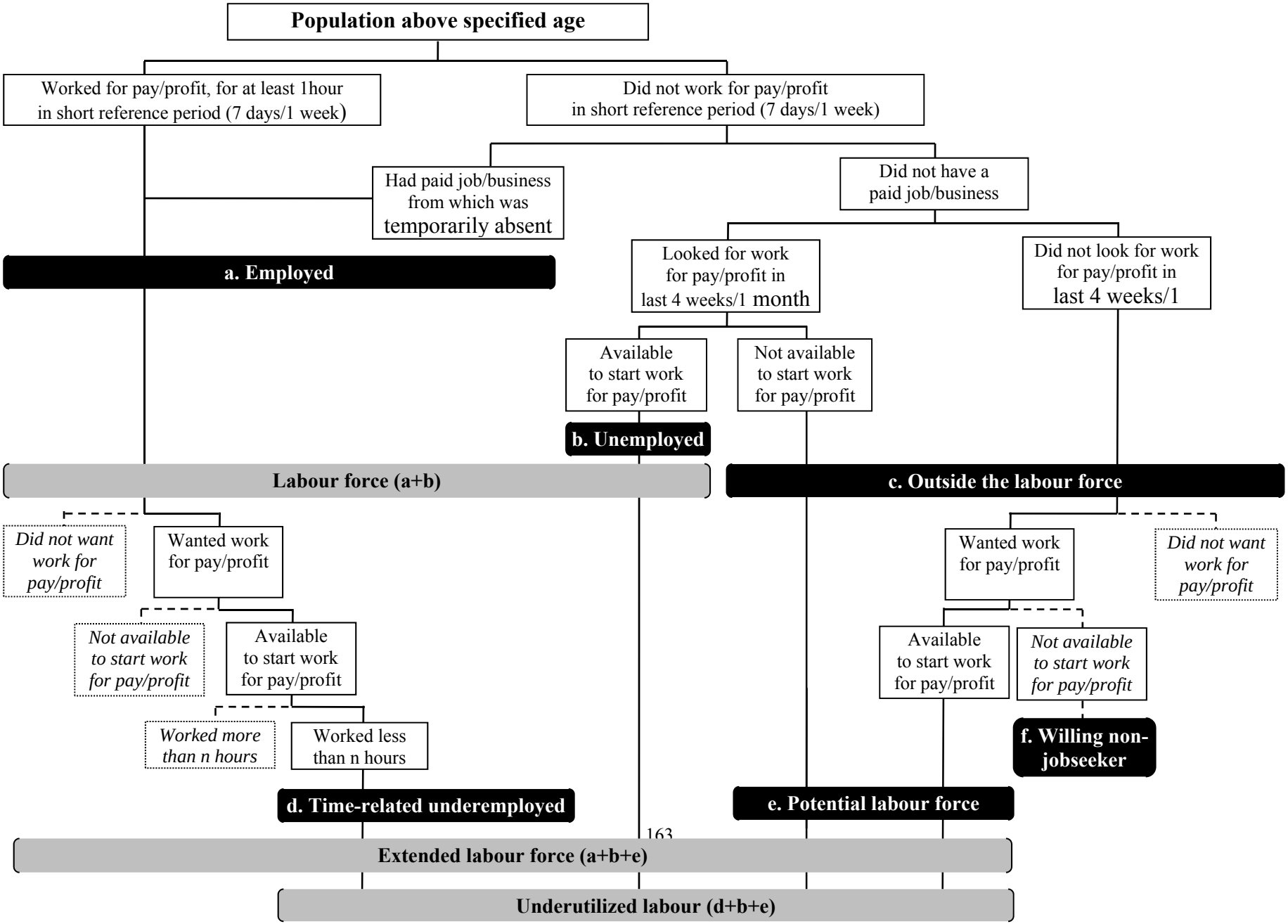
[146] *Resolution concerning the measurement of working time*, adopted by the Eighteenth International Conference of Labour Statisticians (Geneva, 2008).
[147] *Resolution concerning statistics of work, employment and labour underutilization*, adopted by the Nineteenth International Conference of Labour Statisticians (Geneva, 2013), para. 65.
[148] *Resolution concerning statistics of child labour*, adopted by the Eighteenth International Conference of Labour Statisticians (Geneva, 2008).

(c) Labour force status (core topic)

2.251. A classification of persons by their labour force status provides important information about their relation to the labour market, in particular, to the production of goods and services in exchange for pay or profit.

2.252. Persons may be classified in a short reference period according to their *labour force status* as being in employment, in unemployment, or outside the labour force as defined below in 2.253 2.281. The three categories of *labour force status* are mutually exclusive and exhaustive. While even during a short period persons may be engaged in multiple activities, to establish their *labour force status*, priority is given to employment over the other two categories; and to unemployment over outside the labour force (see Figure 2).Thus, a student who is also seeking and available for employment should be classified as *unemployed*, a person who has a part-time job, working only a few hours for pay and who is also seeking another job, should be classified as *employed*. The sum of persons in employment plus persons in unemployment comprises the *labour force*.

Figure 2 Classification of working age population by labour force status and category of labour underutilization



2.252a. The *labour force status* of persons is established with reference to a short reference period of 7 days or one week, which may be either the last 7 days prior to enumeration or the last completed calendar week, or a specified recent fixed week. This short reference period serves to provide a snap-shot picture of labour market participation in the country around the time of the census. As such, the *labour force* (i.e. persons in employment plus persons in unemployment) reflects the supply of labour for the production of goods and services in exchange for pay or profit at a specified point in time. Seasonal variations in employment and unemployment levels, that may be significant both in industrialized and in developing economies, will not be captured. Assessments of such temporal variations in work patterns are more adequately captured through sub-annual household surveys (e.g. monthly, quarterly, etc.). Nevertheless, the census results will provide important information in particular for regions and small groups, as well as for benchmarking. On balance, the last 7 days reference period, which has long been used in most countries for both censuses and surveys, seems the most useful one, being the closest short period. However, some countries prefer to use the calendar week prior to enumeration day as they find respondents relate better to a fixed calendar period. When using the calendar week approach, the exact start and ending day should be given, for example "from Monday to Sunday last week." The use of either reference period should be included in any pre-testing for the census. For comparability purposes, it is particularly useful to apply the same short-reference period for the census as for the national labour force survey, if any.

2.252b. Depending on the way the relevant parts of the census questionnaire have been constructed, the determination of the labour force status of a person may be influenced by respondents' and/or enumerators' subjective understanding of the concepts of employment and unemployment. In this regard, particular attention should be given to special groups for which the determination of the labour force status may be difficult. These groups include, for example, youths, women, and elderly persons after the normal age of retirement, in particular those working as contributing family members. Their participation in employment and/or job search activities are frequently overlooked and need close attention. In particular, the common notion that women are generally engaged in homemaking duties, or cultural perceptions relating to sex roles, can result in a serious omission with respect to measuring women's participation in employment and/or job search activities. To reduce underreporting, enumerators need to be explicitly instructed or the questionnaires specifically designed to ask about the possible jobs, including part-time, casual, temporary and informal jobs, or job search activities of every woman and man above the specified age in the household.

2.252c. The addition of probing questions in an interview or more detailed questions in a self-administered questionnaire may lengthen the time required to complete the questionnaire and increase the cost of the census. Accordingly, it will be necessary to balance the gains in terms of minimizing response errors when such questions are used against the added costs associated with their use. Given the importance of reliable data on labour force status however, serious consideration should be given to minimizing classification errors. To this end, training of enumerators should highlight likely sources of omission or sex bias leading to underestimation of participation in employment by women due to failure of respondents and enumerators to take account of women's multiple activities and the tendency to automatically enter women as homemakers, particularly if married, but also incomplete coverage of part-time, casual or informal jobs, including in self-employment by both men and women. Similar guidance could also be given in the instructions for a self-administered questionnaire.

(i) Persons in employment

2.253. *Persons in employment* are all those above the specified age who during a short reference period of 7 days or one week were engaged in any activity to produce goods or provide services for pay or profit. The notion "for pay or profit" refers to work done as part of a transaction in exchange for remuneration payable in the form of wages or salaries for time worked or work done or in the form of profits derived from the goods and services produced through market transactions. It includes remuneration in cash or in kind (i.e. whether actually received or not, payable directly to the person performing the work or indirectly to a household or family member.

2.254. Two categories of persons in employment are: (a) employed persons "at work", i.e. who worked for pay or profit for *at least* one hour; and (b) employed persons "not at work" due to working-time arrangements (such as shift work, flexitime and compensatory leave for overtime) or to "temporary absence" from a job for pay or profit.

2.255. Use of the one-hour criterion serves to ensure coverage of all types of jobs engaged in, including part-time, temporary or casual jobs, thereby supporting analysis of the conditions of work all persons in employment. It is also essential, in order to ensure that unemployed persons refer to those without *any* employment, who are seeking and available for work for pay or profit. When information on working time is also collected (see para 2.323-2.325a), the use of a one-hour criterion serves to support productivity analyses by fully capturing the volume of work of all employed persons, and to classify employed persons by specified bands of working time thereby enabling identification of persons with short and excessive working time.

2.256. Persons on "temporary absence" from a job, including as employees or self-employed, should be considered as in employment, provided that they were "not at work" for a short duration and maintained a job attachment during the absence. The existence of a job attachment should be established on the basis of the reason for the absence and, in the case of certain reasons, the continued receipt of remuneration and/or the total duration of the absence. Reasons for absence where job attachment is generally maintained, and thus, do not require further probing include: sick leave due to own illness or injury (including occupational); public holidays, vacation or annual leave; and periods of maternity or paternity leave as specified by legislation. Reasons for absence requiring further testing include: parental leave, educational leave, care for others, other personal absences, strikes or lockouts, reduction in economic activity (for example, temporary lay-off, slack work), disorganization or suspension of work (such as due to bad weather, mechanical, electrical or communication breakdown, problems with information and communication technology, shortage of raw materials or fuels). For these reasons, a further test of receipt of remuneration and/or a duration threshold should be used. This threshold should be, in general, not greater than three months. However, where the return to employment in the same economic unit is guaranteed this threshold may be greater than three months.

Treatment of specific groups

2.259. According to the international standards, the following groups of persons should be classified as in employment:

(a) persons with a job for pay or profit who, during the reference period, were on training or skills-enhancement activities required by their job or for another job in the same economic unit;

(b) apprentices, interns or trainees who work for pay in cash or in kind;

(c) persons who work for pay or profit through employment promotion programmes;

(d) persons who work in their own economic units to produce goods intended *mainly* for sale or barter, even if part of the output is consumed by the household or family;

(e) persons with seasonal jobs during the off season, if they continue to perform some tasks and duties of the job, excluding, however, fulfilment of legal or administrative obligations; and

(f) regular members of the armed forces and persons on military or alternative civilian service who perform this work for pay in cash or in kind.

2.261. Persons who either work in a market unit operated by a family member living in the same or in another household (i.e. contributing family workers), or perform tasks or duties of an employee job held by a family member living in the same or in another household, should also be classified as in employment. These groups of workers are included in employment, regardless of the number of hours actually worked, as they contribute their labour to produce goods and services for pay or profit, payable to the household or family.

2.264. In accordance with the priority rule to establish their *labour force status* see para 2.252), persons who during the reference period were primarily students, homemakers, pensioners, registered unemployed, etc, and at the same time were engaged in employment, as defined above, should be classified as in employment.

2.265. Excluded from employment are:

(a) apprentices, interns and trainees who work *without* pay in cash or in kind (see paras 3.329h-2.329k);

(b) participants in skills training or retraining schemes within employment promotion programmes, when *not* engaged in the production process of an economic unit;

(c) persons who are required to perform work as a condition of continued receipt of a government social benefit such as unemployment insurance;

(d) persons receiving transfers, in cash or in kind, not related to employment;

(e) persons with seasonal jobs during the off season, if they *cease* to perform the tasks and duties of the job;

(f) persons who retain a right to return to the same economic unit but who were absent for reasons specified in para 2.256, when the total duration of the absence exceeds the specified threshold and/or if the test of receipt of remuneration is not fulfilled;

(g) persons on indefinite lay-off who do not have an assurance of return to employment with the same economic unit;

(h) persons who work to produce goods intended *mainly* or *exclusively* for consumption or use by the household or family, even if a surplus or part of the output is sold or bartered (that is persons engaged in own-use production of goods, see paras 2.329b-2.329g); and

(i) persons who work voluntarily and *without* pay to produce goods or services through or for other economic units, including market, non-market units and households

2.270. Information should be given in the census reports describing how the above-mentioned groups and other relevant groups (for example, retired persons) were treated. Consideration should also be given to the desirability of identifying some of the groups (for example, paid apprentices, interns and trainees) separately in tabulations.

(ii) Persons in unemployment

2.271. *Persons in unemployment* are all those above the specified age who at the time of the census:
(a) were not in employment;
(b) carried out activities to seek employment during a specified recent period; and
(c) were currently available to take up employment given a job opportunity.

2.266. To be classified as unemployed, a person must satisfy all of the three criteria, where:

(a) "not in employment" is assessed with respect to the short reference period for the measurement of employment as defined in in para 2.253;

(b) "to seek employment" refers to any activity when carried out, during a specified recent period comprising the last four weeks or calendar month prior to enumeration, for the purpose of finding a job or setting up a business or agricultural undertaking. This includes also part-time, informal, temporary, seasonal or casual employment, paid apprenticeships, internships or traineeships, within the national territory or abroad. Examples of such activities are: arranging for financial resources, applying for permits, licences; looking for land, premises, machinery, supplies,

farming inputs; seeking the assistance of friends, relatives or other types of intermediaries; registering with or contacting public or private employment services; applying to employers directly, checking at worksites, farms, factory gates, markets or other assembly places; placing or answering newspaper or online job advertisements; placing or updating résumés on professional or social networking sites online;

(c) "currently available" serves as a test of readiness to start a job in the present, assessed with respect to a short reference period comprising that used to measure employment. Depending on national circumstances, the reference period may be extended to include a short subsequent period not exceeding two weeks in total, so as to ensure adequate coverage of unemployment situations among different population groups.

2.272. Unemployment has been one of the most widely used measures of labour underutilization. However it only captures persons in situations of complete lack of work for pay or profit, and where opportunities for job search exist. In settings with few channels for seeking employment or where labour markets are limited in scope, or when labour absorption is inadequate, unemployment will not capture fully all persons with an unmet need for employment, as persons will take any available jobs, create their own jobs, often as own-account workers or become discouraged. In such cases, countries should aim to separately identify additional population groups that may be considered as underutilized labour according to national circumstances. Particularly important are, among persons outside the labour force, the *potential labour force*, defined in para 2.279b below and, among persons in employment, persons in *time related underemployment*, defined in para 2.328 (see also Figure 2). Separate identification of these groups of persons is recommended in order to enable better assessment of the different types of underutilization affecting labour markets across settings, and for more targeted policymaking.

2.273. It may be useful to distinguish first-time job seekers, who have never worked before, from other job seekers in the classification of the unemployed. Such a separation would be useful for policy purposes as well as in improving the international comparability of employment statistics. To do so, however, may require an additional question regarding previous work experience, which may be too much for a population census.

Treatment of specific groups

2.274 According to the international standards the following group of persons should be classified in unemployment:

(a) *future starters* defined as persons "not in employment" and "currently available" who did not "seek employment" because they had already made arrangements to start a job within a short subsequent period, set according to the general length of waiting time for starting a new job in the national context but generally not greater than three months;

(b) participants in skills training or retraining schemes within employment promotion programmes, who on that basis, were "not in employment", not "currently available" and did not "seek employment" because they had a job offer to start within a short subsequent period generally not greater than three months; and

(c) (c) persons "not in employment" who carried out activities to migrate abroad in order to work for pay or profit but who were still waiting for the opportunity to leave.

2.277. In accordance with the priority rules of the labour force framework, persons mainly engaged in non-economic activities during the reference period (for example, students, homemakers), who satisfy the criteria for unemployment laid down in paragraph 2.271 above should be regarded as unemployed on the same basis as other categories of unemployed persons and be identified separately, where possible. Information should be given in the census reports on how persons in these and any other specific groups were treated.

(iii) Persons outside the labour force

2.278. Persons outside the labour force comprise all those above the specified age who in the short reference period were neither in employment nor in unemployment as defined above.

2.279. Different classifications of persons outside the labour force may be used for analytical purposes. Particularly useful to inform labour market and social policies and programmes are classifications by *degree of labour market attachment* and by *main reason for not entering the labour force*. These alternative classifications may be used separately or in combination to enable further analysis.

2.279a. Persons outside the labour force may be classified by the *degree of labour market attachment* into the following groups:

(a) *unavailable jobseekers*, that is, those "seeking employment" but not "currently available";

(b) *available potential jobseekers*, that is, those not "seeking employment" but "currently available";

(c) *willing non-jobseekers*, that is, those neither "seeking employment" nor "currently available" but who want employment;

(d) *others*, that is, persons neither "seeking employment" nor "currently available" who do not want employment.

2.279b. The classification of persons outside the labour force by degree of labour market attachment allows identification of the *potential labour force*, computed as the sum of (a) *unavailable jobseekers* plus (b) *available potential job seekers*. Together with unemployment and time-related underemployment, the *potential labour force* is a key measure of labour underutilization, relevant both in more and less developed settings, specially where the conventional means of seeking employment are of limited relevance, where the labour market is largely unorganized or of limited scope, when labour absorption is, at the time, inadequate, or where persons are largely self-employed.

2.279c. Although not a part of the potential labour force, the group (c) *willing non-jobseekers*, represents another group of persons outside the labour force with an expressed interest in employment and is particularly relevant for social and gender analysis in specific contexts.

2.279d. Persons outside the labour force may also be classified by *main reason for not entering the labour force* into the following groups:

(a) *Attending an educational institution* refers to persons outside the labour force, who attended any regular educational institution, public or private, for systematic instruction at any level of education, or were on temporary absence from the institution for relevant reasons corresponding to those specified for employed persons "not at work";

(b) *Performing unpaid household services* refers to persons outside the labour force, who engaged in the unpaid provision of services for their own household, such as spouses and other relatives responsible for the care and management of the home, children and elderly people. (Domestic and personal services provided by domestic employees working *for pay* in somebody else's home are considered as employed in line with para 2.253 above.);[149]

(c) *Retiring on pension or capital income* refers to persons outside the labour force who receive income from property or investments, interests, rents, royalties or pensions from former employment;

(d) *Other reasons* refers to all persons outside the labour force who do not fall into any of the above categories (for example, children not attending school, those receiving public aid or private support and persons with disabilities).

[149] See also paragraphs XXX on school attendance.

2.280. It is recommended that the population outside the labour force be classified at least according to the above-mentioned reasons. Some persons may be classifiable in more than one of the above categories. In such situations, priority should be given to the possible categories in the order above. Additional reasons for not entering the labour force that are considered particularly important and included in the regional recommendations should also be taken into account in the classification of population outside the labour force.

2.281. The information needed to classify the population outside the labour force by these alternative classifications should be derived using the same questions that are applied to identify the unemployed. For this purpose, questions on activities to "seek employment", "current availability" and "main reason for not seeking/being available for employment" should be asked of *all* persons "not in employment" in the short reference period. Where relevant, the question to determine whether persons wanted employment, needed to identify the "willing non-job seekers" should only be asked to those who did not carry out job search activities (see Figure 2).

[Note: The section on Usual activity status including Figure 3 has now been deleted]

[Note: Figure 3 deleted]

[Note: The section on Status of volunteers has now been deleted]

(d) Characteristics of jobs and establishments

2.296. Once the labour force status of persons has been established, additional important topics regarding the labour market participation of the population relate to the characteristics of their jobs and of the establishments in which they work. These include in particular: status in employment, occupation, place of work, industry, institutional sector, working time and income.

2.297. A job is defined as the set of tasks and duties performed or meant to be performed by one person for a single economic unit. Persons in employment can and do sometimes have more than one job in the reference period. In such cases the *main job* is defined in the international standards as that with the longest hours *usually* worked even if the employed person was not at work in the reference period[150].

2.298. Job-related characteristics are generally collected in reference to the main job for persons in employment, and may also be collected in reference to the *last main job* (if any) for persons not in employment. This allows for classification of the labour force (that is,. employed persons and unemployed persons) and of the potential labour force by characteristics of their (last) main job. Once the (last) main job is identified, it is essential that all subsequent questions refer to the same job, even if the respondent was not at work in the reference period. Systematic exclusion of main jobs from which respondents may be temporarily absent could cause important problems in respect of comparisons with other employment data, such as those from establishments. The census questionnaire or the census information taken from registers should be designed in a way that will ensure that the variables "occupation", "industry", "status in employment" and "institutional sector" are measured for the same job. This should be a central concern also for countries that rely on the use of administrative registrations for the capturing of the correct values of these variables.

2.299. The collection of data on characteristics of the *last main job* of persons not in employment, especially occupation, industry and status in employment, is particularly useful in order to inform policies aimed at promoting employability and job creation. To serve this purpose, it is generally recommended to set a time limit for past employment experience (for example, during the last 10 years) and only collect information on the characteristics of the last main job if it was held within the time limit.

[150] *Resolution concerning statistics of work, employment and labour underutilization*, adopted by the Nineteenth International Conference of Labour Statisticians (Geneva, 2013), para. 12(b).

2.300. When secondary jobs held in the reference period are also identified, the questionnaire should be designed so as to enable clear and separate identification of characteristics relating to main and secondary jobs. Identification of secondary jobs is particularly important in countries where multiple-job holding is commonplace, to describe the extent and structure if employment in the informal sector, and when collecting information on income-from employment and working time, in order to support analysis of the relationship between employment, income and poverty, labour input and productivity.

(e) Status in employment (core topic)

Recommended tabulations: 7.4-A, 7.5-A, 7.6-A

[Note: This revised section has been brought forward in the text but, for ease of comparison, the corresponding paragraph numbers have been retained.]

2.310. **Status in employment** refers to the type of explicit or implicit contract of employment with other persons or organizations that the employed person has in his/her job. The basic criteria used to define the groups of the classification are the type of economic risk, an element of which is the strength of the attachment between the person and the job, and the type of authority over establishments and other workers that the person has or will have in the job. Care should be taken to ensure that an employed person is classified by status in employment on the basis of the same job(s) as used for classifying the person by "occupation", "industry" and "sector".

2.311 For purposes of international comparison, it is recommended that the main job of employed persons be classified by status in employment in accordance with the latest standards for statistics on this topic. At the time the present set of census recommendations was approved, a revision of these standards was under way and expected to be completed by 2018[151]. The latest standard was the International Classification of Status in Employment (ICSE-93) adopted by the 15th International Conference of Labour Statisticians in 1993[152]. Based on ICSE-93, jobs may be classified by status in employment as follows:

(a) *Employees*
(b) *Self-employed*
    (i) *Employers*
    (ii) *Own-account workers*
    (iii) *Contributing family workers*
    (iv) *Members of producers' cooperatives*
(c) *Not stated/Not applicable*

2.312. An *employee* is a person who works in a job where the explicit or implicit contract of employment gives the incumbent a basic remuneration that is independent of the revenue of the unit for which he or she works (this unit can be a corporation, a non-profit institution, a government unit or a household). *Employees* are typically remunerated by wages and salaries, but may be paid by commission from sales, or through piece rates, bonuses or in-kind payment such as food, housing or training. Some or all of the tools, capital equipment, information systems and/or premises used by the incumbent may be owned by others, and the incumbent may work under the direct supervision of, or according to strict guidelines set by, the owner(s) or persons in the owner's employment. Among employees, it is possible to distinguish between employees with stable contracts (including regular employees) and

[151] Information about the issues that may be addressed in the revision of these standards may be found in *Revision of the International Classification of Status in Employment (ICSE-93),* Room Document 8, 19th International Conference of Labour Statisticians, 2-11 October 2013 (Geneva, 2013).
[152] For more details see *Resolution concerning the International Classification of Status in Employment (ICSE)*, adopted by the Fifteenth International Conference of Labour Statisticians (Geneva, 1993).

other employees. *Employees with stable contracts* are those employees who have had and who continue to have a contract, or a succession of contracts, with the same employer on a continuous basis. *Regular employees* are those employees with stable contracts for whom the employing organization is responsible for payment of relevant taxes and social security contributions and/or where the contractual relationship is subject to national labour legislation. *Owner-managers of incorporated enterprises* are workers who hold a job in an incorporated enterprise in which they (a) alone, or together with other members of their families or one or a few partners, hold controlling ownership of the enterprise and (b) have the authority to act on its behalf as regards contracts with other organizations and the hiring and dismissal of employees, subject only to national legislation regulating such matters and the rules established by the board of the enterprise.

2.313. A *self-employed* person is one who works in a job where the remuneration is directly dependent upon the profits (or the potential for profits) derived from the goods and services produced through market transactions.

2.314. An *employer* is a person who, working on his or her own account or with one or a few partners, holds a *self-employment* job and, in this capacity, has engaged on a continuous basis (including the reference period) one or more persons to work for him/her as employees. The incumbent makes the operational decisions affecting the enterprise, or delegates such decisions while retaining responsibility for the welfare of the enterprise. In this context an *enterprise* includes one-person operations. Some countries may wish to distinguish among employers according to the number of persons they employ.

2.315. An *own-account worker* is a person who, working on his own account or with one or a few partners, holds a *self-employment job*, and has not engaged on a continuous basis any employees. (Note, however, that during the reference period an own-account worker may have engaged one or more employees on a short-term and non-continuous basis without being thereby classifiable as an employer).

2.316. A *contributing family worker* is a person who holds a self-employment job in a market-oriented establishment operated by a related person living in the same household, and who cannot be regarded as a partner (that is to say, an employer or own-account worker) because the degree of his or her commitment to the operation of the establishment, in terms of working time or other factors to be determined by national circumstances, is not at a level comparable with that of the head of the establishment. Where it is customary for young persons, in particular, to work without pay in an economic enterprise operated by a related person who does not live in the same household, the requirement that the person live in the same household may be relaxed.

2.317. A *member of a producers' cooperative* is a person who holds a self-employment job in an establishment organized as a cooperative, in which each member takes part on an equal footing with other members in determining the organization of production, sales and/or other work, investments and the distribution of proceeds among the members. Note that employees of producers' cooperatives are not to be classified as in this group but should be classified as “employees”. Members of informal cooperatives should be classified as “employers” or “own-account workers”, depending on whether or not they employ any employees on a continuous basis.

2.318. *Not stated/Not applicable* include those persons with jobs about which insufficient information is available, and/or who cannot be included in any of the preceding categories (for example, persons who work for pay payable to the household or family performing the tasks or duties of an employee job held by a family member living in the same or in another household).

2.319. Countries that include members of the armed forces in employment should include them in the category of employees. However, because of the wide range of national practices in the treatment of the armed forces, it is recommended that census tabulations and related notes provide an explicit indication of the *status-in-employment* category in which they are included.

2.320. There are several groups of workers that are on the margin between employee and self-employed, such as owner-managers of incorporated enterprises, outworkers, contract workers and commission workers[153]. Consultations between national accountants and labour market analysts will be necessary to make decisions about the treatment of these groups in a consistent manner depending on the descriptive and analytical purposes of the statistics.

2.320a. With reference to para 2.320, *owner-managers of incorporated enterprises* are workers who hold a job in an incorporated enterprise in which they (a) alone, or together with other members of their families or one or a few partners, hold controlling ownership of the enterprise and (b) have the authority to act on its behalf as regards contracts with other organizations and the hiring and dismissal of employees, subject only to national legislation regulating such matters and the rules established by the board of the enterprise. Irrespective of where this group of workers may be classified, it is recommended to separately them to support analysis and comparisons.

2.321. In most census questionnaires, the information concerning status in employment will be captured through pre-coded alternatives where only a few words can be used to convey the intended meaning of each category. This may mean that classification of some of the situations on the borderline between two or more categories will be carried out according to the subjective understanding of the respondent rather than according to the intended distinctions. This should be kept in mind in designing the questionnaire and also when presenting the resulting statistics. Countries which rely on the direct use of administrative records for the classification of persons according to status in employment may find that the group "contributing family workers" cannot be separately identified. Those who would have been classified as being in this group in countries using a questionnaire may either be classified as part of one of the other groups or excluded from those persons in employment.

(f) Occupation (core topic)

Recommended tabulations: 2.4-A, 7.2-A, 7.6-A, 7.7-A

2.301. **Occupation** refers to the type of work done in a job by the person employed (or the type of work done in the last job held, if the person is unemployed), irrespective of the industry or the status in employment in which the person's job should be classified. Type of work is considered in terms of the main tasks and duties performed in the job.

2.302. For purposes of international comparisons, it is recommended that countries make it possible to prepare tabulations involving occupations in accordance with the latest revision available of the International Standard Classification of Occupations (ISCO). At the time the present set of census recommendations was approved the latest revision was the one adopted by Tripartite Meeting of Experts in Labour Statistics in 2007 and endorsed by the Governing Body of the International Labour Organization (ILO) in 2008[154].

2.303. Countries should code the collected occupational response at the lowest possible level supported by the information given. In order to facilitate detailed and accurate coding, it would be useful for the questionnaire to ask each active person for both the occupational title and a brief description of the main tasks and duties performed on the job. The information collected on industry (see paras 2.302-2.306) may also be used to assist in the coding of occupation data, where the occupation information on its own is insufficient to assign a detailed occupation classification code.

[153] For a discussion of the treatment of these groups, see *Resolution concerning the International Classification of Status in Employment (ICSE)*, adopted by the Fifteenth International Conference of Labour Statisticians (Geneva, 1993) and *Revision of the International Classification of Status in Employment (ICSE-93),* Room Document 8, 19th International Conference of Labour Statisticians, 2-11 October 2013 (Geneva, 2013).

