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Principles and Recommendations for Population and Housing Censuses

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Part One: 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, small-area population statistics is its foundation. The role of the population and housing census is to collect, process and disseminate small area detailed statistics on population, its composition, characteristics, spatial distribution and organization (families and households). Censuses are periodically conducted in the majority of 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 been also actively promoting the population and housing census by compiling the Principles and Recommendations for the Population and Housing Censuses.

1.2. While the roles of the population and housing census are many and will be elaborated in details throughout this version of Principles and Recommendations for Population and Housing Censuses, several of the essential ones are listed below:

1) 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 nation-wide: distributing and allocating government funds among various regions and districts for education, health services, delineating electoral districts at the national and local levels, 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.

2) The census also plays an essential role in all elements of the national statistical system, including 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 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.

3) The basic feature of the census is to generate statistics on small geographical areas 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 (e.g. 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 the use in the private sector for applications such as business planning and market analyses.

4) 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 public and private sector.

1.3. As outlined, it is critically important to produce small-area detailed statistics as a building block for efficient governance at all levels. For a vast majority of nations in the 2010 World Programme on Population and Housing Censuses, 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, small area population statistics for 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 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 homeless persons and nomadic groups as well. 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 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 often used in the presentation and analysis of the results of the housing census.

B. Essential features

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

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.

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

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 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.

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. 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 pre-determined 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) proving 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 under-coverage and response error, *(f*) improving methods of evaluation and the means to convey findings to users and (*g*) developing 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. Subsidiary objectives relate to (*a*) capturing data more cost-effectively, (*b*) using efficient, speedy and reliable processing systems that are no more complex than necessary, (c) 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, (*d*) exploring possible sources of alternative funding and, if appropriate, developing proposals for cost recovery and income-generation and (*e*) 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, for administrative purposes, for 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 . 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

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

population registers and sample surveys without undertaking a complete enumeration. These alternative data sources are presented under "Types of Approaches to the Census".

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 policy-making, planning and administrative purposes

1.23. The fundamental purpose of the population census is to provide the facts essential to governmental policy-making, 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 democratically elected governments 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 agenda objectives like the Millennium Development Goals (MDGs) and the focus on poverty eradication with formulation of Poverty Reduction Strategy Papers (PRSPs) has 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, and in annexes I and II.

1.24. Population censuses serve many 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 and detailed demographic and socio-economic analysis of the population. The census also provides data for the calculation of social indicators,[4] particularly those that may be observed infrequently because they measure phenomena that change slowly over time, and those that are needed for small populations or small geographical areas.

1.25. One of the most basic administrative uses of census data is in the demarcation of constituencies and the allocation of representation on governing bodies. 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 of their populations.

(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

[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).
[4] Handbook on Social Indicators, Studies in Methods, No. 49 (United Nations publication, Sales No. E.89.XVII.6).

occupation and education, the evolution of the sex and age structure of the population, and the mortality and fertility differentials for various population groups, 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 local availability of labour for the production and distribution of such commodities and services 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, migration histories and the situation of disabled persons.

1.30. The value of census data is enhanced when it is part of an integrated programme that encompasses a strategy in the compilation and dissemination of statistics from a variety of data sources. In these circumstances, the planning of population and housing censuses presents an ideal opportunity to thoroughly evaluate data needs for as broad a range of users as possible in the public and private sectors.

2. Uses of housing censuses

(a) Uses for development of benchmark housing statistics

1.31. 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.

1.32. The Statistical Commission at its ninth session directed the attention of national statistical services to the need to develop, from housing censuses, the sort of benchmark statistics in housing that could be supplemented by current building and construction statistics and which would provide a continuous up-to-date picture of the housing position needed for the consideration of housing programmes.[5] 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

[5] Official Records of the Economic and Social Council, Twenty-second Session, Supplement No. 7 (E/2876), para. 117.

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 policy makers 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.[6] 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.[7]

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 in the type of housing materials provided by census data 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.

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[6] For some statistical indicators for measuring housing conditions, reference may be made to Statistical Indicators of Housing Conditions, Studies in Methods, No. 37 (United Nations publication, Sales No. 62.XVII.7) and to Handbook on Social Indicators, Studies in Methods, No. 49 (United Nations publication, Sales No. E.89.XVII.6).

[7] Improving Social Statistics in Developing Countries: Conceptual Framework and Methods, Studies in Methods, No. 25 (United Nations publication, Sales No. E.79.XVII.12).

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 will be necessary to try to enumerate homeless persons in the housing census. Information collected from enumerating homeless persons will 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. Sometimes such a sample inquiry may be the only means of obtaining benchmark housing data.[8]

1.43. The population and housing census can provide the frame for scientific sample design in connection with such surveys; 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. However, in many developing countries, 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.

[8] Handbook of Household Surveys (Revised Edition), Studies in Methods, No. 31, United Nations, New York, 1983 (United Nations publication, Sales No. E.83.XVII.13).

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*[9], 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 data from the population census to meet their needs.

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 later 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 these principles and recommendations. 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 synchronised 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 of 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

[9] FAO Statistical Development Series No. 11 (Rome, 2005)

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 five or ten) 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 confi-dentiality 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. Types of Approaches to the Census

1.58. As part of their preparation for the 2010 global round of population and housing censuses, some countries are developing, testing, and implementing alternative methods for collecting, processing and disseminating key statistics that used to be generated by the traditional approach to population and housing censuses. Even so, the crucial principle of providing detailed statistics at the lowest geographical level remains of paramount importance.

1. The traditional approach

1.59. During the 2000 round of censuses, over 190 countries conducted a population census and an overwhelming majority utilized the traditional approach to a census. It is 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 to meet the requirements of universality and simultaneity. Both short and long forms may be used within the context of traditional censuses. The short form contains only questions intended for universal coverage, while the long form is used to collect information only from 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 are utilized during the same time frame of the census, with no content data collected outside of that time frame. While the long form estimates are not based on full coverage they are regarded as census output.

1.60. Because 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 classic design may utilize very different methodologies in doing so.

1.61. The traditional census has unrivalled merit in providing a snap shot of the entire population at a specified period and the availability of data for relatively small geographic domains. In that sense the traditional census is perhaps unique in nature. This approach is particularly suitable for the countries having a federal structure and having the requirement of producing population numbers by various social and economic characteristics simultaneously for all geographical levels to meet the needs of planning and 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. Because of their complexity and expense, such censuses are usually mounted only once every five or ten years, so that census data is often several years out of date.

2. The register-based approach

1.62. 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 1970's, and several countries succeeded in using this approach to generate census data in the 1990 round of censuses. The underlying philosophy in this concept is to take advantage of the existing administrative sources, namely different kinds of registers of which the following are of primary importance: registers of households, dwellings and individuals. In the next iteration these are linked at the individual level with information in business, tax, education, employment and other relevant registers. While it is theoretically possible to link the records on the basis of the name of the individuals, the existence of a unique identification number for each individual, household and dwelling is of crucial importance as it allows much more effective and reliable linking of records from different registers.

1.63. One of the essential preconditions of this approach is that the country should have an established central population register of high quality and good coverage linked with a system of continuous updating. In the case of local registers, continuous updating along with communication between the register systems must be good. Quality assessments should be conducted. If these conditions are not met, the country should rely on the population census as the primary source of benchmark population statistics.

1.64. The primary advantages of a register approach are reduced cost for the census process and greater frequency of data. However, establishing and conducting administrative registers involve higher costs than the census itself may justify. It is a more useful and effective administration that must prove the need of a register, not the statistics alone. The use of administrative data sources also involves certain drawbacks that need to be taken into account. One such drawback is the fact that register-based descriptions have to rely exclusively on the information contents that can be formed on the basis of the registers available. In addition, in not a few countries, registers are legally restricted to use for another purpose such as making statistics. This imposes some restrictions with respect to characteristics that are available for description, and may also undermine international comparability.

1.65. Related approaches, such as the combination of traditional and register-based designs, and register-based censuses combined with sample surveys, are described at http://unstats.un.org/unsd/demographic/sources/census/default.aspx.

3. The rolling census approach

1.66. A "rolling census" represents an alternative to the traditional model of the census by means of 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). 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 areas results by cumulating five years. Annual surveys may be conducted over the full course of the year or in a particular month or other shorter timeframe.

1.67. Implementation of such an approach requires highly complex sampling and modelling techniques; a high quality sampling frame in order to allow sampling at very low levels of geography (a master address file updated annually is indispensable); and successful consultation about the approach with major stakeholders, including national and local governments and the user community. The main advantage of this approach is the higher frequency for updating data: a traditional census provides an update every five or ten years, whereas a rolling census provides annual updates. Another advantage is in smoothing the burden of the census, instead of the high cost and labor requirement of a traditional census. Further, it is possible to improve the process year after year, and test new technologies. The central disadvantage is that this approach no longer provides a simultaneous snapshot of the whole population, complicating comparisons between areas due to different enumeration times, even if data collected at different dates are adjusted to have the same reference period.

4. Traditional enumeration with yearly updates of characteristics

1.68. This design is a variation on the traditional census design and focuses on counting the population and collecting only the basic demographic data in the census year. A very large household survey collects and tabulates detailed demographic, social, economic, and housing data every year throughout the decade, replacing a census-year long form to collect this detailed data from a sample of the population. It may not be necessary to collect data on all topics every year, since requirements of such data may vary from country to country. The survey samples a percentage of addresses each year to approximate a long form sampling rate over a certain period of the census cycle, such as five years. To improve the reliability of the estimates for small governmental units, a larger proportion of addresses are sampled. The sample is cumulated over time to produce the lowest levels of geographic detail similar to the long form sample in the traditional census. Survey data are weighted to reflect the sample design, to adjust for the effects of nonresponse, and to correct for survey undercoverage or overcoverage. This final weighting adjustment helps to ensure that estimates of the characteristics are comparable to the standard, which is the periodic census. Once the final weights are applied, the statistics are generated, including population estimates, proportions, means, medians, and ratios.

1.69. The primary impetus for this approach is twofold - to provide more frequent and relevant data on the population than is available when a census is conducted only once a decade and to reduce the operational risks associated with the census. However, such a program is costly and technically difficult to mount, and requires a multi-year program of comprehensive planning, development, and testing. Particularly in countries with legal requirements for complete counts of the population at intervals, the complete count component of the census design is crucial.

5. Further information about these and other alternative census designs

1.70. The United Nations Statistics Division's 2010 World Programme website depicts the approaches of a number of countries to the traditional census design and alternative designs. Each participating country describes their approach, including a discussion of how the design meets the essential features of a census, and the necessary conditions (legal, policy, and technical) for implementing such an approach. Additional Internet links are provided for further information about each design. To access this information go to: http://unstats.un.org/unsd/demographic/sources/census/default.aspx.

F. Features of Alternative Approaches to the Census (For Discussion)

1.71. The following section provides short descriptions of each of the major methods, followed by a statement of their ability to meet the four essential features of a census, as presented in Chapter 1.

The Traditional approach
Under this approach, a population and housing census is an operation of directly collecting information from individuals and households on a range of topics and at a specified time. Each household is enumerated either by: (a) an enumerator and the census questionnaires are completed by interview; or (b) forms are distributed to each household to be self-completed by the respondent - those forms may contain information already collected in an administrative register that is sent back to respondents for checking, possibly in addition to seeking supplementary information covering topics for which no register entries exist.

Individual enumeration
Separate information is collected for each individual. Individual information may be reported by a proxy.

Universality within a defined territory

Single form approach:
Where only one form is used all persons within the defined territory who meet the coverage rules are enumerated.

Short form/Long form approach:
Short form topics: All persons within the defined territory who meet the coverage rules are enumerated.

Long form topics: These are surveyed and some persons are not covered by the enumeration but are represented in the results. However, since the collection is coincident with the short form it is possible to relate them together and by convention this survey is included as part of the census.

Simultaneity

The census information is provided with respect to a census instant. In cases where the information refers to a longer period (e.g. "the last week") that period is expressed relative to the instant.

Periodicity

In principle the census is taken at least once in every 10 year period.

The register-based approach

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 1970's, and several countries succeeded in using this approach to generate census data in the 1990 round of censuses. The underlying philosophy in this concept is to take advantage of the existing administrative sources, namely different kinds of registers of which the following are of primary importance: registers of households, dwellings and individuals. In the next iteration these are linked at the individual level with information in business, tax, education, employment and other relevant registers. While it is theoretically possible to link the records on the basis of the name of the individuals, especially in association with age and sex and when associated with a very small geographic domain, the existence of a unique identification number for each individual, household and dwelling is of crucial importance as it allows much more effective and reliable linking of records from different registers.

Individual enumeration

Separate information is collected regarding the characteristics of each individual. Information may be provided to an administrative register for other purposes, before: (i) being passed as individual records to the population register; or (ii) the registers are temporarily linked to form a proxy Population Register.

Universality within a defined territory

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 attributes are populated from subsidiary Registers relating to specific topics. Where a subsidiary does not have an entry for a person the entry in the Population Register is imputed as zero.

Simultaneity

Information is extracted from the Register as it reflects the situation of individuals at the Census instant. The timing of the Census extraction may require careful thought where register update cycles vary.

Periodicity

Extracts meeting the other three essential features can be taken at a desired frequency, including "at least once in 10 years" noting again the need to manage the updating cycles for the registers.

Traditional enumeration with periodic updates of characteristics

This approach is a variation on the traditional census design and focuses on counting the population and collecting only the basic demographic data in the census year. A very large household survey collects and tabulates detailed demographic, social, economic, and housing data every year throughout the decade, replacing a census-year long form to collect this detailed data from a sample of the population.

Individual enumeration

Separate information is collected regarding each individual. Information may be reported by a proxy.

Universality within a defined territory

(i) All persons within the defined territory who meet the coverage rules are enumerated in the Short Census component. (ii) A predefined proportion of the population is sampled in each update period but the update sample never covers the entire population although through sampling methods the entire population is represented.

Simultaneity

(i) The Short Census component is taken in respect of a Census instant. It is likely that all information in that component will refer to the instant. (ii) The update component will utilize temporal reference periods appropriate to the enquiries undertaken.

Periodicity

(i) The Short Census component is taken at least once in 10 years. (ii) The update component is collected at regular brief intervals. (iii) Output is provided at such intervals as data of sufficient quality and lowest

geographical coverage is able to be compiled.

The Register approach supplemented by survey updates

In some countries register-based censuses are complemented by sample surveys. This is the case when registers do not contain all the information for a full-fledged register-based census. This approach combines records from registers with the data collected via sample surveys and links them at the micro-level, that is, the record level. This approach appears to be akin to the population census's short form/long form paradigm: a set of basic topic is enumerated from each individual and households and the set of more detailed topics on the sample of individuals and households and then the results are extrapolated.

Individual enumeration

Separate information is collected regarding each individual in both the register and survey components. Information may be reported by a proxy.

Universality within a defined territory

(i) All persons within the defined territory who meet the coverage rules are enumerated in the register component. (ii) a predefined proportion of the population is sampled in each supporting survey but the update sample never covers the entire population although through sampling methods the entire population is represented.

Simultaneity

(i) The Register component is taken in respect of a Census instant. It is likely that all information in that component will refer to the instant, although as for Register approaches the impact of updating cycles requires careful consideration. (ii) The survey component may also relate to the census instant depending upon operational requirements.

Periodicity

(i) Extracts of the register component meeting the other three essential features can be taken at a desired frequency, including "at least once in 10 years" noting again the need to manage the updating cycles for the registers. (ii) The survey component is taken at least once in 10 years.

The rolling census approach

A "rolling census" represents an alternative to the traditional model of the census by means of a continuous cumulative survey, possibly covering the entire country but 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).

Individual enumeration

Separate information is collected regarding each individual. Information may be reported by a proxy. Where the cycle does not cover all persons, it could be considered that each record is not for an individual but the group that the individual represents through their selection in the sample.

Universality within a defined territory

A proportion of the population is sampled in each period. Two cases may pertain: (i) In some cases an area may be fully enumerated over one or more years. (ii) In other cases every person in the population has a chance of selection but at no time is it possible to say the entire population has responded.

Simultaneity

A range of mathematical techniques (eg averaging and/or projections and/or interpolation) may be employed so that the data is a statistical depiction of the average situation as of a period of time.

Periodicity

Information is collected at regular brief intervals. For very small geographic areas periodicity of dissemination will be determined to some extent by the rate of sample accumulation.

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

1.72. 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.

1.73. 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.

1.74. 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.

1.75. 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 weight 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.[10]

1.76. 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 six phases: (*a*) preparatory work, (*b*) enumeration, (*c*) data processing, (*d*) building of needed databases and dissemination of the results, (*e*) evaluation of the results, and (*f*) 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.

1.77. When the housing census and the 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

[10] 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).

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 light of its own needs and circumstances (see also. 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

1.78. The preparatory work for the census is necessarily long in duration and involves many quite distinct activities. For purposes of presentation, these preparatory activities are divided into 17 somewhat arbitrary elements:

1. Legal basis for a census (paras. 1.78 and 1.79)

2. Financial basis for census (paras. 1.80-1.88)
3. Budget and cost control (paras. 1.89-1.93)
4. Census calendar (paras. 1.94-1.98)
5. Administrative organization (paras. 1.99-1.102)
6. Census communication activities – user consultations, census publicity and promotion of census products (paras. 1.03-1.107)
7. Plans for the quality assurance and improvement programme (paras. 1.108 and 1.109)
8. Mapping (paras. 1.110-1.143)
9. Small-area identification (paras. 1.144-1.152)
10. Living quarters and household listing (paras. 1.153-1.156)
11. Tabulation programme (paras. 1.157-1.159)
12. Questionnaire preparation (paras. 1.160-1.171)
13. Census tests (paras. 1.172-1.174)
14. Plan of enumeration (paras. 1.175-1.178)
15. Plans for data processing (paras. 1.179-1.183)
16. Plans for census outputs and dissemination (paras. 1.184-1.187)
17. Staff recruitment and training (paras. 1.188-1.193)
18. Avoiding gender biases and biases affecting data on minority populations (paras. 1.194-1.197).

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1. Legal basis for a census

1.79. 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 and a legal obligation upon the enumerator to record the responses faithfully. 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.

1.80. The principle of conceptual and organizational flexibility should be observed in drafting the census legislation. Thus, 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 will 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

1.81. 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 by far the largest and most costly activity that governments and/or their National Statistics Office would undertake, and costs are on the rise. Among the factors contributing to the increasing costs of censuses are the high population growth, the complexity of planning census operations and not taking full advantage of modern technologies including IT and new statistical techniques in data analyses, to name a few. As a result, some countries have been forced to delay or even not be able to conduct a census beyond the 10-year interval due to funding constraints. Other countries on the other hand, were able to secure funds at a later stage of their census preparations, which lead to compromises in data processing and dissemination of census results.

1.82. Given the above, there is growing pressure to look into the solutions to census funding, taking into account the role of key stakeholders i.e. governments and their statistical agencies, and the greater involvement of international donors as well as 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.

1.83. It should be emphasized, however, that censuses cannot be carried out merely by National Statistical Offices alone. Rather it should be seen as a national task involving all stakeholders. Thus, Governmental departments, non-governmental organizations (NGOs) and the private sector end-users should be consulted (in all stages) to ensure the legitimacy and need for conducting the census and at the same time improving the advocacy for sufficient funding. Although the conducting of a census is principally financed by the government, it 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 NGOs, communities and donors could be formed to discuss issues related to the cost and funding of the census.