[154] *International Standard Classification of Occupations (ISCO-08) Volume 1, Structure, Group Definitions and Correspondence Tables* (Geneva, International Labour Office, 2012).

2.304. In preparation for the coding of the occupation responses, the organization responsible for the census should prepare a *coding index* reflecting the type of responses that will be given by the respondents.[155] The coding index should be constructed by occupational classification experts on the basis of responses to similar questions in other data collections, such as previous censuses, census tests and labour-force surveys, as well as input from job placement officers of the employment service and the content of newspaper advertisements of vacant jobs. The coding index should clearly distinguish between responses belonging to "not elsewhere classified" categories and responses that do not provide enough information to determine an occupational group.

2.305. Countries coding *occupation* according to a national standard classification should establish a correspondence with ISCO either through double coding or through *mapping* from the detailed groups of the national classification to ISCO. Double coding can be achieved most easily when the coding index carries references both to the national classification and to ISCO. Such double coding may take the form of entering the line number of the selected index entry on the record for each response, or may involve the allocation of a code with separate components for the national and international classifications. Recording of the index line number will provide the most flexibility for future analysis and tabulation. Mapping means that, for each detailed group in the national classification, it is indicated to which ISCO group the (majority of) jobs in that national occupational group would be coded if coded directly to ISCO.

(g) Industry (core topic)

Recommended tabulations: 7.3-A, 7.5-A, 7.7-A

2.306. **Industry** (branch of economic activity) refers to the kind of production or activity of the establishment or similar unit in which the person was employed in a specific job (whether employed or unemployed) during the time reference period established for data on economic characteristics[156].

2.307. For purposes of international comparisons, it is recommended that countries make it possible to prepare tabulations involving the industrial characteristics of employed persons (and unemployed persons where relevant) according to the most recent revision of the International Standard Industrial Classification of All Economic Activities (ISIC) available at the time of the census. At the time the present set of census recommendations was approved, the fourth edition of ISIC, adopted by the United Nations Statistical Commission at its thirty-seventh session in 2006, was the latest revision available.

2.308. Countries should code the collected industry response at the lowest possible level supported by the information given. In order to facilitate detailed and accurate coding, for each job the information to be collected should include the main products and services produced or the main functions carried out at the establishment or enterprise in which the person was employed. It is recommended that the name and address of this place of work be collected (see also para 2.349a). Countries with business registers that are complete and up-to-date can then use this response as a link to the register in order to obtain the industry code given there to the establishment.

2.308a. In preparation for the coding of the industry responses that cannot be matched to a pre-coded register the organization responsible for the census should create a *coding index* that reflects the type of responses that will be given on the census questionnaire. This coding index should be constructed by industry classification experts on the basis of available lists of enterprises, establishments, businesses and so forth, as well as from responses to similar questions in other data collections, including previous censuses, census tests and labour-force surveys. The coding index should clearly distinguish between responses belonging to "not elsewhere classified" categories and responses that do not provide enough information to allow for the coding of a detailed industry group.

[155] The development and use of coding indexes, UNSD/ILO, "C*ollection of economic characteristics in population censuses: technical report"* (New York and Geneva, 2002), chap. XII.

[156] For those persons who are recruited and employed by one enterprise but who actually work at the place of another enterprise (called "agency workers" or "seconded workers" in some countries), there would be user interest in gathering information about the industry of the employer as well as the industry of the place of work. However the collection of both would be more appropriate in a labour force survey rather than in a population census. The industry of the actual place of work may provide more reliable reporting of the "industry" variable in a population census. Any such choice should, however, be consistent with the treatment of this group in the SNA.

2.309. Countries coding *industry* according to a national standard classification should establish correspondence with ISIC either through double coding or through *mapping* from the detailed groups of the national classification to ISIC (see paragraph 2.305 for information about these techniques).

(h) Place of work

2.346. Two main topics related to the place of work of persons in employment are: the *type of workplace* and its *geographic location*. The type of workplace refers to the nature of the place where the person performed his/her *main job* and distinguishes between the home and other workplaces, whether fixed or otherwise.

2.347. Three main categories, or a variation thereof necessitated by national circumstances, are recommended for classifying the *type of workplace*:

(a) *Work at home*. This category includes those who perform the tasks and duties of their main job from within the home, such as farmers who work and live on their farms, homeworkers, self-employed persons operating (work)shops or offices inside their own homes, and persons working and living at work camps;

(b) *No fixed place of work*. This category should be restricted to persons whose work involves travel in different areas and who do not report daily in person to a fixed address, for example, travelling salesmen, taxi drivers and long-distance lorry drivers. It also includes ambulant vendors, operators of street or market stalls which are removed at the end of the workday, construction workers working at different sites during the reference period and push-cart operators, and so forth.

(c) *With a fixed place of work outside the home*. All other persons in employment should be included in this category, including all persons who move around in their job but have a fixed based location to which they report daily, such as bus and taxi drivers (with a base), train and airline staff, and operators of street or market stalls that are not removed at the end of each workday. This group may also include individuals who travel to work, on a regular basis, across the border to a neighbouring country.

2.348. It is likely that for some jobs, performance is at more than one location (for example, at home some of the time/season and in a fixed location outside the home at other times) or the category cannot be clearly distinguished. One approach, in the case of the former, would be to select the place where the individual spends/spent a major part of his or her working time. Where the distinction between categories is blurred, as is the case for work done, for example, on a rented plot of land adjacent to one's home, it would be useful to identify borderline cases, according to national circumstances. Specific instructions should be given to the enumerators on how to select between two or three possible responses or to classify borderline cases.

2.348a. The *geographic location* of the place of work can provide useful information for planning when used together with information on place of residence. To this end, countries may collect, for employed persons with a fixed place of work outside the home, information on the location of the place of work (or the reporting place) during the reference period. The information collected should relate to the smallest civil division in which the job is performed, for example, in order to establish commuter flows from the place of residence to the place of work. Some countries investigating this topic in the population census have recorded the actual address of the place of work, allowing detailed tabulations and mapping of place of residence by geographical location of place of work. Information on actual address of the place of work can also be useful for industry coding (see para 2.308) in countries where an establishment register has been developed that shows the industry code of each recorded establishment.

2.349. In some countries there may be concerns about the sensitivity of questions on the address of place of work owing to fears that there may be follow-up to a respondent's employer. In many developing countries, it may not be possible to gather information on actual address of place of work because street addresses do not exists, and for proxy responses, the address may not be known. In those situations, it would be useful to consider collecting information on the village, suburb, or similar low level of civil division.

2.349a. Additional questions may also be asked on the method of travel to work in order to produce statistics on travel-to-work patterns, valuable as basis for transportation planning.

(i) Institutional sector of employment

2.335 The **institutional sector of employment** relates to the legal organization and principal functions, behaviour and objectives of the enterprise with which a job is associated.

2.335a. Following the definitions provided in the System of National Accounts (SNA), it is recommended, if the census is to provide information on this topic, that the following institutional sectors be distinguished:

(a) *Corporation*, comprising non-financial and financial corporations (in other words incorporated enterprises, private and public companies, joint-stock companies, limited liability companies, registered cooperatives, limited liability partnerships, and so forth) and quasi-corporations (that is to say, an unincorporated enterprise that is managed as if it were a corporation, in that a complete set of accounts is kept), as well as non-profit institutions, such as hospitals, schools and colleges that charge fees to cover their current production costs;

(b) *General government*, comprising central, state and local government units together with social security funds imposed or controlled by those units, and non-profit institutions engaged in non-market production controlled and financed by government, or by social security funds;

(c) *Non-profit institutions serving households* (for example, churches, professional societies, sports and cultural clubs, charitable institutions and aid agencies) that provide non-market goods and services for households (that is to say, free or at prices that are not economically significant) and whose main resources are from voluntary contributions;

(d) *Households* (including unincorporated enterprises owned by households) comprising unincorporated enterprises directly owned and controlled by members of private and institutional households (made up of persons staying in hospitals, retirement homes, convents, prisons and so forth, for long periods of time), either individually or in partnership with others. Partners may be members of the same household or from different households.

2.336. In most census questionnaires, the information concerning *institutional sector of employment* will be captured through pre-coded alternatives where only a few words can be used to convey the intended meaning of each category. This may mean that classification of some units on the borderline between two or more categories will be carried out according to the subjective understanding of the respondent rather than according to the intended distinctions. This should be kept in mind when presenting the resulting statistics.

(j) Employment in the informal sector

2.337. Where informal sector activities play an important role in employment creation and income generation, some countries may wish to consider collecting information on the number and characteristics of persons employed in the informal sector. However, given the complexity of the definition of the informal sector (it includes criteria such as the legal organization of the units as unincorporated enterprises, the lack of a complete set of accounts for them, the composition of their workforce, and so forth), it may be difficult to precisely apply some of its criteria in a population census.

2.339. The population employed in the ***informal sector*** comprises all persons who, during a given reference period, were employed (in the sense of para. 2.253 above) in at least one informal sector unit as defined in para 2.338 below, irrespective of their status in employment and whether it was their main or a secondary job.

[Note: Paras 2.338 and 2.339 have now been reversed]

2.338. In brief, according to the international standards on the subject[157], informal sector units are a sub-group of household unincorporated enterprises, that form part of the household institutional sector of the SNA (see para 2.335a(d). In contrast to corporations and quasi-corporations, a household unincorporated enterprise is a producing unit that is not constituted as a separate legal entity independently of the household member or members who own it. It has no complete set of accounts that would provide a means of identifying flows of income and capital between the enterprise and the owner(s). While all informal sector units can be regarded as household unincorporated enterprises, not all household unincorporated enterprises belong to the informal sector. Additional criteria are required to be considered as informal that differ between enterprises of employers and own-account enterprises. Depending on national circumstances, household unincorporated enterprises of employers (i.e. with regular employees) are considered informal if the total number of workers (or of employees) is small, determined according to national circumstances[158], and/or if the enterprise is not registered under relevant forms of national legislation, and/or if the employees are not registered. In the case of own-account household unincorporated enterprises (i.e. without regular employees), all may be considered informal or only those that are not registered under relevant forms of national legislation.

2.340. Surveys are in fact the most ideal method for collecting data on employment in the informal sector. However, countries still wishing to collect this information through their population census are encouraged to consult the ILO Manual "Measuring informality: a statistical manual on the informal sector and informal employment"[159] and the United Nations Statistics Division/ILO "Collection of Economic Characteristics in Population Censuses: technical report" where additional useful advice is given[160].

(k) Informal employment

2.342. According to international standards informal employment comprises all informal jobs which are not protected by labour law whether carried out in formal sector enterprises, in informal sector enterprises or in households during the specified reference period.[161]

2.343. The types of jobs which are not protected by labour laws include:

(a) Jobs of own-account workers, employers and members of producers' cooperatives, who are employed in their own informal sector enterprises;

(b) Jobs of contributing family workers, irrespective of whether they work in formal or informal sector enterprises;

(c) Jobs of employees holding informal jobs, that is, jobs in which their employment relationship is, in law or in practice, not subject to national labour legislation, income taxation, social protection or entitlement to certain employment benefits such as advance notice of dismissal, severance pay, paid annual or sick leave and others. These jobs can be held in formal sector enterprises, informal sector enterprises, or as paid domestic workers employed by households.

2.344. According to this definition, own account workers, employers and members of producers' cooperatives will have an informal employment if their enterprise is in the informal sector. Therefore, countries that exclude

[157] See *Resolution concerning statistics of employment in the informal sector*, adopted by the Fifteenth International Conference of Labour Statisticians (Geneva, 1993).
[158] The Delhi Group on Informal Sector Statistics recommends that for international reporting, a limit of "less than 5" should be used as the size cut-off; see http://mospi.nic.in/report_3.htm.
[159] International Labour Organization (2013) *Measuring informality: A statistical manual on the informal sector and informal employment* (Geneva, 2013), available at: http://www.ilo.org/wcmsp5/groups/public/---dgreports/---stat/documents/publication/wcms_222979.pdf
[160] See http://unstats.un.org/unsd/demographic/sources/census/census3.htm.
[161] *Guidelines concerning a statistical definition of informal employment* endorsed by the Seventeenth International Conference of Labour Statisticians (Geneva, 2003), see http://www.ilo.org/public/english/bureau/stat/download/guidelines/defempl.pdf.

agricultural activities from the scope of their informal sector statistics should develop suitable definitions of informal jobs in agriculture for these workers. Given the nature of their employment, all contributing family workers, regardless of the characteristics of the enterprise in which they work, are considered to have informal employment.

2.345. Among persons in informal employment, a very important group is made up of those who are not working in the informal sector. They can be employees working in the formal sector or in households (such as paid domestic workers), and, as indicated in para 2.344 above contributing family workers in the formal sector.

(l) Time worked (or 'working time')

2.322. The number of employed persons provides only a very rough estimate of the volume of work performed, especially when such persons have non-standard working hours. Inclusion in the census of an item on *time worked* helps to ensure a more accurate measurement of the concept by capturing the full contribution of persons who were in and out of the workforce or who worked only for a brief time during the year (for example, women). Information on two distinct concepts of working time can be collected in a population census: *hours actually worked* and *hours usually worked*.

2.323. *Hours actually worked* is defined as the time spent in a job for the performance of activities that contribute to the production of goods and/or services during a specified reference period. It covers the time spent in "direct hours", in "related hours", "down time" and short "resting time". "Direct hours" is the time spent carrying out the tasks and duties of the job – and may be performed in any location. "Related hours", while not leading directly to goods produced or services provided, is the time spent maintaining, facilitating or enhancing productive activities, including: up keeping the workplace, etc., changing time/decontamination of work clothes etc.; purchasing/transporting materials; waiting for business/customers/patients; on call duties; travelling in between work locations; work training/skills enhancement required by the economic unit. In practice, "down time" includes unavoidable, temporary interruptions to work (e.g. machinery or Internet breakdown, lack of supplies). "Resting time" is inactive time for short rest or refreshment in the course of performing job related activities, (e.g. coffee breaks). Longer breaks for meals, time spent not working because of vacation, holidays, sickness, industrial disputes etc., commuting to work (if not also performing job tasks or duties) and educational leave even if paid, are excluded from hours actually worked.

2.324. Measurement of hours actually worked in employment can be made using one direct question, although it is optimally measured using a set of questions, requesting hours separately for each day of the week. For employed persons, not at work in the short reference period it is possible to have a value for hours actually worked of zero (for persons away on leave) or reduced (if a part of the reference period was taken off for sickness, holiday, etc.).

2.325. *Hours usually worked* is defined as the typical value of the hours actually worked in a job per short reference period (e.g. week) over a long observation period (month, quarter, season, year) that comprises the short reference period itself. This "typical value" of time worked during a normal or typical week may be the modal value of the hours actually worked in the short period as distributed over the long period. This would include overtime hours regularly worked whether paid or unpaid. Days and hours not usually worked and unusual periods of overtime are not included.

2.325a. Measurement of hours usually worked in employment relating to the short reference period of one week, can be done with one direct question: how many hours do you usually work per week? For persons with more than one job during the reference week, to record both working time in the main job(for which the other descriptive variables are collected) and total working time (sum of working time in all jobs) the questionnaire would require at minimum two complex questions or sets of questions.

(m) Time-related underemployment

2.326. When data are collected on time worked, it is possible to consider the measurement of time-related underemployment. The resolution concerning statistics of work, employment and labour underutilization (19th ICLS 2013), recognizes time-related underemployment as an important component of labour underutilization signalling an unmet need for employment among the employed population. Time-related underemployment exists when the working time of an employed person is insufficient in relation to an alternative employment situation in which the person is willing and available to engage[162].

2.327. As with other measures of labour underutilization, time-related underemployment would be more appropriately measured by a labour force survey. However, for those countries without a frequent household survey programme, it may be useful to include time-related underemployment as a population census topic, in order to provide benchmark information, in particular, on structural situations of time-related underemployment in the population.

2.328. Persons in time-related underemployment are defined as all persons in employment who, during a short reference period, wanted to work additional hours, whose working time in all jobs was less than a specified hours threshold, and who were available to work additional hours given an opportunity for more work, where:

(a) the "working time" concept may be hours actually worked or hours usually worked, depending on the measurement objective (short or long-term situations) and in accordance with the international statistical standards on the topic;

(b) "additional hours" may be hours in the same job, in an additional job(s) or in a replacement job(s);

(c) the "hours threshold" is based on the boundary between full-time and part-time employment, on the median or modal values of the hours usually worked of all persons in employment, or on working time norms as specified in relevant legislation or national practice, and may be set for specific worker groups;

(d) "available" for additional hours should be established in reference to a set short reference period that reflects the typical length of time required in the national context between leaving one job and starting another.

2.329. Depending on the working time concept applied, among persons in time-related underemployment (that is those who wanted and were "available" to work "additional hours"), it is possible to identify the following groups:

(a) persons whose hours usually and actually worked were below the "hours threshold";

(b) persons whose hours usually worked were below the "hours threshold" but whose hours actually worked were above the threshold;

(c) persons "not at work" or whose hours actually worked were below the "hours threshold" due to economic reasons (e.g. a reduction in economic activity including temporary lay-off and slack work or the effect of the low or off season).

2.329a. In order to separately identify the three groups of persons in time-related underemployment, information is needed on both hours usually worked and hours actually worked. Countries using only hours usually worked will

[162] See *Resolution concerning statistics of work, employment and labour underutilization*, adopted by the Nineteenth International Conference of Labour Statisticians (Geneva, 2013), paras. 40 - 46.

cover the sum of groups (a) and (b); Countries using hours actually worked will cover the group (c), so long as the reasons for being "not at work" or for working below the "hours threshold" are also collected.

(n) Participation in forms of work other than employment

[Note: New section not included in the 2nd Revision]

(o) Persons in own-use production of goods

2.329b. Countries where production of goods for own final use (such as foodstuffs from agriculture, fishing, hunting and gathering, water, firewood and other household goods), represents an important component of the livelihood of a part of the population, whether as a main or secondary activity, will need to consider collecting information in the population census on the number of persons engaged in this form of work (previously included within the concept of employment). Such information is essential for benchmarking purposes, especially where household surveys are not frequent, and to enable integration of the population census with the agricultural census.

2.329c. *Persons in own-use production of goods* are all those above the specified age who, during a specified reference period, performed "any activity" to produce goods for own final use. The notion "for own final use" is interpreted as production where the intended destination of the output is *mainly* for final use by the producer in the form of capital formation, or final consumption by household members, or by family members living in other households.

2.329d. According to international standards, "any activity" to produce of goods (within the 2008 SNA production boundary) covers work performed for at least 1 hour in the following activities, when the intended destination of the output is *mainly* for own final use, as specified in para 2.329c above:

(i) producing and/or processing for storage agricultural, fishing, hunting and gathering products;

(ii) collecting and/or processing for storage mining and forestry products, including firewood and other fuels;

(iii) fetching water from natural and other sources;

(iv) manufacturing household goods (such as furniture, textiles, clothing, footwear, pottery or other durables, including boats and canoes); and

(v) building, or effecting major repairs to, one's own dwelling, farm buildings, etc.

2.329e. For measurement purposes, the intended destination of the output should be established in reference to the specific goods produced, based on self-declaration (that is, mainly for own final use). In the case of agricultural, fishing, hunting or gathering goods intended mainly for own consumption, a part or surplus may nevertheless be sold or bartered.

2.329f. Persons may engage in own-use production of goods as a main or secondary activity, throughout the year or on a seasonal basis. To ensure complete coverage, the census questions on participation in own-use production of goods should be applied to all persons above the specified age for collecting information on the economic characteristics of the population, *irrespective* of their labour force status. The reference period may refer to the last 12 months, calendar year, agricultural year or season, as relevant to national circumstances. Where pertinent, the choice of reference period should promote coherence with the agricultural census.

2.329g. For assessments of the volume of work performed by persons in own-use production of goods, particularly when using a long reference period, it may be useful to include a question on working time, in particular hours

usually worked (see para 2.325), or based on broad categories such as part-time/full-time, part-year/full-year, number of months, as feasible and relevant to the main uses of the statistics.

(p) Persons in unpaid trainee work

2.329h. Programmes that train persons in particular trades or professions through workplace learning are very varied within and across settings. Structured apprenticeship systems, often organized in partnerships between enterprises and the national vocational and training system, where the apprentice receives some form of remuneration for the work done while learning a trade or profession are well recognized as a type of employment (*work for pay*). Less recognized are more traditional arrangements whereby experienced workers train apprentices in their trade or craft at workshops, garages, shops, etc as well as newer forms of workplace experience, such as internships, where participants contribute their labour to the production of goods and services of the economic unit, but without receiving a remuneration for the work done or hours worked. Countries may consider collecting information in the population census on the number of persons engaged in unpaid trainee work to produce benchmark information on this form of work, particularly relevant for young persons and for specific occupations.

2.329i. Persons in unpaid trainee work are defined as all those of working age who, during a short reference period, performed any unpaid activity to produce goods or provide services for others, in order to acquire workplace experience or skills in a trade or profession, where:

(a) the short reference period may be that used for the measurement of persons in employment as specified in para 2.253.
(b) "any activity" refers to work for at least one hour;
(c) "unpaid" is interpreted as the absence of remuneration in cash or in kind for work done or hours worked; nevertheless, these persons engaged in unpaid trainee work may receive some form of support, such as transfers of education stipends or grants, or occasional in cash or in kind support (such as a meal or drinks);
(d) production "for others" refers to work performed in market and non-market units that are owned by non-household or non-family members;
(e) acquiring "workplace experience or skills" may occur through traditional, formal or informal arrangements whether or not a specific qualification or certification is issued.

2.329j. To ensure complete coverage, the question(s) to identify persons engaged in unpaid trainee work should be applied to all persons above the specified age for collecting information on the economic characteristics of the population, *irrespective* of their labour force status. As most persons who participate in unpaid trainee work will tend to be young, countries may consider introducing an upper age limit for this topic, according to national circumstances. Included in unpaid trainee work are persons in:

(a) traineeships, apprenticeships, internships or other types of programmes according to national circumstances, when their engagement in the production process of the economic unit is unpaid; and

(b) unpaid skills training or retraining schemes within employment promotion programmes, when engaged in the production process of the economic unit.

2.329k. Excluded from unpaid trainee work are: periods of probation associated with the start of a job; general on-the-job or lifelong learning while in employment, including in market and non-market units owned by household or family members; orientation and learning while engaged in volunteer work; and learning while engaged in own-use production work.

(q) Income

2.330. Countries may wish to collect information on the amounts of income received by individual persons and/or households during a specified reference period, from any source. If this topic is included in the census, it is recommended that data be obtained from all persons above a specified age, whether they are employed or not. Income should be measured both for the individual and for the household of which he/she is a member.

2.331. **Income** may be defined as: All receipts whether monetary or in kind (goods and services) that are received by the household or by individual members of the household at annual or more frequent intervals, but excludes windfall gains and other such irregular and typically one-time receipt. Household income covers (i) income from employment (both paid and self-employment); (ii) income from the production of goods for own final use; (iii) income from the provision of household services for own final use; (iv) property income; and (iv) current transfers received.[163]

2.332. The collection of reliable data on income, especially income from self-employment and property income, is extremely difficult in general field inquiries, particularly population censuses. The inclusion of non-cash income further compounds the difficulties. Collection of household income data in a census, even when confined to cash income, presents special problems in terms of burden of work, response errors, and so forth. Therefore, this topic is generally considered more suitable in a sample survey of households or from administrative data sources such as tax or social security records. Depending on the national requirements, countries may nonetheless wish to obtain limited information on personal or household income, by covering only some of the income components (such as income from employment), for shorter reference period (such as one month), and cover only cash income. As thus defined, the information collected can provide some input into statistics that have many important uses.

2.333. According to international standards on the subject, the income from employment of employed persons should include wages and salaries of employees, income of members from producers' cooperatives and the mixed income of employers and own-account workers operating business and unincorporated enterprises. In addition to the income from employment of employed household members, the total income of the household should include, for example, the interest, dividends, rent, social security benefits, pensions and life insurance annuity benefits of all its members. The Handbook on household income statistics[164] provides further guidance on concepts and methods related to this topic.

2.334. The concepts involved in determining income are not simple to grasp and respondents may be unable or unwilling to provide exact information. For example, income should include social security, pension fund contributions and direct taxes withheld from employees' salaries, but some persons will undoubtedly not include these amounts in reporting their salaries. Significant items of total household income may also be excluded or misstated. Despite instructions given to enumerators, the data collected can therefore be expected to be approximate. Accordingly, in the presentation of results it is usually appropriate to use broad income or earnings size-classes. As an aid to the interpretation of the results, any tabulations of the data should be accompanied by a description of the items of income assumed to be included, and, if possible, an estimate of the accuracy of the figures.

[163] See *Resolution concerning household income and expenditure statistics*, adopted by the Seventeenth International Conference of Labour Statisticians (Geneva, 2003), paras. 4 - 5., available at, http://www.ilo.org/wcmsp5/groups/public/---dgreports/---stat/documents/normativeinstrument/wcms_087503.pdf

[164] Canberra Group Handbook on Household Income Statistics, second edition, 2011, available at http://www.unece.org/fileadmin/DAM/stats/groups/cgh/Canbera_Handbook_2011_WEB.pdf

8. Agriculture

(a) Introduction

2.381. In this chapter two non-core topics on agriculture are presented. These two alternative topics could be considered by countries that would like to collect information in their population census that would facilitate the preparation of the frame of agricultural holdings in the household sector, for a subsequent agricultural census (see also para. 1.44-1.50).

2.382. With the first topic, at the household level, information is collected on whether any member of the household is engaged in own-account agricultural production activities at their place of usual residence or elsewhere. This information can be restricted to limited key items or may include a more comprehensive agricultural module. With the second topic, at the individual person level, information is collected to identify persons involved in agricultural activities during a long reference period, such as a year, before the census, compared with most of the topics included in a population census for which the information generally relates to the shorter reference period of a week before the census.

(b) Own-account agriculture production

2.383. Some countries may want to use the population census to identify households engaged in own-account agricultural production to provide additional data for agriculture related analysis of the population census and for use as a frame for a subsequent agricultural census or other surveys. In this case, information should be collected for all households on whether any member of the household is engaged in any form of own-account agricultural production activities.

2.384. Where possible, information should be collected collected to identify whether the household is engaged in any form of own-account agricultural production, covering the main agricultural activities important to the country (which can include crops, livestock and aquaculture. Information may also be collected on forestry and fishery activities if they are important for a country. Additional information should also be collected giving a measure of farm size – such as the size of area or number of plots used for agricultural purposes. For countries wishing to collect more comprehensive agricultural data may wish to include an agriculture module with the core data items recommended by the WCA 2010 and the FAO/UNFPA Guidelines for Linking Population and Housing Censuses with Agricultural Censuses (FAO and UNFPA, 2012).

2.385. Where aquacultural production is important at the household level, information can also be collected on whether or not any member of the household is engaged in any form of own-account aquacultural production activities. Agricultural production activities refer to groups 011,012 and 013 of ISIC (Rev 3.1) namely:

Group 011: Growing of crops; market gardening; horticulture.
Group 012: Farming of animals.
Group 013: Growing of crops combined with farming of animals (mixed farming).

Aquacultural production activities refer to Class 0502 of ISIC (Rev 3.1), namely:

Class 0502: Aquaculture

2.386. An own-account worker in agricultural production (agricultural holder) is a person who is working on his/her own account (self-employed), or with one or more partners, and where that person has overall responsibility for the management of the agricultural production unit.

(c) Characteristics of all agricultural jobs during the last year

2.387. The population census normally collects employment data in respect of a person's main activity during a short reference period, which may not cover all persons working in agriculture because of the seasonality of many agricultural activities. To overcome this problem, information should be collected for all economically active persons on all agricultural jobs carried out during the year preceding the population census day. The information to be collected should normally be limited to occupation and status of employment (to identify own-

account agricultural production), but can be expanded to identify main or secondary occupation and time worked.

2.388. Information on occupation and status in employment of all agricultural jobs can be used as an alternative way of identifying households engaged in own-account agricultural production activities (see paragraphs 2.383-2.38). Status in employment is used to distinguish between households with own-account agricultural production and households with only paid agricultural workers, which would not classify as farm households.

2.389. Where aquacultural production is important in a country, an additional topic on occupation and status in employment of all aquacultural jobs carried out during the year preceding the population census day can also be included and expanded to identify main or secondary occupation and time worked, as required.

2.390. An agricultural job is defined as a job in the agricultural industry as defined by groups 011,012 and 013 of ISIC (Rev 3.1); namely:

Group 011: Growing of crops; market gardening; horticulture.
Group 012: Farming of animals.
Group 013: Growing of crops combined with farming of animals (mixed farming).

An aquacultural job is defined as a job in the aquacultural industry as defined by

Class 0502: Aquaculture of ISIC (Rev 3.1).

CHAPTER 2 - Housing census topics

A. Factors determining the selection of topics

2.391. In line with the overall approach to revision 2 of *Principles and Recommendations for Population and Housing Censuses*, the selection of housing census topics, as with the population topics described in Chapter VI, is based on the outputs expected to be produced. Therefore, the first step involves the clear identification of expected outputs; the core and additional topics are then decided on that basis. For each of the core topics there is a recommended tabulation. **[Note: This reference has been retained for the time being though it is not yet confirmed that the 3rd revision will include recommended tabulations as before.]**

2.392. Also with reference to the selection of topics to be included in a housing census, limiting statistical inquiries to the collection of data that can be processed and published within a reasonable period of time was deemed important. Such cautions are especially applicable to a housing census, since it is customary to conduct a housing and a population census as simultaneous or consecutive operations. There is a high probability that the amount of data required from a census may be beyond the capacity of enumerators to collect and/or census agencies to process. It may be sufficient in some developing countries, for example, to ascertain only the number of housing units and other sets of living quarters of various types, the number and characteristics of the occupants thereof and the availability of a water supply system. Indeed, it might be neither feasible nor desirable in some cases to do more; if more were attempted, the success and quality of the census could be jeopardized.

2.393. In this context, countries should not attempt to collect housing data that are so incomplete that they fail to serve the principal purposes for which they are required. It is important, therefore, for census takers to consult closely with the principal users at an early planning stage in order to identify the data that is of highest priority and the means of supplying them in the most useful formats.

2.394. The topics, therefore, to be collected living quarters, households and buildings) should be based on:

(a) the needs of the country (at both the national and local area level) to be served by the census data;
(b) the achievement of international comparability, both within regions and on a worldwide basis;
(c) the willingness and ability of the public to give accurate information;
(d) the technical competence of the enumerators in regard to obtaining information on the topics by direct observation, or the availability of relevant information held in administrative data sources; and
(e) the total national resources available for conducting the census.

2.395. Such a balanced consideration will need to take into account the advantages and limitations of alternative methods of obtaining data on a given topic within the context of an integrated national programme for gathering housing statistics.

2.396. In selecting housing topics, regard should be given to the usefulness of historical continuity which provides the opportunity for measuring changes over time. Census takers should avoid, however, collecting information that is no longer required. Information should not be collected simply because it was collected in the past. It becomes necessary, therefore, to review periodically the value of even long standing topics and to re-evaluate the need for their continued collection.
[Note: Much of this introductory section merely repeats the message from the chapter on Population Topics. We might want to consider, therefore, whether it is necessary to include this again here or instead just refer to the previous chapter.]

1. Priority of national needs

2.397. The priority of designing a housing census should be to meet national needs. Should there be any conflict between such national needs and regional or global recommendations, national needs should take precedence followed by regional recommendations and finally by global recommendations. The prime consideration is that the census should provide information on those topics that are of greatest value to the country, with questions framed so

as to elicit data of maximum utility. Experience has shown that national needs will best be served if the census includes topics generally recognized as being of basic value and defined in accordance with regional and global standards. It is recognised however that counties that rely more on administrative records as their prime data source may be more limited in the precise detail of the information that can be collected on particular topics.

2.398. Many countries will find it necessary to include, in the census, topics of national or local interest in addition to the topics included in these recommendations. Housing survey data may supplement census data so to obtain information on topics that cannot be included in the census for whatever reason. It is possible that some countries may omit from the census certain recommended topics because there is not a need to collect the data. For example, a particular amenity, such as electricity or toilet facilities, might be available virtually everywhere in a country, and, consequently, there may be no need to collect such information in a census at all. Conversely, some topics may not be included in a census because of the almost total absence of certain amenities, particularly in the rural areas of some developing countries.

2.399. In all cases, the importance of involving stakeholders in the process of identifying priorities and policy needs has to be taken into consideration early in the process of designing the housing census. The topics that are of particular interest to the policymakers need to be carefully assessed in terms of applicability, reliability of data and census limitations (number of questions, and so forth). More detailed information on involvement of stakeholders is presented in part one, in the section on "Census communication activities: user consultations, census publicity and promotion of census products" (paras. 1.112 – 1.116), and also in the *Handbook on Census Management for Population and Housing Censuses*.[165]

[Note: This largely repeats the message given at para 2.395. We may, therefore want to consider combining the two paragraphs]

[Note: The equivalent section on priority of national needs in Chapter VI only includes the first of these paragraphs. We need to consider (a) whether or not there should be a consistent approach, and (b) whether or not we in fact need to repeat this section here.]

2. Importance of international comparability

2.400. The desirability of achieving regional and worldwide comparability should be another major consideration in the selection and formulation of topics to be included in the census. National and international objectives are usually compatible, since broad studies of countries' experiences and practices are the basis of international recommendations.

2.401. If particular circumstances within a country necessitate a departure from international standards, every effort should be made to explain these departures in the census publications and to indicate how the national presentation can be adapted to the international standards.

[Note: Again this section merely repeats the equivalent paragraphs in Chapter VI.]

3. Suitability of topics

2.402. A pre-requisite for the inclusion of housing topics in the census should be the willingness and ability of respondents to provide accurate information on them. Those topics, for example, on which information is to be obtained through direct observation by an enumerator should be within his or her technical competence. It may be necessary to avoid topics that are likely to arouse fear, local prejudice or superstition or which might be used to deliberately promote political or sectarian causes, or to avoid questions that are too complicated and difficult for the average respondent or enumerator to answer easily. The exact phrasing of any one question so constructed to obtain the most reliable responses will, of necessity, depend on national circumstances and, as described in part one, should be well tested prior to the census (see para. 1.186).

[165] United Nations publication, Sales No. E.00XVII.15 Rev.1.

[Note: Again this section merely repeats the equivalent paragraphs in Chapter VI.]

4. Resources available for the census

2.403. The selection of topics should be carefully considered in relation to the total resources available for the census. An efficient collection of accurate data for a limited number of topics, followed by prompt tabulation and publication, is more useful than the collection of data for an overambitious list of topics that cannot be properly processed and disseminated. In balancing the need for data against resources available, the extent to which questions can be pre-coded is yet another consideration. This may be an important factor in determining whether or not it is economically feasible to include certain topics in the census.

B. List of topics

2.404. The units of enumeration for housing censuses are buildings, living quarters, households and occupants. The building is often an indirect but important unit of enumeration for housing censuses since the information concerning the building (building type, material of construction of external walls and certain other characteristics) is required to describe properly the living quarters located within the building and for the formulation of housing programmes. In a housing census, the questions on building characteristics are normally framed in terms of the building in which sets of living quarters being enumerated are located, and the information is recorded for each of the housing units or other sets of living quarters located within it.

2.405. The principal direct enumeration unit in a housing census is the living quarter. Only by recognizing this as such can data be obtained that will provide a meaningful description of the housing situation and a suitable basis for the formulation of housing programmes.

2.406. The second direct unit of enumeration is the household~~s~~ occupying the living quarters. For each household, it is often useful to collect information on the characteristics of the head or reference person, tenure in the housing unit, and other relevant characteristics.

2.407. The final units of enumeration are the occupants within households. However, the detailed characteristics of each individual household member are collected in a population census and are covered in Chapter VI.

2.408. The list presented below is based on the global and regional census experience of the last several decades. The topics included are those on which there is considerable agreement on their importance and feasibility for inclusion in a census for the purpose of measuring and evaluating housing conditions and formulating housing programmes. Those that are likely to present difficulties and require time-consuming questioning can probably best be investigated in a separate housing survey of a sample of living quarters.

2.409. Core topics are those of common interest and value to countries and also of importance in enabling comprehensive comparison of statistics at the international level. Other topics refer to data that need to be collected in order to meet the additional requirements of national users.

2.410. It should be emphasized that the topics or variables on housing contained herein are for tabulation and production of outputs as this is the overall orientation of these guidelines. Issues that pertain to data collection are addressed in other parts of the *Principles and Recommendations for Population and Housing Censuses* and other relevant United Nations handbooks.

[Note: We might want to consider dropping this paragraph. It adds little. And in any case we will also want to consider making this section consistent with the text in the corresponding section in the population topics chapter, or having one set of guidelines only. For example, where the population chapter refers to 'derived' topics, no such mention is made of them here.]

Table 2 - Housing census topics by unit of enumeration

No.	Topic	Living quarters		Building	Households
		Housing units	Collective living quarters		
1	Living quarters – type of	□	♦		
2	Location of living quarters	□	♦	□	□
3	Occupancy status	♦			
4	Ownership – type of	♦			□
5	Rooms – number of	♦			□
6	Bedrooms – number of	○			○
7	Useful floor space	○	○		○
8	Water supply system	♦	○		□
9	Drinking water - main source of	♦	○		□
10	Toilet – type of	♦	○		□
11	Sewage disposal	♦			□
12	Solid waste disposal – main type of	♦			□
13	Bathing facilities	♦	○		□
14	Kitchen – availability of	♦	○		□
15	Fuel used for cooking	♦			□
16	Lighting and/or electricity – type of	♦	○		□
17	Heating - type and energy used for	○			○
18	Hot water - availability of	○			○
19	Piped gas - availability of	○			○
20	Use of housing unit	○			○
21	Occupancy by one or more households	□			♦
22	Occupants – number of	♦	♦		□
23	Building – type of			♦	
24	Year or period of construction	○		○	
25	Dwellings in the building - number of	○		○	
26	Position of dwelling in the building			○	
27	Accessibility to dwelling	○			
28	Construction material of outer walls	♦		♦	
29	Construction material of floor and roof	○		○	
30	Elevator - availability of	○		○	
31	Farm building	○		○	
32	State of repair	○		○	
33	Age and sex of head or other reference member of the household				♦
34	Tenure				♦
35	Rental and housing costs				○
36	Furnished/unfurnished	○			○
37	ICT devices – availability of				♦
38	Cars – number of available				○

No.	Topic	Living quarters		Building	Households
		Housing units	Collective living quarters		
39	Durable household appliances – availability of				○
40	Outdoor space – access to				○
	Legend: ♦ - Core topic □ - Core topic, derived ○ - Additional topic				

C. Definitions and specifications of topics

2.411. Paragraphs 2.412 – 2.553 below contain the recommended definitions. It is important that census data be accompanied by the definitions used in carrying out the census. It is also important that any changes in definitions that might have been made since the previous census be indicated and, if possible, accompanied by estimates of the effect of such changes on the relevant data. In this way, users will not confuse valid changes over time with increases or decreases that have occurred as the result of changed definitions.

1. Living quarters - type of (core topic)

Recommended tabulations: H1-R – H18-R **[Note: To be reviewed]**

(a) Definition of living quarters

2.412. **Living quarters** are structurally separate and independent places of abode. They may:
(a) have been constructed, built, converted or arranged for human habitation, provided that they are not at the time of the census used wholly for other purposes and that, in the case of non-conventional housing units and collective living quarters, they are occupied at the time of the census; or
(b) though not intended for habitation, were in use for such a purpose at the time of the census.

2.413. In any census with a field enumeration, instructions should be issued to field staff so that it is clearly understood at what stage of completion living quarters should be in order to be included. They may be included as soon as construction has begun, at various stages of construction or when construction has been completed. **[Note: buildings for which construction has only just started can hardly be included as living quarters if the above definition holds true. They are unlikely to be someone's usual place of abode at the time of the census.]** Living quarters being demolished or awaiting demolition should normally be excluded. The system used should be consistent with that employed for the system of current housing statistics and should avoid double counting where construction statistics are used to bring the census data up to date. Special instructions will need to be issued concerning "core dwellings" in countries where these are provided within a preliminary phase of dwelling construction. **[Note: Consider deleting this last sentence unless a reference to 'core' dwellings at para 2.429 is given.]**

(b) Classification of living quarters

2.414. Living quarters are either housing units or collective living quarters. Normally, the collection of information concerning buildings and housing units located within buildings is of prime importance in a housing census, since it is in buildings and housing units that the majority of the population permanently lives. Furthermore, housing units are intended for occupancy, or are occupied, by households, and it is with the provision of accommodation for households that housing programmes and policies are mainly concerned. However, certain types of "collective living quarters" are also of significance with respect to the housing conditions of households; these include hotels, rooming houses and other lodging houses and camps occupied by households. Housing units should

be classified so as to distinguish conventional dwellings from other types of housing units. It should be emphasized that without an adequate classification of living quarters, no meaningful analysis of housing conditions based on housing census data is possible.

2.415. The classification outlined below (see also Figure 7.1) and a system of three-digit codes have been designed to group in broad classes housing units and collective living quarters with similar structural characteristics. The distribution of occupants (population) among the various groups provides valuable information about the housing accommodation available at the time of the census. The classification also affords a useful basis of stratification for sample surveys. The living quarters may be classified into the following categories:

1 Housing units
- 1.1 Conventional dwellings
  - 1.1.1 Has all basic facilities
  - 1.1.2 Does not have all basic facilities
- 1.2 Other housing units
  - 1.2.1 Semi-permanent housing units
  - 1.2.2 Mobile housing units
  - 1.2.3 Improvised housing units
  - 1.2.4 Housing units in permanent buildings not intended for human habitation
  - 1.2.5 Other premises not intended for human habitation

2 Collective living quarters
- 2.1 Hotels, rooming houses and other lodging houses
- 2.2 Institutions
  - 2.2.1 Hospitals
  - 2.2.2 Correctional institutions (prisons, penitentiaries)
  - 2.2.3 Military institutions
  - 2.2.4 Religious institutions (monasteries, convents, and so forth)
  - 2.2.5 Retirement homes, homes for elderly
  - 2.2.6 Student dormitories and similar
  - 2.2.7 Staff quarters (for example, hostels and nurses' homes)
  - 2.2.8 Orphanages
  - 2.2.9 Other
- 2.3 Camps and workers' quarters
  - 2.3.1 Military camps
  - 2.3.2 Worker camps
  - 2.3.3 Refugee camps
  - 2.3.4 Camps for internally displaced people
  - 2.3.5 Other
- 2.4 Other

2.416. Not all the categories in the above classification are of importance under all circumstances. For example, in some countries certain categories may not need to be considered separately, while in others it may be convenient to subdivide them. However, some of the categories are of special significance for assessing the housing situation and should be distinguished even where a simplified classification is employed. The distinction between conventional and informal housing units is referred to particularly.

(c) Definitions of each type of living quarters

2.417. A description of the categories listed in paragraph 2.415 is given below.

1. Housing units

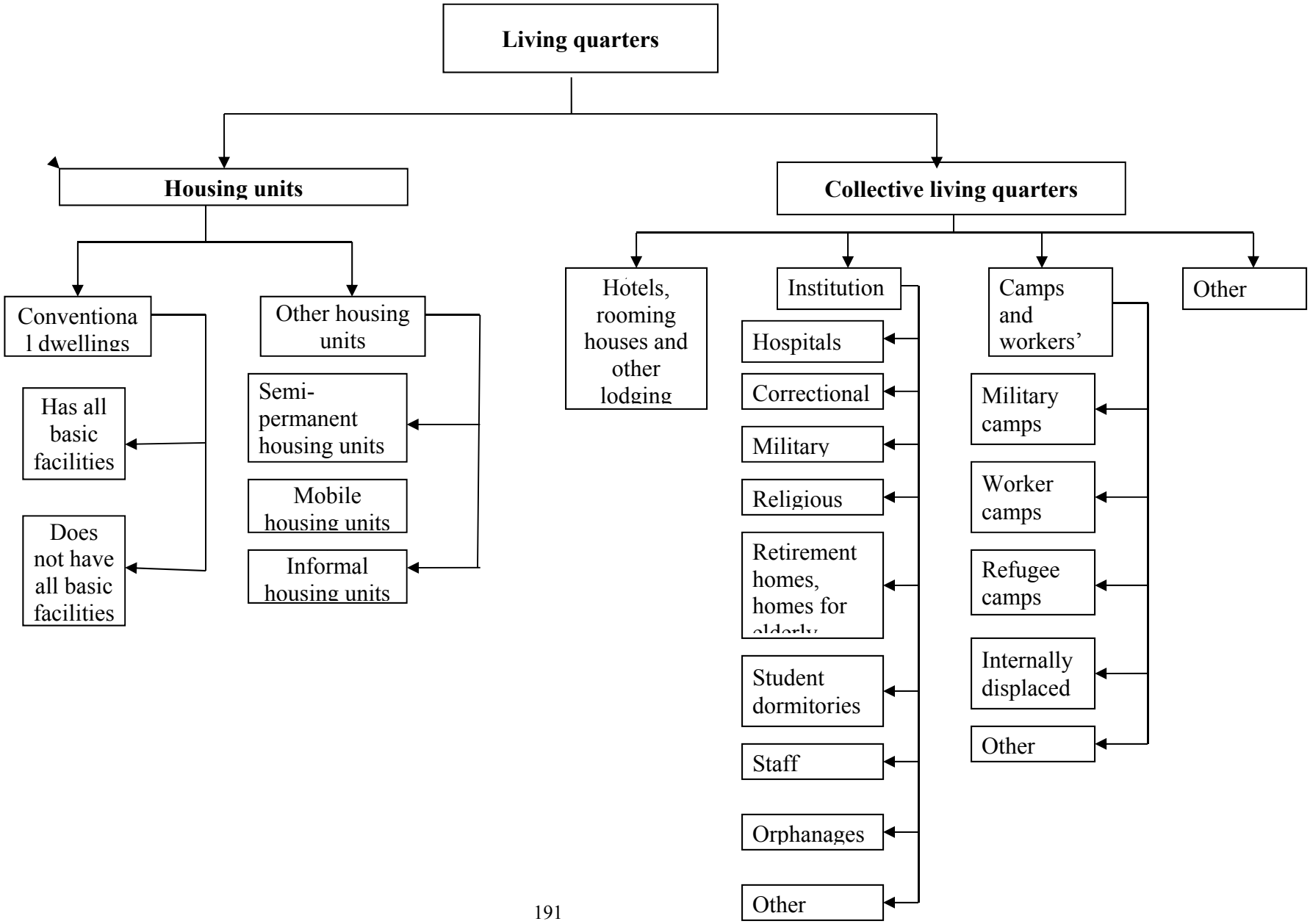
2.418. A **housing unit** is a separate and independent place of abode intended for habitation by a single household,[166] or one not intended for habitation but occupied as living quarters by a household at the time of the census. Thus it may be an occupied or vacant dwelling, an occupied non-conventional housing unit or any other place occupied as living quarters by a household at the time of the census. This category includes housing of various levels of permanency and acceptability and therefore requires further classification in order to provide for a meaningful assessment of housing conditions.

2.419. The essential features of housing units are separateness and independence. An enclosure may be considered separate if surrounded by walls, fences, and so forth, and whether or not covered by a roof so that a person or group of persons can isolate themselves from other persons in the community for the purposes of sleeping, preparing and taking their meals, and protecting themselves from the hazards of climate and environment. Such an enclosure may be considered independent when it has direct access from the street or from a public or communal staircase, passage, gallery or grounds, in other words, when the occupants can come in and go out of their living quarters without passing through anybody else's premises.

2.420. Attached rooms having an independent entrance, or detached rooms for habitation that clearly have been built, or rebuilt or converted for use as part of living quarters should be counted as part of the living quarters. Thus, living quarters may comprise rooms or groups of rooms with independent entrances, or separate buildings.

[166] Although intended for habitation by one household, a housing unit may, at the time of the census, be occupied by one or more households or by a part of a household.

Figure 4.1 Classification of living quarters



2.421. It should be noted that housing units on the grounds or within the buildings housing an institution, camp, and so forth should be separately identified and counted as housing units. For example, if, on the grounds of a hospital, there is a separate and independent house intended for the habitation of the director and his or her family, the house should be counted as a housing unit. In the same way, self-contained apartments located in hotel buildings should be counted as housing units if they have direct access to the street or to a common space within the building. Similar cases will need to be identified and described in the instructions for the enumeration.

1.1 Conventional dwellings

2.422. A 'conventional dwelling' is a room or suite of rooms and its accessories in a permanent building or structurally separated part thereof which, by the way it has been built, rebuilt or converted, is intended for habitation by one household and is not, at the time of the census, used wholly for other purposes. It should have a separate access to a street (direct or via a garden or grounds) or to a common space within the building (staircase, passage, gallery and so on). Therefore, there are four essential features of a conventional dwelling:

(a) It is a room or suite of rooms;
(b) It is located in a permanent building;
(c) It has separate access to a street or to a common space;
(d) It was intended to be occupied by one household.

2.423. Examples of conventional dwellings are houses, flats, suites of rooms, apartments and so forth. Although a conventional dwelling is a housing unit intended, that is to say, constructed or converted, for habitation by one household, it may, at the time of the census, be vacant or occupied by one or more households. It may be noted that the terms dwelling, dwelling unit, dwelling house, residential dwelling unit, family dwelling, house, *logement*, *vivienda*, *unidad de vivienda* and so forth have been used indiscriminately to refer to housing units of any type. The referent of the term "dwelling" is here limited to a housing unit located in a permanent building and designed for occupancy by one household.

2.424. A 'permanent building' is understood to be a structure that is not intended to be moved and that may be expected to maintain its stability for 15 years or more, depending on the way countries define durability. It is recognized that the criterion of permanency or durability (particularly with respect to the significance of materials and methods of construction) may be difficult to apply either in the filed or from information held in administrative records and that its adaptation to local conditions would require considerable study and experimentation by the national offices. In some cases, it may be of greater significance nationally to apply the criteria of construction materials and methods of construction directly in order to establish whether or not the building containing the housing unit is of permanent construction, rather than to translate these criteria into a time period.

1.1.1. Conventional dwelling – has basic facilities all

2.425. A conventional dwelling that has all basic facilities refers to a unit that meets all the needs of the household within its confines, such as protection from elements, cooking, maintaining hygiene and so forth Thus, in addition to the four essential features of a conventional dwelling described in paragraph 2.422, all of the following facilities must be available for a dwelling to fall in this category:

(a) Piped water within dwelling;
(b) Toilet within dwelling;
(c) Fixed bath or shower within dwelling;
(d) Kitchen or other space for cooking within dwelling.

1.1.2 Conventional dwelling – does not have all basic facilities

2.426. The conventional dwellings that fall in this category are dwellings that have the essential features of a conventional dwelling (see para. 2.422) and some, but not all, of the basic facilities described in paragraph 2.425.

2.427. With increased urbanization, the need for building low-cost housing units within the city limit has been increasing in many countries. This housing most frequently consists of buildings containing a number of separate

rooms whose occupants share some or all facilities (bathing, toilet or cooking facilities). Those units do not meet all the criteria of a conventional dwelling with all basic facilities available within the dwelling, especially from the point of view of maintaining health standards and privacy. For example, these units are known as *casa de palomar* in Latin America.

1.2 Other housing units

1.2.1 Semi-permanent housing unit

2.428. The term "semi-permanent housing unit" refers to a structure that, by the way it has been built, is not expected to maintain its durability for as long a period of time as a conventional dwelling, but has some of the main features and facilities of a conventional dwelling. As discussed earlier, durability needs to be specifically defined on the basis of national standards and practices. The number of these units in some countries and areas may be substantial. Semi-permanent housing is not to be confused with informal housing units.

2.429. For example, in some countries "core" or "nuclear" dwellings around which a dwelling will eventually be constructed are provided as part of the housing programmes. In others, a significant proportion of the housing inventory is composed of dwellings that are constructed of locally available raw materials and may be less durable than conventional dwellings.

2.430. Many countries with insufficient resources to meet their housing needs have attempted to alleviate the housing conditions of the population living in squatter areas by providing core or nuclear dwellings. Under these programmes, the households move their improvised shacks from the squatter area to a new location, the idea being that gradually, and generally with government assistance, the households with core or nuclear dwellings will keep adding to the nucleus until they can abandon their shacks entirely.

2.431. A core dwelling is sometimes only a sanitary unit containing bathing and toilet facilities, to which may be added, in subsequent phases, the other elements that will finally make up the completed dwelling. Such units do not fall within the definition of a conventional dwelling. However, although the household obviously continues to occupy its original shelter (which would probably be classified as an "improvised housing unit"), its housing situation is a vast improvement over that of households remaining in the squatter areas and the provision of the cores is a significant step towards the alleviation of housing shortages.

2.432. The problem is thus one of reflecting in the statistics the improvements brought about by programmes such as those described above without distorting the data that refer to fully constructed conventional dwellings. It is recommended, therefore, that core dwellings should be counted as dwellings in the census if at least one room[167] in addition to the sanitary facilities, is completed, and also that those dwellings that have not reached this stage of completion should be recorded as cores. Arrangements should be made so that the facilities available in the core can be related during data processing to the households for whose use they have been provided.

2.433. In other countries and areas, the population has developed, over time, a traditional and typical type of housing unit that does not have all the characteristics of conventional dwellings but is considered somewhat suitable from the point of view of climate and tradition. This is especially the case in many tropical and subtropical rural areas where housing units have been constructed or built with locally available raw materials such as bamboo, palm, straw or any similar materials. Such units often have mud walls, thatched roofs and so forth, and may be expected to last only for a limited time (from a few months to several years), although occasionally they may last for longer periods. This category is intended to cover housing units that are typical and traditional in many tropical rural areas. Such units may be known, for example, as cabins, *ranchos* or *bohíos* (Latin America), *barastis* (Bahrain), or *bahay kubo* (the Philippines).

[167] For the definition of "room", see paragraph 2.472.

1.2.2 Mobile housing units

2.434. A ‘mobile housing unit’ is any type of living accommodation that has been produced to be transported (such as a tent) or is a moving unit (such as a ship, boat, barge, vessel, railroad car, caravan, trailer, yacht and so on) occupied as living quarters at the time of the census. Trailers and tents used as permanent living quarters ~~are~~ may be of special interest in some countries.

2.435. Although mobile housing units are significantly different from other housing units in that they can be readily moved or transported, mobility in itself is not necessarily an indictor of low quality. For the assessment of housing conditions in countries with a substantial number of mobile units, it may be useful to classify them further, as tents, wagons, boats, trailers, and so forth.

1.2.3 Informal housing units

2.436. The term “informal housing unit" refers to a unit that does not have many of the features of a conventional dwelling and are generally characterized as unfit for human habitation, but that are used for that purpose at the time of the census. Therefore, it is neither a permanent structure nor one equipped with any of the essential facilities. Depending on national circumstances, countries should develop detailed instructions to distinguish between informal and semi-temporary housing units.

2.437. Informal housing units comprise three subgroups, namely, "improvised housing units", "housing units in permanent buildings not intended for human habitation" and "other informal housing units". These units are characterized by the fact that they are either makeshift shelters constructed of waste materials and generally considered unfit for habitation (squatters' huts, for example) or places that are not intended for human habitation although in use for that purpose at the time of the census (barns, warehouses, natural shelters and so on). Under almost all circumstances, such places of abode represent unacceptable housing and they may be usefully grouped together in order to analyse the housing conditions of the population and to estimate housing needs. Each subgroup is defined below.

1.2.3.1 Improvised housing units

2.438. An improvised housing unit is an independent, makeshift shelter or structure, built of waste materials and without a predetermined plan for the purpose of habitation by one household, which is being used as living quarters at the time of the census. Included in this category are squatters' huts, *poblaciones callampas* (Chile), *hongos* (Peru), *favelas* (Brazil), *sarifas* (Iraq), *jhuggis* (India and Pakistan), *gubuks* (Indonesia), *gecekondula* (Turkey), *barong barong* (the Philippines) and any similar premises arranged and used as living quarters, though they may not comply with generally accepted standards for habitation, and not having many of the characteristics of conventional dwellings. This type of housing unit is usually found in urban and suburban areas, particularly at the peripheries of the principal cities.

2.439. There is a wide variation in the procedures and criteria used in classifying these units. There are many borderline cases, and countries will need to make decisions and issue detailed instruction on how to enumerate and classify such housing units.

1.2.3.2 Housing units in permanent buildings not intended for human habitation

2.440. Included in this category are housing units (in permanent buildings) that have not been built, constructed, converted or arranged for human habitation but that are actually in use as living quarters at the time of the census. These include housing units in stables, barns, mills, garages, warehouses, offices, booths and so forth.

2.441. This category also may cover units and their occupants in buildings initially built for human habitation but later abandoned with all services cut because of deterioration. These dilapidated buildings can be found, especially in large cities, still standing, although marked for demolition. They should be included in this category if inhabited.

2.442. Premises that have been converted for human habitation, although not initially designed or constructed for this purpose, should not be included in this category, but classified as ‘other informal housing units’.

1.2.3.3 Other informal housing units

2.443. This category refers to living quarters that are not intended for human habitation or located in permanent buildings but that are nevertheless being used as living quarters at the time of the census. Caves and other natural shelters fall within this category.

2 Collective living quarters

2.444. **Collective living quarters** include structurally separate and independent places of abode intended for habitation by large groups of individuals or several households and occupied at the time of the census. Such quarters usually have certain common facilities, such as cooking and toilet installations, baths, lounge rooms or dormitories, which are shared by the occupants. They may be further classified into hotels, rooming houses and other lodging houses, institutions and camps.

2.445. Housing units in the grounds or within the building housing an institution, camp, hotel and so forth should be separately identified and counted as housing units.

2.446. The criteria established for the identification of collective living quarters are not always easy to apply and it is sometimes difficult for an enumerator to decide whether living quarters should be classified as a housing unit or not. This is particularly true in the case of a building occupied by a number of households. Enumerators should be given clear instructions as to when the premises occupied by a group of people living together are to be considered a housing unit and when collective living quarters. This may be less of a problem where census information is collected from administrative data sources and where such buildings are registered as being for communal living.

2.1 Hotels, rooming houses and other lodging houses

2.447. This group comprises permanent structures that provide lodging on a fee basis and in which the number of borders or lodgers exceed five. Where there are less than five, the living quarters should be classified as a housing unit. **[Note: Where does the criterion of five come from? In some countries the limit is ten.]** Hotels, motels, inns, boarding houses, pensions, lodging houses and so forth fall within this category. If there is any accommodation within a hotel or similar establishment that is occupied by a household and which fulfils the requirement of a conventional dwelling it should be classified as such.

2.2 Institutions

2.448. This group covers any set of premises in a permanent structure or structures designed to house (usually large) groups of persons who are bound by either a common public objective or a common personal interest. Such sets of living quarters usually have certain common facilities shared by the occupants (baths, lounges, dormitories and so forth). Hospitals, military barracks, boarding schools, convents, prisons and so forth fall within this category (see the categories in para. 2.415).