1.84. National Statistical Offices need to advocate the importance of investing in censuses within their own governments. 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.

1.85. Good planning is essential for achieving a cost effective census and a most convincing tool in terms of ensuring comprehensive funding. Clear links between all components of the census such as data collection and data processing would enable census activities to be viewed comprehensively and independently, with the price tag attached. Mobilization of resources should commence at a very early stage; and consideration should be given to the recruitment of best qualified people to carry out the census. The use of new technologies, such as scanning, in the census would offer good opportunities for reducing costs. However it is important to recognize the associated risks namely the high paper quality and costs as well as the purchase of additional computers. Countries may be encouraged to consider leasing, hiring or borrowing equipment as an alternative to minimize over- burdening their own resources.

1.86. Outsourcing with the private sector could be considered as another cost saving option particularly in the context of data processing and publicity. This has proved successful in some countries but was not as successful in others due to difficulties in monitoring of the agencies to which the activities were outsourced.

1.87. 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 has also contributed greatly to the success of censuses in many countries. However, pooling of these donor resources could be a cost effective strategy for meeting the rising costs of censuses.

1.88. 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 massive labor force and generate jobs and train people in valuable tasks (such as data entry) or in other ways to add to the national infrastructure.

1.89. In general, population and housing censuses are exclusively the responsibility of national governments and structures; this is particularly true for funding of 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

1.90. 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. And secondly, it is critical for this census plan and budget to be presented by national statistical agencies to their respective governments with adequate lead time, to facilitate the appropriation of sufficient resources from national budgets, or where appropriate, 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.

1.91. 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 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.

1.92. To obtain the information needed to monitor the costs of the current census and that needed to plan for the next, 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. 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, considerably 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.[11]

[11] 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).

1.93. 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.

1.94. 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. 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

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

1.96. 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.

1.97. 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.

1.98. 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.

1.99. 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. In such a case, other tools, commonly referred to as groupware and collaboration software as well as internet forums, can support census operations by providing an environment for exchange of information, files, and data among dispersed teams.

5. Administrative organization

1.100. 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 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. It is important, however, that their advisory and promotional functions be clearly defined and that the final responsibility for planning rest with the executive agency.

1.101. 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.

1.102. 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. 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 must be filled by persons from the area. Personnel may be transferred from the central office or from other areas as the need arises.

1.103. 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 and the development of improved methods.

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

1.104. 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.

1.105. 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. It is often more useful to hold separate consultations with different types of users with common interests, such as administrators, policy makers, planners, demographers, researchers, users in the business community and so forth, rather than a simultaneous meeting of all data users. Such combined meetings 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. 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.

1.106. 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 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.

1.107. 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. 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. 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.

1.108. An integral part of census communication and publicity is informing key census data users and the general public about the many uses of population and housing censuses (1.23 – 1.37) and planned census outputs (1.184 – 1.187). Making transparent why censuses are undertaken and what they are used and useful for helps alleviate possible misconceptions by the general public, thus increasing participation and census coverage, and the utilisation of census results and products. It is critical that such communication strategies are developed as an integral part of census planning, and not left as an optional add-on.

7. Plans for the quality assurance and improvement programme

1.109. Most countries conduct population and housing censuses, once in 10 years. Thus current experience is 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 compose 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 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.

1.110. The quality assurance and improvement system should be developed as part of the overall census programme, and integrated with other census plans 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. Establishing a quality assurance and improvement system at the planning stage is crucial to the success of the overall census operations. For a more extensive discussion of the components of a quality assurance and improvement programme, see paragraphs 1.207-1.228 below.

8. Mapping

(a) Conceptual basis for a census mapping program

1.111. 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. Statistical agencies are 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. However 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.

1.112. The quality of maps used in the census has a major influence on the quality and reliability of census data. They play a vital role in guiding enumerators to dwellings and other places where people are likely to be during the enumeration period. They are crucial in ensuring full and unduplicated coverage of geographic areas.

1.113. Without such maps, field staff have to rely entirely on an address list, written or verbal descriptions and directions or on local knowledge of the area boundaries. Reliance on verbal description 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. For the same kind of reason, the supervisor's mental map of an enumeration area may differ markedly from that of an enumerator. Because census maps provide a realistic picture of the area, they are essential to the data-collection operations, although they can be usefully supplemented by other descriptive material.

1.114. Similarly, maps, more commonly as 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 both by expert users and the general public.

1.115. 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 data base or as an integral component of the data bases forming part of a Geographic Information System (GIS).

1.116. The lead times necessary to create, maintain, print and distribute enumeration area (EA) maps are significant and careful consideration should be given to the mapping activity during the census planning and preparation phases.

1.117. 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. However the design of EAs and other census management areas are of crucial importance for the census and are outlined in the following paragraphs.

(i) Design criteria for enumeration areas

1.118. 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:
(i) Achieving complete coverage by showing clearly that there are no gaps in the area to be enumerated;
(ii) Improving the ability of personnel to manage field operations effectively by recognizing the workload limits of 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. 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;
(iii) 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); and
(iv) Dissemination objectives also require taking into account the demand for small area data, the confidentiality of personal information and be able to be aggregated to present information on larger geographic units. For some defined boundary areas an approximation formed by aggregating EA boundaries may be used for dissemination.

1.119. Procedures should be developed that will allow a comparability listing of areas from one census to the next. 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.

(ii) Design criteria for census management areas

1.120. Census management areas will consist of aggregations of EAs 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 EAs into larger areas) for this purpose need have no role in the design of areas for the dissemination phase which must be driven by the needs of users.

(iii) Appropriate technology

1.121. Before census mapping commences, the census agency needs to determine the appropriate technology for mapping. An agency should assess available maps in any format, that are known to be accurate, and use them with new maps prepared as required. The new maps can either be produced as hand-drawn maps of EAs; incorporate overlays or other technological assistance; or a Geographic Information System (GIS) could be implemented.[12] These options are described in the following paragraphs.

1.122. 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 required by high-quality topographic maps, but are an option when maps for an area: do not exist; or are too small a scale to provide sufficient detail for an EA map; or are seriously out of date.

1.123. Where reasonable-quality topographic maps are available, they should be used as a base and hand-drawn EA boundaries can be added as an overlay on transparent film. 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.

- Satellite images: although expensive to acquire, 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 (i.e., a known scale and orientation, with some latitudes and longitudes, printed on the face of the image).
- Aerial photography: Acquisition of aerial photographs for large tracts 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 way of initiating some components of a Geographic Information System (GIS).
- Global Positioning Systems (GPS): Making a hand-drawn map in the field can be greatly assisted by GPS. A simple, hand-held GPS receiver will give latitude and longitude accurate to about 100 metres. A 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.

1.124. The implementation of strategies using such technologies should be thoroughly planned with the guidance of staff, or external experts, with formal qualifications in the use of advanced mapping technology. It should be noted that there may be additional risks due to the need for equipment to be operated in sub-optimal conditions including poor weather, dusty conditions and/or poor lighting. 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 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 use of both the hardware and the software. Despite its versatility, GPS would 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.

(iv) Geographic Information Systems

1.125. In recent years, many countries have adopted the use of GIS to facilitate census mapping. However, they are comparatively expensive and are complex to maintain and operate. Adoption of GIS should be seen as a major strategic decision with impacts beyond the census operation, and many issues

[12] Readers should refer to the United Nations publication Handbook on Geographic Information System and Digital Mapping for Population and Housing Censuses (ST/ESA/STAT/SER.F/79), for further details on GIS mapping.

need to be considered.

1.126. The costs and benefits of GIS are as follows:
(a) GIS requires a significant level of technical expertise;
(b) GIS will require a higher level of computing infrastructure. One of the benefits of GIS, - a closer linkage between maps for enumerators and map-based products for users - requires that users have the computing infrastructure for GIS. The census agency may take the lead on this issue. This would be a catalyst for an overall national advance in capacity;
(c) 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;
(d) In most cases, the preparation of maps and/or GIS will not be the core business of a statistical agency. The census agency must determine which of the functions it will undertake and which will be outsourced.
(e) Producing duplicate maps may be less expensive with a GIS solution;
(f) Space needed to store input maps for digital purposes will be far less;
(g) GIS will have increased ability to undertake quality assurance of geographic boundaries;
(h) The census agency will have a greater ability to perform spatial queries against the database under GIS.

(b) Implementation of a mapping program

1.127. The mapping programme associated with a census is a daunting, costly and technically demanding process impacting on all census activities. With the exception of hand drawn maps census mapping has two broad components: statistical and technical. Many countries have an agency that provides mapping services to the Government but often will not be involved in large scale mapping of areas for statistical purposes (such as censuses).

1.128. 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.
(i) 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.
(ii) 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 a national coverage of maps well before the census date and before training of field staff.
(iii) 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.

1.129. 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 is of considerable help in delimiting enumeration areas, minimizing chances of omission or duplication and disseminating preliminary census results quickly.

1.130. 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. 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.

1.131. When establishing a digital geographic data base a major consideration in developing a computer-based mapping system, even in developed countries, is the determination by the census agency of data requirements. In determining these requirements, due note should be taken of what data already exists, and plans to enhance that supply only made where a long lead time is available before the census. 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. 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 EA; and/or

b. The data item is relevant to users. Assessing the utility of data items to users, in a 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. Where possible, data items only applicable to one purpose should only be shown in the maps prepared for that purpose (even though both purposes may be satisfied from a common database).

1.132. 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 EA 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; *(c)* Landmark features, such as schools, churches, post offices, parks and large buildings.

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

1.134. 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 to determine where population and boundary variations have occurred 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 area with relevant geographical data.

1.135. 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.

1.136. 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.

1.137. Careful consideration should be given to the time required for printing maps when establishing the project plan for census mapping. Maps should be provided to every level of field staff. At least one map must be printed for every EA in the country and 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. Other considerations for the preparation of enumeration maps include the following: *(a)* 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; *(b)* Enumerators may be required to navigate in poor lighting conditions and thus details should be easily read; *(c*) Folding or refolding of large maps (above A2 in size) is inefficient for staff; *(d)* Maps need to facilitate the addition of handwritten enumerator comments; *(e)* Production of the maps should be cost-effective; *(f)* Boundaries (such as EA boundaries) overprinted on the maps must be clear and unambiguous; *(g)* EAs must be distinguishable when compared to the surrounding area; *(h)* The maps should be suitable for dissemination purposes.

1.138. Maps for supervisors or regional managers should be larger scale, providing sufficient detail to identify major features but not be so large as to be impossible to manipulate easily while, for example,

answering a phone call from an enumerator. 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.

1.139. Regardless of whether clerical or GIS processes are used, the map printing task can take a significant amount of time and will be performed relatively close to the end of the project.

1.140. While preparation of maps, typically as hard copy, for enumeration purposes rightly receives the highest priority and attention from census managers the needs 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) Choose formats that are widely used within the country, so output products can be prepared readily to meet a wide market; and
(b) The suitability of the data for commonly available desktop mapping applications.

1.141. 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.

1.142. Mapping for field purposes under a contract or agreement basis requires the statistical agency to specify its requirements of 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 EA designers to advise on changes to boundaries (and updates to associated aspatial data); *(d)* Producing hard-copy maps as specified for field work.

1.143. The statistical agency would undertake the EA design work and validation of the associated aspatial data, as well as take delivery of the hard-copy maps for quality assurance checks and subsequent delivery into the field logistics programme. The statistical agency would also provide, after the census, any feedback received from enumerators about the base map that may be of use to the mapping agency.

1.144. Mapping for dissemination purposes is more difficult 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.

9. Small-area identification

1.145. 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*.

1.146. 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.

1.147. 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 retabulate the census according to the new boundaries, very expensive recoding of individual records may be involved.

1.148. 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.

1.149. 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. The two approaches to geo-coding that are of most significance for census planning are: (*a*) segment allocation and (*b*) area allocation to grid squares. With segment allocation, coordinates are assigned to nodal points (for example, street intersections) to identify segments or block faces. The grid system involves dividing the national territory into a uniform grid of squares using standard coordinates to identify the squares. 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. It must be stressed, however, that geocoding is more expensive than traditional methods of area coding and its technical prerequisites may not be present in many countries.

1.150. 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.

1.151. 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 the past, 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. 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.

1.152. 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.

1.153. 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.

10. Living quarters and household listing

1.154. 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.

1.155. 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.

1.156. 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.

1.157. Where a good population register exists, it may be possible to pre-print 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

1.158. In most countries, the tabulation programme represents a compromise between the ideal desired tabulations and the limits imposed by practical circumstances. 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. The basic tabulation programme, covering all tables to appear in the published census reports, should be firmly decided soon after the content of the questionnaire is fixed in its final form. 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.

1.159. 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.

1.160. 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

1.161. The following paragraphs relate only to those approaches to provision of census information which involve direct, paper-questionnaire based, 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 program they address.

1.162. Further, where countries utilise the internet to collect a proportion of their census information it is possible that the layout and organisation of the data collection instrument may differ from that of the paper questionnaire. While many of the same principles (e.g. clarity of wording, omission of unnecessary material) will apply to an internet based collection of information, specialised advice should be sought regarding such issues as:

- The technology employed to present the questions to the respondent;
- The method of capturing the response; and
- Quality assurance checks employed during the capture process.

1.163. 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.

1.164. 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. Among the many factors that should be taken into account in designing the questionnaire are the method of enumeration, the type of questionnaire, the data to be collected, the most suitable form and arrangement of the questions and the processing techniques to be employed.

1.165. The method of enumeration 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 upon where each type of

questionnaire can be used and the framing of the questions and the amount of explanatory material that must accompany them.

1.166. It is important that questions are free from ambiguity. Also, 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 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 program including the so-called *pilot census* since poorly worded questions will not only collect poor quality data, but, by confusing respondents and/or enumerators, may also impact upon other subsequent questions in the questionnaire.

1.167. Special provisions 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:

- A single, multilingual questionnaire; or
- One version of the questionnaire for each major language; or
- Translations printed in the enumerators' manual of the questionnaire in the various languages.

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 will also have to take language issues into account.)

1.168. 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.

1.169. Use of many of the more technologically advanced processing techniques[13], such as Optical Mark Reading (OMR) and Intelligent Character Recognition (ICR) will have a significant effect upon the questionnaire design. 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 regards 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 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 1.168, where the scanning process requires that a booklet questionnaire is separated into component pages it is important that some form of linking (eg by serial numbers or bar-codes) is employed to ensure that the correct information is amalgamated in the computer records.

1.170. Questionnaire design must be driven by a planning process based upon a dialogue between the statistical agency and those demanding information. 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.

1.171. The final questionnaire(s) must be drafted in time to allow for its printing (making allowance for the many contingencies, such as industrial action, breakdown of printing equipment, that can arise in these processes); undertaking quality assurance checks to ensure the quality of printing is of sufficient quality to be used in the data capture regime; adequate training of census officials at all levels, and adequate publicity to be generated on its content.

[13] See paragraphs 1.255 to 1.257 for a full description of these techniques.

1.172. 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 UNSD 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.

13. Census tests

1.173. 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 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. Such tests can give important information on the adequacy of the field organization, the training programme, the processing plan 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 on the average time required for enumerating a single household or a single set of living quarters, which 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.

1.174. The kind of tests usually carried out first 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. 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.

1.175. A comprehensive test of all census procedures is often called a *pilot census*. 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, whether to use IT or not, care should be taken for resemblance in conditions of conducting pilot census with the actual enumeration as closely as possible. 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.

1.176. 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 entry and processing well ahead of the census itself. This is particularly important if a new technology is being introduced, such as scanning the questionnaires as a means of capturing data. Tests should include the testing of the equipment itself, as well as the underlying circumstances necessary to avoid equipment malfunctioning, such as climatization, or significant delays due to inadequate quality of paper causing paper jams. In the context of new approaches of using hand-held devices, testing should include daily data transfers to the major depository of data. Testing the efficiency of editing and tabulation applications should be done based on results collected by the *pilot census*.

14. Plan of enumeration

1.177. Several 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, the enumeration process often involves mailing out the census forms, or having the public mail back the completed forms, or both. 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.

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

1.179. The universal enumeration of population and living quarters should be made exclusively on a geographical basis, that is to say, the country should be divided into census enumeration areas and each area should be small enough to be covered by one enumerator during the period of time allowed for the enumeration. 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.

1.180. 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. Special arrangements may also need to be made to enumerate homeless persons as well as the special categories listed in paragraph 2.75 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

1.181. 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, 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.

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

1.183. 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. 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 (PC) 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 centers 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.

1.184. In addition to considering the processing equipment to be used in the census, decisions will have to be made on the software to be used in editing and tabulating the census data. It is very costly and time-consuming to develop software for census editing and tabulation. Consequently a majority of countries in recent years have turned either to one of the several portable software packages available for census editing or tabulation or to one of the commercially available personal computer spreadsheet, database or tabulation packages. These packages can substantially reduce the extent of the systems analysis and programming tasks involved, although sometimes at a price in terms of loss of flexibility. Each country may wish to assess its software requirements in light of its own needs and resources and in light of the general purpose and census software available. Regardless of the software used, sufficient time will have to be allowed for training staff in its use. Whatever choice about the software to be used is made, it is certain that at least some degree of customization can be expected in order to meet the specific requirements of the census, especially with off-the-shelf, commercial software packages not specifically designed for census operations. Therefore, a sufficient IT workforce has to be available for software implementation.

1.185. Out-sourcing some of the predominantly IT-related operations may be considered. Out-sourcing should be implemented in such a way as to bring immediate economic and quality advantages to census operations. Nonetheless, out-sourcing of IT operations should not consist of core census operations such as coding. 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 data bases and domain specifications rests with the NSO and that out-sourcing of these activities is not recommended. In short, out-sourcing 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 census outputs and dissemination

1.186. A census is not complete until the information collected is made available to potential 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, produced as tables in unpublished form for limited distribution or stored in a database and supplied upon request either on magnetic and optical media, or on-line. A detailed plan for producing different census outputs should be guided by early user consultations (1.104) 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 prioritize data processing and tabulations.

1.187. 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 to the census organization, custom tabulations from a separate, purposely-built on-line dissemination database 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.

1.188. Printed publications -despite their production cost - remain in most 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 on-line 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.

1.189. Census maps, in printed or digital form, should be included in the overall dissemination programme of a population and housing census. The provision for needed resources should also be made in the budget from the initial planning stage. 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.

17. Staff recruitment and training

1.190. 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. 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 a somewhat larger field force than is required for the enumeration itself, as a certain amount of attrition is inevitable from the beginning of the training programme until the completion of the fieldwork.

1.191. 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).

1.192. The entire census training programme should be designed to cover each phase of the work and provide an efficient and consistent means of effectively starting large numbers of employees in their work. 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 in the use of adopted IT solutions. (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). 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 operations it is expected they will subsequently perform. The intermediate- and higher-level technical staff, such as programmers and system analysts, may also

benefit from special training programmes. For them, the emphasis should usually be on recent technical developments of relevance to the forthcoming census and on the interrelationships among the various aspects of census plans and operations.

1.193. 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.

1.194. It is important that each training programme be made available in manual (booklet) form and distributed 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, tape 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.

1.195. It is very important to determine the time required to train staff for the various aspects of the census. This depends on several factors: the type of function for which they are being trained, the level at which they will be performing, the complexity of the census, the educational level of the trainees, the number of instructors available and the funds available. Usually, all courses last from one week to one month. It is strongly recommended that the training be carried out daily for a fixed period. The results are not as good if training is provided for a few days per week, since with this approach, which draws out the length of the course, previous work is often forgotten and has to be repeated. For this reason, it is also best to avoid completion of the training long before the start of the actual work. Any duration, however, may be fixed for the course, provided that the main principle -- namely that training should be long enough to permit the assimilation of the syllabus -- is not overlooked.

18. Avoiding gender biases and biases affecting data on minority population

1.196. 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 (for example, relating to household relationships and economic characteristics). 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.

1.197. 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.

1.198. 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.

1.199. 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 and religious minorities and indigenous and nomadic populations. 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 underenumeration among these populations.

B. Contracting Out

1.200. Today, many countries contract out some tasks or activities of the census. It is due to the fact that contracting out is a way of increasing efficiently 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 out-sourcing or contracting out. The appropriateness of contracting out should be determined step-by-step and after subdividing the overall census tasks into stages. Throughout the overall process, activities should be conducted by a method (considering accuracy and timeliness of the results) which can best satisfy the general public. No part of the work tasks should be done by the method which may lower the accuracy or result in loss of trust of the general public. So, in judging the propriety of contracting out, it is recommended that National Statistical Offices should carefully consider the following criteria:
(i) Strict protection of data confidentiality
(ii) Method of confidentiality assurance that satisfies the general public
(iii) Guarantee measures of quality assurance
(iv) Ability to manage and monitor the out- sourced census tasks/activities
(v) Having control over the core competence of National Statistical Office, and appropriateness judgement – considering the specific situation of each country.

1.201. 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 which 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 it is closely related to the earning of trust from citizens and the strict protection of confidentiality. Where temporary enumeration staff are engaged under contracts 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. Procedures should be set that no interviewer and/or enumerator could be able to abuse, copy or deliver the gathered data to non-responsible authorities.

1.202. The second important and related issue that should be considered carefully is conveying confidentiality assurance to the general public. As it is described in the “Essential Roles of the Census”, 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 peculiarities 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 perception among the general public and the providing a sense of inward security.

1.203. The third significant issue to be considered in out-sourcing is the quality assurance that should be guaranteed. Thence, cost should not be the first priority in considering and judging the successful bidder in this respect. 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 (e.g., for printing, manufacturing satchels, etc), 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. Once the contract has been awarded continuous monitoring of the progress of work entrusted to the selected company is necessary. Consequently, in considering the proper contracting out procedures, National Statistical Offices should also take into account the costs for constructing a system or surveillance for monitoring progress of the work being contracted out.

1.204. The fourth major issue in out-sourcing census activities is the procedure of assessment and evaluation of the capabilities of the candidate companies. Through this procedure National Statistical Offices should fully assess both the capabilities as well as the disabilities of companies to select the winner to which the activity/ies in question are to be out-sourced. It is highly recommended that practical and financial pecularities of companies should be considered after the assessment of their capablilities. 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 fulfill the assigned tasks, the probable problems may not be resolved by applying penalties. However, a very significant problem that can occur is that people may not be able to make use of accurate and timely census results. In such a case National Statistical Offices may lose trust of the general public in the census and even in future censuses or other routine statistical projects conducted by the statistics office. It is therefore very important for National Statistical Offices to adopt a method in which risks are as low as possible.

1.205. In addition to managing the out-sourced activities or tasks, the ability or (better to say) the flexibility to cope with sudden or unpredicted change(s) 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 etc., may paralyze the whole activity. 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 contracting out of census activities from this viewpoint.

1.206. It should also be recommended that under no conditions should National Statistical Offices endanger their competence and core responsibilities by contracting out census tasks. For example, in coding of education, occupation, and industrial classification, contracting out is not advised. This is due to the fact that the coding depends on the minor differentiation and level of coding (general or detailed classifications according to different coding standards) as well as of the coding manual and education of the coders. Considering such subtle criteria for judgment is difficult to be prepared in advance and before checking the filled questionnaire.

C. Quality assurance and improvement programme

1. Need for a quality assurance and improvement system

1.207. Because of the size and complexity of census operations, it is likely that errors of one kind or another may arise at any stage of the census. These operational errors may quickly lead to serious coverage or content errors, cost overruns or major delays in completing the census. Moreover, indifference to errors is likely to foster further laxness which, in turn, generates even more errors.

1.208. Every national census organization should establish a system of quality assurance and improvement as an integral part of its census operation. The primary objective of such a programme should be to provide information so that decisions can be taken to modify quickly ongoing census operations in order to improve the quality and cost-effectiveness of the census while it is under way. Thus, the system should be designed to identify processes and personnel that are functioning poorly in terms of coverage or content errors, costs or delays. The programme may also gather information about the quality

of work for use after the census is over. It may be desirable to ascertain the quality level that was achieved in previous censuses and use that information to establish standards for the next census. The result of such studies can be useful in identifying areas where errors have been committed and thus preparing better plans and procedures for future censuses.

1.209. The quality assurance and improvement system should be seen as an important component of the overall census programme. As such, it must be fully integrated with the other census plans and procedures. There is no single standard quality assurance and improvement system that can be applied to all censuses. Census designers and administrators must keep in mind that no matter how much effort is contributed, complete coverage and accuracy in the census data are an unattainable goal. However, efforts to control errors should be at a level that is sufficient to produce data of a reasonable accuracy within the constraints of the budget and time allotted. As the application of the system is the responsibility of various census leaders and field supervisors, the adopted procedures and instructions for their application should be contained in the instruction manuals and other training materials.

2. Quality assurance techniques

1.210. The success of any quality assurance and improvement programme depends on: (*a*) laying down quality standards, (*b*) determining verification techniques, (*c*) measuring quality through record-keeping, and (*d*) providing for timely feedback from the results of the programme so that effective corrective action may be taken. The rectification procedures may include changing the process or procedure, clarifying the instructions, retraining one or more staff members, warning the staff member, rejecting his/her work, or removing him/her from the job. Sometimes two or more of these actions are taken. *Spot checks, complete verification* and *sample verification* are the usual quality assurance techniques adopted in censuses.

1.211. Verification can be *dependent verification* or *independent verification*. In dependent verification, a verifier assesses the work of a census worker by looking at his/her work. There is, however, an inherent danger that the verifier may be influenced by the results obtained in the initial operation. In independent verification, a job is done initially by one person and verified independently by a verifier without reference to the original work. The original results and the results of the verification operation are then compared; if both sets of results agree, the work in question is considered to be correct. In the case of a difference, a third person may resolve the issue. In the case of data entry, the computer can be programmed to compare the records and point out the difference. Independent verification reduces the bias that is often associated with dependent verification. However, if the operation involves contact with the public, such as reinterviewing households, dependent verification may be easier to carry out insofar as the verifier will be aware of what happened in the original census interview.

1.212. Verification of all cases (that is, 100 per cent verification), theoretically assures a complete check of the work of a particular phase in census operations (for example, enumeration, coding or data entry). However, verifying all items can be time-consuming and very costly.

1.213. Sample verification reduces the cost and at the same time can yield results almost as reliable as 100 per cent verification. If the verification of the units in the sample is performed by more experienced and skilled persons, as is usually the case, verification costs will be proportionally higher. The precision would have to be balanced against the cost of operating the sampling plan. To be effective, the sample must be selected on a scientific basis using probability sampling. Sometimes, the cost can be reduced and the quality improved by placing the items into either of the following two groups: (*a*) the group of those items in respect of which normally not many errors are committed and (*b*) the group of those items in respect of which errors are often committed because of the items' complexity. While cases in the former group can be verified on a sample basis, cases in the latter may be checked on a 100 per cent basis. Two types of sampling procedures are frequently used: (*a*) *acceptance sampling* and (*b*) *continuous sampling*.

1.214. Acceptance sampling is generally adopted in jobs involving a large number of employees, such as manual editing and checking of schedules, coding of census documents and data entry. In acceptance sampling, edited or coded documents or keyed-in data are grouped in lots. There are three important numbers in this exercise: the first is the number of items in a lot; the second, the number of items drawn

from the lot; and the third, the acceptance number or the maximum number of allowable defective items in the sample inspected. A lot is accepted or rejected on the basis of the inspection of a sample chosen from the lot by probability methods. Rejection of an entire lot of work outputs brings much stronger pressure to bear on a worker for quality improvement. If over a period of time performance does not improve, there should be an option to remove the worker.

1.215. In the case where the work is continuous and it may not be possible to group the outputs into lots for inspection, a continuous sampling plan may be employed. In census operations, this situation arises mostly during the printing of forms, particularly OMR, OCR and ICR forms. When printing a large amount of forms, a systematic quality assurance arrangement should be set up on quality of paper, size of paper and color of text, figures and answer boxes.

1.216. Other scientific sampling procedures may be used. In addition, spot checking, a subjective device for selecting items for verification, may be used. Since the selection is not carried out according to any type of probability sampling, the reliability of the results cannot be known. This is usually not recommended for operations such as editing, coding or data entry. However, spot checks could be very useful in some census operations, for example the periodic checking as to appropriate filing, of the census documents maintained in the storage room.

3. Implementing a quality assurance and improvement programme

1.217. A quality assurance and improvement programme is an important aspect of census management and has implications for many parts of the census process. It plays a particularly important role in those parts of the census process that involve massive operations, namely, certain aspects of the preparatory work, the actual enumeration and the processing of the census results. In the pre-enumeration stage, quality assurance is particularly relevant for such activities as house listing operations, preparation of EA maps, printing of census materials, and personnel and financial control operations.

1.218. Quality assurance at the enumeration stage can play a critical role in improving the quality of the census results by providing quick feedback so that corrective action can be taken while the census is still in the field. The deployment of ICT such as internet and mobile phone in the communication process between central office, branch offices and field staff could help speed up the acknowledge of problems in the field as well as standardize the remedial solutions. If census forms are distributed by mail or by other persons outside the census office, a system should be established to verify, on a sample basis, that the forms have been received. If the census is organized on the basis of a more traditional census interview, census supervisors will be entrusted with a variety of quality assurance responsibilities.

1.219. Data-processing is one of the crucial steps by which raw data collected in the field are converted into edited, coded and tabulated data. In some of these processes (for example, coding, data entry, recoding, estimation and tabulation) the data are being transformed, while in others (such as editing and imputation, verification, and so on) the data are being corrected. New errors can occur in any of these operations. All three types of quality assurance techniques identified earlier (that is, acceptance sampling, continuous sampling and spot checking) may be used in the data-processing operations. At the initial stage, documents must be checked and the critical information, like geographical identification codes, corrected wherever necessary. The corrections must be made according to predetermined rules and properly documented. At this stage, only simple checks should be adopted. Acceptance sampling procedures specifying the lot size, the sample size to be inspected and the acceptance number would go a long way towards controlling quality in editing.

1.220. Manual editing and coding should be thoroughly verified by another set of personnel. The verification can be dependent or independent. Depending on the resources available, verification may be done on a sample basis or a 100 per cent basis. A number of quality assurance techniques can be adopted. At these stages, the error rates must be maintained on an *operator-wise*, *lot-wise* and *field-wise basis*. Usually, the verification is done on a 100 per cent basis for some time. When an operator achieves the specified low-error rate for a considerable period of time, he/she may be put on sample verification. The work at this stage lends itself to acceptance sampling procedures. The fact that an edited or coded lot is

rejected makes the editor or coder more alert. Since at this stage most of the editing and coding staff are appointed on a temporary basis, persons who perform badly consistently must be removed.

1.221. Many errors may arise in the course of coding and data entry. Lack of supervision and verification at this stage would only delay the release of data, as error detection and correction will be more difficult later. Range checks and certain consistency checks can be built into the data entry software. Usually every time an out-of-range entry or an inconsistent one is encountered, the machine beeps and stops, thereby affecting the speed of data entry. Therefore, the amount of consistency checking to be introduced at the stage of data entry has to be carefully determined so that a reasonable speed of data entry can be maintained. Data entry has to be verified by another set of personnel. Similar quality assurance checks should also be applied in the case where a computer-assisted coding method is used. At this stage dependent or independent verification on a 100 per cent basis or acceptance sampling procedures can be adopted. Error rates can be calculated *operator-wise* and *field-wise*. An operator consistently showing a large error rate or a relatively low speed can be warned to be extra-vigilant, or he or she can be retrained or replaced.

1.222. If data are keyed at one centre and the computer processing occurs at another location, the data will have to be transferred to diskettes, tapes or other magnetic media and these media sent to the processing centre. A control sheet should accompany all diskettes, tapes or other media showing the area the media relate to and the number of records they contain. A back-up copy of the media should be maintained at the data entry centre. At the processing centre, the media must be checked for the number of records they contain, and the figure compared with that of the inventory. In the case of any discrepancies, the data entry centre must be contacted and all such discrepancies reconciled. Only after this has been done should further processing proceed.

1.223. Computer edits play an important role in error detection and correction. At the computer edit stage, detailed consistency checks can be laid down in consultation with subject-matter specialists. Errors detected can be corrected either by reference to original schedules or automatically. While automatic editing speeds up data-processing, careful control has to be exercised over the quality of incoming data. *Batch statistics* giving number and percentage of edits field-wise would give an idea of the kind of errors that the documents are subject to. If in a particular area too much editing is reported for a specified field, the reasons for this should be thoroughly investigated.

1.224. Spot checks can assess whether the documents are being maintained in the *census documents storage* rooms in a prescribed manner, whether all registers for movement of documents are being maintained and updated properly and whether the control procedures are being followed. In some countries, the movements of documents are controlled by computer. While computers can reduce the routine and monotonous work of filling out forms, success will depend on the extent to which the control procedures are adopted in practice. Similar control procedures will need to be instituted for the flow of census records through electronic data interchange.

1.225. A population and housing census generally produces tables at different area levels. Before the release of tables, it would be essential to conduct a thorough check to ensure that all planned tabulations have been prepared for all intended geographical units. A special team should be constituted to check the tables generated on computer. It should go through and scrutinize different tables to determine whether quantities that should be equal to each other and quantities that should be greater (or less) than others actually are. A list of *pre-release checks* must be finalized. These checks should include spelling checks, title checks and checks as to whether tables have been generated for all areas and groups of the population originally planned for.

1.226. While range checks and consistency checks introduced at the editing stage can reduce most of the errors, an aggregate check after the tables have been prepared is essential. In this case, a few trained and experienced persons should go through the different tables to check as to whether the reported numbers in different cells are reasonable. Comparison with the published figures of previous censuses could help in identifying such errors. To control for timely dissemination of the census result, it is suggested that an output editing of the census results as against other related sources and remedial action should be done as

quickly as possible. This process could be facilitated by preparing selected figures to be used for comparing and confronting with the census result in advanced. In a few cases, a quick reference to census schedules would indicate whether there are coding errors. Calculation of some ratios and growth rates, and comparison with previous census figures or other figures published by sample surveys, can be useful. Comparison with other survey-based figures should be attempted only if the concepts used are comparable.

4. Management of quality assurance and improvement programme

1.227. User orientation and continuous improvement are important components of quality consciousness and hence of any quality assurance activity carried out as part of the census. The aim of continuous improvement should be reflected in all aspects of the census organization, and such improvement should be aimed at all census operations and at all levels. As a first step, census managers should identify error-prone activities, whether due to human or machine factors, and target these activities for intensive quality assurance activities. Separate plans should be designed for each job, keeping in mind the nature of the operation performed. Suitable information systems about quality must be designed for different levels of management. The information must be provided in time for action to be taken. The most important aspect of any quality assurance and improvement programme should be the taking of appropriate action to prevent further errors from occurring and to identify and, if possible, correct the errors that have occurred.

1.228. It is also useful to institute a mechanism by which a check of the overall census operation, as a cohesive system, can be carried out so as to verify that all elements of the operation are well synchronized. A computer-based management system could assist in such a systemic endeavour. It would require the development of well-functioning interlinked databases, such as EA files, along with any relevant information, for example, data on population and households; personnel (field staff) files; payment system files; and any other data files that might be needed for the management of a quality assurance system. The development of such a system requires a high level of expertise and a long lead time of preparation. However, once it is successfully established, countries will gain significant advantages including higher efficiency, reduced costs and higher-quality census products.

D. Enumeration

1. Method of enumeration

1.229. 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, postal distribution of the questionnaire, with or without postal return, is used in conjunction with the householder method. This mail-out and mail-back procedure can be used exclusively or combined with on-site checking by a census official.

1.230. 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 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 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. New hardware and software technologies have made possible other enumeration methods, such as self-enumeration on the Internet, or CAPI. While these new methods can supplement and not replace more traditional approaches, caution about their adoption should be exercised. However, overly complex designs should be avoided and adequate quality checks, especially to avoid double counting and fraud cases, in case of coexisting enumeration methods have to be considered.

1.231. 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 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.

1.232. 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.

1.233. 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.

1.234. For more detailed information on the methods described above and for other methods of enumerating nomads, reference may be made to the study presented to the Conference of African Statisticians at its tenth session.[14]

2. Timing and length of the enumeration period

1.235. 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

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

should be chosen when most people are staying at their usual place of 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 on 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.

1.236. 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.

1.237. 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.

1.238. 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.

1.239. 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.

1.240. 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. Supervision

1.241. 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.

4. Use of sampling in the enumeration

1.242. Sampling may be employed in the enumeration for collecting information on any topics that need not be tabulated for small areas. 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 1.358-1.391 below.

E. Data-processing

1.243. 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.

1.244. The most common procedure is to have the census documents arrive in the processing centre in batches by enumeration area. 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 a 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 processing consists of the scanning and text/image recognition of census questionnaires. In the case of questionnaires transmitted electronically, it is appropriate to set-up a *meta-data 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. Method of processing

1.245. 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 servers side most of heavier computing operations, such as scanning, aggregation and analysis of large sets of micro-data, coordination of data transmission, intranet web hosting and so forth, can be executed more reliably than on micro-computers. 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.

1.246. In a census office that utilizes a networked computer environment, the file servers allow both data and program files to be stored in a central location. This system economizes on storage space for client computers and removes the need for much physical movement of programs and data on computer media such as diskettes. Data storage requires frequent back-ups of the system information to avoid major data loss due to hardware or software faults. Thus, having servers does have such a strategic importance that their location and administration must be well defined and secure enough to ensure data protection.

1.247. 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 data is particularly important for identifying improvements needed in the census questionnaire, instructions to enumerators 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.

2. Coding

1.248. Whenever possible, *pre-coded* responses should be used in census questionnaires with numerical or alphanumeric codes being printed next to each category. 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 coder (possibly computer-assisted) or by a dedicated computer program for automatic coding. 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.

1.249. A 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 source of errors, coders should not rely only on their memory: they must base their function on the use of the *code books*. Automatic or computer-assisted coding (CAC) may support efficiently the coding activity, by enhancing the quality of operations, reducing coding errors, and speeding up the coding process.

1.250. *Computer-assisted coding* uses personal computers (PCs) 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 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.