2.449. It may be useful, depending on national needs, to require that an institution be used as the principle usual residence of at least one person at the time of the census.

2.3 Camps

2.450. Camps are sets of premises originally intended for the temporary accommodation of persons with common activities or interests. Included in this category are military camps, refugee camps and camps established for the housing of workers in mining, agriculture, public works or other types of enterprises.

2.4 Other

2.451. This is a residual category for collective living quarters which may not conform to the definitions of those included in groups 2.1 through 2.3. It should be used only when the number of units in question is small. Where the number is substantial, additional groups of living quarters that have common characteristics and which are of significance for an improved appraisal of housing conditions should be established.

~~2.452.~~ In some countries, it seems that certain types of multi-household living quarters have emerged in response to the particular needs of the population, and that the characteristics of these quarters enable them to be readily identified by an enumerator. It may be useful in these countries to provide a separate subgroup for any such special types.

2.453. It should be stressed that the types of living quarters to be included in this category are those intended for communal habitation by several households, that is to say, constructed or converted for this purpose. Housing units intended for occupancy by one household, but those at the time of the census are occupied by several households, are not to be included as collective living quarters because this obscures the identification of households doubling up in dwellings (an important element in estimating housing needs). It is suggested that, in carrying out the census, a strict distinction be maintained between a housing unit occupied by more than one household and living quarters constructed or converted for communal habitation by several households.

2. Location of living quarters (core topic)

Recommended tabulations: H1-R – H18-R

2.454. A great deal of information relevant to the location of living quarters is contained under the definition of "locality" and "urban and rural". It is important for those concerned with carrying out housing censuses to study this information, because the geographical concepts used in carrying out a housing census to describe the location of living quarters are extremely important both for the execution of the census and for the subsequent tabulation of the census results. When the housing census is combined with, or closely related to, a population census, these concepts need to be carefully coordinated so that the geographical areas recognized in carrying out the two censuses are of optimum value for both operations.

2.455. Information on location should be collected in sufficient detail to enable tabulations to be made for the smallest geographical subdivisions required by the tabulation plan. To satisfy the requirements of the geographical classifications recommended in the tabulations in this publication, information is needed on whether the living quarters are located in an urban or rural area, the major civil division, the minor civil division and, for living quarters located in principal localities, the name of the locality.

2.456. Where a permanent system of house or building numbers does not already exist, it is essential for the census to establish a numbering system so that the location of each set of living quarters can be adequately described. Similarly, in cases where streets do not have names or numbers properly displayed, such identification should be provided as one of the pre-census operations. Adequate identification provides the basis for the preparation of census control lists (see also "living quarters and household listing" in paras. 1.173 – 1.176); it is required in order to monitor and control the enumeration, and to identify living quarters for possible call-backs and post-enumeration evaluation surveys as well as for other post-censal inquiries that use the census as a sampling frame or other point of departure. Ideally, each building or other inhabited structure should be provided with a number, as should each set of living quarters within buildings or structures. In preparing a census control listing, it is the practice to identify further each household within the living quarters.

2.457. Living quarters that are not located in areas with a conventional pattern of streets, such as those in squatter areas or in some places not intended for habitation, may require special identification. Since it may not be possible to describe the location of these units in terms of a formal address, it may be necessary to describe them in terms of their proximity to natural or created landmarks of various kinds or in relation to buildings that are located in areas where a formal address is possible.

[Note: The location of the living quarters and the location of the place of usual residence are, for many countries, one and the same. The latter is already considered as characteristic of the population and is accordingly covered in Chapter VI. We will need to consider therefore whether or not there is any value in

repeating the characteristics of location, locality and urban/rural classification here. At the very least there should be a cross-reference to the discussion in Chapter VI.]

2.458. The various geographical designations that together define the location of living quarters are discussed below.

(a) Address

2.459. Information that describes the place where the living quarters are to be found and distinguishes them from other living quarters in the same locality falls within this category. As a rule, the information includes the name or number of the street and the number of the living quarters; in the case of apartments, the building number and the apartment number are required.

(b) Locality

2.460. For the definition of "locality", see paragraphs 2.78-2.80 of the current revision of the *Principles and Recommendations for Population and Housing Censuses.*

(c) Urban and rural

2.461. For the definition of "urban and rural", see paragraphs 2.81-2.84 of the current revision of the *Principles and Recommendations for Population and Housing Censuses.*

3. Occupancy status (core topic)

Recommended tabulation: H4-R

[Note: We might want to consider including a formal definition set in a shaded box along the lines of: "Occupancy status refers to whether or not a conventional dwelling is occupied at the time of the census. For those dwellings not occupied (because they are vacant or in secondary use), the reason for not being occupied is classified."]

2.462. Information should be obtained for each conventional dwelling to show whether the dwelling is occupied or vacant at the time of the census. For vacant units intended for year-round occupancy, the type of vacancy (for rent, for sale, and so forth) should be reported. Occupancy status applies only to conventional dwellings, since all other types of living quarters are required by definition to be occupied in order to fall within the scope of the census.

2.463. The enumeration of vacant conventional dwellings is likely to pose difficult problems, but at least a total count should be made for purposes of controlling the enumeration. The type of vacancy is frequently indicated by "for sale" or "for rent" signs posted on the dwelling. Although it may not be feasible to investigate all of the topics included in the census for vacant units, as much information as possible should be collected, including information on whether the living quarters are vacant seasonally or non-seasonally.

2.464. Vacant units intended for seasonal or secondary occupancy may represent a substantial proportion of the housing stock in resort areas and in areas where large numbers of seasonal workers are employed. The separate identification of such categories may be necessary for the correct interpretation of the overall vacancy rate, as well as for an evaluation of the housing situation in the area concerned.

2.465. Whether or not living quarters whose occupants are temporarily absent or temporarily present should be recorded as occupied or vacant will need to be considered in relation to whether a de jure or de facto population census is being carried out. In either case, it would seem useful to distinguish as far as possible conventional dwellings that are used as a second residence. This is particularly important if the second residence has markedly different characteristics from the primary residence, as is the case, for example, when agricultural households move during certain seasons of the year from their permanent living quarters in a village to rudimentary structures located on agricultural holdings. The recommended classification of occupancy status for conventional dwellings is as follows:

1 Occupied
2 Vacant / not occupied
  2.1 Seasonally vacant
    2.1.1 Holiday homes
    2.1.2 Seasonal workers' quarters
    2.1.3 Other
  2.2 Secondary residences
  2.3 For rent/sale
  2.4 For demolition
  2.5 Other

[Note: An alternative, more radical, approach to presenting the concept of occupancy status is set out in an Annex to this Chapter. This attempts to describe the concepts of vacancy and seasonal/secondary dwellings in more detail.]

4. Ownership - type of (core topic)

Recommended tabulation: H5-R

2.466. This topic refers to the type of ownership of the housing unit itself and not of that of the land on which it stands. Type of ownership should not be confused with tenure which is a characteristic of the household and is covered in Chapter VI. **[Note: Set as a definition in a shaded box]**

2.467a Information should be obtained to show:

(a) Whether the housing unit is owned by the public sector (central government, local government, public corporations);

(b) Whether the housing unit is privately owned (by households, private corporations, cooperatives, housing associations and so on). The question is sometimes expanded to show whether the housing units are fully paid for, being purchased in instalments or mortgaged. The classification of housing units by type of ownership is as follows:

1 Owner-occupied
2 Non owner-occupied
  2.1 Publicly owned
  2.2 Privately owned
  2.3 Communally owned
  2.4 Cooperatively owned
  2.5 Other

2.467. Housing units are defined as owner-occupied if used wholly or partly for own occupation by the owner. In principle, if a housing unit is being purchased in instalments or mortgaged according to national legal systems and practices, it should be enumerated as being owned. Instructions should also cover other arrangements, such as housing units in cooperatives, housing associations and so forth.

2.468. The information on ownership may be classified, as a minimum, into two main groups, namely "private ownership" and "other ownership". Depending upon the prevalence of various types of ownership and their significance with respect to housing conditions and the formulation of housing programmes, it may be useful to dissect the category "other ownership" into the relevant examples of the subgroups shown. The categories used

should be consistent with those employed in the system of national accounts of the country concerned and in accordance with the recommendations contained in the *System of National Accounts, 1993*.[168]

2.469. It has been observed that the collection of information on type of ownership in a general census may be hampered by the fact that the occupants might not know who the owner of the property is and that the owners or their representatives may be situated outside the enumeration zone. Furthermore, there are numerous cases of borderline and mixed ownership, which make the topic difficult for nationwide enumeration. This is one of the topics for which more accurate information might be obtained through a housing survey.

2.470. In countries where there is a substantial amount of employer-issued housing, it would be useful to include the subcategories "issued by the employer" and "not issued by the employer" under the category "privately owned" (or publicly owned where the employer is a public sector entity). It is important that such information be known from the point of view of assessing the impact of job loss, in order to gauge the magnitude of the population whose loss of a job would include loss of housing as well.

5. Rooms - number of (core topic)

Recommended tabulation: H6-R

2.471. A **room** is defined as a space in a housing unit enclosed by walls reaching from the floor to the ceiling or roof covering, or to a height of at least two metres, of an area large enough to hold a bed for an adult, that is, at least four square metres. **[Note: Only information on rooms in housing units would usually be collected in a census.]** The total number of types of rooms therefore includes bedrooms, dining rooms, living rooms, studies, habitable attics, servants' rooms, kitchens, rooms used for professional or business purposes, and other separate spaces used or intended for dwelling purposes, so long as they meet the criteria concerning walls and floor space. Passageways, verandas, lobbies, bathrooms and toilet rooms should not be counted as rooms, even if they meet the criteria. Separate information may be collected for national purposes on spaces of less than four square metres that conform in other respects to the definition of ”room” if it is considered that their number warrants such a procedure.

2.472. Rooms used exclusively for business or professional purposes should be counted separately, as it is desirable to include them when calculating the number of rooms in a dwelling but to exclude them when calculating the number of persons per room. This procedure allows density levels to be studied according to the number of rooms available for living purposes in relation to the number of occupants. In any event, each country should indicate the procedure that has been followed.

2.473. It is recommended that kitchens be included in the count of rooms provided they meet the criteria concerning walls and floor space. Kitchens or kitchenettes that have an area smaller than four square metres or that have other characteristics that disqualify them should be excluded. For national purposes, countries may wish to identify and count kitchens within a separate group that may be analysed with respect to size and utilization, and to consider separately those used exclusively for cooking.

6. Bedrooms - number of

2.474. A **bedroom** is defined as a room equipped with a bed and used for night rest.

2.475a In addition to enumerating the number of rooms, some countries may wish to collect information on the number of bedrooms in a housing unit in order to provide a measure of overcrowding.

7. Useful floor space

[168] United Nations publication, Sales No. E.94.XVII.4.

2.475. This topic refers to the useful floor space in housing units, that is to say, the floor space measured inside the outer walls of housing units, excluding non-habitable cellars and attics. Information on this topic is often collected to supplement that on the number of rooms. In some countries, however, such information is collected in preference. In multiple-dwelling buildings, all common spaces should be excluded. [**Note: Only information on rooms in housing units would usually be collected in a census.]**

[Note: Consider recommending a classification along the lines:

(1.0) Under 15 square metres
(2.0) 15 and less that 30 square metre
(3.0) 30 and less than 40 square metres
(4.0) 40 and less than 50 square metres
(5.0) 50 and less than 60 square metres
(6.0) 60 and less than 80 square metres
(7.0) 80 and less than 100 square metres
(8.0) 100 and less than 120 square metres
(9.0) 120 and less than 150 square metres
(10.0) 150 square metres and over]

2.476. For collective living quarters, it would be more useful to collect information on the useful floor space per occupant of the set of collective living quarters. Data should be derived by dividing the total useful floor space by the number of occupants who are living in the space.

[Note: Consider recommending a classification along the lines:

(0.0) Less than 5 square metres per occupant
(1.0) 5 and less that 10 square metres per occupant
(2.0) 10 and less than 15 square metres per occupant
(3.0) 15 and less than 20 square metres per occupant
(4.0) 20 and less than 30 square metres per occupant
(5.0) 30 and less than 40 square metres per occupant
(6.0) 40 and less than 60 square metres per occupant
(7.0) 60 and less than 80 square metres per occupant
(8.0) 80 square metres and over per occupant]

2.477. Collecting information on the floor space available to occupants of housing units may prove to be difficult; occupants often may not know the exact or even the approximate area of the housing unit they occupy; training enumerators to calculate the floor space would be complicated and costly, and would result in inaccuracies. In this context, and taking into account the importance of the information concerned, countries should take into consideration developing detailed instructions on proper procedures for assessing these data (for example, a request for information on floor space from the official documents available to the occupants, such as the rental agreement and the title, that are supposed to include such information).

8. Water supply system (core topic)

Recommended tabulation: H7-R

2.478. Basic information to be obtained in the census is whether housing units have or do not have a piped water installation, in other words, whether or not water is provided to the housing unit by pipes from a community-wide system or a private installation, such as a pressure tank or pump. The unit of enumeration for this topic is a housing unit. It is also recommended that countries should indicate whether the unit has tap water inside or, if not, whether it is within a certain distance from the door. The recommended distance is 200 metres, assuming that access to piped water within that distance allows occupants of the housing unit to obtain water for household needs without being subjected to extreme efforts. Besides the location of the tap water relative to the housing unit, the source of water available to households is also of interest. Therefore, the recommended classification of housing unit by water supply system is as follows:

1 Piped water inside the unit
  1.1 From the community scheme

1.2 From an individual source
2 Piped water outside the unit but within 200 metres
2.1 From the community scheme
2.1.1 For exclusive use
2.1.2 Shared
2.2 From an individual source
2.2.1 For exclusive use
2.2.2 Shared
3 Other (see category 3 of the classification in para. 2.484 for more details)

2.479. A community scheme is one that is subject to inspection and control by public authorities. Such schemes are generally operated by a public body but, in some cases, they are operated by a cooperative or private enterprise. **[Note: An explanation of what constitutes an 'individual source' is also required.]**

2.480. As noted above the unit of enumeration for this topic is the housing unit. However, some countries may find it useful to collect information on the availability of piped water for the use of occupants in collective living quarters. Such living quarters are usually equipped with multi-facilities for the use of large groups, and information on the water supply system in relation to the number of occupants would be significant in respect of analysing housing conditions. The water supply system in collective living quarters constitutes an additional topic.

2.481. The most significant information from a health point of view is whether the living quarters have piped water within the premises. However, a category may be added to distinguish cases where the piped water supply is not within the living quarters but rather within the building in which the living quarters are situated. It may also be useful to collect information that would show whether the water supply is for the sole use of the occupants of the living quarters being enumerated or whether it is for the use of the occupants of several sets of living quarters, as indicated in the above classification at the three-digit level. Where there is a large proportion of housing units with no piped water, this category may be expanded to specify sources commonly used in a country. Additional information may be sought on the availability of hot as well as cold water and on the kind of equipment used for heating water.

9. Drinking water - main source of (core topic)

Recommended tabulation: H8-R

2.482. Having enough water for drinking and personal hygiene is essential, but quantity by itself is not sufficient. The quality of the water is also a crucial health issue. Consequently, one of the targets of the Millennium Development Goals is "sustainable access to safe drinking water and basic sanitation", assessed in part by having access to an improved water supply source. Sustainable access to an improved water source as defined in the guidelines for monitoring the Millennium Development Goals refers to the following types of water supply: piped water, public tap, borehole, protected dug well, protected spring, properly collected rainwater and bottled water.[169] **[Note: Reference 59 should be updated to refer to the WHO/UNICEF JMP publication Post-2015 WASH targets and indicators.]** Improved water sources do not include vendor-provided water, tanker truck water, unprotected wells and springs, or surface water (river, stream, dam, lake, pond, canal, and irrigation channel). **[Note: Is it still relevant to talk about the Millennium Development Goals? If not, this paragraph will need some revision to remove the references.]**

2.483. Countries are encouraged to collect the information on the main source of drinking water for the household, particularly where there is considerable difference between sources of water for general household use and for drinking. For those countries wishing to collect this information, the following categories of main source of drinking water are recommended:

[169] Bottled water is considered an "improved" source of drinking water only where there is a secondary source of improved water for other uses such as personal hygiene and cooking. Source: *Water for life: making it happen (*World Health Organization and UNICEF, 2005).

1 Piped water inside the unit
  1.1 From the community scheme
  1.2 From an individual source
2 Piped water outside the unit but within 200 metres
  2.1 From the community scheme
    2.1.1 For exclusive use
    2.1.2 Shared
  2.2 From an individual source
    2.2.1 For exclusive use
    2.2.2 Shared
3 Other
  3.1 Borehole
  3.2 Protected dug well
  3.3 Protected spring
  3.4 Rainwater collection tank
  3.5 Vendor-provided water
  3.6 Bottled water
  3.7 Tanker trucks
  3.8 Unprotected dug well/spring/river/stream/lake/pond/dam

[Note: To be decided how this should be aligned with the recommendations from the joint WHO/UNICEF monitoring programme for Water Supply and Sanitation. In particular, it is not clear what the difference is between 'vendor-provided water' and 'tanker trucks'.]

10. Toilet – type of (core topic)[170]

Recommended tabulation: H9-R

2.484. A **toilet** may be defined as an installation for the disposal of human excreta. A flush toilet is an installation provided with piped water that permits humans to discharge their wastes and from which the wastes are flushed by water. The unit of enumeration for this topic is a housing unit.

2.485. For housing units reported as having a toilet, additional information may be sought to determine whether the toilet is used exclusively by the occupants of the living quarters being enumerated or is shared with the occupants of other living quarters. For living quarters reported as having no toilet, it would be useful to know if the occupants have the use of a communal facility and the type of facility, or if they have the use of the toilet of other living quarters and the type, or if there is no toilet of any kind available for the use of the occupants.

2.486. Some countries have found it useful to expand the classification for non-flush toilets so as to distinguish certain types that are widely used and indicate a certain level of sanitation. The recommended classification of housing unit by toilet facilities is as follows:

1 With toilet within housing unit
  1.1 Flush/pour flush[171] toilet
  1.2 Other

2 With toilet outside housing unit
  2.1 For exclusive use
    2.1.1 Flush/pour flush toilet
    2.1.2 Ventilated improved pit latrine[172]

[170] Also necessary to distinguish between conventional dwellings with all main facilities and other conventional dwellings.
[171] A pour flush toilet uses a water seal, but unlike a flush toilet, a pour flush toilet uses water poured by hand for flushing (no cistern is used).

2.1.3 Pit latrine without ventilation with covering
2.1.4 Holes or dug pits with temporary coverings or without shelter
2.1.5 Other

2.2 Shared
2.2.1 Flush/pour flush toilet
2.2.2 Ventilated improved pit latrine
2.2.3 Pit latrine without ventilation with covering
2.2.4 Holes or dug pits with temporary coverings or without shelter
2.2.5 Other

3 No toilet available
3.1 Service or bucket facility (excreta manually removed)
3.2 Use of natural environment, for example, bush, river, stream, and so forth.

[Note: To be decided how this should be aligned with the recommendations from the joint WHO/UNICEF monitoring programme for Water Supply and Sanitation.]

2.487. As noted above the unit of enumeration for this topic is the housing unit. However, some countries may find it useful to collect information on the availability of toilet facilities for the use of occupants in collective living quarters. Living quarters of this type are usually equipped with multi-facilities for the use of large groups, and information on the number and type of toilets in relation to the number of occupants would be significant in terms of analysing housing conditions. The availability of toilets for collective living quarters represents an additional topic.

11. Sewage disposal (core topic)

Recommended tabulation: H9-R

2.488. Information on toilets should be combined with the sewage disposal system to which they are connected in order to determine the adequacy of sanitation facilities of the housing unit. To be considered adequate sanitation, toilets or latrines have to be connected to non-clogged sewage disposal systems. The information on housing units by type of sewage disposal system may be classified as follows:

1 Empties into a piped system connected to a public sewage disposal plant
2 Empties into a piped system connected to an individual sewage disposal system (septic tank, cesspool)
3 Other - toilet empties into an open ditch, a pit, a river, the sea, and so forth
4 No disposal system.

12. Solid waste disposal – main type of (core topic)

[Note: Move section to immediately follow Sewage disposal.]

Recommended tabulation: H13-R

2.489. Securing sustainable development and, in this context, the usual manner of treatment of solid waste (garbage) generated by the household, has prompted the incorporation of this topic in a number of national housing censuses.

2.490. This topic refers to the usual manner of collection and disposal of solid waste/garbage generated by occupants of the housing unit. The unit of enumeration is a housing unit. The classification of housing units by type of solid waste disposal is according to the following guidelines:

1 Solid waste collected on a regular basis by authorized collectors
2 Solid waste collected on an irregular basis by authorized collectors
3 Solid waste collected by self-appointed collectors

[172] A ventilated improved pit latrine (VIP) is a dry pit latrine that uses a hole in the ground to collect the excreta and a squatting slab or platform that is firmly supported on all sides, easy to clean and raised above the surrounding ground level to prevent surface water from entering the pit. The platform has a squatting hole, or is fitted with a seat.

4 Occupants dispose of solid waste in a local dump supervised by authorities
5 Occupants dispose of solid waste in a local dump not supervised by authorities
6 Occupants burn solid waste
7 Occupants bury solid waste
8 Occupants dispose solid waste into river/sea/creek/pond
9 Occupants compost solid waste
10 Other arrangement

[Note: Consider setting the definition part of this section as a shaded box]

13. Bathing facilities (core topic)[173]

Recommended tabulation: H10-R

2.491. Information should be obtained on whether or not there is a fixed bath or shower installation within the premises of each set of housing units. The unit of enumeration for this topic is a housing unit. Additional information may be collected to show whether or not the facilities are for the exclusive use of the occupants of the living quarters and where there is a supply of hot water for bathing purposes or cold water only. In some areas of the world the distinction proposed above may not be the most appropriate for national needs. It may be important, for example, to distinguish in terms of availability among a separate room for bathing in the living quarters, a separate room for bathing in the building, an open cubicle for bathing in the building and a public bathhouse. The recommended classification of housing units by availability and type of bathing facilities is as follows:

1 With fixed bath or shower within housing unit
2 Without fixed bath or shower within housing unit
  2.1 Fixed bath or shower available outside housing unit
    2.1.1 For exclusive use
    2.1.2 Shared
  2.2 No fixed bath or shower available

[Note: An alternative classification has been proposed for use in developing countries:
1) **Separate room for bath or shower within the housing unit;**
2) **No separate room for bath or shower but bathing space available within the housing unit (for example it may be in an open area around the well within the housing unit , say in the courtyard;**
3) **Bathing room available but outside the housing unit for exclusive use; and**
4) **Shared and lastly bathing facility in the open]**

2.492. As noted above the unit of enumeration for this topic is the housing unit. However, some countries may find it useful to collect information on the availability of a bath/shower for the use of occupants in collective living quarters. Living quarters of this type are usually equipped with multi-facilities for the use of large groups, and information on the number of fixed baths or showers in relation to the number of occupants would be significant in terms of analysing housing conditions. The number of fixed baths or showers in collective living quarters would represent an additional topic.

14. Kitchen – availability of (core topic)[174]

Recommended tabulation: H11-R

2.493. Information should be obtained on whether the housing unit has a kitchen, whether some other space is set aside for cooking, such as a kitchenette, or whether there is no special place set aside for cooking. The unit of enumeration for this topic is a housing unit.

[173] Also necessary to distinguish between conventional dwellings with all main facilities and other conventional dwellings.
[174] Ibid.

2.494. A **kitchen** is defined as a space that conforms in all respects to the criteria for a room, and is equipped for the preparation of the principal meals of the day and intended primarily for that purpose.

2.495. Any other space reserved for cooking, such as a kitchenette, will fall short in respect of possessing the attributes of a room, although it may be equipped for the preparation of the principal meals of the day and is intended primarily for that purpose. The collection of data on the availability of a kitchen may provide a convenient opportunity to collect information on the kind of equipment that is used for cooking, for example, a stove, hotplate, or open fire, and on the availability of a kitchen sink and a space for food storage so as to prevent spoilage. The recommended classification of housing units by availability of a kitchen or other space reserved for cooking within the housing unit is as follows:

1 With kitchen within housing unit
  1.1 For exclusive use
  1.2 Shared
2 With other space for cooking within housing unit, such as kitchenette
  2.1 For exclusive use
  2.2 Shared
3 Without kitchen or other space for cooking within housing unit
  3.1 Kitchen or other space for cooking available outside housing unit
    3.1.1 For exclusive use
    3.1.2 Shared
  3.2 No kitchen or other space for cooking available

2.496. As noted above the unit of enumeration for this topic is the housing unit. However, some countries may find it useful to collect information on the availability of kitchen facilities for the use of occupants in collective living quarters. Living quarters of this type are usually equipped with multi-facilities for the use of large groups, and information on the number of kitchens or kitchenettes in relation to the number of occupants would be significant in terms of analysing housing conditions. It represents an additional topic.

15. Fuel used for cooking (core topic)

Recommended tabulation: H11-R

2.497. The proportion of households using solid fuels is one of the indicators for monitoring the Millennium Development Goals. **[Note: Is it still relevant to talk about the Millennium Development Goals? If not, this paragraph will need some revision to remove the references.]** There are important linkages between household solid fuel use, indoor air pollution, deforestation and soil erosion and greenhouse gas emissions. The type of fuel and participation in cooking tasks are important predictors of exposure to indoor air pollution. It is thus recommended to collect information on the fuel used for cooking by each housing unit. Fuel used for cooking refers to the fuel used predominantly for preparation of principal meals. If two fuels (for example, electricity and gas) are used, the one used most often should be enumerated. The classification of fuels used for cooking depends on national circumstances and may include electricity, gas, oil, coal, firewood, animal dung and so forth. It would also be useful to collect this information for collective living quarters as well, especially if the number of sets of collective living quarters in the country is significant. The classification of fuel used for cooking is as follows:
[Note: Consider setting the definition part of this paragraph as a shaded box]

1 Gas
2 Electricity
3 Liquefied petroleum gas (LPG)
4 Kerosene/paraffin (petroleum-based)
5 Oil (including vegetable oils used as fuel)
6 Coal
7 Firewood
8 Charcoal

9 Animal dung
10 Crop residues (for example, cereal straw from maize, wheat, paddy rice, rice hulls, coconut husks, groundnut shells)
11 Other

16. Lighting and/or electricity - type of (core topic)

Recommended tabulation: H12-R

2.498. Information should be collected on the type of lighting in the housing unit, such as electricity, gas, oil lamp and so forth. If the source of energy for lighting is electricity, some countries may wish to collect information showing whether the electricity mainly comes from a community supply, private generating plant or some other source (industrial plant, mine and so on). In addition to the type of lighting, countries may assess the information on the availability of electricity for purposes other than lighting (such as cooking, heating water, heating the premises and so forth). If housing conditions in the country allow this information to be derived from the type of lighting, there would be no need for additional inquiry.
[Note: Consider setting the definition part of this paragraph as a shaded box]

2.499. As noted above the unit of enumeration for this topic is the housing unit. However, some countries may find it useful to collect information on the availability of electricity for the use of occupants in collective living quarters. Such living quarters are usually equipped with multi-facilities for the use of large groups, and information on electricity would be significant in terms of analysing housing conditions. The availability of electricity in collective living quarters is defined as an additional topic. No classification is specifically recommended.

17. Heating - type and energy used for

2.500. This topic refers to the type of heating of housing units and the energy used for that purpose. The units of enumeration are all housing units. This topic may be less relevant for a number of countries where, owing to their geographical position and climate, there is no need to provide energy for heating.

2.501a. Type of heating refers to the kind of system used to provide heating for most of the space: it may be central heating serving all the sets of living quarters or serving a set of living quarters, or it may not be central in which case the heating will be provided separately within the living quarters by a stove, fireplace or some other heating body. As for the energy used for heating, it is closely related to the type of heating and refers to the predominant source of energy, such as solid fuels (coal, lignite and products of coal and lignite, wood), oils, gaseous fuels (natural or liquefied gas), electricity and so forth. No classification is specifically recommended.
[Note: Consider setting the definition part of this paragraph as a shaded box]

18. Hot water – availability of

2.501. This topic refers to the availability of hot water in housing units. Hot water denotes water heated to a certain temperature and conducted through pipes and tap to occupants. The information collected may indicate whether there is hot water available within the housing units, or outside the living quarters for exclusive or shared use, or not at all. No classification is specifically recommended.
[Note: Consider setting the definition part of this paragraph as a shaded box]

19. Piped gas – availability of

2.502. This topic refers to whether piped gas is available in the housing unit or not. Piped gas is usually defined as natural or manufactured gas that is distributed by pipeline and whose consumption is recorded. This topic may be irrelevant for a number of countries where there is either a lack of sources of natural gas or no developed pipeline system. No classification is specifically recommended.
[Note: Consider setting the definition part of this paragraph as a shaded box]

20. Use of housing unit

~~2.503.~~ **Use of housing unit** refers to whether the housing unit is being used wholly for habitation (residential) purposes or not. The housing unit can be used for habitation and for commercial, manufacturing or some other purposes. In a number of countries, houses are used simultaneously for more than one purpose. For example, the lower floor is used as a store or workshop, and the upper floors for habitation.