1.251. In the second approach, which is mainly used in image processing of data (ICR method) for non-Latin or multi-lingual countries, due 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. At the same time a pull-down menu from a coding data base will present the coder 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 data base for that specific case. Although this approach is more time consuming and costly in comparison to the first one, the quality of coding is much higher than in the traditional way of coding.

1.252. 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.[15]

1.253. *Automatic coding* is a process in which the decision about the code to be assigned is delegated to a computer program. The main difference with computer-assisted coding consists in the automatic acceptance of the answer if its score is over a pre-determined 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 manually or by some form of automatic reading. Developing computer software for automatic coding is a complex task. The error rates and rates of unsolvable cases for difficult variables tend to be high. Automatic coding methods need to be complemented by computer-assisted or conventional coding methods for unresolved responses.

3. Data capture

1.254. 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*, optical mark reading, optical character reading and imaging processing techniques. Computer-assisted keyboard data entry is usually carried out using personal computer (PC) data entry programs with built-in logical 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.

1.255. *Optical mark reading* (OMR; also 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 processing technologies. Owing to relatively stringent requirements for the successful processing 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.

1.256. 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

[15] For additional references see Economic and Social Commission for Asia and the Pacific, "Report of the Workshop on Computer-Assisted Coding, New Zealand, 17-21 April 1989" (STAT/WCAC/Rep.); also European Workshop on Census Processing, Fareham, United Kingdom, 6 and 7 March 1995; (Eurostat, Office of Population Censuses and Surveys, 1995); Economic Commission for Europe, Conference of European Statisticians (CES), "Le recensement de la population de 1982 en France: saisie et chiffrement assistés par ordinateur: rapport de l Institut national de la statistique et des études économiques de la France (INSEE)" (CES/SEM.21/R.24), 30 July 1987 French National Institute of Statistics and Economic Studies (INSEE), Automatic Coding of Descriptive Data in INSEE Surveys: Use of the QUID System (CES, ISIS 90, 1990).

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.

1.257. *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 as ICR. In the context of censuses, therefore, this would require that handwriting of text in questionnaire forms by the enumerators be as uniform as possible to common "model" handwriting so as to enable the work of the recognition software engine. In general, only numerals will give acceptable results in an uncontrolled environment, that is to say, one where the machine has not been adapted to the writing style of a particular person. Nevertheless, letters or other writing symbols may also give good recognition rates, as experimented in a multitude of past censuses, if all enumerators comply to use a common handwriting style. OCR/ICR technology has progressed very much and it is still improving thanks to the implementation of more sophisticated recognition algorithms and the use of neural networks for self-learning of the system. Even OCR restricted to numbers represents a considerable step forward when compared with OMR. Clear number writing instructions have to be provided for the enumerators.

1.258. *Imaging techniques* and *scanner devices*, together with OCR software, have recently been used by several countries for data capture. Several countries, at different levels of development in their statistical infrastructure, find the modern imaging technology increasingly cost-effective. Experience shows that significantly low error rates are achieved in recovering marks or ticks from questionnaires. *Numerical and alphanumeric characters* written by trained enumerators can also be captured with an acceptable error rate. However, *alphanumeric characters* are more prone to higher error rates. The equipment developed recently has shown an expanded tolerance to variations in paper quality. Nevertheless, 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 is needed in conjunction with the OCR/ICR system providers.

1.259. The quantity and type of data entry equipment required will depend on the method of data capture selected, the time available for this phase of the census, the size of the country, the degree of decentralization of the data capture operations, and a number of other factors. For keyboard data entry, the average input rates usually vary between 5,000 and 10,000 keystrokes per hour. Some operators have stayed well below that range, while others have surpassed it significantly. Among the factors that affect operator speed are (*a*) the supporting software and program; (*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.

1.260. 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. 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.

4. Data editing

(a) Micro-editing

1.261. 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 making a back-up copy of the original data file at every stage, in case there is a need to go back over the work.

1.262. 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. For cases where sufficient information is unavailable for the specific persons or household to correct apparent errors, the *hot-deck imputation* method can be used. 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, it requires careful programming work, considering the fact that search for appropriate information in the census data-base would slow down computer program execution. The use of hot-deck imputation is often limited to cases involving essential variables where Unknown or Non-response is not an acceptable value. [16]

1.263. 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. Considering this aspect and in comparison with para. 1.262, this method/way is preferred. But precautionary measures should also be defined and set for the fact that Over-ambitious 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 EA 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.

1.264. 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.

(b) Output or Macro Editing

1.265. 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 dataset as the best possible. A range of conditions could cause errors that cause the data to be consistently wrong: perhaps a condition in the editing suite itself is set incorrectly; proportions in an imputation program may be set wrongly; enumerators may complete a collection control panel incorrectly etc. 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

[16] European Workshop on Census Processing, Fareham, United Kingdom, 6 and 7 March 1995 (Eurostat, Office of Population Censuses and Surveys, 1995); IMPS: Integrated Microcomputer Processing System (Washington, D.C., United States Bureau of the Census, International Statistical Programs Center, 1994).

unusual values. These key tables may be a subset of those intended for output or may be tables specifically designed for this purpose.

1.266. 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:
i) 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 re-processing is required.
ii) 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.

1.267. 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). 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.

1.268. A second component of the analysis is the compilation of a set of information regarding expected changes since the benchmark survey. For example:
(i) It is possible that in the due time (since the previous collection) improvements in maternal health care programs have led to an increased survival rate for women. Thus a decreased sex ratio around the child bearing ages may be noticed.
(ii) 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.

1.269. There will be a need for careful judgement when the analytical tables show a significant and unexpected difference to 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:
i) A problem in the collection that has generated the benchmarks; or
ii) A genuine and previously undetected social change that is being correctly revealed by the current collection.

1.270. 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 meta-data) so that they would be able to treat and analyze 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 fully being 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
a) Significance of the error
b) The number of questionnaires that have already been processed
c) Time duration for the reprocessing
d) The impact of such a decision on other consecutive phases of the census (such as tabulation and dissemination) and at last but not the least,
e) Cost and expenditure of that decision
The above mentioned factors are very determinant and may cause some critical objections with respect to the value and validity of the census if not National Statistical Office activities - by top officials and decision makers as well as expert end users.

5. Processing control

1.271. 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.

1.272. 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 1.227-1.228.

6. Master file for tabulation

1.273. 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, to have 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.

1.274. 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 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.

1.275. Census *master data files* may become large. Nowadays servers are much more powerful and able 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

1.276. 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. 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, On-Line 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.

1.277. 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.

1.278. 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.

1.279. Another factor that should be taken into consideration when selecting software packages for tabulation work is 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. Moving to a different software environment should be the result of a careful analysis of all the factors concerned.

8. Provisional census results

1.280. 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. 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 programme (see chap. IX below). Tabulations may be based on all of the returns or on a sample. 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.

F. Databases

1.281. 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.

1.282. 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.

1.283. 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.

1.284. 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

1.285. 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. As time goes by, new technologies for mass storage will undoubtedly evolve. 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.

1.286. 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 data base requires a cross-tabulation programme 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.

1.287. 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.

1.288. 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 consider-ation. In most countries, the use of the census data to identify individuals is prohibited by law. Moreover, the long-term reputation of national statistical authority may well be jeopardized if such disclosures occur.

1.289. There are a range of 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

1.290. 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

1.291. 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 web site of the census office. A machine-readable publication-equivalent database has the advantage of being cheaper to prepare than its hard-copy counterpart and of not being subject to the gradual degradation typical of printed reports. 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.

1.292. 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, as in the case of CD-ROM or DVD-ROM.

(b) Table-oriented databases

1.293. 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.

1.294. 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.

1.295. 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.

1.296. 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 meta-language 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, unit of measures, indicators, values, the time dimension and footnotes and in short the *meta-data*. 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

1.297. 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.

1.298. 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. Such metadata -- 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.

1.299. In addition, various processing modules (custom-made or commercial) can be attached, allowing seasonal adjustment, interpolation and extrapolation, model building, 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

1.300. 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.

1.301. Several census organizations have produced this kind of product, sometimes in cooperation with a commercial company. Many users want data for relatively small areas 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.

1.302. 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. Geographical information systems

1.303. A geographical information system (GIS) can be seen as a system of hardware, software and procedures designed to support the capture, management, manipulation, analysis, modelling and display of spatially referenced data. 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.

1.304. 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, *inter alia*, it is feasible to maintain such a system during the intercensal years and where there is no dependence on external support.

1.305. 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 policy makers 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.

1.306. 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.

1.307. Being a rather complex technology and a resources-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 analysing 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

1.308. A census is not complete until the information collected is made available to potential users in a form 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 on-line (in this case it will be available only to connected population).

1.309. 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 offers respective advantages and limitations, and the choice of using one or several 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.

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

1. Publication of printed tables and reports

1.311. Printed publications - despite their production cost - remain in most countries the preferred 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 easily deteriorate, and do not require that the user have any particular equipment, software or technical skills.

1.312. 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.

1.313. 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.

1.314. 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.

1.315. 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.

1.316. As a cheaper alternative to printing, census reports can be reproduced on microform (microfilm or microfiche). This technique allows broadening the publication program 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

1.317. For an increasingly 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. Magnetic media are usually diskettes, but they are becoming rapidly obsolete owing to the advent of CD-ROMs and DVD-ROMs. Important drawbacks of diskettes are their limited capacity and vulnerability. Adequate storage and frequent recycling are necessary to avoid demagnetization and loss of data. CD-ROMs have a capacity of up to 700 Mbytes, while DVD-ROMs have a capacity from 4.7 to 17 Gbytes.

1.318. Technologies such as CD-ROM, and the emerging DVD-ROM, provide a much better 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. On-line dissemination

1.319. With the surge in importance of the Internet and the World Wide Web, on-line dissemination of all kinds of information, including statistical information, has gained a new impetus. The advantages of on-line dissemination are found primarily in terms of speed, flexibility and cost. 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 - usually equivalent to the price of a local telephone call - 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.

1.320. On-line 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 web sites. One could use the same web site for both internal and broad community communication, with the granting of access rights in certain areas to privileged users only. Security measures including passwords, call-back 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 web site 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 web site in direct contact with the public. It is also recommended that a powerful firewall constitutes a security layer between the web site that is visible to the public and the working network of the census office. Web sites 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 technical nature, has to be mandated, demanded and provided resources for by the highest levels of management of the census office.

1.321. An Internet web site 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 on-line 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”.

1.322. Internet web sites 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. For example, there may be a database of aggregated census data for small areas - or a micro-data database - that users can access in this way. 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 Internet users census micro-data samples and an interactive tabulation system. Users can then select records from these data sets that satisfy certain parameters and compute statistical information, such as two-dimensional cross-tabulations of either original or recoded variables. Program 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 web site be made available in a static format, which is faster to download. Letting the user to run data extraction on on-line 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.

1.323. Another electronic dissemination method, limited in depth but broad in accessibility, is television videotext. Quite a few statistical offices already maintain on certain television channels a number of pages of actual information that are accessible by anyone having a television set with videotext capability. From a public relations point of view, this is an excellent way to bring the work of the statistical office to the attention of a very broad audience. Since the taxpayer generally still funds an overwhelming part of the costs of official statistics, such a consideration is not to be neglected. Similarly other 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.

1.324. 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 web site or optical media, while additional information may be provided by telephone or some other on-line protocols, such as File Transfer Protocol (FTP) sites. This will usually take the form of a package that contains basic data, metadata and a 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 sub-national 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 web site specifies the instructions on how to contact officers responsible for special dissemination needs.

1.325. 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

1.326. 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.

1.327. 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

1.328. 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

1.329. 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 confidentiality when utilizing the data, and the public reasons 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.

1.330. 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. 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 persons or housing units in the census enumeration. The 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, persons who for one reason or another will 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.

1.331. 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 such activities as the census publicity campaign. 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 control and improvement programme provides further recommendations relating to controlling and assessing the quality of census operations.

1.332. Evaluation efforts focused on census results should generally be designed to serve one or more of the following main 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. 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.

1.333. 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 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.

1.334. 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 clearly described in the census report.

1.335. The process of census evaluation should not be permitted to delay the prompt publication of the principal results of the census. Evaluations of the completeness and accuracy of the data can be issued after the initial census results are published.

2. Methods of census evaluation

1.336. 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.

1.337. 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.

1.338. Demographic analysis and post enumeration surveys[17] are two very important methods for evaluating census data, and these are discussed in further detail in the following two subsections.

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

3. Demographic analysis for census evaluation

1.339. Demographic analysis offers a powerful methodology for evaluating the quality of a census and countries are encouraged to use demographic analysis 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 internal consistency check, 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-gender ratios from the ones expected for each five-year age group and combining the results into a single score.[18] Other summary indices are Whipple's Index and Myer's Blended Index, used for judging age-heaping.

1.340. Stable population theory is also used 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. Its usefulness is demonstrated by the fact that the conditions assumed under the model -- constant fertility and constant or recently declining mortality -- are satisfied in a number of countries. Recent declines in fertility in a given country render the technique somewhat less useful as an evaluation tool, however, since the technique is sensitive to changes in fertility levels.

1.341. 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.

1.342. 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 consistent (cohort survival regression method).[19] 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

1.343. The post-enumeration survey (PES), a special kind of survey designed to measure census coverage and/or content error, has been used effectively in a wide range of countries in recent decades.

1.344. 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

[18] See Methods of Appraisal of Quality of Basic Data for Population Estimates: Manual II, ST/SOA/SER.A/23 (United Nations publication, Sales No. E.56.XIII.2).

[19] Detailed methodologies including step-by-step procedures for applying all the demographic techniques mentioned above, plus others, are contained in chapter 5 of Evaluating Censuses of Population and Housing, (Washington, D.C., United States Department of Commerce, Bureau of the Census, 1985). Numerical examples are also given in the chapter regarding the application of these techniques in many developing countries. The complete publication is also useful as an overall census evaluation reference.

ensure that the impact of natural population changes (births, deaths and migration) and lapses in respondent recall do not hopelessly complicate the exercise.

1.345. The methodology for a PES may entail either a single or a dual system estimation procedure for estimating the "true" total population and hence, the coverage error which is typically an undercount. When dual system estimation is used, an essential property in terms of design is PES independence of the census. Independence implies the presence of many features that are often difficult to introduce in actual practice, including the use of a frame for PES sampling that is unrelated to the census operation, a PES staff of enumerators and other field personnel who are different from the census staff, and organizational management of the PES operation that is under the general supervision of someone other than the census director. When sufficient independence cannot be achieved, a PES design that relies upon single system procedures may be usefully employed. Even though the sampling frame is then based on the census and the PES managed by the census director, this methodology still assumes that the PES, with its better trained enumerators and more intensive field procedures, will give results superior to those of the census. However, unlike the dual system approach, this method cannot account for those persons missed in both the census and the PES, and so the degree of under-coverage is usually understated when a single system PES is used.

1.346. Another basic property of PES design and execution, irrespective of whether single or dual system estimation is used, 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 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.

1.347. 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.

1.348. 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 excellent references are available that set out highly detailed procedures for designing a PES and the conditions under which they may or should be considered.[20]

5. Re-interview surveys

1.349. 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.

1.350. As part of the design of some post-enumeration surveys, a sample of the original census

[20] The most comprehensive material is found in chapter 2 of Evaluating Censuses of Population and Housing, Washington, D.C., (1985), United States Department of Commerce, Bureau of the Census, Developments in Dual System Estimation of Population Size and Growth, K. Krotki, ed. Alberta, Canada, University of Alberta Press, 1978), is also highly recommended for its exposition of the use of PES in census evaluation; especially relevant therein are, "The role of dual system estimation in census evaluation,"(chap. 10); E. Marks and J. Rumford, "The 1974 post-enumeration survey of Liberia" (chap. 11); and C. Scott, "The problem of independence and other issues," (chap. 12).

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

1.351. 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.

1.352. 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 other research organizations. 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.

1.353. 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 analyse 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.

1.354. 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.

1.355. 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 dissemination of census experience

1.356. It is recommended that every country should prepare and, if possible, publish a methodological and administrative report providing 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 information on the manner in which the census was planned, organized and conducted, the important methodological and other problems encountered at the various stages of the programme, and points to be considered in future censuses. 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. 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.

1.357. The cumulative experience of past censuses in a country is definitely of great help in the preparation of a new census. Because of the lapse of time between censuses and the likelihood of changes in upper-echelon personnel even in a permanent census office, it is most useful to assemble complete records on the methodology of each census, an evaluation of the techniques employed and detailed records on costs and implementation of the census budget. These records should be arranged in such a way as to ensure that information on each aspect of the census operation may be found easily. Setting up or implementing a programme of knowledge management in the census office may thus support a rationale and efficient manner of modelling flows of information, centres of responsibility, and map essential working processes connected with the execution of the census. Knowledge management tools and techniques help in 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.

IV. Use of sampling in population and housing censuses

1.358. The potential role of sampling in population and/or housing 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.

1.359. 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

1.360. The use of sampling in a census entails an awareness of the precision desired in sample estimates. The higher the levels of precision, 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.

1.361. Sampling methods employed in census-taking, with the exception of pilot tests, should make use of probability samples as opposed to judgmental, 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.

1.362. Of course, estimated results based on samples are subject to sampling errors in addition to various types of nonsampling 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.

1.363. 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

1.364. 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.

1.365. 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.

1.366. 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.

1.367. 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

1.368. 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

1.369. 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.

1.370. 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.

1.371. 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

1.372. 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.

1.373. 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 cannot be collected by sampling.

1.374. 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.

1.375. 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.

1.376. 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.

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

3. Post-enumeration surveys and field checks

1.378. 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.

1.379. 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 under-coverage with a certain degree of reliability. In addition, the estimates of under-coverage 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 under-coverage) are wanted. When designing a PES it is important that:

(a) Time between the census and the PES be minimized to avoid as much recall error as possible;
(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;
(d) Dual system estimation should be used because it requires assuming that the PES is only a second independent enumeration, and not that it is a higher quality (or perfect) enumeration than the census;
(e) The members of households interviewed in the PES should be matched to the census on a case-by-case basis to determine whether they were enumerated in the census; and
(f) The PES must have a rule for people who move between Census Day and the survey interview. For example, the independent sample may be the people who are residents of the sample areas on Census Day, which includes the out-movers.

4. Quality assurance and improvement programmes

1.380. As mentioned earlier, sampling can be used effectively for measuring and controlling the quality of many phases of census operations. 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.

1.381. 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

1.382. 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.

1.383. 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.

1.384. 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.

1.385. 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

1.386. 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 that CSPro and IMPS should be used as 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, they should keep in touch with the latest technology to be used for data processing and tabulation.

1.387. 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

1.388. An essential ingredient of probability sample design is the existence of a complete, accurate and up-to-date sampling frame. A samping 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. 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.

1.389. 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 upto-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), and that 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.

1.390. Maps and prior census information concerning small areas are very important for the devising of 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.

1.391. 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 and sub groups of the population, 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

1.392. 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.

1.393. 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.

1.394. 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.

1.395. It is recognized that there may be difficulty in some countries in maintaining independent concepts of ***household*** and of ***housing unit***.[21] However, the advantages in terms of the usefulness of the data that

[21] For further discussion on the concepts of households and housing units, see paragraphs 1.398 and 1.403; also, for the definition of “housing unit, see paragraph xxx.

result from preserving separate concepts usually outweigh the additional effort required in maintaining them.

1.396. 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

1.397. For census purposes, the term ***person*** denotes each individual falling within the scope of census. As emphasized above, 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 1.404 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 V, section C. In addition, each tabulation presented in annex I is accompanied by a description of the population to be included in the tabulation.

2. Household

1.398. 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.

1.399. The concept of household provided in paragraph 1.398 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 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).

1.400. Some countries use a concept different than 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.

1.401. 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 2.403-2.406.

1.402. 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. 2.518-2.521) which can be perceived in different ways by different communities.

The following two categories or degrees of homelessness are recommended:
1. Primary homelessness (or rooflessness). This category includes persons living in streets or without a shelter that would fall within the scope of living quarters.
2. Secondary homelessness. This category may include the following groups:
2.1. Persons with no place of usual residence who move frequently between various types of accommodations (including dwellings, shelters or other living quarters).
2.2.
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.

1.403. 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

1.404. As emphasized in paragraph 1.390, 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.[22] Personnel responsible for the running of an institution and not living in dormitories or similar accommodations should be excluded from the institutional population.

1.405. 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. Living quarters

1.406. The principal units of enumeration in a census of housing are sets of 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.

1.407. 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 temporary, mobile and marginal housing units and collective living quarters, they are occupied or (*b*) although not intended for habitation,

[22] For more detailed definition and specifications of institutions as a subset of collective living quarters, see paragraphs xxx-xxx.

actually be in use for such a purpose at the time of the census.[23]

5. Building

1.408. 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 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.

1.409. A building is any independent free-standing structure comprising one or more rooms[24] or other spaces, covered by a roof and usually enclosed within external walls or dividing walls[25] 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.[26]

1.410. 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.

B. Place of enumeration

1. Concepts relating to place of residence

1.411. "Usual residence" is defined for census purposes as the place at which the person has lived for most of the past 12 months. For persons who have not lived in one place for most of the previous 12 months the place of usual residence should be the place at which they were residing on census night.

1.412. A number of special cases may be encountered in which the application of this definition may require some additional explanation. The principle that is followed is to consider where the person will require delivery of government or private services to support them. Some of the more difficult cases more likely to be encountered in a census are:

1) Students at boarding school and living away from family homes at universities: in most cases the students will spend more than 6 months in aggregate at the educational institution. They should regard the locality of the institution as their place of usual residence.

2) Persons working away from their family home: This situation covers a wide range of cases including:

a) People who spend the working week (5 days) in the area close to their work and weekends and holidays at the family residence. Since they will spend the majority of time away from the family home they should record their usual address as the place they spend the week;

b) Workers who constantly travel to different places, such as traveling salesmen, truck drivers, short term consultants. They will be unlikely to spend, in aggregate more than 6 months in one place and should thus report the family home as their place of usual residence;

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[23] 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 paragraphs xxx-xxx.

[24] For the definition of "rooms", see paragraph xxx.

[25] 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.

[26] For a more detailed discussion of the definition of "building" and related concepts, see paragraphs xxx-xxx.

c) Workers on long term, or semi-permanent assignment to a location away from the family home. In many cases these workers will support the family by remitting a proportion of their wages to their family. However the worker themselves will be accessing services at the location of their work and that location should be regarded as the usual residence.

1.413. 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.

1.414. 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

1.415. 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.

1.416. 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.

1.417. 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.

1.418. 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.

1.419. 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.

1.420. 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.

1.421. With the exception of mobile housing units (see discussion in para 1.421), living quarters and buildings have a fixed location and therefore the place where they are to be enumerated does not have, 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.

1.422. 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 or basic dwellings or they should be excluded from the census if they are of a type other than that of conventional or basic dwellings.[27]

1.423. 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

1.424. 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 if there is only one census day.

1.425. 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.

1.426. 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

[27] By definition, all sets of living quarters except conventional and basic dwellings are required to be occupied in order to be included in the census.

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.

1.427. 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.

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

1.428. 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 Two: Topics for population and housing censuses

VI. Topics to be investigated in population censuses

A. Factors determining the selection of topics

2.1. The topics to be covered in the census (that is, the subjects regarding which information is to be sought for each individual) should be determined upon balanced consideration of (a) the needs of the broad range of data users in the country; (b) achievement of the maximum degree of international comparability, both within regions and on a worldwide basis; (c) the probable willingness and ability of the public to give adequate information on the topics; and (d) the total national resources available for conducting the census. 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.

2.2. In making the selection of topics, due regard should be paid to the usefulness of historical continuity in providing the opportunity for comparison of changes over a period of time. Census takers should avoid, however, collecting information that is no longer required 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 topics traditionally investigated and to re-evaluate the need for the series to which they contribute, particularly in 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.

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 the census schedule. National and international objectives are usually compatible, however, since international recommendations, based on a broad study of country experience and practice, are recommendations for definitions and methods that have successfully met general national needs in a wide range of circumstances. Furthermore, the analysis of census data for national purposes will often be facilitated if, by 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 departures 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. Thus, it may be necessary to avoid topics likely to arouse fear, local prejudice or superstition, and questions too complicated and difficult for the average respondent to answer easily in the context of a population census. The exact phrasing of each question that is needed in order to obtain the most reliable response will of necessity depend on national circumstances and should be well tested prior to the census.

4. Resources available

2.7. The selection of topics should be carefully considered in relation to the total resources available for the census. An accurate and efficient collection of 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 investigated, processed and disseminated in a timely, reliable and cost-effective manner. In balancing the need for data against resources available, several additional factors will enter into the decision, including the extent to which questions can be precoded.

B. List of topics

2.8. The list of topics included in these global recommendations for population censuses are based on the global and regional census experience of the last several decades. The topics included here are, with minor revisions, the same as those included in the previous United Nations population census recommendations,[28] with the addition of a topic on agriculture.

2.9. It should be stressed that no country should attempt to cover all the topics included in the list of population topics. Rather, countries will need to make their selection of topics in light of the considerations discussed in paragraphs 2.1-2.7 above, bearing in mind current regional recommendations pertaining to census topics.

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 likely to present difficulties in terms of data collection or processing are probably best collected for only a sample of the 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 better circumstances, might be investigated more suitably by other means.

2.11. Although the set of topics covered in these recommendations is quite comprehensive in terms of topics 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 of particular national or local interest. 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

[28] *Principles and Recommendations for Population and Housing Censuses, Revision 1,* Statistical Papers No. 67/Rev.1 (United Nations publication, Sales No. E.80.XVII.8); and Supplementary Principles and Recommendations for Population and Housing Censuses, Statistical Papers No. 67/Add.1 (United Nations publication, Sales No. E.98.XVII.8).

recommendations in previous census decades.

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

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. The former are those for which data are collected by a specific item on the census. 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.

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.

List of population census topics

Topics collected directly		Derived topics	
1. Geographical and internal migration characteristics (paras. 2.44-2.88)			
(a)	**Place of usual residence** (paras. 2.46-2.51)	(g)	**Total population** (paras. 2.71-2.77)
(b)	**Place where present at time of census** (paras. 2.52-2.56)	(h)	**Locality** (paras. 2.78-2.80)
(c)	**Place of birth** (paras. 2.57-2.63)	(i)	**Urban and rural** (paras. 2.81-2.88)
(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)		
2. Household and family characteristics (paras. 2.89-2.114)			
(a)	**Relationship to head or other reference member of household** (paras. 2.96-2.105)	(b)	**Household and family composition** (paras. 2.106-2.113)
		(c)	Household and family status (para.2.114)
3. Demographic and social characteristics			

Topics collected directly	Derived topics
(paras. 2.115-2.146)	
(a) **Sex** (para. 2.116)	
(b) **Age** (paras. 2.117-2.125)	
(c) **Marital status** (paras. 2.126-2.133)	
(d) Religion (paras. 2.134-2.136)	
(e) Language (paras. 2.137-2.140)	
(f) Ethnicity (paras. 2.141-2.143)	
(g) Indigenous peoples 2.144-2.146)	
4. Fertility and mortality (paras. 2.147-2.175)	
(a) **Children ever born** (paras. 2.156-2.161)	(h) **Births in the past 12 months** (para. 2.164)
(b) **Children living** (paras. 2.162-2.163)	(i**) Infant deaths in the past 12 months (paras 2.169-2.170)**
(c) **Date of birth of last child born alive** (paras. 2.164-2.166)	
(d) Age, date or duration of first marriage (para. 2.167)	
(e) Age of mother at birth of first child born alive (para. 2.168)	
(f) **Deaths in the past 12 months** (paras. 2.169-2.170)	
(g) Cause of death in broad categories (paras. 2.171-2.172)	
(g) Maternal or paternal orphanhood (paras. 2.173-2.175)	
5. Educational characteristics (paras. 2.176-2.206)	
(a) **Literacy** (paras. 2.176-2.184)	
(b) **School attendance** (paras. 2.185-2.190)	
(c) **Educational attainment** (paras. 2.191-2.198)	
(d) Field of education and educational qualifications (paras. 2.199-2.206)	
6. Economic characteristics (paras. 2.207-2.324)	
(a)Purpose of collecting data on the economic characteristics of persons (paras. 2.207-2.212)	
(b) Economic activity of persons (paras. 2.213-2.215)	

Topics collected directly	Derived topics
(c) **Activity status** (paras. 2.216-2.268)	
(d) Time worked (paras. 2.269-2.277)	
(e) Selection of "job" to be classified by descriptive variables (paras. 2.278-2.282)	
(f) **Occupation** (paras. 2.283-2.289)	
(d) **Industry** (paras. 2.290-2.294)	
(e) **Status in employment** (paras. 2.295-2.306)	
(f) Income (paras. 2.307-2.311)	
(g) Institutional sector of employment (paras. 2.312-2.321)	
(h) Place of work (paras. 2.322-2.324)	
7. International migration characteristics (paras. 2.325-2.340)	
(a) **Country of birth** (paras. 2.329-2.330)	
(b) **Citizenship** (paras. 2.331-2.336)	
(c) **Year or period of arrival** (paras. 2.337-2.340)	
8. Disability characteristics (paras. 2.341-2.370)	
(a) **Disability status** (paras. 2.342-343)	
(b) Disability framework and terminology (paras. 2.344-2.366)	
(c) Use of census to screen for disability and follow-up with other surveys (paras. 2.367-2.370)	
9. Agriculture (paras. 2.371-2.380)	
(a) Introduction (paras. 2.371-2.372)	
(b) Own-account agricultural production (paras. 2.373-2.376)	
(c) Characteristics of all agricultural jobs during the last year (paras. 2.377-2.380)	

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 and policy development.

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.

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 1.441-1.423 describe the place of enumeration basis for the census.

2.21. Population counts may be required on a population present, usual resident population, or service population basis. The choice of population count required will depend on national circumstances and 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).

2.22. The aim of the census is to achieve unduplicated, full coverage of the population. In practice, countries face a range of challenges in enumerating the population on the basis 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 hard to enumerate groups of the population and persons for whom usual residence is not easily defined.

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.

1. Population Present Count

2.24. A population present count is the simplest form of population count from a population census. People are counted at their place of enumeration, usually the dwelling where they will spend census night. Foreign residents who are in the country at the time of the census will be included and usual residents of the country who are absent at that time will be excluded. A population present count can be used with information on migration flows to produce an estimate for the national resident population of a country.

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. 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 provide a full count of usual residents 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, 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 difficult to enumerate groups set out in 4, except for categories (b), (e) and where applicable (g). For some of these groups the concept of "at the time of the census" may need to be extended to allow enumeration to take place. Collecting on a place of enumeration basis in these situations may increase the risk of either overcount or undercount. 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.

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 determine the definition of a usual resident according to their circumstances, the recommended definition of a usual resident is "one who lives or is expected to live in that country for a period of 12 months or more". Usual residents may have citizenship or not, and they may also include undocumented persons, applicants for asylum, or refugees if they are living, or intend to live in the country for 12 months or more. Usual residents then may include foreign residents who reside, or intend to reside, in the country for 12 months or more. Persons who may consider themselves usual residents of a country because of citizenship or family ties, but are absent from the country for 12 months or more, 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 if their absence is, or is expected to be, less than 12 months. Countries applying a different definition of a usual resident for national purposes are recommended to 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 either be enumerated on a 'place where present' basis or on a 'where usually resident' basis, as described in paragraphs 1.411-1.423.

2.34. Ideally a usual resident population count should include all the difficult to enumerate groups set out in 4, except for categories (c), (e) and where applicable (f).

2.35. To produce a usual resident population count, information is required on all usual residents, and the address of their usual residence. If the census is enumerated on a place present at census basis, then the information collected needs to clearly differentiate 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 the census is enumerated 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 time of the census to

provide information about those people. Estimates 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 usual resident if a person could be considered to have more than one usual residence, sometimes in different countries. There may also be those who do not consider themselves to have a usual residence, such as nomadic peoples or undocumented persons. 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.

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, working 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 residents 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 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 organise for their enumeration. Communication publicising 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 refugees, 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) 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.

(e) 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 planning service delivery.

(f) 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.

(g) 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.

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 be indicated 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 forth in chapter IV.

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 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, a question on their place of usual residence can be easily put and 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 is the geographical place where the enumerated person usually resides. The crucial word "usually" means that this is where the person has resided for most of the previous 12 months. The place of usual residence may be the same as, or different from, the place where he or she was present at the time of the census or his or her legal residence.

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 special cases, where persons have more than one residence. 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. In some other circumstances referring to the person's intentions for the future may assist the determination of the place of usual residence. The treatment of all such difficult cases should be based upon the concept of where people have lived for most of the previous 12 months and clearly set forth in the census instructions. More details on these cases is described in paragraph 1.412.

2.49. Problems may also arise with persons who have 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, and also with persons who have 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.

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 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 slept on the night preceding the census day, because many persons appearing in the questionnaire were not physically present at the place of enumeration during most of the day.

2.54. As mentioned in chapter V, 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 as of 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 entered 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.

(c) Place of birth (Core topic)

Recommended tabulation: 1.4

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.

2.58. The place of birth is, the civil division in which the person was born or, for those born in other countries, the country of birth. For persons born in the country where the census is taken (the native born population), the concept of place of birth usually refers to the geographical unit of the country in which the mother of the individual resided at the time of the person's birth. In some countries, however, the place of birth of natives is defined as the geographical unit in which the birth actually took place. Each country should explain which definition it has used in the census.

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, which therefore desire to compile information only 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.

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.

2.61. For the latter purpose, 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. For studies of internal migration, data on the place of birth of the native population even in terms of major civil divisions are not adequate in themselves. For an understanding of the movements of people since birth it is 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 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 in the light of their own circumstances must address the second problem.

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 and place of previous residence or of residence at a specified date in the past.

(d) Duration of residence (Core topic)

Recommended tabulation: 1.5

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 and (*b*) the major or smaller civil division in which that locality is situated.

2.65. 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.

2.66. In collecting information on duration of residence, it should be made clear that the concern is with length of residence in the major or smaller civil division and the locality but not in the particular housing unit.

(e) Place of previous residence

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 his or her present civil division of 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, the duration of residence should also be investigated, if at all possible, so that the data can be crossclassified.

(f) Place of residence at a specified date in the past

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). The former reference date provides current statistics of migration during a single year; the latter may be more appropriate for collecting data for the analysis of international migration although perhaps less suitable for the analysis of current internal

migration. Also to be taken into account in selecting the reference date should be the probable ability of individuals to recall with accuracy their usual residence one year or five years earlier than the census date. 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. In other cases, one-year recall may be more likely than five-year recall. Some countries, however, may have to use a different time reference than either one year or five years preceding the census because both of these intervals may present recall difficulties. National circumstances may make it necessary for the time reference to be one that can be associated with the occurrence of an important event that most people will remember. In addition, information on year of arrival in the country may be useful for international migrants.

2.70. No matter what previous date is used, provision must be made for the treatment of infants and young children not yet born at that 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 another group of the population is included or excluded, depending on national circumstances, despite the fact that the general term used to describe the total might imply a treatment opposite to the one given 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 counted in the total. If the group was enumerated, its magnitude should be given; if it was not enumerated, an estimate of its size 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.

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, including refugees;
(n) 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 underenumeration or overenumeration, both the enumerated figure and the estimated corrected population figure should be shown and described. 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, may comprise either all usual residents of the unit or all persons present in the unit at the time of the census.

(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 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 segments of a single locality rather than separate localities.

2.80. A large locality of a country (that is to say, a city or a town) is often part of an urban agglomeration, which comprises the city or town proper and also the suburban fringe or thickly settled territory lying outside, but adjacent to, its boundaries. The urban agglomeration is therefore not identical 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, for the most part, even 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 industrialized countries, this distinction has become blurred and the principal difference between urban and rural areas in terms of the circumstances of living tends to be a matter of the degree of concentration of population. Although the differences between urban and rural ways of life and standards of living remain significant in developing countries, 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, a 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. A basic classification by five size-categories has been recommended for the Economic Commission for Europe (ECE) countries.[29]

2.84. Density of settlement 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 the facilities noted above are available in some areas that are still rural since agriculture is the predominant source of employment, it might be advisable to adopt different criteria in different parts of the country. Care must be taken, however, to ensure that the definition used does not become too complicated for application to the census and for comprehension by the users of 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 locality is the most appropriate unit or classification 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. Household and family characteristics

2.89. 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.

2.90. 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 than 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,

[29] Economic Commission For Europe, draft "Conference Of European Statisticians Recommendations For The 2010 Censuses Of Population And Housing" (CES/AC.6/2005/2/Add. 1), 13 March 2006.

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.

2.91. A household may be located in a housing unit 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. The household may also be homeless. For more discussion on homeless households, see para. 1.402.

2.92. 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.

2.93. 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 exists; census tabulations should therefore clearly indicate whether they relate to households or to families within households.

2.94. From the definitions of "household" and "family", it is clear that household and family are different concepts that cannot be used interchangeably in the same census. The difference between the household and the family is *(a)* that a household may consist of only one person but a family must contain at least two members and *(b)* that the members of a multi-person household need not be related to each other, while the members of a family must be related. 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 individuals countries should decide how best to derive and report data on families.

2.95. It is recommended that the household be used as the unit of enumeration 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, 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 residence 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 head or other reference member of household (Core topic)

Recommended tabulations: 2.1, 2.2, 2.3

2.96. In identifying the members of a household, 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.

2.97. 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.

2.98. 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.

2.99. Where spouses are considered equal in household authority and responsibility and may share 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.

2.100. 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.

2.101. 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 are changing. 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. 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.

2.102. 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)* child, *(c)* spouse of child, *(d)* grandchild or great-grandchild, *(e)* parent (or parent of spouse), *(f)* other relative, *(g)* domestic employee or *(h*) 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 *(e)* and *(f)* may be consolidated as Other relative and *(g)* and *(h)* can be consolidated as Other unrelated person.

2.103. As an aid to the identification of conjugal family nuclei 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.

2.104. For estimating fertility by the *own children* method, 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.

2.105. 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 allowable answers, that relationships be specified completely in the census questionnaire, and that any precoded categories used should be sufficiently detailed to produce desired outputs.

(b) Household and family composition

2.106. 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.