2.504a. The recommended classification of the use of the housing unit is as follows:

1 Used solely for habitation
2 Used for habitation and economic activity

21. Occupancy by one or more households (core topic)

Recommended tabulation: H14-R

2.504. For the definitions of "household", "household head" and "persons living in institutions", see paragraphs 2.107-2.132 and 1.454-1.455 in the current revision of the *Principles and Recommendations for Population and Housing Censuses.* [**Note: Move this paragraph to the end of the section to run on from paragraph 2.509]**

2.505. For the purpose of a housing census, each household must be identified separately. With respect to housing programmes, the use of the separate concepts of 'household' and 'living quarters' in carrying out housing censuses permits the identification of the persons or groups of persons in need of their own dwellings. If the household is defined as a group of persons occupying a set of living quarters, the number of households in the living quarters and the number of sets of occupied living quarters will always be equal and there will be no apparent housing need as reflected by the number of 'sharing' households that require their own living quarters. If living quarters are defined as the space occupied by a household, the number of households in living quarters will again be equal to the number of sets of living quarters, with the added disadvantage that there will be no record of the number of structurally separate living quarters.

2.506. Occupancy by more than one household is a useful topic for assessing the current housing situation and measuring the need for additional housing. For countries relying on the housekeeping concept (see paragraph 1.449), the number of households occupying a housing unit is needed to understand the extent of shared housing. For countries relying on the dwelling unit concept of households (see paragraph 1.450), the household is equivalent to the dwelling unit.

2.507. In countries where it is traditional to count families, the family in the broad sense of the term may be adopted as an additional unit of enumeration; in the great majority of cases the composition of this unit will coincide with that of the household.

2.508. A household and family should be defined in the same way for housing census purposes as for population censuses (see paragraphs 2.107-2.112 and 2.124-2.129).

22. Occupants - number of (core topic)

Recommended tabulations: H3-R and H6-R

2.509. Each person usually resident in a housing unit or in collective living quarters should be counted as an occupant. Therefore, the units of enumeration for this topic are living quarters. However, since housing censuses are usually carried out simultaneously with population censuses, the applicability of this definition depends upon whether the information collected and recorded for each person in the population census indicates where he or she was on the day of the census or whether it refers to the usual residence (see paras. 2.46-2.56). Care should be exercised in distinguishing persons occupying mobile units, such as boats, caravans and trailers, as living quarters from persons using these units as a means of transportation.

2.510a. Depending on their national requirements for information, some countries may wish to distinguish between those occupants that are usually resident and those that are not usually resident in the living quarters for the purposes of better understanding the housing conditions and living arrangements of non-residents.

23. Building - type of (core topic)

Recommended tabulation: H15-R

(a) Definition of building

2.510. A **building** is any independent free-standing structure comprising one or more rooms[1] or other spaces, covered by a roof and usually enclosed within external walls or dividing walls[2] that extend from the foundations to the roof. However, in tropical areas, a building may consist of a roof with supports only, that is to say, without constructed walls; in some cases, a roofless structure consisting of a space enclosed by walls may be considered a "building" (see also "compound" in para. 2.518).

2.511a. In defining a 'building', particular care should be given to differentiating this from 'type of living quarter' (see paragraph 2.412). Type of living quarter refers to structures that are designed for residential habitation or are being used for residential habitation. A building could be a number of living quarters, a commercial premises not meant, or being used, for habitation, or a mix of the two.

2.511. A building may be used or intended for residential, commercial or industrial purposes or for the provision of services. It may therefore be a factory, shop, detached dwelling, apartment building, warehouse, garage, barn and so forth. In some exceptional cases, facilities usually provided by a set of living quarters are located in two or more separate detached structures, as when a kitchen is in a separate structure. In the case of living quarters with detached rooms, these rooms should be considered separate buildings. A building may therefore contain several sets of living quarters, as is the case for an apartment building or duplex; it may be coextensive with ~~a~~ single detached ~~set of~~ living quarters; or it may be only part of the living quarters, as is the case, for example, for living quarters with detached rooms, which are clearly intended to be used as part of the living quarters.

2.512. The concept of a building should be clearly defined and, in a census with a field enumeration, the instructions should indicate whether all buildings are to be listed and enumerated or only those used in whole or in part for residential purposes. Instructions should also indicate whether buildings under construction are to be recorded and, if so, at what stage of completion they are to be considered eligible for inclusion. Buildings being demolished or awaiting demolition should normally be excluded.

(b) Classification of buildings by type

2.513. The following classification of buildings (or of living quarters) by type of building is recommended:

1.0 Residential buildings
- 1.1 Buildings containing a single housing unit
  - 1.1.1 Detached
  - 1.1.2 Attached
- 1.2 Buildings containing more than one housing unit
  - 2.2.1 Up to 2 floors
  - 2.2.2 From 3 to 4 floors
  - 2.2.3 From 5 to 10 floors

[1] For the definition of "room", see paragraph 2.472.

[2] The term "dividing walls" refers to the walls of adjoining buildings that have been so constructed as to be contiguous, for example, the dividing walls of "row" houses.

2.2.4 Eleven floors or more
1.3 Buildings for persons living in institutions
1.4 Other residential buildings
2.0 Non-residential buildings

~~2.514.~~ It should be noted that, for the purpose of the housing census, the above classification refers to the building in which the sets of enumerated living quarters are located and that usually it will be the living quarters, not buildings, that will be tabulated according to the classification.

2.515. Category 1 provides separate subgroupings for "detached" and "attached" buildings because, although most single-unit buildings (suburban homes, villas, and so forth) are detached, in some countries a substantial number may be attached (row houses, for example) and in such cases it may be useful to identify these separately. According to the definition of building in paragraph 2.511 above, a group of, for example, three row houses that are attached is considered to be three separate buildings if their "external walls or dividing walls" extend from "the foundations to the roof". Buildings containing more than one housing unit (category 2) will usually be apartment buildings, but they may also be other types of buildings, for example, buildings that are structurally subdivided so as to contain more than one housing unit. Buildings under the latter category should be subdivided into the following: up to two floors, from 3 to 10 floors and 11 floors or more. Category 3, "Buildings for persons living in institutions", includes hospital buildings, prisons, military establishments, and so on. On the other hand, a structurally separate housing unit (a house or apartment intended for the occupancy of staff of the institution) or one that is either within a building of the institution or detached but within the grounds, belongs in category 1; if the housing unit is coextensive with a building, it belongs in category 2.

2.516. In addition to the above, and for subsequent analysis of housing conditions, each country will find it useful to provide for separate identification of the special types of buildings that are characteristic of the country concerned. These can be classified as category 4.

[Note: There is already a separate topic – position of dwelling within the building - that refers to floor level, so it may be seen as superfluous to include floor level to classify buildings as well. More relevant perhaps, particularly as the topic is generally being used to classify dwellings, is to indicate size of building in terms of the number of dwellings. Such a classification along the following lines might be considered:

(1.0) Residential buildings
(1.1) Detached house (houses not attached to any other buildings)
(1.1.1) Detached houses with one dwelling
(1.1.2) Detached houses with two dwellings (with one above the other)
(1.2) Semi-detached house (two attached dwellings)
(1.3) Row (or terraced) house (at least three attached or connected dwellings each with separate access to the outside)
(1.4) Apartment buildings
(1.4.1) Apartment buildings with three to nine dwellings
(1.4.2) Apartment buildings with 10 or more dwellings
(1.5) Other residential buildings
(2.0) Non-residential buildings

See also the note at Topic 25 Dwellings in the building]

(c) Compound

2.517. In some countries, it may be appropriate to use the "compound" as a unit of enumeration. In some areas of the world, housing units are traditionally located within compounds, and the grouping of sets of housing units in this way has economic and social implications that need to be studied. A compound, in these circumstances, becomes a distinct unit of enumeration, on a par with a housing unit. For purposes of international comparability, a compound should be classified according to the main features and facilities it displays and classified with housing units.

24. Year or period of construction

2.518. This topic refers to the age of the building in which the living quarters are located. It is recommended that the exact year of construction be sought for buildings constructed during the decennial period immediately preceding the census. For buildings constructed before that time, the information should be collected in terms of periods that will provide a useful means of assessing the age of the housing stock. Difficulty may be experienced in collecting data on this topic in a field enumeration because in some cases the occupants may not know the date of construction. However, more accurate information is more likely to be available where countries use housing registers or other administrative data sources for the census.

2.519. The collection of data for single years during the most recent intercensal period is seen as a method of checking construction statistics for deficient coverage and of more closely integrating the housing census with current housing statistics.

2.520. Instead of collecting single years of construction, if this is seen to be too burdensome on the respondent, periods of construction should be collected. The periods could be defined in terms of events that have some special significance in the country concerned, particularly with regard to the effect on the condition of the housing stock; examples would be the period since the Second World War, the period between the First World War and the Second World War; the period before a major earthquake, flood or fire and so forth. Alternatively, the response ranges could be equal to intervals from one census to the next, such as ten or five year age groupings depending on the frequency of census collection. This allows for comparisons across the same periods and across censuses. Narrow periods of construction) are most important in the first few decades of a dwelling when the dwelling is undergoing changes, such as foundation setting or defects in dwelling systems such as electrical or plumbing reveal themselves. Then afterwards, the ranges could widen, but should be as homogeneous as possible to allow for cohort analysis. The total period covered by the age groups and the number of groups distinguished will depend upon the materials and methods of construction used in the country concerned and the number of years that buildings normally last.

2.521. Where parts of buildings have been constructed at different time, the year or period of construction should refer to the major part. Where living quarters comprise more than one building (living quarters with detached rooms, for example), the age of the building that contains the major part of the living quarters should be recorded.

2.522. In countries where a significant number of households construct their own living quarters (countries with large non-monetary sectors, for example), it may be useful to collect additional information that will distinguish the living quarters according to whether or not they were constructed by the household(s) occupying them. The information should refer only to living quarters constructed during the preceding intercensal or 10-year period, and it should be made clear in formulating the question that it refers to living quarters constructed mainly by households (with or without the help of other households in the community) and not to construction executed by enterprises on behalf of households.

25. Dwellings in the building – number of

2.523. This topic refers to the number of conventional dwellings in the building. This topic is applicable in cases where there is a possibility to have unique identifier for the building itself. If a census established such an identifier (building number, for example, linked to the address) then it would be possible to introduce this topic.
[Note: See the comments on Type of building. There is perhaps a case to consider combining these two topics, since the counting unit is dwellings in both cases.]

26. Position of dwelling in the building [Note: New topic]

2.524a. Some countries may want to collect information on the position of dwelling/housing unit in the building. This information can be used as an indicator of accessibility to dwellings, possibly in conjunction with information on the accessibility to the dwellings.

2.524b. The following classification of dwellings by position in the building is recommended:

(1.0) Dwelling on one floor only

(1.1) Dwelling below the ground floor

(1.2) Dwelling on the ground floor of the building
(1.3) Dwelling on the 1st or 2nd floor of the building
(1.4) Dwelling on the 3rd or 4th floor of the building
(1.5) Dwelling on the 5th floor of the building or higher

(2.0) Dwellings on two or more floors

(2.1) Dwelling on the ground floor of the building or below ground level
(2.2) Dwelling on the 1st or 2nd floor of the building
(2.3) Dwelling on the 3rd or 4th floor of the building
(2.4) Dwelling on the 5th floor of the building or higher

2.524c. For dwellings on two or more floors, information should be provided with reference to the lowest floor level of the dwelling.

27. Accessibility to dwelling [Note: New topic]

2.524d. The following classification of accessibility to the front door of the dwelling/housing unit is recommended, based on the presence of ramps, steps, and lifts:

(1.0) Access with no steps or ramp

(2.0) Access by ramp
(3.0) Access by disabled stair lift
(4.0) Access using lift only (though the building may have staircases as well)
(5.0) Access by using only steps
(6.0) Access only by using both lift and steps

Note: these categories are not mutually exclusive.

28. Construction material of outer walls (core topic)

Recommended tabulations: H15-R and H16-R

2.524. This topic refers to the construction material of external (outer) walls of the building in which the living quarters are located. If the walls are constructed of more than one type of material, the predominant type of material should be reported. The types of materials distinguished will depend upon the materials most frequently used in the country concerned and on their significance from the point of view of permanency of construction or assessment of durability. The following classification of construction materials is recommended:

(1.0) Burnt clay (bricks, blocks, panels), stone, concrete
(2.0) Unburnt clay, mud, earth
(3.0) Wood
(4.0) Bamboo
(5.0) Corrugated sheets
(6.0) Prefabricated units
(7.0) Other materials

2.525. In some countries, the material used for the construction of roofs or of floors may be of special significance for the assessment of durability and, in such cases, it may be necessary to collect information on this as well as on the material of the walls. Durability refers to the period of time for which the structure remains habitable, subject to regular maintenance. A durable structure is one expected to remain sound for a considerable period of time. Countries may wish to define the length of the period, for example, 15 or 20 years. Durability does not depend solely on the materials used in construction, since it is also affected by the way the building was erected, that is to say, whether it was built according to construction standards and regulations. Technological developments in treating traditional building materials, such as bamboo, have extended the durability of those materials for several decades. Construction material of outer walls may be considered an indicator of the building's durability. Therefore, in order to assess quality of the national housing stock, durability may be measured in terms of material used together with adherence to construction standards. Specific instructions for enumerators at the national level should be developed on the basis of national building construction practice.

2.526. While the material of construction is a useful addition to data collected on the type of living quarters, it should not be considered a substitute for the latter topic. Wood, for example, may be the material of both a poorly constructed squatter's hut and a durable and well-constructed dwelling. In these cases, information on the type of living quarters adds significantly value of the census in assessing the quality of a country's housing stock.

29. Construction material of floor and roof

In some cases the material used for the construction of roofs and floors may be of special interest and can be used to further assess the quality of dwellings. This topic refers to the material used for roof and/or floor (although, depending on the specific needs of a country, it may also refer to other parts of the building in which the housing unit is located, such as the frame or the foundation). Information on the predominant material only should be collected. The following classification of construction materials is recommended:

(1.0) Tile
(2.0) Concrete
(3.0) Metal sheeting
(4.0) Wood
(5.0) Bamboo
(6.0) Palm, straw
(7.0) Mud
(8.0) Plastic sheeting
(9.0) Other materials

30. Elevator – availability of

2.527. This topic refers to the availability of an elevator (or lift) in a multi-storey building (categories 2.2.3 to 2.2.4 of the classification of type of buildings). It is recommended that the information should be collected on the availability of an elevator that is operational for most of the time, subject to regular maintenance.

2.528. This topic can be useful for providing further information for indicating the accessibility to the building or the housing unit. This is of particular relevance for older persons and people with disabilities. In this context it could also be useful to collect information on the size of the lift (for the handicapped persons and ambulance transport), if the lift goes to the ground floor, and whether or not the lift stops on the same floor as the dwelling.

31. Farm building

2.529. Some national censuses may collect information to identify if a buildings or dwelling is located on a farm. A farm building may be considered as being one that is part of an agricultural holding whether it is residential or not, that is whether it is used for agricultural and/or housing purposes. All the information that is relevant to other buildings and dwellings should also be collected.

32. State of repair

2.530. This topic refers to whether the housing unit or the building in which the housing unit is located is in need of repair and to the kind of repair needed. The following classification is recommended:

(1.0) Repair not needed,
(2.0) In need of repair
  (2.1) Minor repair
  (2.2) Moderate repair
  (2.3) Serious repair
(3.0) Irreparable

2.532. Minor repairs refer mostly to the regular maintenance of the building and its components, such as repair of a cracked window. Moderate repairs refer to the correcting of moderate defects such as missing gutters on the roof, large areas of broken plaster, stairways with no secure handrails and so forth. Serious repairs are needed in the case of serious structural defects of the building, such as missing shingles or tiles on the roof, cracks and holes in the exterior walls, missing stairways and so forth. The term "irreparable" refers to buildings that are beyond repair, that is to say, with so many serious structural defects that it is deemed more appropriate to demolish the buildings than to undertake repairs; most usually this term is used for buildings with only the frame left standing, without complete external walls and/or roof and so forth.

33. Age and sex of the reference person of household (core topic)

Recommended tabulation: H17-R

2.531. From among the topics recommended for inclusion in the population census, age has been selected as being of most significance in relation to housing conditions. For the housing census, the data usually relate only to the housing units or building in which the housing units are located, but some characteristics of households that are related the housing condition can usefully be presented by the age and sex of household head or other reference person in the household.

2.532. While this information will usually be collected in a country's population censuses (see paragraph 2.xxx) and, if the population and housing censuses are conducted simultaneously, as is the practice in the majority countries, then information on age of the head or other reference member of the household will be collected together with other relevant demographic characteristics in the population part of the census. If, however, the housing census is collected independently of the population census, then there should be a provision for collecting this information.

34. Tenure (core topic)

Recommended tabulation: H18-R

2.533. Tenure refers to the arrangements under which the household occupies all or part of a housing unit. The unit of enumeration is a household occupying a housing unit. The classification of households by tenure is as follows:

1 Household owns housing unit
2 Household rents all or a part of housing unit
  2.1 As a main tenant
  2.2 As a subtenant
3 Household occupies housing unit partly free of rent
4 Household occupies housing unit wholly free of rent
5 Household occupies housing unit under some other arrangement

2.534. National circumstances can dictate the need to assess the number of households occupying the housing unit free of rent to further distinguish whether such arrangement is with or without the consent of the owner. However,

this information regarding the consent of the owner is subject to special scrutiny in terms of reliability. Furthermore, in countries where communal ownership is significantly represented, this topic on tenure might be further expanded in order to capture tenure arrangements of communally owned housing. Likewise, the category "Other arrangements" can be extended to capture forms of tenure specific to some countries.

2.535. The information on tenure collected in the census needs to be clearly distinguished from the information on ownership (see paragraphs 2.467-2.471) and is one that should ~~to~~ be asked of all households, otherwise there is a danger that it may be omitted in cases where more than one household occupies a single housing unit. Under some circumstances, it may be useful to indicate separately households that, although not subtenants in the sense that they rent from another occupant who is a main tenant or owner-occupant, rent part of a housing unit from a landlord who lives elsewhere. These households and subtenant households may be of special significance in formulating housing programmes. On the contrary, in countries where subtenancy is not usual, information on subtenants may not be collected in the census or, if collected, may be tabulated only for selected areas.

2.536. In countries where the land and the living quarters are frequently occupied under separate tenure, the topic may be expanded to show separate information for the tenure under which the household or households occupy the living quarters and for the tenure of the land upon which those living quarters are located.

35. Rental and housing costs

2.537. Rent is the amount paid periodically (weekly, monthly, and so forth) for the space occupied by a household. Information may be obtained on the basis of a scale of rents rather than on that of the exact amount paid. The data may be considered in relation either to household characteristics or to the characteristics of the living quarters. In the latter case, where more than one household occupies a single set of living quarters, the rents paid by all the households will need to be summed in order to obtain the total rent for the living quarters. In the case of living quarters that are partly rented and partly owner-occupied, it may be necessary to impute the rent for the owner-occupied portion.

2.540a. In countries where rent for the housing unit is paid separately from rent for the land upon which the housing unit stands, separate information may need to be collected reflecting the amount of ground rent paid.

2.538. In addition to the amount of rent paid by renting households, it may be useful to collect information on the housing costs which could include information on monthly mortgage payments (for owner-occupiers), taxes, cost of utilities and so forth.

36. Furnished/unfurnished

2.539. Countries may wish to make some provision for indicating whether the housing units covered by the rent are furnished or unfurnished and whether utilities such as gas, electricity, heat, water and so forth are included.

37. Information and communication technology devices – availability of (core topic)

Recommended tabulation: H19-R

2.540. The importance of availability of information communication technology (ICT) devices is increasing significantly in contemporary society. These devices provide a set of services that are ever changing the structure and pattern of major social and economic phenomena. The census provides an opportunity to assess the availability of these devices to the household. The choice of topics should be sufficient for understanding the place of ICTs in the household, as well as for use for planning purposes by government and private sector to enable wider and improved delivery of services, and to assess their impact on the society. The recommended classification is:

1. Household having a radio
2. Household having a television set

3. Household having a fixed-line telephone
4. Household having one or more mobile cellular telephones
5. Household having a personal computer~~(s)~~
6. Household accessing the Internet from home
   6.1 Landline connection
   6.2 Mobile connection
7. Household accessing the Internet from elsewhere other than home
8. Household without any access to the Internet

2.541. Availability of ICT devices in the household is a very relevant topic for inclusion in a modern census. For instance, a category on the "Internet and personal computers (PCs)" would be concerned with determining the status of access to the Internet and PCs by households for a country, in relation to other socio-economic or geographic classificatory variables, while a category on "access path and devices" would be concerned with determining the households with the means for electronic communication (fixed-line and mobile cellular telephones) and the equipment that provides the interface between the user and the network (PCs), in relation to other socio-economic or geographic classificatory variables.

2.542. In designing the questions, census planners should differentiate between two distinct viewpoints, namely (a) the availability of ICTs to the households, and (b) access to, and use of, ICTs by the household members. The distinction is important, since households need not own, but may still have access to personal computers and the Internet through school/university, public access centres, and/or other households. It also means that countries interested in collecting information on ICT use, particularly of the Internet, would need to include a relevant question topic in their census individual form. The rational for adopting either viewpoint, or even a combination of both, is not necessarily only technical, but rests more on the prevailing conditions in the society, and/or on how the information will be used to characterize the socio-economic profile of households of a country. Usage statistics, including the intensity (frequency) of use and the range of activities performed, are preferably obtained using household surveys.

2.543. Radio and television are the most widespread ICTs in the world. They are also the reliable and useful ICTs for many parts of the world where modern, Internet-based ICTs are not affordable, or not yet available. In hindsight, radio and television are the narrowband and broadband ICTs of old. Few countries collect the number of radio and television sets, and thus most data are estimates. A radio set is a device capable of receiving broadcast radio signals, using popular frequencies in the FM, AM, LW and SW ranges. A radio set may be a standalone device, or it may be integrated into other electronic units including portable. A television set is a device capable of receiving broadcast television signals, using popular access means such as over-the-air, cable and satellite. A television set is also typically a standalone device, but it may also be integrated into some other device, such as a computer or a mobile device.

2.544. Fixed-line telephones refer to telephone lines, typically copper wires, which connect a customer's terminal equipment, for example, a telephone set or facsimile machine, to a public switched telephone network (PSTN), and have a dedicated port on a telephone exchange. Although fixed telephone lines have now been surpassed by mobile telephony globally, they are still an important affordable communication medium. Furthermore, they provide a basis for Internet access in most economies, whether through dial-up, Integrated Services Digital Networks (ISDNs), or Digital Subscriber Line (DSL) services.

2.545. Mobile cellular telephones have become the predominant method of communications in many countries. Indicators related to mobile telephony are therefore fundamental indicators of the information society. Mobile cellular telephones refer to portable telephones using cellular technology that provides access to PSTN. Mobile cellular subscribers refer to users of such telephones with either post-paid subscriptions or pre-paid accounts.

2.546. The personal computer (PC) is a generic term that refers to any computer designed primarily for use by one person at a time at home, office, or school. PCs, whether desktops, laptops or notebooks, comprise any combination of processors, input/output devices, storage drives and network interface cards; are run by a variety of operating systems; and may be connected to other PCs or to the Internet. They exclude terminals connected to mainframe computers for data processing, and midrange multi-user systems that are primarily intended for shared use. Devices such as handheld personal digital assistants (PDAs) and smart telephones are usually not considered PCs, as they

have only some, but not all, of the components of the PC, such as, for instance, standard keyboard and large screen. Internet-enabled telephones, which essentially perform a similar service as the PC but for mobile networks, are also not considered PCs.

2.547. Internet access from home refers to the ability of the household to connect to the public Internet using TCP/IP protocols. Internet connections may be classified according to the technology employed, devices used, communication medium, and/or connection bandwidth (speed). Internet access at home is meant to include both narrowband and broadband connections. Broadband may be defined loosely as transmission capacity with sufficient bandwidth to permit combined provision of voice, data and video. The International Telecommunication Union has set a lower limit of broadband access at 256 Kbit/sec, as the sum of the connection uploading and downloading capacities. Broadband is implemented mainly through xDSL, cable, (wireless) local area network ([W]LAN), satellite broadband Internet, or fibre-to-the-home Internet access. Narrowband access is typically carried out through dial-up modems, ISDNs, and most second-generation (2G) mobile cellular telephones. Access to the Internet is measured irrespective of the type of access, device used to access the Internet, or the method of payment.

38. Cars – number of available

2.548. This topic refers to the number of cars or vans normally available for use by members of the household. The term "normally available" refers to cars and vans that are either owned by occupants or are under some other more or less permanent agreement, such as a lease, and includes those provided by an employer if available for use by the household, but excludes vans used solely for carrying goods or other commercial purposes.

39. Durable household appliances – availability of

2.549. The unit of enumeration is a household occupying a housing unit and information may be collected on the availability, within the housing unit, of durable appliances such as washing machines, dishwashing machines, refrigerators, deep freezes, microwave cookers, and so forth, depending on national circumstances.

40. Outdoor space – access to

2.550. This topic refers to the reasonable access to an outdoor space intended for the recreational activities of the members of a household occupying a housing unit. The classification can refer to the outdoor space available as part of a housing unit (for example, a garden or backyard), the outdoor space available adjacent to the building (for example, playgrounds placed next to the apartment building), the outdoor space available as part of common recreational areas within a walkable distance from the housing unit (for example, parks, lakes, sports centres and similar sites) or outdoor space not available within a 10-minute walk.

Part III – Census Products and Data Utilization

VIII. Census products and services

A. Introduction

3.1 The demand and use of statistical products and services must drive all census operations. Consequently, census should not be an end in itself but be backed by the value of the results, in terms of utilization, by the diverse categories of data users. Promoting utilization of census results calls for a sound strategy for developing suitable products and services to respond to the diverse needs of data users. Such strategies should be based on an active dialogue with the users regarding their needs in terms of products and the format of those products (see also para. xxx on census communication activities: use consultations, census publicity and promotion of census products).

3.2. The fundamental paradigm shift in the 2020 Round of Population and Housing Censuses is the utilisation of statistics *for transparency*, mutual accountability and governance, *results*-based management *and transformation*. The role of statistical leadership is to anticipate and define measurement of policy questions. The increased use of statistics by government, business and the citizens at large will drive different and better results and thereby succeed in mobilizing society for change.

3.3. The population and housing census represents one of the pillars for the data collection on the number and characteristics of the population of a country. The population and housing census is part of an integrated national statistical system, which may include other censuses (for example, agriculture), surveys, registers and administrative files. It provides at regular intervals the benchmark for the population counting at national and local levels. For small geographical areas or sub-population it may represent the only source of information for certain social, demographic and economic characteristics. For many countries the census also provides a unique source for a solid framework to develop sampling frames.

3.4. Timely and quality census data are indispensable for informed decision-making, development planning and better implementation outcomes. Specifically, census data are instrumental in understanding development challenges and the appropriate actions for influencing and informing change in relation to socio-economic progress and environmental phenomena. Census data must therefore be transformed into usable format to respond to the needs of stakeholders.

3.5. It is important for census offices to consult stakeholders and identify their needs during the preparatory phase to pro-actively anticipate the type and format of census products to be produced. This is to ensure that census products are relevant, responsive and add value to the current policy questions and stakeholders needs. It is recommended that census offices include a census products plan and budget as part of the preparatory phase.

Anticipate user needs and provide support

3.6. With the rapid development of technology, census data users have an increasing interest in a broad range of products and services from the census organization. The types of output that census offices may produce and disseminate must be current and may include printed products, static electronic products, interactive electronic products, customised products, user interactive products and special audience products and services. (see paras. 1.206-1.209). Partnerships with key stakeholders are encouraged in the development of the various census products. ,

Embed use through consultation, training and user support

3.4. Some data users will need specialized products that the census organization is not planning to produce as part of the general census programme. , It is recommended that the census organization establish a

Create systems and infrastructure for access and use of census results

service to meet such specialized requests. Pricing of special products and services may be included in a pricing policy.

3.5. In the development of census products, two cautionary notes are important to keep in mind. First, certain cross-tabulations may be of questionable value from a substantive viewpoint because of response or processing errors or because of processing or imputation procedures. The census authorities have to establish procedures for warning potential users about such problems to help safeguard the credibility of the entire census. Some census organizations refuse to permit the release of certain cross-tabulations for reasons related to substantive quality, although such a policy may alienate users. Other organizations will release such cross-tabulations only where there is a clear policy that takes into account both substantive and technical considerations. Second, some detailed cross-tabulations and all files with individual records potentially pose problems in respect of disclosing information about identifiable individual respondents in violation of the rules on census confidentiality. This issue is more fully discussed in part one (see paras. 1.376-1.377). Both the substantive quality and confidentiality issues need to be addressed and appropriate safeguards established. On the other hand, neither issue should pose any problem with respect to the dissemination of a wide range of census products.,

3.6 In order to ensure the harmonisation and comparability of census data with other data sets, it is recommended that census products must be accompanied with metadata. Metadata will promote transparency and credibility of census results.

B. Publication of census results

1. Release of results

Provisional results

3.7. Some countries release provisional results very soon after enumeration is completed. Subject to change once the full data-processing and verification operations have been completed, they nevertheless provide a general picture of population trends. Data users should be made aware of possible differences between the provisional and final results. Implications of using provisional population counts must be outlined. It is recommended that quality assurance processes be put in place to minimise variances between the provisional and final results. The schedule and description of upcoming releases of final results and products should be made public early in the process to maintain interest by the public in the census (see also release calendar, paras. xxxx). The releases can be staggered, from simple, descriptive one-page summary fact sheets covering a country's major geographical divisions initially, to more comprehensive tabulations and descriptive reports later on.