2.107. 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 or *(d)* a mother with one or more unmarried children. Couples living in consensual unions may, where appropriate, be regarded as constituting a family nucleus.

2.108. The concept of family nucleus as defined above limits relationships between children and adults to direct (first-degree) relationships, i.e. between parents and children. In some countries, numbers of skip generation households, i.e. households consisting of (a) 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. The census report should clearly state whether or not skip generation households are included in the family nucleus definition.

2.109. 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.

2.110. 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, their two never-married children, one of their children who is divorced, 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. 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.

2.111. 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.

2.112. 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. 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) Father with child(ren);

(iii) Mother with child(ren);

(c) Extended household, defined as a household consisting of any one of the following: [30]

(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 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: [31]

(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/Unknown.

2.113. 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 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

[30] The subdivisions in this category should be modified to suit national circumstances.
[31] The subdivisions in this category should be modified to suit national circumstances.

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

2.114. 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. The following household and family status classifications illustrate how such an approach may be used.[32] Care should be taken at the planning stages to relate this item to the classification of households by type as recommended in paragraph 2.112.

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 Lone mother[33]
1.4 Lone father[34]
1.5 Child living with both parents
1.6 Child living with lone mother
1.7 Child living with lone father
1.8 Not a member of a family nucleus
1.8.1 Living with relatives
1.8.2 Living with non-relatives

2 Person in a household with no family nucleus
2.1 Living alone
2.2 Living with others[35]
2.2.1 Living with sibling(s)
2.2.2 Living with other relatives
2.2.3 Living with non-relatives

Persons are classified by family status as:[36]

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

[32] To date, only the population and housing census recommendations for the ECE region contain household and family status classifications.
[33] Person living with children, without spouse.
[34] Person living with children, without spouse.
[35] The subdivisions in this category should be modified to suit national circumstances.
[36] The subdivisions in this category should be modified to suit national circumstances.

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

3. Demographic and social characteristics

2.115. Of all the topics investigated in population censuses, *sex* and *age* are more frequently cross-classified with other characteristics of the population than are any other topics. Aside 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. Possible difficulties in securing accurate age data are often not recognized because the topic appears to be a simple one. The difficulties are therefore stressed in paragraphs 2.117-2.125 below.

(a) Sex (Core topic)

Recommended tabulations: All population tabulations except 2.3

2.116. The sex (male or female) of every individual should be recorded in the census questionnaire.

(b) Age (Core topic)

Recommended tabulations: 1.4, 1.5, 2.2, 3.1, 3.2, 3.3, 4.1, 4.2, 4.3, 4.4, 5.1, 5.2, 5.3, 6.1, 6.2, 6.3, 6.4, 6.8, 7.1, 7.2, 8.1

2.117. 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 age of each person, particularly of children under 15 years of age.

2.118. 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.

2.119. The first method yields more precise information and should be used whenever circumstances permit. If neither the exact day nor even the month of birth is known, an indication of the season of the year can be substituted. 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 needed conversion can be best carried out as part of the computer editing work.

2.120. 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, roundings 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.

2.121. 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 possibility 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 editing stage.

2.122. In spite of its drawbacks, the direct question on age is the only one to 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 entered. 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.

2.123. 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.[37]

2.124. 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.

2.125. 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.

(c) Marital status (Core topic)

Recommended tabulations: 2.1, 3.2

2.126. 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 are at least the following: (*a*) single, in other words, never married, (*b*) married, (*c*) widowed and not remarried, (*d*) divorced and not remarried and (*e*) married but separated.

[37] For a more detailed discussion of the investigation of age, see William Seltzer, Demographic Data Collection: A Summary of Experience (New York, The Population Council, 1973), pp. 8-18.

2.127. 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 (*e*) should comprise both the legally and the de facto separated, who may be shown as separate subcategories if desired. Regardless of the fact that couples who are separated may be considered to be still married (because they are not free to remarry), neither of the subcategories of (*e*) should be included in category (*b*).

2.128. In some countries, it will be necessary to take into account customary unions (which are legal and binding under customary law) and extralegal unions, the latter often known as de facto (consensual) unions.

2.129. 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.

2.130. 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.

2.131. 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.

2.132. 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.

2.133. The marital status categories described above do not provide complete information on the range of de facto unions of varying degrees of stability, which may be common in some countries; nor do they adequately describe the prevalence of formal marriage combined with relatively stable de facto union 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 formal marital unions, on de facto unions and on the duration of each type of union.

(d) Religion

2.134. 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 forth, in the census publication, the definition that has been used.

2.135. 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.

2.136. 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.

(e) Language

2.137. There are three types of language data that can be collected in censuses, namely:

(a) Mother tongue, defined as the language usually spoken in the individual's home in his or her early childhood;

(b) Usual language, defined as the language currently spoken, or most often spoken, by the individual in his or her present home;

(c) Ability to speak one or more designated languages.

2.138. 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.

2.139. 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.

2.140. Information on 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.

(f) Ethnicity

2.141. The decision to collect and disseminate information on ethnic or national groups of a population in a census of a population 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. Identification of the ethno-cultural characteristics of a country’s population has increasing importance in the context of migration, integration, and policies affecting minority groups. Due 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 on the potential uses and need for data pertaining to ethnicity, as this improves public support for the census exercise. Data on ethnicity provides 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.

2.142. 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 moveable boundaries.

2.143. 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 is 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. 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 ones and those based on nationality. Since countries collect data on ethnicity in different ways and for different reasons, and because the ethno-cultural composition of a country could vary widely from country to country, no internationally relevant criteria or classification can be recommended.

(g) Indigenous Peoples

2.144. Some countries may wish to collect information in their census of population on the indigenous or aboriginal people living in their country. The responding public should be informed on the potential uses and need for such data to improve public support for the census exercise. Furthermore, the sensitive nature of questions pertaining to the indigenous population requires care in ensuring the public that the appropriate disclosure and data protection methods are being enforced. Facilitating the collection of data on indigenous peoples for national and international needs can serve to improve socioeconomic and active participation of indigenous peoples in the development process for many countries. Dissemination of census data pertaining to indigenous peoples contributes to research in areas such as the socioeconomic conditions of the indigenous population, trends, causes for inequities, and the effectiveness of existing policies and programs. Availability of this 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 programs 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.

2.145. Generally, indigenous peoples of a particular country are social groups with a distinct social and cultural identity from 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, that multiple criteria are developed to accurately capture identity and socioeconomic conditions of indigenous peoples. Defining the indigenous population can be done in many ways, such as through a question on ethnic origin (i.e. 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. In India, the terms “scheduled tribe” are used to identify the indigenous population (the Adivasis). 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 census forms for the indigenous population, and/or with follow-up or complimentary surveys. In Canada, for example, identifying the indigenous population not only comes from a national census, but also a post-censal survey. In Australia, in addition to a 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.

2.146. Involvement of the indigenous community in the data-collection process provides the arena for capacity-building. Using local indigenous languages, employing local indigenous people (as interpreters for example), 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.

4. Fertility and mortality

2.147. 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 ("children born alive", "children living", and "age at marriage or union") are equally appropriate because they provide data that are not easily available from registration data. The population census provides an opportunity to collect data for estimating fertility and mortality at national and subnational 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.

2.148. Three questions are posed to obtain information on fertility: 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. 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.

2.149. A number of countries have restricted the collection of data from fertility and mortality questions in the census to a sample of enumeration areas,[38] 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 under-reporting 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. Enumerator manuals should also include the measures that are needed to minimize such errors.

2.150. The universe for which data should be collected for each of the topics included in this section consists of women 15 years of age and over regardless of marital status. Information should be collected from all such women, regardless of marital status, unless from a cultural standpoint it is not feasible to collect information on childbearing from never-married women. It may be appropriate in some countries to reduce the lower age limit by several years. 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.

2.151. 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.[39] The application of this method 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, or children living 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.

2.152. Mortality topics include infant and child mortality obtained from data on children ever born and

[38] For the use of sampling in the enumeration, see chapter III.

[39] For methodological details, see Manual X: Indirect Techniques for Demographic Estimation, Population Studies, No. 81 (United Nations publication, Sales No. E.83.XIII.2), chap. VIII, sect. C.

children living, and adult mortality obtained from deaths in the past 12 months and maternal or paternal orphanhood. The extent to which adult mortality can be adequately measured from population census data -- particularly from the more innovative approaches to mortality estimation, such as the orphanhood method -- is still uncertain. Accurate responses to these questions are difficult to obtain but are essential for arriving at valid mortality estimates, since the recording of deaths in the past 12 months by sex, age and date in often subject to error.

2.153. As far as possible, efforts should be made to obtain information on the mortality of a child or the survival of a woman's children should be obtained directly from the mother herself. 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 reference person in the household). 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 sample of enumeration areas.

2.154. 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.

2.155. As a general guide, only one of the items listed here is recommended for inclusion in all situations: (a) Children ever born. 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. 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, two items are especially important, as they allow for the indirect estimation of mortality levels: (b) Children living, and (f) Deaths in the past 12 months. In situations where one or more deaths are reported during the past 12 months, an additional set of questions is recommended as well: (g) Cause of death in broad categories. The four remaining items listed here are less essential in general: (c) Date of birth of last child born alive, (d) Age, date or duration of first marriage/union, (e) Age of mother at birth of first child born alive and (h) Maternal or paternal orphanhood. Experience has shown that these four items are less reliable as a means of deriving indirect estimates of fertility and mortality compared to the other topics described here. However, in situations where a country has asked one of these items in consecutive previous censuses, it may be useful to collect comparable information for sake of continuity.

(a) Children ever born[40] (Core topic)

Recommended tabulations: 4.1

2.156. 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.

2.157. Data on the total number of live-born children should preferably be collected for all women 15 years of age and over, regardless of marital status. If, from a cultural standpoint, it is not feasible in some countries to obtain the information for single women, it should be collected at least for all women 15 years

[40] "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 Estimation of Child Mortality, Population Studies, No. 107 (United Nations publication, Sales No. E.89.XIII.9).

of age and over who are or have been married or in a union (in other words, all ever-married or ever-in-a union women), a group also including 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 substantial age-misreporting in the population census, which distorts fertility and mortality estimation based on children ever born and children living cross-tabulated by age of the woman.[41]

2.158. 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"; (*c*) "total number of sons born alive who have died before the census date"; and (*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 solved during the interview.

2.159. The number of sons and daughters should comprise all children ever born alive whether born of the present or a prior marriage or union[42] 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.

2.160. 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. 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.

2.161. 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[43] (Core topic)

Recommended tabulation: 4.2

2.162. 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. 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"; and (*f*) "total number of daughters born alive who have died before the census date". These questions not

[41] 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 Manual X: Indirect Techniques for Demographic Estimation, Population Studies, No. 81 (United Nations publication, Sales No. E.83.XIII.2) chap. II, sect. A.2, and chap. III, sect. A.1). For additional methodological details on the uses of the data, see Manual X.

[42] As indicated in paragraph 2.78, couples living in consensual unions should be regarded as married.

[43] For methodological details on the uses of the data, together with data on live-born children, see the publications mentioned in footnote 49.

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.

2.163. 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, 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: 4.3

2.164. Information on date of birth (day, month and year) of the last child born alive and on the sex of the child is used for estimating current fertility. Later, at the processing stage, "the number of children born alive in the 12 months immediately preceding the census date" can be derived as an estimate of live births in the last 12 months. For estimating current age-specific fertility rates and other fertility measures, the data provided by this approach are more accurate than information on the number of births to a woman during the 12 months immediately preceding the census.

2.165. It should be noted, however, that information on the date of birth of the last child born alive does not produce data on the total number of children born alive during the 12-month period. Even if there are no errors in reporting of the data on the last live-born child, this item ascertains the number of women who had at least one live-born child during the 12-month period, not the number of births, since a small proportion of women will have had more than one child in a year.

2.166. 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 are collected. If the data on children ever born are collected for a sample of women, information on current fertility should be collected for the same sample.

(d) Age, date or duration of first marriage

2.167. "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). Include not only contractual first marriages and de facto unions but also customary marriages and religious marriages. For women who are widowed, separated or divorced at the time of the census, "date of/age at/number of years since dissolution of first marriage" should be secured. Information on dissolution of first marriage (if pertinent) provides data necessary to calculate "duration of first marriage" as a derived topic at the 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.[44] 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.

(e) Age of mother at birth of first child born alive[45]

2.168. Age of mother at the time of the birth of her first live-born child is used for the indirect estimation

[44] See Manual X: Indirect Techniques for Demographic Estimation, Population Studies, No. 81 (United Nations publication, Sales No. E.83.XIII.2), chap. II, sect. D.
[45] Ibid., chap. II, sect. B.3.

of fertility based on first births and to provide information on onset of childbearing and also for the indirect estimation of child mortality. If the topic is included in the census, information should be obtained for each woman who has had at least one child born alive.

(f) Deaths in the past 12 months[46] (Core topic)

Recommended tabulation: 4.4

2.169. Information on deaths in the past 12 months are used to estimate the level and pattern of mortality by sex and age 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 deaths in the past 12 months by sex and age be reported as completely and as accurately as possible. The fact that mortality questions have been included extensively in the census questionnaire in the past decades has resulted in an improvement in the use of indirect estimation procedures for estimates of adult mortality.

2.170. Ideally, mortality should be sought 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.

(g) Cause of death in broad categories

2.171. When information is collected on deaths in the past 12 months (or some other reference period), a pair of follow-up questions concerning cause of death is recommended as well. After ascertaining the name, age, sex, and date of death, two additional questions should be asked: *(a)* Was the death due to an accident, violence, homicide or suicide?, and *(b)* If the dead person is a woman aged 15[47] to 49, did the death occur while she was pregnant or during childbirth or during the six weeks after the end of pregnancy? Ideally, both of these questions should elicit a simple “yes/no” answer, although in some cases the only available answer may be “unknown” or “not sure.”

2.172. Data derived from such questions can be used to better understand trends in levels and some causes of adult mortality. At the 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 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, it should be possible to derive useful information about major trends in causes which are otherwise difficult to obtain from these simple census questions.

[46] See Manual X: Indirect Techniques for Demographic Estimation, Populaton Studies, No. 81 (United Nations publication, Sales No. E.83.XIII.2), chap. V, sects. A and B; Data Bases for Mortality Measurement, (United Nations publication, Sales No. E.83.XIII.3); Ian M. Timaeus, "Measurement of adult mortality in less developed countries: a comparative review", Population Index, vol. 57, No. 4 (winter 1991), pp. 552-568..

[47] It may be appropriate in some countries to reduce the lower age limit by several years.

(h) Maternal or paternal orphanhood[48]

2.173. 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.

2.174. For the collection of information on orphanhood, two direct questions should be asked, namely *(a)* whether the natural mother of the person enumerated in the household is still alive at the time of the census and *(b)* whether 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 over-counting may occur in the case of parents with more than one surviving child among the respondents, particularly in high fertility societies.

2.175. It is preferable for these questions to be collected from every person in the household regardless of age.

5. Educational characteristics

(a) Literacy (Core topic)

Recommended tabulation: 5.3

2.176. 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 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 but not write as well as one who can read and write only a ritual phrase that has been memorized. However, new understandings referring to a range of levels, of domains of application, and of functionality are now widely accepted.

2.177. The notion of literacy applies to any language insofar 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 and this item would therefore be a useful additional subject of inquiry.

2.178. 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

[48] For methodological details on the uses of the data, see Handbook of Population and Housing Censuses, Part II, Studies in Methodology, No. 54 (United Nations publication, Sales No. E.91. XVII.9), chaps. III and IV, Manual X: Indirect Techniques for Demographic Estimation, Population Studies, No. 81 (United Nations publication, Sales No. E.83.XIII.2), chap. IV, sects A, B.1 and B.2; J. G. C. Blacker, "The estimates of adult mortality in Africa from data on orphanhood", Population Studies, vol. XXXI, No. 1 (March 1977), pp. 107-128; Kenneth H. Hill and T. James Trussel, "Further developments in indirect mortality estimation", Population Studies, vol. XXXI, No. 2 (July 1977), pp. 313-334; William Brass and K. Hill, "Estimating adult mortality from orphanhood", in International Population Conference, vol. 3 (Liège, Belgium, International Union for the Scientific Study of Population, 1973), pp.11-123; Ian Timaeus and Wendy Graham, Measuring Adult Mortality in Developing Countries. A Review and Assessment of Methods, World Bank Working Paper, No. 155 (Washington, D.C., World Bank, Population and Human Resources Department, April, 1989); Ian M. Timaeus, "Measurement of adult mortality in less developed countries: a comparative review", Population Index, vol. 57, No. 4 (winter 1991), pp. 552-568.

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.

2.179. Straightforward operational criteria and instructions for collecting literacy statistics should be clearly established on the basis of the concept given in paragraph 2.176, and applied during census-taking. 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 such as writing a personal letter or message. They 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.

2.180. It would be preferable also to use standardised questions, harmonised across countries to ensure comparability. UNESCO has developed a reference database of model questions. In addition, it would be preferable that literacy tests also be administered as part of a census survey, or combined with household surveys, in order to verify as well as improve the quality of literacy data. An evaluation of the quality of literacy statistics should be provided with census statistics on literacy.

2.181. 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.

2.182. The literacy question currently varies across countries and as a result, the data based on them 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.

2.183. The UNESCO Institute for Statistics (UIS) is undertaking a new literacy initiative called the Literacy Assessment Monitoring Programme (LAMP) which is a household survey based literacy assessment tool. It is the opinion of the UIS that literacy attainment is best measured by such instruments such as LAMP rather than through the use of 1 or 2 simple self-assessment questions which are often used in Census. Notwithstanding this, the census is still a crucial vehicle in measuring issues such as literacy.

2.184. The document, both paper and electronic form, should consider the inclusion of a link to the UIS Literacy and LAMP webpage so that persons have a "up-to-date" source of information and guidance in this area for the census. This work is ongoing and developments will take some time to occur.

(b) School attendance (Core topic)

Recommended tabulation: 5.2

2.185. 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. For the purposes of ISCED education is taken to comprise all deliberate and systematic activities designed to meet learning needs. 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.

2.186. Information on school attendance in principle should 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 para. 2.185), community-based organizations and other non-educational institutions, the age range may be adjusted as appropriate.

2.187. Data on school attendance should be cross-classified with data on educational attainment, according to the person's current level and grade. This cross-classification can provide useful information on the correspondence between age and level or grade of educational attainment for persons attending school.

2.188. The issue surrounding the number of "Out-of-School" children has grown in importance within the last decade, particularly within the context of EFA Goal 1 – achieving universal primary education. 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 UIS and UNICEF are jointly working on efforts to better measure the number of out-of-school children in the world.

2.189. School attendance is complementary too 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.

2.190. It is also recommended that member states consider the need for an "internationally-harmonized" question(s) in order to measure school attendance and school enrolment.

(c) Educational attainment (Core topic)

Recommended tabulations: 5.1 and 6.1

2.191. The recommendations on "educational attainment" and "educational qualifications" make use of categories of the 1997 revision of the International Standard Classification of Education (ISCED), issued by the United Nations Educational, Scientific and Cultural Organization (UNESCO)[49]. 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 ISCED97 classification system, this typically being achieved during post-census processing.