Final results

3.8 The final census results must be published as soon as possible. Countries may aim to publish the basic/essential results within one year of enumeration. The use of technology may reduce the time between the release of the provisional and final results which may over time render provisional results obsolete. The dissemination of the final census results must be part of a comprehensive dissemination strategy and plan.

Recommendation: Dissemination phase must be included between census products and utilisation

2. Tabulations

3.8. Every effort should be made to publish the principal results of a population census (such as those on age, sex and geographical distribution of the population) and of a housing census (such as a geographical distribution of sets of living quarters, households and population by type of living quarters) as soon as possible after the enumeration, otherwise their usefulness and the extent of their interest to the public will be diminished. With the tehcnological advancements, the time required for processing and tabulating results have been greatly reduced. As a result, collection restrictions, in terms of cost and accuracy of the data, have a greater relative weight in determining

the number and complexity of the tabulations that can be produced and disseminated. Tabulation plan must respond to user needs (Paragraph 1.206)

3.9. The population and housing census tabulations shown below and illustrated at http://www....are intended to provide, in published form, the most important census information needed as a basis for programmes of economic and social development and to be used for research purposes. They do not in any way represent all of the tabulations that a given country may publish and certainly not all of the tabulations that may eventually be prepared for special purposes. The tabulations do not take into account the form in which information may be entered into a database, which may be more detailed than that required for these illustrative census tabulations.

3.11. A major goal of these recommendations is to provide a set of tabulations that need to be produced at the lowest geographical level pertaining to the same point in time so that a country or area is able to meet its data needs for evidence-based socio-economic development planning and monitoring. While the majority of national statistical authorities use a population and housing census as the single most comprehensive vehicle to collect these necessary statistics, others use sample surveys, registers of population and vital events, and other administrative sources or a combination of these methods to derive them.

3.12. Three categories of tabulations are described below: (a) basic/essential, (b) recommended, and (c) optimum tabulations.

(a) Basic/essential tabulations

3.13. These are tabulations that are deemed of top priority for production by countries. They are also regarded as essential for countries in difficult circumstances, such as those that have emerged from a conflict or those that have not carried out a census in a long time, in terms of providing minimum statistics to meet their basic data needs.

3.14. There are 20 basic/essential tabulations on population and 7 on housing characteristics. They are marked with an asterisk in the list below.

(b) Recommended tabulations

3.15. Recommended tabulations are those that are considered adequate for meeting the essential data needs for evidence-based planning, monitoring and implementation of national policies because of their perceived relevance at both the national and the international levels. These tabulations are also designed with the potential for producing statistics at the lowest geographical level and are expected to be produced by each country at least once in the census decade.

3.16. The recommended set of tabulations also includes the basic/essential tabulations discussed above and includes 33 tabulations on population and 19 on housing characteristics. Schematic presentations of all tabulations are presented on-line at http://www.xxxxxxx

3.17. Associated with the recommended tabulations are the core topics that go into their production. Core topics are therefore the main variables for the recommended tabulations. There are 31 core topics on population with 25 of them direct topics and 6 indirect (for a more detailed discussion of direct and indirect topics, see para. 2.14).

3.18. As stated in paragraph 2.1, the aim of the recommended tabulations is to permit national and international comparability of data due to use of common concepts and definitions of the core topics. For each of the recommended tabulations, the core topics that it represents are listed as part of the metadata. Other metadata that are presented for each of the recommended tabulations include: (a) the source of statistics, that is to say, whether from a (i) traditional census, (ii) register-based census, (iii) survey, or (iv) rolling survey; (b) the type of population count, that is to say, whether a de jure or de facto population or a combination of these; and (c) the definition of urban and rural areas used.

(c) Optimum tabulations

3.19. The optimum set of tabulations includes the basic/essential and the recommended tabulations discussed above, as well as additional tabulations, and is designed to meet the needs of most of the users at the national and the international levels. This set can be viewed as being equivalent to the complete set of tabulations that could be generated from a population and housing census.

List of recommended tabulations for population censuses[1],[2]

Group 1. Tabulations on geographical and internal migration characteristics

P1.1-R Total population and population of major and minor civil divisions, by urban/rural distribution and by sex*
P1.2-R Population by size-class of locality and by sex*
P1.3-R Population of principal localities and of their urban agglomerations, by sex
P1.4-R Native and foreign-born population, by age and sex*
P1.5-R Population, by duration of residence in locality and major civil division, age and sex*
P 1.6a-R Population by place of usual residence, duration of residence, place of previous residence and sex
P.1.6b-R Population … years of age and over, by place of usual residence, place of residence at a specified date in the past, age and sex

Group 2. Tabulations on international migration and immigrant stock

P2.1-R Foreign-born population, by country of birth, age and sex
P2.2-R Foreign-born population, by year or period of arrival, country of birth, age and sex*
P2.3-R Population, by country of birth and citizenship, age and sex
P2.4-R Economically active foreign-born population ... years of age and over, by year or period of arrival, main occupation and sex

Group 3. Tabulations on household characteristics

P3.1-R Population in households, by relationship to head or other reference member of household, marital status and sex, and size of institutional population
P3.2-R Head or other reference member of household, by age and sex; and other household members, by age and relationship to head or other reference member*
P3.3-R Households, population in households and number of family nuclei, by size of household*

Group 4. Tabulations on demographic and social characteristics

P4.1-R Population, by single years of age and sex*
P4.2-R Population, by marital status, age and sex*

Group 5. Tabulation on fertility and mortality

P5.1-R Female population 10 years of age and over, by age and number of children ever born alive by sex*
P5.2-R Female population 10 years of age and over, by age and number of children living (or dead) by sex*
P5.3-R Female population ... to 49 years of age, by age, number of live births, by sex within the 12 months preceding the census, and deaths among these live births, by sex
P5.4-R Household deaths, by sex and age within the 12 months preceding the census; and total population, by age and sex

Group 6. Tabulations on educational characteristics

P6.1-R Population ... years of age and over by school attendance, educational attainment, age and sex*

[1] Recommended tabulations are identified by an "R" as part of the table number.
[2] An asterisk (*) represents a basic/essential tabulation.

P6.2-R Population 5 to 29 years of age, by school attendance, single years of age and sex*
P6.3-R Population 10 years of age and over, by literacy, age and sex

Group 7. Tabulations on economic characteristics

P7.1-R Population ... years of age and over, by current (or usual) activity status, educational attainment, age and sex*
P7.2-R Currently (or usually) active population by activity status, main occupation, age and sex*
P7.3-R Currently (or usually) active population by activity status, main industry, age and sex*
P7.4-R Currently (or usually) active population by activity status, main status in employment, age and sex*
P7.5-R Currently (or usually) active population by activity status, main status in employment, main industry and sex
P7.6-R Currently (or usually) active population by activity status, main status in employment, main occupation and sex
P7.7-R Currently (or usually) active population by activity status, main industry, main occupation and sex*
P7.8-R Population not currently (or usually) active, by functional category, age and sex* **[Note: to be changed]**

Group 8. Tabulations on disability characteristics

P8.1-R Population with and without disabilities by age and sex*
P 8.2-R Population 5 years of age and over, by disability status, educational attainment, age and sex
P 8.3-R Population 15 years and over, by disability status, current (or usual) activity status, age and sex

Group 9. Tabulations on housing characteristics

H1-R Persons, by broad types of living quarters and number of roofless*
H2-R Persons in collective living quarters by type
H3-R Households in occupied housing units, by type of housing unit*
H4-R Conventional dwellings by occupancy status
H5-R Occupied housing units, by type of housing unit, cross-classified by type of ownership of the housing units
H6-R Housing units, by number of rooms, cross-classified by type of housing unit and number of occupants per housing unit
H7-R Occupied housing units, by type of housing unit, cross-classified by water supply system*
H8-R Occupied housing units, by type of housing unit, cross-classified by main source of drinking water*
H9-R Occupied housing units, by type of housing unit, cross-classified by type of toilet and type of sewage disposal*
H10-R Occupied housing units, by type of housing unit, cross-classified by type of bathing facilities
H11-R Occupied housing units, by type of housing unit, cross-classified by availability of kitchen and fuel used for cooking
H12-R Occupied housing units, by type of housing unit, cross-classified by type of lighting and/or use of electricity
H13-R Occupied housing units, by type of housing unit, cross-classified by main type of solid waste disposal
H14-R Households in housing units, by type of housing unit occupied, cross-classified by number of households per housing unit
H15-R Conventional dwellings by type of building, and construction material of outer walls
H16-R Housing units by type and construction material of outer walls
H17-R Households, by type of living quarters, cross-classified by sex and age of head or other reference member of household*
H18-R Households in housing units, by type of housing unit, cross-classified by tenure of household and, for tenant households, ownership of housing unit occupied*
H19-R Households in housing units, by type of housing unit, cross-classified by information and communication technology devices and access to Internet

Ensure that methods are known and understood through the provision of metadata with results

List of additional tabulations for population censuses

Group 1. Tabulations dealing with geographical and internal migration characteristics

P1.1-A Native population, by major civil division of birth, age and sex

Group 2. Tabulations dealing with international migration and immigrant stock

P2.1-A Foreign-born population, by marital status, age and sex
P2.2-A Foreign-born population ... years of age and over, by current (or usual) activity status, age and sex
P2.3-A Foreign-born population ... years of age and over, by educational attainment, age and sex

Group 3. Tabulations dealing with household characteristics

P3.1-A Population in households, by household status, age and sex, and institutional population by age and sex
P3.2-A Households and population in households, by size and type of household
P3.3-A Multi-person households and population in such households, by type and size of household
P3.4-A Households and population in households, by size of household and number of members under ... years of age
P3.5-A Household population under 18 years of age, by age and sex and by whether living with both parents, mother alone, father alone, or neither parent
P3.6-A Households and population in households, by sex, by size and type of household and number of persons 60 years of age and over

Group 4. Tabulations dealing with demographic and social characteristics

P4.1-A Population, by religion, age and sex
P4.2-A Population, by language (mother tongue, usual language or ability to speak one or more languages), age and sex
P4.3-A Population, by ethnic group, age and sex

Group 5. Tabulations dealing with fertility and mortality

P5.1-A Female population 10 years of age and over in their first marriage/union or married only once, by five-year duration of marriage/union group and number of children ever born alive by sex
P5.2-A Female population, by age at first birth, by current age and place of residence
P5.3-A Median age at first birth, by current age of women, place of residence and educational attainment
P5.4-A Mothers 10 years of age and over with at least one child under 15 years of age living in the same household, by age of mother and by sex and age of children
P5.5-A Female population ... to 49 years of age, by age, number of live births by sex within the 12 months preceding the census and educational attainment
P5.6-A Population with mother alive (or dead), by age

Group 6. Tabulations dealing with educational characteristics

P6.1-A Population that has successfully completed a course of study at the third level of education, by educational qualifications, age and sex
P6.2-A Population 15 years of age and over, by field of education, age and sex

Group 7. Tabulations dealing with economic characteristics

P7.1-A Currently (or usually) active population, by activity status, main status in employment, place of work, main occupation and sex
P7.2-A Currently (or usually) active population, by activity status, institutional sector of employment, main industry and sex

P7.3-A Currently (or usually) active population, by activity status, main occupation, educational attainment, age and sex

P7.4-A Currently (or usually) active population, by activity status, main industry, educational attainment, age and sex

P7.5-A Usually active population, by activity status, sex, main status in employment and number of weeks worked in all occupations during the last year

P7.6-A Currently active population, by activity status, sex, main status in employment and number of hours worked in all occupations during the last week

P7.7-A Currently (or usually) active population, by activity status, main occupation, marital status, age and sex

P7.8-A Currently (or usually) active population, by activity status, main status in employment, marital status, age and sex

P7.9-A Currently (or usually) active population in the informal sector, by activity status, main status in employment, place of work, main occupation and sex

P7.10-A Usually active population, by monthly or annual income, occupation and sex

P7.11-A Households and population in households, by annual income and size of household

P7.12-A Population not currently active (in other words, not in the labour force), by primary reason for inactivity, age and sex

P7.13-A Heads or other reference members of households ... years of age and over, by economic activity status, age and sex

P7.14-A Households and population in households, by size of household and number of currently (or usually) active members

P7.15-A Households, by size, number of currently (or usually) unemployed members and dependent children under 15 years of age in household

P7.16-A Currently (or usually) active heads or other reference members of households ... years of age and over, by activity status, main status in employment, main industry and sex

Group 8. Tabulations dealing with disability characteristics

P8.1-A Total population by disability status, whether living in household or institution, age and sex

P8.2-A Households with one or more persons with disabilities and size of household

P8.3-A Total population 15 of age years and over, by disability status, marital status, age and sex

P8.4-A Population 5 to 29 years of age, by disability status, school attendance, age and sex

List of additional tabulations for housing censuses

H1-A Households in occupied housing units, by type of housing unit, cross-classified by type of household
H2-A Households in collective living quarters, by type of living quarters
H3-A Family nuclei, by broad types of living quarters and number of roofless family nuclei
H4-A Family nuclei in housing units, by type of housing unit occupied, cross-classified by number of family nuclei per housing unit
H5-A Households, by type of housing unit, cross-classified by activity status, occupation and sex of head or other reference member of household
H6-A Homeless households, by age and sex of head or other reference member of household
H7-A Vacant housing units, by type of vacancy
H8-A Buildings, by year (or period) of construction of building (in which dwelling is located), cross-classified by type of building and construction material of outer walls
H9-A Housing units, by number of dwellings in the building
H10-A Households in housing units, by type of housing unit occupied, cross-classified by number of households and number of rooms per housing unit
H11-A Households in occupied housing units, by type of housing unit, cross-classified by type of ownership of the housing units
H12-A Households in occupied housing units, by type of housing unit, cross-classified by type of bathing facilities
H13-A Occupants of housing units, by type of housing unit, cross-classified by type of bathing facilities
H14-A Households in occupied housing units, by type of housing unit, cross-classified by availability of kitchen and fuel used for cooking
H15-A Occupants of housing units, by type of housing unit, cross-classified by availability of kitchen and fuel used for cooking
H16-A Households in occupied housing units, by type of housing unit, cross-classified by water supply system
H17-A Occupants of housing units, by type of housing unit, cross-classified by water supply system
H18-A Households in occupied housing units, by type of housing unit, cross-classified by main source of drinking water supply
H19-A Occupants of housing units, by type of housing unit, cross-classified by main source of drinking water
H20-A Housing units, by type of housing unit occupied, cross-classified by type of toilet
H21-A Occupants of housing units, by type of housing unit, cross-classified by type of toilet and type of sewage disposal
H22-A Households in housing units, by type of housing unit, cross-classified by type of owner of the housing unit, availability of piped water and availability of toilet facilities
H23-A Households in occupied housing units, by type of housing unit, cross-classified by type of lighting and/or use of electricity
H24-A Occupants of housing units, by type of housing unit, cross-classified by type of lighting and/or use of electricity
H25-A Households in occupied housing units, by type of housing unit, cross-classified by type of solid waste disposal
H26-A Occupants of housing units, by type of housing unit, cross-classified by type of solid waste disposal
H27-A Renting households in housing units, by rent paid, cross-classified by type of owner of the housing unit, whether space occupied is furnished or unfurnished and tenure of the household
H28-A Renting households, classified by whether space occupied is furnished or unfurnished, and amount of rent paid monthly by the household, cross-classified by type of housing unit and number of households in housing unit
H29-A Rented housing units, classified by whether space occupied is furnished or unfurnished, and amount of rent paid monthly for the housing unit, cross-classified by type of housing unit and number of rooms
H30-A Rented housing units, classified by whether space occupied is furnished or unfurnished, and amount of rent paid monthly for the housing unit, cross-classified by type of housing unit, water supply system and toilet facilities
H31-A Occupied housing units, by type, cross-classified by available floor area and number of occupants

3.20. In order to avoid producing census tabulations that are overly voluminous or that contain a large number of empty cells, some countries may find it necessary to employ a more restricted geographical classification than that suggested in the illustrations. For example, basic facilities such as piped water or electricity may be almost completely lacking for large areas of some countries. Under these circumstances, tabulation of the relevant data for small geographical areas would not be appropriate. The geographical classification to be utilized needs to be carefully considered, taking into account the type of information being tabulated, its probable frequency distribution and the uses to which the data are likely to be put. Privacy and confidentiality of individuals and households must at all times be protected (paras 3.36, 3.51, 3.81).

3.21. Some countries may also collect data on additional topics in the census questionnaire to address specific concerns. For example, whether or not the birth of an individual is registered, the age a woman first marries, or vocational and technical skills. In other cases, detailed tabulations for special population may be required for use in planning or evaluation of programmes. Tabulations for the non-core topics may be done after the basic tabulations are completed. Consultations with user groups both at the national and at the local levels may be helpful in determining the most suitable tabulation plan and method of dissemination.

3. Thematic statistical or analytical reports

3.23. Many countries prepare different types of thematic or analytical reports. These reports must be planned and scheduled during the preparatory phase and published according to the release calendar in order to avoid out-dated reports. The reports may range from volumes presenting extensive and detailed statistical tabulations, particularly cross-tabulations, to more analytical reports that combine tabular materials with some interpretative or analytical text. This latter group of reports might include, for example, *volumes of regional analysis* on such subjects as population or housing conditions of urban areas, major metropolitan areas or big cities, and regional distributions; locality reports on infrastructure; and comparisons of key social indicators such as education, living arrangements, housing conditions, sanitation and economic activities. Other such reports might include *community profile analysis*, of, for example, the indigenous population, and so forth and *profiles of specific population groups*, such as families, children, youth, persons with disabilities and the older persons. Reports on *population growth and distribution* that examine changes in the demographic characteristics of the country's population with breakdowns by two or three levels of administrative areas would be very useful. Such reports might focus on the growth, location and mobility of the population at the national and regional levels, and administrative areas. It is recommended that multidisciplinary task teams be established including line ministries and agencies for the preparation of thematic and analytical reports in line with agreed guidelines. Partnership and external cooperation with academic institutions and other specialists in subject matter, which can facilitate such work and strengthen collaborations, may be sought whenever possible.

3.24 Thematic and analytical reports must be based on user needs and respond to a country's specific development needs and emerging issues. These reports may combine census data with other data sources to provide a more comprehensive and current outlook.

4. Methodological reports

3.24. Other published reports may include the census methodology, encompassing, if applicable, sampling design and methodology and a census evaluation report, which may include estimates of census coverage and the methodology used for their preparation.

3.25. It is important that users of census products be provided on a timely basis with as much relevant information regarding the census as possible. A publication that contains information on all types of products that will be available following the census is very useful to users. A brief description of each product should be provided including the estimated timing of release, the level of geographical detail that each product carries and, for products released periodically, the frequency of release. In the case of large census operations, several such documents tailored to the needs of different sets of users (for example, users in education, health or local government) may be useful.

3.26. Many countries publish a *census dictionary*, which contains comprehensive definitions of terms and concepts and detailed classifications used to present census outputs. Some countries also publish geographical classifications and codes and the definitions of areas used in the census and their relationships with the administrative areas. Explanations of user-defined areas for specific census tabulations and the type of format available (printed or electronic) may be provided.

5. Administrative report

3.27. One of the most important reports in the publication programme is the *administrative report,* which is a record of the entire census undertaking, including problems encountered and their solutions (see also paras. xxx on systematic recording and documentation of the census experience). The report may include the following topics: a brief history of the census in the country, legal basis for conducting the census, budget requirements, expenditure and control; source and allotment of funding; census committees and their activities; stakeholder management; census organization and personnel structure; staff management; quality control procedures; census calendar; census cartographic work; development and design of the questionnaires; enumeration methodology; census promotion, publicity and communication; field organization; manual editing and coding; data-processing development and organization; data capture; computer editing and imputation procedure; capital, equipment, and infrastructure management; computer hardware and software used; census evaluation; publication and data dissemination programme; and archiving. The census administrative report is very useful both for the users and for the census organization itself. The administrative report is an essential product for the planning of future censuses (see also paras. 1.406-1.407).

3.28. With developments in information technology, the census data files and publications have become increasingly available in electronic formats. A description of the procedure in the development of these data files may also be included in the procedural report. Consideration of a separate volume of the procedural report for the processing and dissemination phases may be considered to ensure the completion of the planning and field operations phases immediately after the census enumeration.

C. Dissemination geography

1. Basic mapping

3.29. Census offices should take advantage of emerging GIS technologies to make the census results more understandable and easier to use. The purpose of statistical maps is to present the results in terms of their geographical distribution. There is special interest in the current pattern of the distribution and also in changes in the patterns that have occurred over time, particularly since the last census. Harmonisation of the boundaries between the censuses are essential for comparability of data.

3.29a. The provision of maps serves two purposes: first, census area identification maps locate and show the boundaries of all administrative areas for which data are reported in census publications and, second, statistical or thematic maps and graphs present the significant results of the census, thus allowing the general user to visualize the geographical distributions and patterns inherent in the data. Well-designed and attractive maps will interest the users of census reports, and may raise questions that send them to the statistical tables for further details.

3.30. A comprehensive map publication programme should be developed as part of the overall population and housing census publication programme in order that the needed resources may be provided within the budget at the initial planning stages. In addition to preparing maps for the census tables and reports, many countries have also found it useful to produce a population atlas as a census output. Collaboration with other departments and interested agencies might be sought to facilitate the production of an atlas volume. The atlas would include maps depicting population and housing characteristics, as well as other data influencing the growth, composition and distribution pattern of population and housing (see paras. 1.143-1.148).

3.31. There are three major types of area identification maps that are commonly used in most census publications in printed or GIS shape-file formats: (a) national maps showing the boundaries of the first- and second-order

geographical divisions and of the major cities or metropolitan areas; (b) maps of each first-order division showing the boundaries of the second- and third-order divisions for which statistical tables will be prepared; and (c) urban or metropolitan maps showing small sub-area boundaries as well as general streets, roads and rivers.

2. Thematic mapping

3.33. As regards *thematic maps*, priority indicators for a population and housing census are total population and its distribution by sub-areas, population density, urban and rural population or metropolitan and non-metropolitan population, and changes in the population totals since the last census. Other important indicators include age, sex, fertility, mortality, migration, educational attainment, employment, household size, type of housing, ownership, number of rooms, and sanitary facilities, with a growing demand also for data on communication (telephones, television, computers and internet access), transport (vehicles), a broad range of household amenities, and recently also population-based development indicators such as household access to safe water, household waste management, and multiple sources of household incomes, such as the incidence of remittances. This list of indicators is merely an illustration of the type of thematic maps individual countries might find useful to produce. Producing maps using the same set of indicators enables countries to meaningfully compare their results over time and with international or regional norms.

3.34. Maps are an invaluable aid in meaningfully comparing subnational results with national values or with other international and regional norms. Emerging technologies provide great flexibility in composing informative and visually appealing maps. Often several maps can be combined on a single page to show one indicator, for example, for the urban and the rural population. Also, combining maps and statistical charts is an effective means of presenting census information.

3.35. By having associated graphing and mapping capabilities, databases will greatly increase their usefulness. Ideally users should be able to generate the graphs and/or maps for their own needs.. Several census organizations have produced this kind of product, sometimes in cooperation with a commercial company. However, it is recommended that census offices develop mapping capabilities as a core competence for statistical production. Many users require small area data concerning such matters as home ownership, educational profiles, the labour market, and so on. While the database may be for one census, some historical information can be included to allow users to observe prevailing trends over time. As with all time-series type data, it is important to maintain consistency in both definition and spatial representations to ensure comparability.

3.36. Both micro- and macro-data can be at the basis of these dissemination products. However, owing to the need to maintain confidentiality, and in order to increase processing speed, some form of prior aggregation is usually applied, for example by using summary data. Such summary data could also be combined with the general purpose graphing and mapping software. Making available a census database with codes and names matching the GIS shape-files with tightly integrated graphing and mapping capabilities (which usually implies a tabulation function) is an excellent way to improve the effectiveness of census information dissemination. If it is to be commercially successful, the product must be easy to use.

3.37. The following list presents some suggested topics for census maps. The list is not exhaustive: most topics that appear in the questionnaire as well as derived topics covered in part two can be presented in cartographic form. In some countries, special topics such as population distribution by ethnic or language group may be appropriate. Conversely, some of the listed maps present information on the same topic in somewhat different form, so that a statistical agency may wish to select the most suitable indicator for the needs of the country.

Illustrative list of thematic census maps

Population dynamics and distribution

- Percentage population change during intercensal period(s)
- Average annual growth rate
- Population density (persons per square kilometre)
- Urban population as percentage of total population
- Distribution and size of major cities and towns
- In-migration, out-migration and net migration rates

Born in country and foreign-born
Born in another division of the country

Demographic characteristics

Sex ratio (males per 100 females), possibly by age groups
Percentage of population age 0-14
Percentage of population age 15-64
Percentage of population age 65 and over
Percentage female population in childbearing ages 15-49
Total dependency ratio (population age 0-14, and 65 and over, as percentage of population age 15-64)
Marital status
Birth rate
Total fertility rate
Mean age at first marriage
Death rate
Infant mortality rate
Life expectancy at birth
Percentage of people with disabilities

Socio-economic characteristics

Percentage of children not in primary school
Adult literacy rate (age 15 and over)
Mean years of schooling (age 25 and over)
Illiteracy rate of population age 15 and over
Illiterate population age 15 and over (total number)
Educational level of population age 10 and over
Labour force as percentage of total population
Women's share of adult labour force
Percentage of labour force by economic sector, type of occupation and status in employment
Poverty mapping

Households and housing

Average number of persons per household
Percentage of households headed by women
Average number of dwelling rooms per household
Tenure status (owned, rented, and so forth)
Type of construction material
Percentage of population with access to adequate shelter
Percentage of population with access to safe water
Percentage of population with access to electricity
Percentage of population with access to sanitation
Percentage of population with access to health services

3.38. Where appropriate, the indicators can be presented disaggregated by gender as well as by urban/rural areas (for example, where the rural population is greater than about 25 per cent of the total population). If information about an indicator is also available from a previous census, it is often very informative to produce change maps or to present maps for both time periods.

3.39 Where appropriate, countries are encouraged to perform spatial statistical analysis by producing maps showing spatial clustering and outlier analysis of the variables of interest such as electricity and water.

3.39. The development of locality (village/towns/city/community/small area) population size maps by region is of particular value. These maps combine two types of information: localitypopulation statistics and localitylocations in each region or subnational area. More information can be presented on, for example, the locality location within the district and the region, habitable and non-habitable areas, densely populated localities, areas with no localities, and the proximity of localities. Locality population size maps can also be used as base maps for additional

information on locality services and activities, and on location and distribution of localities without specific services, such as primary schools, dispensaries, piped water, and so forth.

D. Interactive web-based electronic outputs

1. Overview

3.40. It is of paramount importance that census data and information produced are widely disseminated and communicated, and that national statistical/census offices involved in this process have a pronounced customer/client and stakeholder focus. That means that national. Statistical/census offices should place more emphasis on providing a service and creating partnerships than on merely providing products, and should be guided by user-relevance and user-friendliness in all their operations, rather than by tradition in producing tables, graphs and reports that they have always produced.

3.40a. Given its importance and widespread use, the web has emerged as the primary means of providing general access to census statistics. Many national statistical/census offices have utilized the internet as the principal channel for data communication, positioning their websites into comprehensive census data repositories, enabling users access to all published data online. When developing new census products, and when reviewing existing products, national statistical/census offices should consider all ways and means of making census statistics accessible, giving high priority to dissemination on the web. The advantages of online dissemination are primarily in terms of speed, flexibility and cost as well as in providing accessibility to census results to a wide range of data users and allowing the delivery of data to be tailored to the level of sophistication of the user.

3.41. Making a census database available online along with integrated searching, tabulating, graphing, mapping and analysis capabilities is an important way to improve the effectiveness of census data dissemination. Most national statistical/census offices provide user access to electronic databases and data files through their websites, satisfying the full range of needs of internal and external data users. This is a valuable service that allows users to access and display census data instantaneously and interactively. The establishment of such databases can enhance the dissemination of census results as well as increase their usefulness by allowing user interaction with census data. User interaction is a key concept whereby users are enabled and empowered to access and explore census data themselves, and build their own customized tables or spatially configure data outputs according to their own requirements.

3.41a. Interactive web-based data tools provide a user-friendly entry-point to the entire range of census outputs disseminated by national statistical/census offices. Basic design considerations of web-based interactive tools should factor issues such as identification of the different types of users, their information requirements and the types of information to be stored in the database. Content should be organised so that it can be easily understood and found, with an overview given to provide orienting information to users about the data that can be accessed using the interface. Context should always be provided to all outputs through metadata (see also section on metadata, para. xxxx), links to related information, and cross-referencing to glossaries, publications and other background material.

3.41b. In practical terms, interactive web-based data tools should enable users to access census data themselves, and build their own customized tables or spatially configure data outputs according to varying spatial requirements. The tools should allow users to visualize and explore the data in column charts, line graphs, maps, and scatterplots. The table building functionality should also have the ability to sort and order tabular results, and more easily select survey years and indicators. Tools should also be provided for downloading, conducting analysis or for retrieval for use in other software. Design considerations to improve the interactivity of data interfaces should include the provision of user support. It is highly recommended to help users to anticipate, interpret and evaluate results. Support to users should include demonstrations and tutorials intended to describe how to perform the various functions related to the interactive web-based tools.

2. Geographic information systems

3.42. Geographic information systems (GIS) embody hardware and software configurations designed to support the capture, management, analysis and dissemination of spatially referenced data. Applied to census activities and outputs, such systems facilitate census cartography and data capture, and by linking population data (demographic, social and socio-economic) to geographical areas, GIS provides very powerful data management functionalities in allowing users to explore, analyse, describe and communicate population census information according to their own data and information demands.