2.192. Educational attainment is defined as the highest grade completed within the most advanced level attended in the educational system of the country where the education was received. Some countries may also find it useful to present data on educational attainment in terms of highest grade attended. If required, data on educational attainment can take into account education and training received in all types of organized educational institutions and programmes, particularly those measurable in terms of grade and level of education or their equivalent such as programmes in adult education, even if the education and training were provided outside of the regular school and university system. For international purposes, a "grade" is a stage of instruction usually covered in the course of a school year. Information on educational attainment should preferably be collected for all persons 5 years of age and over.

2.193. To produce statistics on educational attainment, a classification is needed that indicates the grades or years of education in primary, secondary and post-secondary school. 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

[49] See annex II of document 29C/20 of the twenty-ninth session of the General Conference of UNESCO (8 August 1997).

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.

2.194. Information collected on the highest grade of education completed by each individual facilitates flexible regrouping of the data according to various kinds of aggregation by level of education, for the purpose, for example, of distinguishing between persons who did and persons who did not complete each level of education.

2.195. 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 5a: First stage of tertiary education (provides sufficient qualifications for gaining entry into advanced research programmes and professions with high skills requirements)
ISCED level 5b: First stage of tertiary education (provides practical oriented/occupationally specific training and the successful completion of which usually provides the participants with a labour-market relevant qualification)
ISCED level 6: Second stage of tertiary education (leading to an advanced research qualification)

Persons with no schooling should also be identified. Any differences between national and international definitions and classifications of education should be explained in the census publications in order to facilitate comparison and analysis.

2.196. Countries could consider asking a question which captures levels of education not successfully completed should this be of interest to policy. 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.

2.197. Data on school attendance, educational attainment and literacy status should be collected and tabulated separately and independently of each other, without any assumption of linkages between them.

2.198. In order to ensure continued and improved international comparability of census data by level of education, it is recommended that member states continue to ensure that the educational attainment variable is able to be mapped into the ISCED97 classification. This is typically achieved in post-census processing.

(d) Field of education and educational qualifications

(i) Field of education

2.199. Information on persons by level of education and field of education is important for examining the match between the supply and demand for qualified manpower 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.

2.200. A question on field of education 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.

2.201. The revised ISCED distinguishes between the following major fields (one-digit codes) and sub-fields (two- digit codes) of education:

Code	
0	General programmes
01	Basic programmes
08	Literacy and numeracy
09	Personal development
1	Education
14	Teacher training and education science
2	Humanities and arts
21	Arts
22	Humanities
3	Social science, business and law
31	Social and behavioural science
32	Journalism and information
34	Business and administration
4	Science
42	Life sciences
44	Physical sciences
46	Mathematics and statistics
48	Computing
5	Engineering, manufacturing and construction
52	Engineering and engineering trades
54	Manufacturing and processing
58	Architecture and building
6	Agriculture
62	Agriculture, forestry and fishery
64	Veterinary
7	Health and welfare
72	Health
76	Social services
8	Services
81	Personal services
84	Transport services
85	Environmental protection
86	Security services
9	99 Not known or unspecified

2.202. Countries may wish to consider collecting data on detailed fields of education, not only major ones. When coding field of education, countries should make use of an established national classification or, if this does not exist, adopt the classification and coding of fields of education of ISCED. Any difference between national and international definitions and classifications of fields of education should be explained in the census publications so as to facilitate international comparison and analysis.

2.203. Countries coding field of education according to a national classification should also 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 of persons with interdisciplinary or multi-disciplinary fields of specialization. It is recommended that countries follow the procedure of identifying the major or principal field of education of those with multidisciplinary specialization.

2.204. In order to ensure continued and improved international comparability of census data by field of education, it is recommended that the classification structure for the “fields of education” continue to be

based on the ISCED97.

(ii) Educational qualifications

2.205. Qualifications are the degrees, diplomas, certificates, professional titles and so forth that an individual has acquired, whether by full-time study, part-time study or private study, whether conferred in the home country or abroad, and whether conferred by educational authorities, special examining bodies or professional bodies. The acquisition of an educational qualification therefore implies the successful completion of a course of study or training programme.

2.206. 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.

6. Economic characteristics

(a) Purpose of collecting data on the economic characteristics of persons

2.207. Statistics on the economic characteristics of persons are needed from population censuses for many reasons. Information on the number and characteristics of the employed, unemployed and inactive persons are needed in detail at the same reference point of time that other demographic and social items are being measured so that a comprehensive picture of the socio-economic situation is available.

2.208. Such statistics might be obtained from other sources such as a household-based labour force survey or administrative records, but these other sources 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. Administrative records may not have the same quality of occupational and industry coding nor the same comprehensiveness in population coverage as a population census.

2.209. Other personal, household and dwelling characteristics that are included in the range of census topics (such as education, income level, type of dwelling, etc) are strongly related to economic activity of the household members. It is therefore desirable to collect information on the economic characteristics of household members in the census so that cross-relationships between these data items can be examined.

2.210. The population census provides benchmark information on economic characteristics to which statistics from other sources can be related. Population censuses also provide the sample frames for most household-based surveys, including labour force surveys. It is therefore useful to include as many data items as possible in the benchmark information or sample frames.

2.211. There may however be problems in reconciling figures obtained from different sources due to differences in scope and coverage, concepts and definitions, classifications, statistical units, reference periods, precision, measurement errors, and so on. Household surveys, especially labour force surveys, have greater scope for generating quality statistics on economic characteristics at aggregate levels, such as national and broad regional groupings, while population censuses provide these statistics at lower levels of aggregation. When presenting census results, it is suggested that any such 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. Countries that carry out regular labour force surveys may wish to designate these surveys as their official sources for statistics on the economically active population when reported at national level or for broad regional groupings.

2.212. The census topics relating to economic characteristics of the population discussed below concentrate on the economically active population as defined in the recommendations of the International Conferences of Labour Statisticians (ICLS), especially the resolution concerning statistics of the economically active population, employment, unemployment and underemployment of the 13th ICLS.

(b) Economic Activity of persons

2.213. The *economically active population* comprises all persons of either sex who provide the supply of labour during a specified time- reference period, as employed or as unemployed, for the production of economic goods and services, where the concept of economic production is established with respect to the System of National Accounts (SNA)[50]. Activities are within the economic production boundary defined by the SNA[51] if they comprise *(a)* production of goods or services supplied to units other than their producers, or intended to be supplied, including the production of goods and services used up in the process of producing such goods or services (intermediate consumption); *(b)* production of all goods retained by their producers for their own final use (own-account production of goods); and *(c)* production of housing services by owner-occupiers and of domestic and personal services produced by paid domestic staff.

2.214. Own-account production of goods and production of housing services by owner-occupiers includes for example, production of agricultural products and their subsequent storage; production of other primary products such as mining of salt, cutting of peat, supply of water; processing of agricultural products (**note** that the preparation of meals for own consumption is excluded); and other kinds of processing such as weaving of cloth, dressmaking and tailoring; production of footwear, pottery, utensils or durables; making of furniture or furnishings; and major renovations, extensions to dwellings, replastering of walls or re-roofing by owners of owner-occupied dwellings.[52] It is advisable for countries to develop a more extensive list of such own-account production activities considered to be within the SNA production boundary, so as to ensure that those involved in such activities are correctly classified as economically active. In principle, the production of all goods falls within the SNA production boundary, irrespective of whether the goods are intended for supply to other units or for the producers' own final use. In practice, however, the production of a good for own final use within households should be recorded only if the amount of the good produced by households for their own final use is believed to be quantitatively important in relation to the total supply of that good in a country. According to the 13th International Conference of Labour Statisticians, persons engaged in the production of goods for own final use within the same household should be considered as economically active only if such production comprises an important contribution to the total consumption of the household. It should be noted however that the own-account production of housing services by owner-occupiers has no labour input according to the SNA.

2.215. Domestic or personal services provided by unpaid household members for final consumption within the same household are **excluded** from the economic production boundary and hence are **not** considered to be economic activities. (Examples are *(a)* the cleaning, decoration and maintenance of the dwelling occupied by the household, including small repairs of a kind usually carried out by tenants as well as owners; *(b)* the cleaning, servicing and repair of household durables or other goods, including vehicles used for household purposes; *(c)* the preparation and serving of meals; *(d)* the care, training and instruction of children; *(e)* the care of sick, infirm or old people; and *(f)* the transportation of members of the household or their goods.) Persons engaged in such activities may be included among providers of unpaid social and personal services.

(c) Activity status (Core topic)

Recommended tabulations: 6.1, 6.2, 6.3, 6.4, 6.5, 6.6, 6.7, 6.8

2.216. The activity status of a person is determined over a short reference period such as a week or a day in terms of being economically active (employed or unemployed during the reference period or economically inactive. Even within a short reference period, persons may have more than one economic activity status. So, to ascribe a single, unique activity status to each person, priority is given to the status of

[50] Commission of the European Communities, International Monetary Fund, Organisation for Economic Cooperation and Development, United Nations and World Bank, *System of National Accounts 1993* (United Nations publication, Sales No. E.94.XVII.4).
[51] Ibid., para. 6.18.
[52] Ibid., paras. 6.24 and 6.25

being economically active over being economically inactive and to being employed over being unemployed. In other words, a student who is seeking work should be classified as *unemployed* and economically active; and a person looking for work who also works for the minimum amount of time required by the census to count as being employed should be classified as *employed* and not as unemployed. This principle is referred to as the "priority rule". More details of the international standards are given in the *Resolution concerning statistics of the economically active population, employment, unemployment and underemployment*, adopted by the 13th International Conference of Labour Statisticians (1982).

2.217. Information on activity status should in principle cover the entire population, but in practice it is collected for each person at or above a minimum age set in accordance with the conditions in each country. The minimum school-leaving age should not automatically be taken as the lower age-limit for the collection of information on activity status. Countries in which, normally, many children participate in agriculture or other types of economic activity (for example, mining, weaving, petty trade) will need to select a lower minimum age than that in countries where employment of young children is uncommon. In determining the lower limit, special note should be taken of the importance of statistics on the economic activities of children, especially with respect to child labour. Tabulations of economic characteristics should at least distinguish persons under 15 years of age and those 15 years of age and over; and countries where the minimum school-leaving age is higher than 15 years and where there are economically active children below this age should endeavour to collect data on the economic characteristics of these children with a view to achieving international comparability at least for persons 15 years of age and over. A maximum age limit for measurement of the economically active population is not recommended. Many people continue to be engaged in economic activities beyond their normal 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 economic activity 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.

2.218. Depending on the way the relevant parts of the census questionnaire have been constructed, the determination of the economic activity status of a person may be influenced by respondents' and enumerators' subjective understanding of the notion of work and economic activity. In this regard, particular attention should be given to special groups for which the determination of activity status may be difficult. These groups include, for example, active youth, women and elderly persons after the normal age of retirement, in particular those working as contributing family members. Their participation in economic activities is frequently overlooked and needs close attention when measuring the economically active population. To reduce under-reporting of economic activity, enumerators need to be explicitly instructed or the questionnaires specifically designed to ask about the possible economic activity of every woman and man in the household above the minimum age specified for measuring the economically active population. Clear direction needs to be given in the enumerators' manual on the appropriate use of probes, whenever necessary and possible, for example by providing the enumerator with a list[53] of typically misclassified activities and instructing them to use a follow-up question addressed only to (or about) those reported as homemakers. The use of an activity list has been found useful in clarifying the concept of economic activity and could be provided in the enumerators' manual. Examples of specific activities, such as unpaid work that are part of economic activity could also be included in the questionnaire.

2.219. In particular, the common notion that women are generally engaged in home-making duties, or cultural perceptions relating to sex roles, can result in a serious omission with respect to measuring women's economic activity status. A review of national practices and experimental research indicate that the potential for women to be classified as homemakers rather than economically active persons is high when only the basic questions are asked. Better results, showing higher proportions of women as economically active, have been recorded in cases when further probes are used to determine whether those reported as homemakers were in fact involved in some typically misclassified economic activities.

[53] See [1], paras. 6.24 and 6.25, for an example of such a list and a basic principle to follow when drawing it up.

2.220. The use of probes may lengthen the interview and increase the cost of the census. Accordingly, it will be necessary to balance the gains in terms of minimizing response errors when probes are used against the added costs associated with their use. Given the importance of reliable data on activity status, serious consideration should be given to minimizing classification errors. To this end, in addition to the use of probes, improved training may help to reduce interviewers' bias and change their perceptions of what activities or types of production are economic. Training of enumerators should highlight likely sources of sex biases leading to underestimation of women's participation in economic activities as incomplete coverage of unpaid economic activities, failure of respondents and enumerators to take account of women's multiple activities, some economic and some non-economic, and the tendency to automatically enter women as homemakers, particularly if the women are married.

(i) Economically active population

2.221. Two concepts of the "economically active" population can be distinguished: (a) the *usually active population*, measured in relation to a long reference period such as a year; and (b) the *currently active population* (or, equivalently, the *labour force*), measured in relation to a short reference period such as one week or one day. A complete set of data compiled on both the usually active population and the currently active population has advantages for a number of important uses, but this may be difficult in a census because of expense, limitations of questionnaire space and the burden of coding and processing. To enhance the possibilities for the analysis of economic activity, countries using the labour-force concept (*current activity*) should endeavour to obtain supplementary data covering at least a count of persons who were *usually economically active* during a specified 12-month period, and countries using the concept of *usual activity* should endeavour to obtain supplementary data covering at least the size of the labour force during a one-week reference period.

2.222. The choice of approach for measuring the economically active population in population censuses should take account of the advantages and disadvantages of each approach, as well as national circumstances and specific needs, as described below. It is fundamental to the scope and quality of census data on the economic characteristics of the population and their linkage with similar statistics obtained from other sources (for example, labour-force surveys, establishment surveys and administrative records). Furthermore, such a choice is vital to the international comparability of economic statistics of countries and regions.

2.223. The "not economically active" population comprises all persons, irrespective of age, including those below the age specified for measuring the economically active population, who were not "economically active" as defined above.

(ii) Usual activity status

2.224. Usual activity status is the usual relationship of a person to economic activity based on a long reference period such as a specified 12-month period. Such a long reference period will provide information on the year as a whole, giving results that are much less dependent on the timing of the census date. Thus the census results will give data that are considered to represent a stable measure of the economically active population and its structural distribution for economic analysis, projections and development planning. Further, it provides an opportunity for collecting information needed not only on the principal activity of an individual but also on any secondary activity. It is also possible to obtain useful information on the intensity of activity over the year and relate it to household income for that period (if collected). The main drawback of the usual activity approach is that it is susceptible to recall errors. Another drawback is the problem of ascertaining the principal *occupation* and *industry* over a long period such as a year, unless an appropriate question or series of questions are introduced to identify a main job, which may be defined in terms of time worked or income earned. Resolving these complicates the construction of the census questionnaire. In countries where the economic activity of people varies widely over the year and where people are likely to be engaged in more than one type of economic activity during the year or to be seasonally unemployed, the "usual activity" concept is considered as appropriate. A specified twelve-month period should be used as the reference period.

a. Usually active population

2.225. The usually active population comprises all persons above a specified age whose main activity status, as determined in terms of the total number of weeks or days during a long specified period (such as the preceding 12 months or the preceding calendar year) was either 'employed' or 'unemployed' within the labour force (current activity) framework.

2.226. In applying the above definition of the usually active population, it is necessary to determine the "main activity status" of each person above the specified minimum age. For this purpose, the "main activity status" of a person is based on a summation of the variable activity statuses (active or inactive) of that person during the 52 weeks or the 365 days of the specified 12-month period. One procedure to determine the "main activity status" of a person is to classify the person as "usually active" if the number of weeks (or days) of active statuses (employed or unemployed) is greater than or equal to that of inactive statuses. This is referred to as the majority criterion. Another procedure is to classify a person as "usually active" if the number of weeks (or days) of active statuses is not less than some cut-off point (e.g. duration of agriculture/tourist season).[54]

2.227. The main activity status could be substantially different depending on whether it is based on weeks or days as the unit of measurement. In countries where employment is mostly of a regular and continuing nature and hence a week of employment generally means a week of full time employment or, at any rate, employment for a major part of the working time, it is recommended to base the main activity status on weeks of employment or unemployment. However, in countries where employment is largely of an irregular nature and where a week of employment does not generally mean a week of full time employment or even employment for a major part of the working time, usual activity would better be based on days of employment or unemployment.

2.228. The usually active population may be subdivided into employed and unemployed in accordance with the situation that prevailed most of the time. That is, usually active persons should be classified as usually employed if the number of weeks (or days) of employment is larger than or equal to the number of weeks (or days) of unemployment, and as usually unemployed if the number of weeks (or days) of employment is smaller than the number of weeks (or days) of unemployment. The sub-division into usually employed and usually unemployed is limited only to persons already determined to be usually active. Doing it the other way round, that is using the direct classification of all persons as usually employed or as usually unemployed in order to determine the usually active population, could lead to a different population group being classified as economically active than that derivable from the above definition. It is therefore recommended to construct the questionnaire in a way that makes it possible first to distinguish between usually active and usually inactive persons, before making the distinction between usually employed and usually unemployed persons among the usually active persons.

2.229. It is also worth noting that the usual activity status during a long reference period is not the same concept as the main activity during this period when comparing between inactive, active employed and active unemployed. A person who spent 20 weeks inactive, 18 weeks unemployed and 14 weeks employed during the last year would be classified as active by usual activity status, for which the period of employment and the period of unemployment are summed. He/she would then be classified as usually unemployed, because the number of weeks unemployed exceeds the number of weeks employed. However "inactivity" was the person's main activity as this occupied the largest spell amongst the three activities during the last year.

b. The population not usually active

2.230. The "population not usually active" comprises all persons, irrespective of age and of sex, whose

[54] R. Hussmanns, F. Mehran and V. Verma, Surveys of the Economically Active Population, Employment, Unemployment and Underemployment: An ILO Manual on Concepts and Methods (Geneva, International Labour Office, 1990), p. 51.

main activity status during the long reference period used to measure usual activity was neither employed nor unemployed. It is recommended that this population be classified into the following four groups

(a) Students: persons not classified as usually economically active, who attended any regular educational institution, public or private, for systematic instruction at any level of education;

(b) Homemakers: persons not classified as usually economically active, who were engaged in household duties in their own home, for example, spouses and other relatives responsible for the care of the home, children and the elderly (domestic employees, working for pay, however, are classified as economically active;

(c) Pension or capital income recipients: persons not classified as usually economically active, who receive income from property or investments, interests, rents, royalties or pensions from former economic activities, and who cannot be classified as students or homemakers;

(d) Others: persons not classified as usually economically active, who are receiving public aid or private support, and all other persons not falling into any of the above categories (e.g. children not attending school).

Where considered useful, separate subcategories may be introduced to identify (a) persons engaged in unpaid community and volunteer services and (b) other persons engaged in activities that fall outside the boundary of economic activities.

2.231. Since some individuals may be classifiable in more than one category of the not economically active population (for example, a person may be a student and a homemaker at the same time), the enumeration instructions should indicate the order of preference for recording persons in one or another of the categories. Consideration might also be given to presenting the categories in the census questionnaire in the preferred order because persons tend to answer according to the first category that applies to them.