3.43. In practical terms, such systems may range from simple desktop mapping facilities to complete GIS systems capable of solving complex planning and management problems, producing detailed geo-referenced inventories and spatial statistical analysis. The ability to use space to integrate and manipulate data sets from heterogeneous sources can make its application relevant to planning and managing the census process itself. For example, GIS provides functions for the aerial interpolation of statistical data in cases where the boundaries of aerial units have changed between censuses. .

3.44. Geospatial analysis must become a core competence in any census office.

3.45. Statistical offices should develop GIS applications with population data and other geo-referenced data from other sources for more advanced forms of spatial analysis. The role of the census office should be to supply census data at the right level and in the right format to users. Census offices provide vital information on current demographic conditions and future trends for policymakers in a range of sectors, such as health care, education, infrastructure planning, agriculture and natural resources management; and the provision of spatially referenced census databases is an essential prerequisite of the facilitation of the use of demographic data in these fields.

3.46. To achieve maximum efficiency gains, GIS applications should also be capable of generating additional geographical information beyond those used in the census, such as school and health districts, water and other biophysical catchment areas, and power and utility service units. These entities will have to be constructed from the smallest geographically identified units available in the census, such as census blocks, grid squares, or enumeration areas (EAs). If, as is the case in most developing countries, EAs are the smallest units, this will have important implications for the establishment of EA boundaries. This requires close collaboration between national statistical organizations and national mapping and survey agencies on one side, and school, health, water and power authorities on the other, when EA boundaries are drawn or modified, to avoid potential problems later on.

3.48. Apart from providing national statistical organizations with a very effective means to disseminate and increase the utilization of census data, geographic information systems, more than any other data management system, provide easy and user-friendly access to census data in user-relevant formats. This allows analysts and planners to undertake policy analysis, planning and research that can more readily identify thematic and geographic priority areas and thus contribute to evidence-based and better-informed policy and decision-making at different levels of geography. Some of the spatial statistical analysis includes clustering, moran auto-correlation, Anselin outlier analysis, Getis-ord hotspot analysis, ordinary least squares regression and geographically weighted regression. It allows governments to effectively monitor development progress across different sectors at village, municipality and subregional levels; it raises awareness about the importance of census and other socio-economic data; and it increases the institutional capacity of national statistical offices and social/economic planning agencies to engage in more in-depth analyses of social and economic data and deliver information products in even more user-friendly formats.

E. Metadata

1. Definition and content

3.48a. Metadata is descriptive and structured information or documentation about data which informs users about the content, quality and condition of data. In this context, metadata help to guide on the proper usage or interpretation of data by providing information on the processes of production and describing the structure of datasets thereby making it easier to retrieve, use, or manage the data. Metadata is a standardized way of organizing

data and can be categorised as follows (a) reference metadata that allows understanding and interpretation of the corresponding statistical data by describing the concepts, definitions, methodology and quality of data; production and dissemination process, data access conditions, etc. and (b) structural metadata is 'data about data' that provides information about the structure of the dataset and acts as identifiers and descriptors of the data, making it possible to properly identify, retrieve, browse and further process the data.

2. Uses of metadata

3.48b. The need for comprehensive and easily accessible metadata to better understand the statistical data being presented cannot be emphasized enough. Metadata is a key element of census dissemination to ensure that the underlying concepts and definitions are well understood and that the results are well interpreted. Metadata is used by people or systems to make proper and correct use of statistical data in terms of capturing, reading, processing, interpreting, analysing and presenting the information.

3.48c. All tabulations should include the following metadata or references to where this information can be obtained. Census questions; reasons why they are asked; conceptual definitions (census dictionary); geographic hierarchies used; changes since the previous census with regard to content, operational methods or geographic boundaries; and quality indicators such as coverage rates and item non-response. Datafiles must also be accompanied with metadata, including names and codes for common variables, personal files and household files.If a long-form sample is used in the census, metadata should also provide information on the sampling variability of the results. When the census tabulations include suppressed data cells due to small numbers, the metadata should also include a methodological note on the rules and methods of suppression. Metadata should be preserved for future reference. With the increased use of technology, properly designed metadata systems for web based applications are recommended.

F. Customized products and services

3.49. The increasing activity in the field of economic and social planning and the attention of such planning to subnational areas are placing new demands on statistical information in general and on population and housing censuses in particular. There is an increasing need for tabulations and mapping not only by major and minor civil divisions and by other units of analysis such as metropolitan areas but even, beyond these, by small local areas.

3.50. Therefore, it is useful to establish an *"on request"* service for users who require aggregates not available through other means. This will be especially relevant in situations where outsiders cannot obtain census micro-databases. In essence, the service would require that users provide the census office with the details of the tables or other aggregates requested so that the census office could fulfil the request, normally against payment of a certain compensation fee. Offering and promoting this service, especially on-line, would place the statistical service in a more desirable proactive position, rather than a static one, and could be a strong catalyst for closer cooperation with census product users.

3.51. The cost of such special-purpose tabulations, which require computer programming, could be high, especially for academic institutions and other users who do not have access to a large budget. Some statistical organizations allow the users to do the necessary work using a user-friendly kind of software. A clearly written manual is required to guide the users in using the software, including the contents of the census data dictionary and other relevant information. The resulting tables are checked for any possible breach of confidentiality, in particular table cells with very small values.

3.52. Many census organizations provide services for special requests for census products, such as thematic databases, tables, and graphic and mapping outputs that can be designed for small, medium and large businesses, communities or special interest groups. These services are normally provided to meet the increasing demand of data

users for a wide range of applications, such as monitoring trends, analysing unmet needs, identifying market potentials, segmenting markets, identifying service areas and priority zones, determining optimum site locations, designing and advertising new products and services, and so forth. Each category of products should also be made available on various media (namely, paper, disk, online, cellphone or tablets) for dissemination according to the users' requirements (see paras. 1.358-1.375).

3.53. Once the databases are created and have served the policy needs, they can serve other data users if they have market value. Since the national statistical organization is normally the only source of many geographical databases related to census data applications, market demand for these products is increasing, particularly in the geographical and population-related areas. In such cases, census products could be governed by a licence. The licence permits the users to use the product without a transferring of the ownership, since the ownership remains with the government agency. Either of two different licensing arrangements may be applied. The first is offered to organizations that use the data for their own needs and the other is offered to organizations that redistribute data or provide analytical services using census data to other persons or organizations for a fee.

3.54. Customized services of data on computer media are differentiated in terms of the forms of the data. Census products may be distributed in their original form, with or without other related information, or they can be distributed after making certain value-added modifications to meet the need of the users. Examples of such value-added activities include converting the data into another format (for use by other software packages), making the data more useful by correcting errors, adding missing information, creating subsets of the original data sets, merging the data from other sources, and bundling with software. In cases where copyright laws protect census data ownership, some royalty fees and data usage fees may be charged to the distributors to ensure a minimum return. However, if prices are too high such charges can also be a barrier to the use of the census data.

3.54a. Some countries may assist their users by merging selected variables with the GIS shapefiles as a customized product. This has proven to be beneficial for school children.

G. General interest products and special audience products

3.55. With the increase of demand for census products, efforts must be made by census offices to produce a variety of products to various stakeholder groups, including special interest groups. As the traditional forms of data on population and housing censuses are being published, there are many ways to disseminate census data in a more accessible format and thus increase the utilization of the information collected.

3.56. It should be noted that the following products can only be effective in encouraging the use of census information if it is prepared in a timely and professional manner. This will require specialist skills from people familiar with communicating to the target audiences,. These resources are expensive and countries are required to adequately plan and budget for these products and campaigns.

1. Posters

3.57. One of the most common ways to disseminate census information consists of publishing posters highlighting key facts such as How many are we? Where do we live? and summarizing a profile for the major civil divisions of a country. Posters might also be prepared addressing issues relevant to special population segments: teenagers, adults, indigenous populations, seniors, and women’s groups.

3.58. Since the objective of a poster is to catch the eye at a distance, relatively few facts should be presented in a way so that the key message is immediately visible. Posters can be greatly enhanced by the addition of a well-designed graphs, infographics and maps to increase the readability and comprehensibility of the key message. Posters and banners are short-term communication products and should be used to communicate key findings.

2. Brochures and flyers

3.59. Professionally designed brochures and flyers are another way to disseminate basic census data. These brochures should be written in a very easy and comprehensible language indicating the demographic profile of the

country illustrated with suitable graphics and explanatory material. In some countries these brochures might be addressed to specific issues on population. They are particularly suitable for preparation as promotional materials for people attending events and exhibitions, such as the launch of more traditional materials, or for inclusion on display racks in libraries of government offices.

3. Special audience reports

3.60. Information generated by a census is by definition of use to a wide range of users with a variety of expertise.
3.61 In order to address the various stakeholder needs, census offices must segment stakeholder into groups to better know, understand and respond to their needs. This will form the basis of the various census products.

3.62 In response to the stakeholder needs, census offices may prepare special audience products for key variables such as policy summary reports; thematic/analytical reports; key findings reports; fact sheets; posters/brochures/flyers; basic reports; detailed tables and spreadsheets; articles; video and social media products. Special audience analytical or thematic reports incorporate a high level of very sound analysis undertaken by staff who have a solid foundation in analytical techniques as well as the topic being analysed. In some cases, countries may undertake the analysis in collaboration with academic institutions or other specialists.

3.62. Criteria used in establishing the topics chosen will have to be set by the country concerned; particularly interesting facts shown by the census data (perhaps confirming or rebutting conventional theories; confronting census data with material from other sources; or responding to issues raised by the public during user consultations of the collection).

4. Videos, sketches, theatre and YouTube

3.63. In order to create a better understanding among certain interest groups, the use of other communication mediums are recommended including videos, sketches, theatre, YouTube etc, In order to promote the story behind the numbers and increasing the use of census data, graphics such as charts or maps could be included on videotape; compact disc (CD) or digital video disc (DVD), memory sticks. These might indicate how census data can assist policymakers, planners and people in general to understand their societies and how census data can assist in identifying the main problems and assist with evaluation of solutions.

5. Instructional materials

3.64. Instructional materials in an easy to understand form can be prepared for the general public, indicating the advantages and limitations of census data. Such material can often form the basis of information campaigns as part of the advocacy material for the next census.

3.65. A particular implementation of instructional materials can be the preparation of a kit for use in schools. Not only will this provide high quality information for the students but, by including exposure to the use of statistical materials in the school process, it will encourage the use of evidence based analysis throughout society. It should be noted that professional assistance should be sought in ensuring that these materials follow sound educational practices and can be accommodated within the appropriate curriculum.

6. Social media

3.66. Instructional

IX. Census data utilization

A. General uses of population and housing censuses

3.66. Population censuses are traditionally used for public and private sector policymaking, planning, administrative and research purposes at national and subnational level. One of the most basic of the administrative uses of census data is in the demarcation of constituencies and the allocation of representation on governing bodies. Certain aspects of the legal or administrative status of territorial divisions may also depend on the size of their populations. Housing censuses are used to develop benchmark housing statistics and to formulate housing policy and programmes, and in the private sector to assist in site selection for industrial, retail and service facilities, as well as for the commercial development of residential housing.

3.67. Information on the size, distribution and characteristics of a country's population is essential to describing and assessing its economic, social and demographic circumstances and to developing sound policies and programmes aimed at fostering the welfare of a country and its population. The population and housing census, by providing comparable basic statistics for a country as a whole and for each administrative unit and locality therein, can make an important contribution to the overall planning process and the management of national development. The availability of information at the lowest levels of administrative units is valuable for the management and evaluation of such programmes as education and literacy, employment and human resources, reproductive health and family planning, housing and environment, maternal and child health, rural development, transportation and highway planning, urbanization and welfare. Population and housing censuses are also unique sources of data for producing relevant social indicators to monitor the impact of these government policies and programmes (see paras. 3.86-3.88).

1. Uses of population censuses

3.68. The uses of population census results and the associated tabulations described in this volume are listed according to the topics presented in paragraph 2.16. Detailed general descriptions of the uses of tabulations in all eight subject groups may be obtained in the following United Nations publications: *General Principles for National Programmes of Population Projections as Aids to Development Planning*;[1] manuals on methods of estimating population: *Manual I: Methods of Estimating Total Population for Current Dates*;[2] and *Manual X: Indirect Techniques for Demographic Estimation*;[3] *Projection Methods for Integrating Population Variables into Development Planning*, vol. I: *Methods for Comprehensive Planning*, *Module One: Conceptual issues and methods for preparing demographic projections*, and *Module Two: Methods for preparing school enrolment, labour force and employment projections*;[4] *Indicators of Sustainable Development Framework and Methodologies*;[5] and *Principles and Recommendations for a Vital Statistics System, Revision 2*.[6]

3.69. The total population, as defined in paragraph 2.71, and its distribution among major and minor territorial divisions and localities are frequently a legal requirement of the census because these results are used for determining the apportionment of representation in legislative bodies, for administrative purposes and for planning the location of economic and social facilities. Internal migration, one of the major sources of population change, frequently affects the trends in population distribution. Data on internal and international migration, together with fertility and mortality, are needed to prepare population estimates for planning purposes and for determining policies on migration and assessing their effectiveness. For more detailed descriptions, see the following United Nations publications: *Handbook of Population and Housing Censuses, Part II: Demographic and Social Characteristics;*[7]

[1] United Nations publication, Sales No. E.65.XIII.2.
[2] United Nations publication, Sales No. E.52.XIII.5.
[3] Population Studies, No. 81 (United Nations publication, Sales No. E.83.XIII.2).
[4] ST/ESA/SER.R/90 and Add.1.
[5] United Nations publication, Sales No. E.96.II.A.16.
[6] United Nations publication, Sales No. E.01.XVII.10).
[7] Studies in Methods, No. 54 (United Nations publication, Sales No. E.91.XVII.9).

Manual VI: Methods of Measuring Internal Migration[8] (manuals on methods of estimating population); *Internal Migration of Women in Developing Countries*;[9] and *Recommendations on Statistics of International Migration, Revision 1*.[10]

3.70. The household, a basic socio-economic unit in all countries, is often central to the study of social and economic development. The number, size and structure of households and changes in the rate of household formation are useful for planning and for developing special policies formulated for selected groups of the population, such as children, the elderly and persons with disabilities. Therefore, the distribution of individuals within households is used to determine the living arrangements of families, the patterns of family structure observed, the time when new families are formed and changes in family structure due to death, divorce, migration or the departure of children to form their own households. The relationship among household members can be used to determine family structure and the existence of households composed, partially or completely, of unrelated persons, as indicated in the following manuals on methods of estimating population: *Manual VII: Methods of Projecting Households and Families*;[11] and *Handbook of Population and Housing Censuses, Part II : Demographic and Social Characteristics*.[12]

3.71. Traditionally defined demographic and social characteristics collected from the population census include sex, age, marital status, religion, language, and national and/or ethnic group. Sex and age are fundamental to the majority of the characteristics collected in the census. Census data provide more data than any other single source on gender differences, as indicated in the following United Nations publications: *The World's Women 2005: Progress in Statistics;*[13] *Compiling Social Indicators on the Situation of Women*[14]; *Manual II: Methods of Appraisal of Quality of Basic Data for Population Estimates*;[15] and *Handbook on Social Indicators.*[16]

3.72. Depending on national circumstances, cultural diversity may be measured by language spoken in the home or community, religion and national and/or ethnic group. For countries that are not homogeneous in terms of one or more of these variables, linguistic, religious and national and/or ethnic groups provide the basic information for a quantitative assessment of the relative size and age-sex distribution of this diversity. For more detailed descriptions of the uses of the data in the tabulations, see the following United Nations publications: *Human Development Report 2004*;[17] *Handbook of Population and Housing Censuses, Part II: Demographic and Social Characteristics;*[18] *Manual III: Methods for Population Projections by Sex and Age;*[19] and *First Marriage: Patterns and Determinants, 1988*.[20]

3.73. Although census data on fertility and mortality cannot serve as a substitute for reliable birth and death statistics from registers, they are particularly valuable for countries where birth or death registration is lacking or incomplete and vital statistics are therefore unavailable. Even in countries with complete registration of these events, the population census is useful as a supplement to satisfactory registration data because the fertility questions provide data for calculating lifetime fertility of the female population or cohort fertility. For more detailed descriptions of the uses of the data in tabulations dealing with fertility and mortality, see the following United Nations publications: *Step-by-Step Guide to the Estimation of Child Mortality*;[21] *Handbook of Population and Housing*

[8] United Nations publication, Sales No. E.70.XIII.3.
[9] United Nations publication, Sales No. E.94.XIII.3.
[10] Statistical Papers, Series M, No. 58, Rev.1 (United Nations publication, Sales No. E.98.XVII.14).
[11] United Nations publication, Sales No. E.73.XIII.2.
[12] Studies in Methods, No. 54 (United Nations publication, Sales No. E.91.XVII.9).
[13] United Nations publication, Sales No. E.05.XVII.7.
[14] Studies in Methods, No. 32 (United Nations publication, Sales No. E.84.XVII.2).
[15] United Nations publication, Sales No. E.56.XIII.2.
[16] Studies in Methods, No. 49 (United Nations publication, Sales No. E.89.XVII.6).
[17] United Nations Development Programme, New York, 2004.
[18] Studies in Methods, No. 54 (United Nations publication, Sales No. E.91.XVII.9).
[19] United Nations publication, Sales No. E.56.XIII.3.
[20] ST/ESA/SER.R/76.
[21] United Nations publication, Sales No. E.89.XIII.9.

Censuses, Part II: Demographic and Social Characteristics;[22] "Assessing the effects of mortality reduction of population ageing";[23] and *Socio-economic Differentials in Child Mortality in Developing Countries*.[24]

3.74. Education has historically been one of the key factors determining the quality of life, and interest in education continues today in most countries of the world, with emphasis on improving access to education and the quality of education, as well as broadening the scope of basic education.[25] Education is also considered a major tool in closing the gap between women and men in respect of socio-economic opportunities. Benchmark data obtained from national population censuses will therefore be of considerable importance towards fulfilling this objective. Census data reveal the disparity in educational opportunities between the sexes, age cohorts or generations, urban/rural populations and so forth, and provide important indications of the capacity of the nation for economic and social development. They furnish material for the comparison of the present educational equipment of the adult population with the present and anticipated requirements of educated human resources for various types of economic activities. Such a comparison may serve as a guide both for national policy in terms of the development of the educational system, and for the planning of the economic development programmes that it will be feasible to undertake in view of human resource requirements. For more details, see the following United Nations publications: *Human Development Report, 1996*;[26] *Report on the World Social Situation, 2005;*[27] and *Education For All: Global Monitoring Report, 2006*.[28]

3.75. Census information on the economic characteristics of the population focuses on enumerating the economically active population so as to provide benchmark data for current studies of employment, unemployment and underemployment. It provides information on the growth, composition and distribution of the economically active population for use in policy formulation and the appraisal of human resource utilization. Economic data from censuses can also provide some input into statistics on the distribution of income, consumption and accumulation of households, on participation in agriculture and non-agricultural activities, and on participation in the informal sector. Furthermore, the data on the economically active population may give an approximate indication of the number of workers who are responsible for the support of dependants.

3.76. Statistics obtained from different sources (for example, labour-force surveys, agriculture surveys, establishment surveys and administrative records) rely on the census for sampling frames, and the use of common concepts in the different sources helps in securing comparability when multiple sources for changing patterns of economic activity are being relied upon. See the following United Nations publications: "Collection of economic characteristics in population censuses";[29] *Methods of Analysing Census Data on Economic Activities of the Population*;[30] *Handbook of Household Surveys (Revised Edition);*[31] and *Handbook of Population and Housing Censuses, Part IV: Economic Activity Status*.[32]

3.77. As interest in the movement of people across national boundaries, in other words, international migration, has grown steadily among countries, census items and tabulations relative to international migration have grown in importance. Such tabulations are designed to assess the impact of migration on receiving countries, to understand patterns of diversity and develop programmes for the adaptation of migrants to new countries, and to serve as a source of information on emigration from sending countries. For further details, see the following United Nations publications: *National Migration Surveys,* Manuals I-IX[33] and *Recommendations on Statistics of International Migration, Revision 1*.[34]

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[22] Studies in Methods, No. 54 (United Nations publication, Sales No. E.91.XVII.9).
[23] Article by Shiro Horiuchi in Population Bulletin of the United Nations (New York), Nos. 31/32 (1991). Sales No. E.91.XIII.18.
[24] United Nations publication, Sales No. E.85.XIII.7.
[25] Education for All Summit of Nine High-Population Countries, New Delhi, 12-16 December 1993: Final Report (Paris, UNESCO, 1994).
[26] New York, Oxford University Press, 1996.
[27] United Nations publication, Sales No. E. 05.IV.5.
[28] Paris, United Nations Educational, Scientific and Cultural Organization, 2005.
[29] Technical Report by the United Nations Statistics Division and International Labour Office, 2002 (ST/ESA/STAT/119).
[30] United Nations publication, Sales No. E.69.XIII.2.
[31] Studies in Methods, No. 31 (United Nations publication, Sales No. E.83.XVII.13).
[32] Studies in Methods, No. 54 (Part IV) (United Nations publications, Sales No. E.96.XVII.13).
[33] Economic and Social Commission for Asia and the Pacific, *Comparative Study on Migration, Urbanization and Development in ESCAP Region. National Migration Surveys*, Manuals I-IX (Bangkok, 1984).
[34] Statistical Papers, No. 58, Rev.1 (United Nations publication, Sales No. E.98.XVII.14).

3.78. The census is also an important source of data on persons with disabilities. Census data help to monitor the social and living conditions of persons with disabilities in terms of school attendance, educational attainment, employment, marital status and living arrangements. The data also provide a basis for developing policies to meet the needs of persons with disabilities and for evaluating the effectiveness of these policies, as demonstrated in the following: *Standard Rules on the Equalization of Opportunities for Persons with Disabilities*[35]; *World Programme of Action Concerning Disabled Persons*;[36] *Manual for the Development of Statistical Information for Disability Programmes and Policies*.[37]

3.78a. The census is also an important source of information on household poverty and living conditions.

2. Uses of housing censuses

3.79. The primary uses of information from housing censuses include development of a basis for planning housing and human settlement programmes and policies, public and private sector studies of urban and other non-agricultural land use, evaluation of the adequacy of housing stock and assessment of the need and market for new housing, and studies of the living conditions of the homeless and those living in temporary or substandard housing. Information collected on the number of sets, type and characteristics of living quarters and their occupants is crucial from the point of view of monitoring housing conditions and needs of the population. Combined with the information collected by regular annual statistical programmes on housing construction, data from the housing census provide a basis for identifying national, regional and local housing patterns which are needed for the development of a rational housing market aimed at stimulating various types of housing construction. The type and quality of shelter in which people are housed, that is to say, the space, degree of crowding, facilities, surroundings and available transport, affect their economic activity, health, social intercourse and general outlook. The supply, characteristics and costs of housing are therefore subjects for which the housing census is an important source of information.

B. Uses of small area data

3.80. Censuses provide data from the highest to the lowest geographical levels of aggregation. Tabulations from census results yield the relevant statistics for any reasonable combination of characteristics for the country as a whole, regions or provinces, down to small areas such as localities, , and even enumeration areas. This important feature of the census makes the data amenable to the development of estimates of variables of interest for small/local areas in two major ways: directly from the production of tables from the micro-level data for the required characteristics, and indirectly from applying estimation techniques by combining other sources, such as sample surveys and administrative statistics to the population and housing census results.

3.81. Census data are typically aggregations of data for many individual small areas, and may commonly be used to study large regions or entire nations. Data for small areas enable the user to obtain statistical information about any number of local areas of interest, in addition to showing variations among small areas in individual parts of the country. Modern computer technology greatly facilitates the utilization of census results for analysing the information for small areas, limited only by issues of confidentiality and collection design when cell entries in cross-tabulations become very small. For example, the analysis of whether population programmes have affected the level of fertility at a regional level may be carried out by analysing data from the smallest administrative units so as to observe local variation and produce more accurate assessments of cause and effect.

[35] The Standard Rules on the Equalization of Opportunities for Persons with Disabilities were adopted by the United Nations General Assembly at its 48th session on 20 December 1993 (Resolution 48/96).

[36] The World Programme of Action concerning Disabled Persons was adopted by the United Nations General Assembly at its 37th regular session on 3 December 1982, by its resolution 37/52.

[37] Statistics on Special Population Groups, No. 8 (United Nations publication, Sales No. E.96.XVII.4 and Corr.1).

3.82. Implementation of various national social and economic development programmes is a function of the state, province or lower levels of government in many countries. Results of population and housing censuses are useful for planning and monitoring development at the local area, small town level or small area. Small area data are also important for private businesses in developing their distribution and marketing strategies. For example, information on housing demand from the population and housing census may be used by local authorities, local real estate companies, building and housing development contractors, and manufacturers of construction materials, among others.

3.83. Census data have been traditionally aggregated by various types of administrative units (for example, towns, villages, provinces, electoral units and so forth). In addition, other types of small areas are sometimes used in the census that are essentially statistical in nature (for example, census tracts and grid squares which do not change from census to census, and very small units such as city blocks or block faces). There have also been increasing demands for small area data that cut across the local administrative boundaries. Population and housing censuses provide a powerful tool for assessing the impact of population on the environment, for example, on drainage basins and on water resource management systems. The spatial units for such a study may combine a group of local administrative areas. In this situation the availability of census databases with mapping capability (see paras. 1.126-1.128) is of great importance.

3.84. Tabulations for small areas may be prepared on the basis of the resident population of each area or on the basis of the population present in each area at the time of the census. Tabulations relating to the resident population are produced for the apportionment of representation in legislative bodies, the measurement of internal migration, the computation of measures of fertility and mortality by place of residence, and the planning and administration of such services as schools and housing, which have relevance only to the resident population. Tabulations based on the population present in the area at the time of the census are useful where this population is considerably larger than the resident population and thus raises the demand for products and services above the level required by the resident population alone. The combined population and housing census may also be used to make comparisons of resident and daytime populations in specific localities, if an item on place of work is included in the population census. As indicated in part one (see paras. 1.14-1.19), users need to express their needs for particular data disseminated in a given format, based on the usual residence or place of enumeration, at an early stage of census preparations.

3.85. It was mentioned in chapter 1 how the census plays an essential role in the economic and social components of the national statistical system and serves as a sampling frame for sample surveys. Another significant way in which the census results complement survey statistics is in small area estimation, whereby models constructed from survey data are applied to census results for any specified geographical area. This estimation approach may be used for generating such indicators as employment, poverty and other economic indicators, for which measurement is required at the local area level.[38] The application of small area estimation technique to poverty measurement and mapping is an important extension in the use of census results. Many countries perform mid-year population estimates at national level, however the application of small area estimation techniques can be used to compile mid-year population estimates at sub-national and local level. If such use is contemplated, it would need to be taken into account during the planning stages of the census exercise, when decisions about topics to be included in the census are being made.

C. Dissemination of micro-data[39]

1. Definition of microdata

[38] Technical report on "Collection of economic characteristics in population censuses: technical report" (ST/ESA/STAT/119), chap. XVII.

[39] The elaboration on the dissemination of microdata is largely based on the *Dissemination of Microdata Files: Principles, Procedures and Practices,* Olivier Duprez and Ernie Boyko, IHSN Working Paper No. 005, August 2010.

3.85a. In general, when statistical agencies or other data producers conduct surveys or censuses or collect administrative data, they gather information from each unit of observation. Such a unit can be a household, a person, a firm or enterprise, an agricultural holding, a school, a health facility, or other. In the context, microdata are the electronic data files containing the information about each unit of observation. Microdata are thus opposed to macrodata or aggregated data, which provide a summarised version of this information in the form of means, ratios, frequencies or other summary statistics.

3.85b. Typically, microdata are organised in data files in which each line (or record) contains information about one unit of observation. This information is stored in variables. Variables can be of different types (e.g. numeric or alphanumeric, discrete or continuous, and so forth). They can be obtained directly from the respondent via a questionnaire or by observation or measurement (e.g. by GPS positioning) or imputed or calculated.

3.85c. In the context of the population and housing census, microdata refer to electronic files consisting of individual records on persons, households and housing units. More specifically, microdata would typically be organized in multiple files: one with records on households, another with records on individuals, and yet another with records on housing units.

2. Core principles for disseminating census microdata[40]

3.85d. The United Nations Fundamental Principles of Official Statistics[41] provide unambiguous guidance in administering official statistics at national and international levels. A particular emphasis of these principles is on confidentiality of information collected for statistical purposes. In the context, the sixth principle governing International Statistical Activities states: "Individual data collected by statistical agencies for statistical compilation, whether or not they refer to natural or legal persons, are to be strictly confidential and used exclusively for statistical purposes." [42]

3.85e. Any principles for microdata access must be consistent with this recommended principle or the principles contained in the legislation pertaining to national statistical authority. The following principles should be considered for managing the confidentiality of microdata:

Principle1: Appropriate use of microdata

3.85f. It is appropriate for microdata collected for official statistical purposes to be used for statistical analysis to support research as long as confidentiality is protected.

3.85g. Making available microdata for research is not in contradiction with the sixth UN Fundamental Principle as long as it is not possible to identify data referring to an individual. Principle 1 does not constitute an obligation to provide microdata. The National Statistical Office should be the one to decide whether to provide microdata or not. There may be other concerns (for example, quality) that make it inappropriate to provide access to microdata. Or there may be specific persons or institutions to whom it would be inappropriate to provide microdata." [24]

Principle 2: Microdata should only be made available for statistical purposes

3.85h. "For Principle 2, a distinction has to be made between statistical or analytical uses and administrative uses. In the case of statistical or analytical use, the aim is to derive statistics that refer to a group (be it of persons or legal entities). In the case of administrative use, the aim is to derive information about a particular person or legal entity to make a decision that may bring benefit or harm to the individual. For example, some requests for data may be legal (a court order) but inconsistent with this principle. It is in the interest of public confidence in the official statistical system that these requests are refused. If the use of the microdata is incompatible with statistical or analytical

[40] The elaboration of core principles for dissemination of microdata is quoted from *Managing Statistical Confidentiality and Microdata Access: Principles and Guidelines of Good Practice,* United Nations Economic Commission for Europe, Conference of European Statistician, United Nations publication, Sale No. E.07.II.E.7, United Nations, 2007.
[41] Presented at the United Nations Statistics Division website at: http://unstats.un.org/unsd/dnss/gp/fundprinciples.aspx.
[42] Ibid.

purposes, then microdata access should not be provided. Ethics committees or a similar arrangement may assist in situations where there is uncertainty whether to provide access or not.

3.85i. Researchers are accessing microdata for research purposes but to support this research they may need to compile statistical aggregations of various forms, compile statistical distributions, fit statistical models, or analyse statistical differences between sub-populations. These uses would be consistent with statistical purposes. To the extent that this is how the microdata are being used, it could also be said to support research purposes.

Principle 3: Provision of microdata should be consistent with legal and other necessary arrangements that ensure that confidentiality of the released microdata is protected

3.85j. With respect to Principle 3, legal arrangements to protect confidentiality should be in place before any microdata are released. However, the legal arrangements have to be complemented with administrative and technical measures to regulate the access to microdata and to ensure that individual data cannot be disclosed. The existence and visibility of such arrangements (whether in law or supplementary regulations, ordinances, and so forth) are necessary to increase public confidence that microdata will be used appropriately. Legal arrangements are clearly preferable but in some countries this may not be possible and some other form of administrative arrangements should be put in place. The legal (or other arrangements) should also be cleared with the privacy authorities of countries where they exist before they are established by law. If such authorities do not exist, there may be NGOs who have a "watchdog" role on privacy matters. It would be sensible to get their support for any legal or other arrangements, or at least to address any serious concerns they might have. In some countries, authorizing legislation does not exist. At a minimum, release of microdata should be supported by some form of authority. However, an authorizing legislation is a preferable approach.

Principle 4: The procedures for researcher access to microdata, as well as the uses and users of microdata should be transparent, and publicly available

3.85k. Principle 4 is important to increase public confidence that microdata are being used appropriately and to show that decisions about microdata release are taken on an objective basis. It is up to the NSO to decide whether, how and to whom microdata can be released. But their decisions should be transparent. The NSO web site is an effective way of ensuring compliance and also for providing information on how to access research reports based on released microdata.

3. Microdata anonymisation[43]

3.85l. When disseminating census microdata files to the public, researchers or other agencies, the national statistical authority faces a conflicting mission. On one hand, it aims to release microdata files supporting a wide range of statistical analyses; on the other, it must safeguard the confidentiality of respondents' identities. Processes aimed at the latter are referred to collectively as Statistical Disclosure Control or anonymisation.

3.85m. A disclosure occurs when a person or organisation recognises or learns via released data something they did not know about another person. There are two types of disclosure risk: **identity disclosure** and **attribute disclosure**[44]. The former occurs when a respondent's identity is directly associated with a disseminated data record. This can occur easily when the data record includes variables unambiguously identifying the respondent – for instance, the respondent's name, address, passport/identification number or telephone number. It is essential that such identifying variables be removed from any microdata files before dissemination. Attribute disclosure occurs when attribute values (or estimates thereof) in the disseminated data are associated with a particular respondent.

3.85n. A combination of variables in a microdata record that can be applied to re-identify a respondent is referred to as a 'key'. Re-identification can occur when a respondent is (a) rare in the population with respect to a certain key

[43] The elaboration of procedures for anonymizing microdata draws extensively from *Handbook on Statistical Disclosure Control, Version 1.0,* Anco Hundepool, Josep Dominho-Ferrer, Luisa Franconi, Sarah Giessing, Rainer Lenz, Jane Longhurst, Eric Schulte Nordholt, Giovanni Seri, Peter-Paul de Wolf, Centre pf Excellence for Statistical Disclosure Control, Eurostat project, December 2006.
[44] *Measures of Disclosure Risk and Harm,* Diane Lambert, Journal of Official Statistics, Volume 9, Number 2, Statistics Sweden, 1993.

value; and when (b) this key can be used to match a microdata file to other data files that might contain direct or other identifiers such as voter lists, land registers or school records (or even publically-accessible Internet search engines).

3.85o. The essential component of dissemination of census micro data files is avoiding both identity and attributes disclosures. In that respect, there is a need to strictly apply statistical disclosure control or anonymisation techniques for census micro data files. The first key step in anonymising of a microdata file is to remove all direct identifiers – variables that unambiguously identify the respondent. Thereafter, a microdata file can be anonymised further by applying statistical disclosure control techniques.[45]

4. Protocols for dissemination of census microdata

3.85p. Disseminating census microdata may be an unprecedented activity for the national statistical authority. In that context, there is a need to develop particular protocols that would comply with the essential principles for disseminating microdata, as described in paragraph 2 of this section and would also spell out the necessary requirements and components of such dissemination. Hence, such a protocol would need to take into account the following components and requirements[46]:

Openness - Access on equal terms for the research community at the lowest possible cost, preferably at no more than the marginal cost of dissemination.

Flexibility - Taking into account the rapid and often unpredictable changes in information technologies, (...), legal systems and cultures of each (...) country.

Transparency - Information on research data and data producing organisations, documentation on the data and specifications of conditions attached to the use of these data should be internationally available in a transparent way, ideally through the Internet.

Legal conformity - Data access arrangements should respect the legal rights and legitimate interests of all stakeholders.

Protection of intellectual property - Data access arrangements should consider the applicability of copyright or of other intellectual property laws that may be relevant to publicly funded research databases.

Formal responsibility - Access arrangements should promote explicit, formal institutional practices, such as the development of rules and regulations, regarding the responsibilities of the various parties involved in data related activities. These practices should pertain to authorship, producer credits, ownership, dissemination, usage restrictions, financial arrangements, ethical rules, licensing terms, liability, and sustainable archiving.

Professionalism - Institutional arrangements for the management of research data should be based on the relevant professional standards and values embodied in the codes of conduct of the scientific communities involved.

Interoperability - Technological and semantic interoperability is a key consideration in enabling and promoting international and interdisciplinary access to and use of research data.

Quality - The value and utility of research data depends, to a large extent, on the quality of the data itself. Data managers, and data collection organisations, should pay particular attention to ensuring compliance with explicit quality standards.

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[45] For full elaboration of these techniques, refer to the Chapter 7 of the *Dissemination of Microdata Files: Principles, Procedures and Practices,* Olivier Duprez and Ernie Boyko, IHSN Working Paper No. 005, August 2010.

[46] As presented in *OECD Principles and Guidelines for Access to Research Data from Public Funding,* Organization for Economic Co-operation and Development, 2007.

Security - Specific attention should be devoted to supporting the use of techniques and instruments to guarantee the integrity and security of (...) data.

Efficiency - One of the central goals of promoting data access and sharing is to improve the overall efficiency of publicly funded (data collection) to avoid the expensive and unnecessary duplication of data collection efforts.

Accountability - The performance of data access arrangements should be subject to periodic evaluation by user groups, responsible institutions and (...) funding agencies.
Sustainability - Due consideration should be given to the sustainability of access to publicly funded research data as a key element of the research infrastructure. This means taking administrative responsibility for the measures to guarantee permanent access to data that have been determined to require long-term retention.

5. Dissemination of population and housing census microdata in practice

3.85q. It can be expected that the 2020 Round of Population and Housing Censuses, taking into account the contemporary development of processing technology and power, brings considerable pressure on national statistical authorities in respect of dissemination of population and housing census microdata. In the context of implementing the principles and protocols described in the preceding paragraphs, national statistical authorities would need to ensure such dissemination in at least two different settings.

3.85r. For the purpose of public dissemination, either online or on electronic media, only a representative sample of the individual records should be made available after ensuring the confidentiality or non-disclosure of individual information as elaborated above. The size of the sample would depend on the capacity and resources of the national statistical/census office.

Use statistical products to measure outcomes and impact measures to spur change

3.85t. As for the access to the complete population and housing census master file, it should be made available to users using the model of the *data enclave.* This is a facility equipped with computers not linked to the internet or an external network and from which no information can be downloaded via USB ports, CD-DVD or other drives. Users interested in accessing a data enclave will not necessarily have access to the full census dataset – only to the particular data subset they require. They will be asked to complete an application form demonstrating a legitimate need to access these data to fulfil a stated statistical or research purpose and be briefed on the legal responsibility and repercussions related to maintaining the confidentiality of individual information. The outputs generated need to be scrutinised by way of a full disclosure review before release and they can contain only aggregates.

D. Cross-cutting and emerging social issues

3.86. Reflecting the concerns and priorities among countries around the world, the United Nations convened, , a series of global conferences: on children, education, environment and climate change, human rights, population, sustainable development, women and human settlements. Each of these conferences recognized the importance of adequate information in formulating policy and monitoring progress in the achievement of conference goals, and called on countries and international organizations to develop and improve the requisite statistics and indicators. These recommendations are reflected for example in the Vienna Declaration and Programme of Action of the World Conference on Human Rights;[47] the Programme of Action of the International Conference on Population and Development;[48] the Copenhagen Declaration on Social Development and the Programme of Action of the World Summit for Social Development;[49] the Platform for Action[50] adopted by the Fourth World Conference on Women;

[47] A/CONF.157/24 (Part I), chap. III.
[48] *Report of the International Conference on Population and Development, Cairo, 5-13 September 1994* (United Nations publication, Sales No. E.95.XIII.18), chap. I, resolution 1, annex.
[49] *Report of the World Summit for Social Development, Copenhagen, 6-12 March 1995* (United Nations publication, Sales No. E.96.IV.8), chap. I, resolution 1, annexes I and II.

the Post 2015 Development Agenda Declaration adopted by the National Assembly; and the Climate Change Declaration. The programmes of action adopted by these international conferences targeted many interrelated areas of concern, and called for improved statistics to monitor progress. In deciding which social groups merit monitoring in regard to measuring the disadvantages suffered by particular groups of people, each country should determine which groups within it need special attention. Some of the common factors leading to social disadvantage are gender, age, physical or mental impairment, race, creed, and so forth. The disadvantaged are not necessarily small in number; they may constitute the majority of the population.[51]

3.87. To meet the need for statistics on gender, many activities have been undertaken during the last two decades at the national and international levels to improve concepts, definitions and classifications for collection of statistics related to women and men. In the present publication, the importance of the population and housing census as a data source has often been stressed. The population and housing census is also the principal or sometimes the only comprehensive national data source with respect to meeting the need for statistics on children, youth, the elderly and the disabled in the development of policies and programmes at the national and the international levels. Therefore, it is important that countries identify data requirements concerning various population groups of particular interest when planning their censuses and ensure that the definitions and classification to be followed in censuses are appropriate and also consistent with those in use for the entire population.

3.88. Furthermore, the census tabulation plan should ensure in advance the inclusion of all relevant details about special population groups and a range of cross-classifications for each group, with a view to analysing its social and economic conditions. Concepts and methods for the census and the tabulation plan should be reviewed with users concerned with statistics for each special population group. In the case of some groups, for example, people with disability, a special set of questions is required to identify members of the group. In the case of others, standard questions, for example, on age, are sufficient to identify groups such as children, youth and the elderly. In both cases, most variables needed for cross-tabulations are already provided for in the international recommendations and many national censuses. In the census operations, however, attention will often need to be given to improvement of coverage, quality-of-data issues and avoidance of stereotypic treatment. The present section deals with gender, a few special population categories such as children and youth, the elderly, and persons with disabilities, so as to assist in the preparing of detailed tabulations and databases according to international standards.

1. Statistics on gender

3.89. The global conferences on women have contributed to an increased awareness of the importance of statistics not only on women but, more broadly, on gender issues. For example, in developing census plans in a number of countries, efforts have been made to review and assess the adequacy of statistics for understanding the diversity of both women's and men's lives. It is now recognized that biases in statistics extend, in the case of women, to their economic roles and in the case of men, to their roles in the family as husband and father and their roles in the household. Improvement of gender statistics countries should be gender sensitive in all stages of census undertaking, in planning, data collection, analysis and dissemination, and in all topics.

3.90. In addition to the more general problems of the quality of census data, two other types of problem that apply particularly to women and stem from sex-based stereotypes and sex biases have been noted. Similarly, the notion that only men can be heads of the household affects the way questions have been designed and asked in censuses. Such stereotypes also affect the way respondents reply to the questions. If, for example, the gardening and poultry-raising done by many rural women are not perceived as work, such women may not be reported as economically active even though those activities may be the main source of family livelihood.

3.91. The second type of problem relates to biases in the collection, processing, compilation and presentation of data. For example, when census tabulations are prepared for the employed by occupation, they may be prepared

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[50] *Report of the Fourth World Conference on Women, Beijing, 4-15 September 1995* (United Nations publication, Sales No. E.96.IV.13), chap. I, resolution I, annex II.

[51] Note by the Secretary-General transmitting the report of the Expert Group on the Statistical Implications of Recent Major United Nations Conferences (E/CN.3/AC.1/1996/R.4), annex, paras. 68-69. Presented to the Working Group on International Statistical Programmes and Coordination at its eighteenth session, New York, 16-19 April 1996.

either for males only or for both sexes, but only on the assumption that information on the occupational pattern of women is not of much use.

3.92. During the past few decades, considerable effort has been devoted, on the one hand, to reviewing such bias and its impact on statistics concerning the situation of women and, on the other hand, to improving the concepts and methods involved in the collection of data in censuses and surveys. Related improvements in the revised System of National Accounts (SNA) and the International Labour Organization (IL0) recommendations concerning statistics of the economically active population are also of importance to the population census. They are intended to overcome the above-mentioned conceptual deficiencies and to identify all women active in agriculture and in the informal sector. Similarly, efforts at the national level have been focused, for example, on eliminating biases in concepts, classifications and definitions of head of the household. For more information on these developments and their application in censuses for the improvement of statistics on women, see *Improving Concepts and Methods for Statistics and Indicators on the Situation of Women* [52] and *Methods of Measuring Women's Economic Activity: Technical Report*.[53]

3.93. Important statistical series and measures on the status of women can be readily obtained based on the topics in paragraph 2.16 and recommended tabulations for preparation from censuses. Furthermore, in the case of most topics, the primary unit of classification is the individual and therefore a vast array of indicators may be obtained by devising appropriate additional cross-classifications for the female and male populations separately. For an illustration of census topics and tabulations that are useful for developing comprehensive statistics on women, see "Statistics and indicators on women and men"[54] and *Handbook for the Development of National Statistical Data Bases on Women and Development.*[55] The household and family status classifications presented in paragraph 2.132 are appropriate for analysing the living situation of women and men, with specific reference to single mothers and fathers and elderly women and men living alone.

3.94. It should be emphasized that while all data collected at the individual level can be presented by sex, this is not always done. Cross-classifications by sex tend to be suppressed when cross-tabulations become complex with multiple-variable tables. In order to satisfy one basic condition for gender statistics, which is that all statistics on individuals should be presented by sex, sex should be considered the overriding variable in all tables, irrespective of the medium of storage or dissemination. This disaggregation by gender should be provided in all publications, databases and computer printouts of census tables on individuals.

3.95. Another important consideration is to broaden the target of dissemination and use of census data by popularizing the statistics that are published. One approach to achieving this wide outreach is to present statistics in the form of charts and simplified tables, with a simple and clear interpretation of the data. Countries planning to issue an analytical report might wish to consider using such innovative techniques and formats as those presented in *The World's Women 2005: Progress in Statistics*[56] in order to highlight the census findings and to make the statistics more readily accessible to a wide group of users. The analytical publication could cover the main census topics or alternatively a few areas that are especially important to understanding the relative position of women and men in the country. Guidelines on preparing an analytical publication on gender statistics at the national level are provided in *Handbook for Producing National Statistical Reports on Women and Men.*[57]

2. Statistics on children and youth

3.96. Extensive data on children and youth are available in censuses but may need improvements in terms of coverage and quality of information on specific characteristics, and on their presentation.

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[52] Studies in Methods, No. 33 (United Nations publication, Sales No. E.84.XVII.3).
[53] Studies in Methods, No. 59 (United Nations publication, Sales No. E.93.XVII.6).
[54] Available at: http://unstats.un.org/unsd/demographic/products/indwm/indwm2.htm.
[55] Social Statistics and Indicators, No. 6 (United Nations publication, Sales No. E.89.XVII.9).
[56] United Nations publication, Sales No. E.05.XVII.7.
[57] See note by the Secretary-General transmitting the report of the Expert Group on the Statistical Implications of Recent Major United Nations Conferences (E/CN.3/AC.1/1996/R.4) annex.

3.97. For statistical purposes, "children" are defined as persons under 15 years of age and "youth" are defined as those aged 15-24. However, it is useful to further divide these special groups by five-year age groups (or nationally, by groups of specific school ages) because of the rapid changes in characteristics in this age range, such as in school attendance, marital status and activity status. Also, because of differences by sex in the age at marriage, family or household status and entry into the labour market, data should be classified not only by age but also by sex. To this end, the distribution by single years of age and sex is useful. If single-year age distribution is not feasible for young children under age 5, it would be desirable to distinguish between those under one year of age (infants) and those aged 1-4. For youth aged 15-19, it would be desirable to distinguish between those 15-17 years of age and those 18-19 years of age, or to have a distinction corresponding to the age below which the country considers an individual to be a minor.

3.98. For the purpose of developing statistics on children, the principal topics in census recommendations include, inter alia, (a) sex, (b) age, (c) school attendance (for school-age children) and (d) relationship to head or other reference member of the household.

3.99. Children under five years of age are generally underenumerated in censuses and all efforts should be made to achieve complete coverage of this group. Further improvement of age data should be striven for in censuses, including an in-depth evaluation of the accuracy of age data.

3.100. Given the priority on the girl child highlighted by the World Summit for Children (1990), the International Conference on Population and Development (1994) and the Fourth World Conference on Women (1995), special attention needs to be given to improving and disseminating statistics on children. Of particular concern is the situation of the girl child with respect to school attendance, mortality, early marriage and so forth A basic problem with statistics on the girl child is that data on children ever born and children surviving tend not to be disaggregated by sex at either the questionnaire design or the tabulation stage. These data are used for indirect estimates of child mortality.

3.101. The principal topics of investigation identified for children apply also to youth, with the following additions: (a) marital status, (b) literacy, (c) educational attainment, (d) economic activity status, (e) number of children born alive and (f) age at marriage.

3.102. Some of the useful statistics and measures can be readily compiled based on the above-mentioned topics, while any additional indicators can also be obtained based on more detailed cross-classifications using the existing recommended census topics and/or tabulations. For an illustrative set of indicators on youth, see *Statistical Indicators on Youth*.[58]

3. Statistics on older persons

3.103. For older persons also, extensive data are available in population and housing censuses but may need detailed age-sex classification, as described below.

3.104. Older persons are defined as all persons aged 60 years and over. For purposes of classification, depending on the national situation, it is useful to tabulate data by five-year age groups up to age 100, instead of including them in the single broad age category 60 and over.

3.105. For the purpose of developing statistics and indicators on older persons, the principal topics in census recommendations include, inter alia, (a) sex, (b) age, (c) marital status, (d) economic activity status, (e) income, (f) household (or family) composition, (g) type of living quarters and (h) institutional population.

3.106. The statistics needed for studies of older persons are disparate, depending as they do on national policies and circumstances. Internationally, no illustrative list of indicators is available to ensure appropriate tabulations

[58] Statistics on Special Population Groups, No. 1 (United Nations publication, Sales No. E.85.XVII.12).

from the censuses. For some guidance in this area, see *Handbook on Social Indicators* [59] and consult regional recommendations, where available.

4. Statistics on persons with disabilities

3.107. The census can provide a valuable source of information on the frequency and distribution of disability in the population, at national, regional and local levels. Experience shows that although an increasing number of countries ask questions about disability in their censuses, the presentation of disability data has often been limited to tabulations showing the number of specific severe disabilities present in the population. Unfortunately, cross tabulations with other characteristics are not usually made.

3.108. A great deal of work on concepts, classifications and development of statistics on persons with disabilities has been undertaken in recent years, particularly through the work of the Washington Group on Disability Statistics,[60] and increasing numbers of countries are including disability as a topic in their censuses. For the second time, recommendations on including disability questions in a population census are included in these guidelines (see paras. 2.350-2.380). A brief treatment of this topic is given below to highlight issues involved in preparing detailed census tabulations on people with disability.

3.109. For the purpose of developing statistics on the situation of persons with disabilities the principal topics in census recommendations that would be necessary for the assessment of equalization of opportunities include, inter alia (a) sex, (b) age, (c) place of residence, (d) type of household, (e) marital status, (f) educational attainment and school attendance, (g) activity status, (h) status of employment, (i) industry and (j) occupation.

3.110. Not only should the tabulation plan for the disability data include prevalence rates by sex and age, but it is also very important that tabulations comparing persons with and without disabilities on key social and economic characteristics be presented. Tabulations based on the topics listed above provide information on prevalence of disability and on the situation of persons with disabilities. In addition, tabulations should be presented in a way that facilitates comparisons of persons with disabilities and those without. For further discussion on the development and use of concepts, definitions and indicators related to disability statistics, see the *Guidelines and Principles for the Development of Disability Statistics*[61] and *Manual for the Development of Statistical Information for Disability Programmes and Policies*[62]

5. Ethno-cultural characteristics

3.111. Receiving information about ethnic composition of population allows deeper studying of the ethnic background of a country's population, especially with respect to indigenous population, international migrants and other specific groups of population (for example nomads).

3.112. There are some difficulties in collecting this information since some population groups may name their ethnic identification based on its local meaning and in order to correctly allocate these persons to their particular ethnic group it is necessary to compile a list of ethnos, sub-ethnos and local definitions of small ethnic population groups. This will allow for obtaining accurate data about the ethnic composition of population. It would also be useful if scientists and specialists in the field of ethnography, as well as organizations dealing with indigenous people, would be involved in creating such a list.

3.113. In order to obtain comprehensive information characterizing ethnic composition of population, it would be useful to tabulate data by (a) sex, (b) age, (c) place of living, (d) marital status, (e) birth, (f) death, (g) education, (h) economic activity, (i) employment status, (j) industry, (k) occupation, and (l) type and size of household.

[59] Studies in Methods, No. 49 (United Nations publication, Sales No. E.89.XVII.6).
[60] For more information on the Washington Group on Disability Statistics, go to: http://www.cdc.gov/nchs/citygroup.htm.
[61] Statistics on Special Population Groups, No. 10 (United Nations publication, Sales No. E.01.XVII.15).
[62] Statistics on Special Population Groups, No. 8 (United Nations publication, Sales No. E.96.XVII.4 and Corr.1).

3.114. It is important to obtain comprehensive information on indigenous populations in order to have statistics on the number as well as the demographic and socio-economic structure of the given population group. These data would be valuable information to support the development of programmes for social support of indigenous peoples.

Inspire better and different outcome expectations to drive change

3.115. Statistics about the ethnic composition of international migrants together with information about country of birth and citizenship will help to more precisely determine the flows and volume of international migration.

3.116. Population censuses are also the sources of information about religious identification of the population. It would be useful to obtain this information by (a) sex, (b) age, (c) ethnic group, (d) place of living, and (d) place of birth. This information would be useful to study distribution of confessions.

3.117. Information about knowledge of languages is widely used. Countries find it useful to study the official language of the country as well as mother tongues or some other languages. In any case it would be useful to have this information by (a) sex, (b) age, (c) ethnic group, (d) place of living, and (d) place of birth.

3.118. Information about knowledge of the official language of the country would be very useful for studying the integration of international migrants and may be used, for example, for development of programmes to learn the language.

3.119. Information about knowledge of the mother tongue of indigenous population is very important. This information could allow obtaining statistics of "indigenous" languages and would be very useful for development programmes to support the development of those languages.

6. Statistics on poverty

3.120. The census data can provide a valuable source of information on conditions of life of households as a proxy measure of poverty to complement quantitative survey data. Census data provides a qualitative approach to measuring poverty.

3.121. In some cases, countries may compile multiple deprivation indices using census data.

E. Development indicators

3.122. Indicators are required by countries to track the progress of various developmental goals and as such efforts must be made by census offices to produce relevant indicators to meet this need. In the 2010 round of Population and Housing censuses, most countries produced indicators based on the MDG goals as was recommended. The type of indicators required to meet international and national reporting requirements need to be taken into account early in the planning phase of the census.

3.123. It should be emphasized that both global and national reporting and monitoring require reliable and comparable national data for the compilation of sustainable indicators. In this regard, it is of paramount importance that countries have the statistical capacity to produce, analyse and disseminate the requisite data for these indicators. The availability of reliable statistics and the capacity of the governments to systematically measure and monitor indicators is a critical success factor for the achievement of the development goals. The lack of statistical capabilities in some developing countries makes it difficult to obtain good and reliable data. Many countries do not have a sustainable, coherent programme of household surveys, or administrative data systems which can be used to produce basic statistics routinely. Where basic statistical systems are not available, the global monitoring may have to rely on national and international estimates of widely varying quality and reliability. This may lead to misjudgements regarding progress and may undermine the effectiveness of policy interventions at national and subnational levels.

3.124 Following the adopted of the Millennium Declaration in 2000, the Millennium Development Goals (MDGs) were set as the world's time bound and quantified targets for addressing extreme poverty, with a 2015 deadline. It is acknowledged that while MDGs have made a huge impact in the lives of millions, much remains to be done. The international community is now engaged in consultative discussions on the post 2015 development agenda in order to address continuing inequalities as well as new challenges facing people and the planet. Once development goals for the 2015 development agenda have been adopted they will be incorporated into this section and be made available on-line.

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F. Promotion of, and training on, uses of census data

3.125. The main purpose of a census is to collect, process and disseminate information that will be used as the basis of informed, evidence-based decision-making. The benefits of this approach to decisions are not always apparent to users, especially in situations where other approaches may have been used in the past. It is therefore important to promote such uses of census results among users.

3.126. In other cases, users may be willing to use the information but require additional training to more fully understand the data. Such training may be usefully combined with training in statistical dissemination techniques and/or uses of more advanced data products. At a very basic level, some users may require training in such mundane issues as how to contact the national statistical office, or how to find the information they require within the systems of that office, or how to use the website and other electronic applications and tools.

3.127. Whichever approach is taken to enhancing promotion and training in the use of statistical data, a number of strategic issues need to be addressed. These include:

(a) Ensuring that the needs for training are identified early in the census planning process and that required funds are included in the census budget. In this regard it should be noted that in many cases the courses requested by users will be specific to those users: in such a case it may be desirable to request the user to provide funds to cover the marginal (or full) costs of the course;

(b) The proposed courses or materials should be fully integrated into the overall census advocacy or training programme. It is essential that messages about the use of data fully reflect the message(s) given when initially advocating taking the census and/or seeking public cooperation with and participation in the collection phase;

(c) If the training facility is itself promoted properly, it is highly likely that the demand for training will far outstrip the ability of the statistical office to deliver it. In this case it will be necessary for the statistical office to have prepared transparent strategies that (a) identify those areas in which the statistical office wishes to participate (for example, dealing with lifeline clients; and topics on which the statistical office has particular knowledge or expertise); (b) establish partnerships with other bodies to provide training; (c) use approaches other than classroom training to provide learning-at-a-distance opportunities (for example, e-learning); and (d) have a pricing regime to cover costs where this is seen as desirable.

3.128. The list of target audiences and topics for such training must be determined countries. It should be noted, however, that basic training in the use and interpretation of the results of one census is a very strong method of advocating support for future censuses. It is thus recommended that countries consider development of a basic course in (a) potential uses of census data; (b) how to access census data and (c) interpretation of census data at the broadest level, including the interpretation of its completeness and level of accuracy (d) spatial analysis. The target audience for such training should be key decision makers in the political and administrative hierarchy of the country. It should be outlined that the uses of census data at the local level (small areas) offer substantial potential for constructive use of census data: spatial distribution of population by age and sex, for example, provides an ideal framework for local officials to address the most pressing issues of their constituents, such as location of schools, utilities, service delivery and so forth.

3.129. A second group of key importance are members of the mass media, such as print, radio and TV journalists. A focus on training such personalities is important because they can carry the message to many other people. This

will assist in the general raising of awareness in the population at large, as well as in generating an awareness of the census among the government, academic and business users who may not have contact with the statistical office on a regular basis. Obviously such training should be completely integrated with the overall public relations and advocacy work.

3.130 A third group to be targeted are schools, both learners and teachers. A focus on training of teachers to use census data in mathematics and geography curriculum creates awareness amongst children about using statistics in decision-making and exposure to develop numerical skills using real data.

3.131 A fourth group to be targeted are geographers with the aim of integrating census and survey data with GIS shape files in order to perform spatial statistical analysis. This training will enable specialists to better present statistics in space.

3.132 A fifth group to be targeted are non-users of census data. There is a number of stakeholders that are unaware of how census data can be used in their area of work to make evidence-based decisions. Countries need to aim to increase the usefulness of census data by identifying non-users. User segmentation will be a valuable source of information to identify possible non-users to be targeted.

3.133 A sixth group to be targeted is the research community. The focus of the training and demonstrations will be on the application of various statistical techniques on census data. This will increase better utilisation of census data.