2.232. It is recommended that the census questionnaire be designed in such a way as to allow for each person enumerated an indication of whether or not the person is engaged in economic activity, full-time studies or household duties in his or her own home (*homemaking*) as his or her main activity, and for each activity an indication of the total length of time in days, weeks or months.

c. Current activity status

2.233. Current activity status is the relationship of a person to economic activity, based on a brief reference period such as one week or one day. One advantage of the use of a short reference period is that it requires information concerning only activities undertaken on the census reference date or immediately prior to that date. This minimizes the possibility for recall errors. Also, since the short reference period limits the possibility of having a large number of different activities undertaken and situations experienced, the construction of the questionnaire is simpler than when using a longer reference period. The use of current activity is considered most appropriate for countries where the economic activity of people is not greatly influenced by seasonal or other factors causing variations over the year, that is to say where the results will not significantly depend on the timing of the reference period during the year. It may not, however, be equally appropriate for countries where the economic activity of people is carried out predominantly in sectors subject to significant seasonal variations, such as agriculture and tourism, and where people are therefore likely to be seasonally unemployed or engaged in more than one type of activity. Seasonal variations in employment and unemployment may be significant both in industrialized and in developing economies, but such variations tend to be less widespread in the former and are therefore generally measured through monthly or quarterly household surveys for which the census results will provide an important supplement, in particular for regions and small groups, as well as a source for benchmarking. A time-reference period of one week preferably should be used, which may be either a specified recent fixed week, or the last complete calendar week, or the last seven days prior to enumeration. The "current activity" measure is the one used as the basis for international comparisons of the

economically active population, employment and unemployment.

2.234. The use of current activity concept is considered most appropriate for countries where the economic activity of people is not greatly influenced by seasonal or other factors causing variations over the year, that is to say where the results will not significantly depend on the timing of the reference period during the year. It may not, however, be equally appropriate for countries where the economic activity of people is carried out predominantly in sectors subject to significant seasonal variations, such as agriculture and tourism, and where people are therefore likely to be seasonally unemployed or engaged in more than one type of activity. Seasonal variations in employment and unemployment may be significant both in industrialized and in developing economies, but such variations tend to be less widespread in the former and are therefore generally measured through monthly or quarterly household surveys. Nevertheless, even for these countries, the census results will provide an important supplement, in particular for regions and small groups, as well as a source for benchmarking. Preferably, a time-reference period of one week rather than one day should be used, which may be either a specified recent fixed week (the preferred option), or the last complete calendar week, or the last seven days prior to enumeration. The "current activity" measure is the one used as the basis for international comparisons of the economically active population, employment and unemployment.

d. Currently active population (i.e., the labour force)

2.235. The *currently active population*, or the *labour force*, comprises all persons (above the stated minimum age) who are either employed or unemployed, as defined below.

i. Employed population

2.236. The *employed* population comprise all persons above the minimum age specified for measurement of the economically active population who, during a short reference period of either one week (preferred option) or one day:

(a) performed some work for pay, profit or family gain, in cash or in kind; or

(b) were temporarily absent from a job in which they had already worked and to which they maintained a formal attachment or from a self-employment activity such as a business enterprise, a farm or a service undertaking

2.237. 'Work' means engagement in economic activities as defined in paragraphs 2.213-2.215) above. The census documentation and tabulations should clearly describe the minimum time chosen for the purpose of considering persons to be 'at work'. According to the present international recommendations, the notion of *some work* should be interpreted as work for at least one hour during the reference period. The one-hour criterion is an essential feature of the labour-force framework embedded in the international definitions of employment and unemployment, and a prerequisite of the consistency of employment statistics with national accounts data on production. It derives from the priority rules referred to in paragraph 2.216 above and ensures that unemployment is defined as a situation of total lack of work (zero hours of work). Countries concerned about the usefulness of the one-hour criterion for other users of census results should also consider collection of information on the time worked variable, following the recommendations of paragraphs 2.269-2.273, so that employed persons can be classified by time worked.

2.238. Special attention should be paid to homemakers, since some of their activities fall within the production boundary of the national accounts system and constitute employment (for example, production of agricultural products, and their subsequent storage; production of other primary products such as mining of salt, cutting of peat, supply of water; processing of agricultural products; and other kinds of processing such as weaving of cloth, dressmaking and tailoring) but may not be perceived as economic activity by those involved.

2.239. Employees temporarily absent from work should be considered as in paid employment provided they maintained a formal job attachment. Such temporary absences might be because of illness or injury,

holiday or vacation, strike or lockout, educational or training leave, maternity or parental leave, reduction in economic activity, temporary disorganization or suspension of work due to such reasons as bad weather, mechanical or electrical breakdown, or shortage of raw materials or fuels, or characterized by other temporary absence with or without leave. A formal job attachment should be determined on the basis of one or more of the following criteria: a continued receipt of wage or salary; an assurance of return to work following the end of the contingency, an agreement as to the date of return; or the elapsed duration of absence from the job which, wherever relevant, may be that duration for which workers can receive compensation benefits without obligations to accept other jobs

2.240. *Self-employed persons* (excluding contributing family workers) should be considered "employed" and with enterprise but not at work", if their absence from work is temporary and their enterprise meanwhile continues to exist, for example, because orders for work in the future are received.

2.241. The *Guidelines concerning treatment in employment and unemployment statistics of persons on extended absences from work*, endorsed by the Sixteenth International Conference of Labour Statisticians, (October 1998)[55] provide standards on the economic status classification of the following groups of persons on extended absence from work:

1. "Women on maternity leave, who have an assurance of a return to work following the end of the leave, should be classified as employed if, during the reference period, they are in receipt of all or a significant part of their wage or salary from the employer or an equivalent payment from other sources received by virtue of being an employee. Women on maternity leave, who have an assurance of a return to work following the end of the leave, should also be considered as being employed during the compulsory period of leave stipulated by national legislation to ensure that mothers before and after childbirth have sufficient rest, or for a period to be specified according to national circumstances. In countries where they are not classified as employed according to these criteria, women on maternity leave should be classified as unemployed or not economically active, depending upon their current availability for work and recent job-search activity."
2. Employees on unpaid leave initiated by the employer: (including leave paid by the government or social security funds) should only be classified as employed if they have an agreed date for return to work and if the elapsed duration of their leave falls within a time-limit to be specified according to national circumstances. All other employees on unpaid leave initiated by the employer should be classified as unemployed or economically inactive, depending upon their expectation of returning to work in the near future, current availability for work, recent job-search activity and the reason for not seeking work. The notion of expectation of returning to work "in the near future" should be specified in the light of the national circumstances and economic situation of each country.
3. Employees on other types of extended leave such as parental leave or educational or training leave, who have an assurance of a return to work with the same employer following the end of the leave, should be classified as employed if the employer continues to pay all or a significant part of the wage or salary of the person on leave, or if the duration of the leave does not exceed a time-limit to be specified according to national circumstances. Persons, who do not meet these criteria, should be classified as unemployed or not economically active, depending upon their current availability for work and recent job-search activity.
4. Seasonal employees not engaged in any kind of work during the off-season should be classified as employed if they have an assurance of a return to work with the same employer at the beginning of the next season, and the employer continues to pay all or a significant part of their wage or salary during the off-season. Seasonal employees not at work during the off-season, who do not meet these criteria, should be classified as unemployed or not economically active, depending upon their current availability for work, recent job-search activity and the reason for not seeking work.
5. Seasonal employers, own-account workers, members of producers' cooperatives and contributing family workers not engaged in any kind of work during the off-season when the enterprise ceases to exist

[55] For further guidance, see "The Guidelines concerning treatment in employment and unemployment statistics of persons on extended absences from work", [4], pp.88 & Also available at http://www.ilo.org/public/english/bureau/stat/download/guidelines/exleave.pdf. For further details see general report at http://www.ilo.org/public/english/bureau/stat/download/16thicls/report4.pdf

should not be considered as employed. It is assumed that seasonally-operated enterprises (such as ice cream shops, fruit stalls, beach restaurants) cease to exist during the off-season if their owners do not continue to do any work in them. (Thus, there is consistency between this point and paragraph 2.240) concerning self-employed persons "with an enterprise but not at work".) If the enterprise continues to exist in the off-season (such as a farm), a self-employed person (excluding contributing family workers) not at work can be classified as employed provided that the period of absence from work is sufficiently short for the absence to be considered temporary.

ii. Treatment of specific groups

2.242. According to the standards adopted by the International Conference of Labour Statisticians in 1982, the following treatment of certain groups of individuals in paid employment or self-employment is recommended.

2.243. *Contributing family workers* should be considered to be at work on the same basis as other self-employed workers, that is to say, irrespective of the number of hours worked during the reference period. Countries that prefer for special reasons to set a minimum time criterion higher than one hour for the inclusion of contributing family workers among the employed should identify and separately classify those who worked less than the prescribed time, so as to be able to provide internationally comparable data. As contributing family members do not have an enterprise of their own, they cannot be "with an enterprise but not at work". Accordingly, contributing family workers who were not at work during the reference period should not be considered as employed.

2.244. Persons engaged in economic activities in the form of *own-account production* of goods for own final use within the same household should be considered to be in self-employment (and classified as own-account workers) if such production constitutes an important contribution to the total consumption of the household (see para. 2.214 above).

2.245. *Apprentices and trainees* who received pay in cash or in kind should be considered in paid employment and classified as at work or not at work on the same basis as other persons in paid employment.

2.246. Participation in *job training schemes* may be important in some countries and may generate particular forms of employment and intermediate situations on the borderlines of employment, unemployment and economic inactivity.[56] Such participants are considered to be "employed" if the training takes place within the context of an enterprise and in connection with its production, or if the participants retain a formal job attachment to an enterprise in which they had formerly been employed, even if the training is outside the context of the enterprise or without connection to its production. Other participants in job training schemes are to be classified as unemployed or not economically active, depending upon their current availability for work and recent job-search activity. In particular, if the job training scheme implies a definite commitment to employment at the end of the training, participants who are currently available for work should be considered unemployed even when they are not actively seeking work (see para. 2.259 below).

2.247. In accordance with the priority rules of the labour force framework (para. 2.216), students, homemakers, pensioners, registered unemployed persons and others who were mainly engaged in non-economic activities during the reference period, but were at the same time in paid employment or self-employment as defined above should be considered employed on the same basis as other categories of employed persons. Such persons should be identified separately where possible, that is, as having been engaged in paid employment, or as having been self-employed for longer than the stated minimum number of hours during the reference period (see para. 2.237).

2.248. All members of the armed forces should be included among persons in paid employment. The

[56] See Fourteenth International Conference of Labour Statisticians, Geneva, 28 October-6 November 1977. Report of the Conference (Geneva, International Labour Office, 1988), document ICLS/14/D.14.

"armed forces" should include both regular and the temporary members as specified in the most recent revision of the *International Standard Classification of Occupations* (ISCO).

2.249. “Requital” workers (that is persons who work for friends, neighbours, etc within a mutual exchange of work as part of an exchange of work but not money) should be considered as employed because the remuneration that they receive in exchange for their economic activity is the provision of labour input by someone else (barter of work).

2.250. Persons who provide community work (building bus shelters, village administration, etc) for pay in cash or kind should be considered as employed.

2.251. Volunteers (without any pay in cash or kind) who produce goods for any enterprise/institution/household or who produce services for a market enterprise should also be considered as employed. However, volunteers (without any pay in cash or kind) who produce services for another household or for non-profit organizations are not considered to be employed.

2.252. Similarly persons, including family members, who provide unpaid labour inputs to produce goods for any enterprise/institution/household or to produce services for a market enterprise should also be considered as employed. However, such persons who provide unpaid labour inputs to produce services for another household or for non-profit organizations are not considered to be employed.

2.253. 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, apprentices and trainees) separately in tabulations.

2.254. Persons engaged in unpaid community and volunteer services (even if engaged in producing goods or market services within the SNA production boundary) and other persons engaged in activities that fall outside the boundary of economic activities should not be considered as employed. They should be classified as unemployed or not economically active, depending upon their current availability for work and recent job-search activity. If classified as inactive, then separate sub-categories of the inactive may be introduced to identify them, where considered useful.

iii. Unemployed population

2.255. The *unemployed* comprise all persons above the minimum age specified for measurement of the economically active population who during the reference period were:

(a) *Without wor*k, in other words, were not in paid employment or self employment, where work is as defined in paragraph 2.237 above;
(b) *Currently available for work*, in other words, were available for paid employment or self employment during the reference period; and
c) *Seeking work*, in other words, had taken specific steps in a specified recent period to seek paid employment or self employment. (The specific steps may have included registration at a public or private employment exchange; application to employers; checking at worksites, farms, factory gates, markets or other places of assembly; placing or answering newspaper or other forms of public advertisements; seeking assistance of friends and relatives; looking for land, building, machinery or equipment to establish one’s own enterprise; arranging for financial resources; applying for permits and licences, and so forth.) It would 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 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.

2.256. In general, to be classified as unemployed, a person must satisfy all three of the above criteria. However, in situations where the conventional means of seeking work are of limited relevance, where the

labour market is largely unorganized or of limited scope, where labour absorption is, at the time, inadequate, or where the labour force is largely self-employed, the standard definition of unemployment may be applied by relaxing the criterion of seeking work. Such a relaxation is aimed primarily at those developing countries where the criterion does not capture the extent of unemployment in its totality. With this relaxation of the criterion of seeking work, which permits in extreme cases the criterion's complete suppression, the two basic criteria that remain applicable are "without work" and "currently available for work".

2.257. In the application of the criterion of current availability for work, especially in situations where the seeking-work criterion is relaxed, appropriate tests should be developed to suit national circumstances. These tests may be based on notions such as present desire for work, previous work experience, willingness to take up work for wage or salary on locally prevailing terms, and readiness to undertake self-employment activity, given the necessary resources and facilities. These criteria are expected to ensure objectivity in the expression of current availability.

iv. Treatment of specific groups

2.258. As seen in paragraph 2.236 above, in respect of *paid employment* or *self-employment*, some persons fall into borderline groups that require careful treatment to determine if their members are properly included in the category of unemployment. The following paragraphs discuss the treatment recommended in respect of such groups.

2.259. Persons without work and currently available for work who had made arrangements to take up paid employment or undertake self employment activity at a date subsequent to the reference period should be considered unemployed, irrespective of whether or not they recently sought work.

2.260. Persons temporarily absent from their jobs, with no formal job attachment, who were currently available for work and were seeking work should be regarded as unemployed in accordance with the standard definition of unemployment. Countries may, however, depending on national circumstances and policies, prefer to relax the seeking-work criterion in the case of persons *temporarily laid off*. In such cases, persons temporarily laid off who were not seeking work but were classified as unemployed should be identified within a separate subcategory of unemployed persons.

2.261. In accordance with the priority rules of the labour force framework, persons mainly engaged in non economic activities during the reference period (e.g. *Students, homemakers*), who satisfy the criteria for unemployment laid down above in paragraph 2.255 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.

e. Population not currently active(in other words, population not in the labour force)

2.262. The population *not currently active* or, equivalently, persons not in the *labour force*, comprises all persons who were neither *employed* nor *unemployed* during the short reference period used to measure current activity, including persons below the minimum age specified for measurement of the economically active population.

2.263. They may, according to reason for not being *currently active*, be classified in any of the following groups:

(a) Attending an educational institution: refers to persons not “currently active”, who attended any regular educational institution, public or private, for systematic instruction at any level of education, or temporary absence from the institution for relevant reasons corresponding to those specified

for persons temporarily not at work. [57]

(b) Performing household duties: refers to persons, “not currently active”, who engaged in household duties in their own home such as spouses and other relatives responsible for the care of the home, children and elderly people. (Domestic and personal services produced by domestic employees working for pay in somebody else's home are considered as economic activities in line with paragraph 2.213 above.)

(c) Retiring on pension or capital income: refers to persons, not "currently economically active", who receive income from property or investments, interests, rents, royalties or pensions from former economic activities.

(d) Other reasons: refers to all persons, not "currently economically active", who do not fall into any of the above categories (e.g. children not attending school, those receiving public aid or private support; persons with disability or impairment).

2.264. It is recommended that the population not in the labour force be classified at least according to the above mentioned reasons for current inactivity. Some not currently economically active persons may be classifiable to 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 inactivity that are considered particularly important and included in the regional recommendations should also be taken into account in the classification of population not in the labour force. 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.

2.265. Countries adopting the standard definition of unemployment may identify persons not classified as unemployed who were available for work but not seeking work during the reference period and classify them separately under the population not currently active.

f. Status of volunteers and other providers of non-paid social and personal services

2.266. Countries may wish to identify separately the persons who provide social and personal services to their own household, other households or to voluntary, non-profit organizations on an unpaid basis, either for a short reference period or for a longer one. Such persons may be sub-divided either according to types of services provided or according to type of recipient.

2.267. Unpaid services are a significant area of human activity. Information about unpaid services helps in understanding how individuals and families balance their paid work with other important aspects of their lives, such as family and community commitments. The information is important in measuring the characteristics of groups with special needs such as the elderly, children and people with disabilities. Areas covered may include unpaid domestic activities, unpaid care, unpaid care of children and unpaid voluntary work. Time use surveys are the key source of data on people’s use of time, including activities such as unpaid work. However, being sample-based, information is not usually available at a small area level.

2.268. It should be noted that the provision of non-paid services to other households and to voluntary, non-profit organizations is outside the production boundary as defined by the national accounts, and thus not considered as an economic activity. Such persons should be classified as unemployed or not economically active, depending upon their current availability for work and recent job-search activity. If classified as inactive, then separate sub-categories of the inactive may be introduced to identify them, where considered useful.

(d) Time worked

2.269. 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

[57] See also paragraphs 2.150-2.152 on school attendance.

the year (for example, women). This item is also particularly useful for countries concerned with the usefulness for some users of the one-hour criterion in the definition of employment when measuring current activity. Alternative lower limits for the definition of employment can then be applied when tabulating census results for such users. When employing the usual activity approach, information on time worked may be used to screen persons who did not have an at least minimum threshold (for example, one week or one day) of economic activity during the long reference period.

2.270. *Time worked* is the total time actually spent producing goods and services, within regular working hours and as overtime, during the reference period adopted for economic activity in the census. It is recommended that if the reference period is short, for example, the week preceding the census, time worked should be measured in hours. In this case, time worked may be measured by requesting separate information for each day of the week entailing a careful and in-depth training of interviewers. If the reference period is long, for example, the 12 months preceding the census, time worked should be measured in units of weeks, or in days where feasible, or in terms of larger time intervals. Time worked should also include time spent in activities that, while not leading directly to produced goods or services, are still defined as part of the tasks and duties of the job, such as preparing, repairing or maintaining the workplace or work instruments. In practice, it will also include inactive time spent in the course of performing these activities, such as time spent waiting or standing by, and in other short breaks. Longer meal breaks and time spent not working because of vacation, holidays, sickness or industrial disputes should be excluded.

2.271. To minimize response errors, the set of questions used to measure time worked need to ensure that responses exclude all absences, whether paid or unpaid, and that all overtime, whether paid or unpaid, is included. Recall errors can be reduced by using short reference periods or broad time units. To use separate questions to highlight those activities that tend to be erroneously included in or excluded from time worked, and to ask the respondents to account for the nature, duration and location of all (economic and non-economic) activities (in other words, to use time diaries) both tend to give better-quality results. However, such in-depth questions are normally too costly to be envisaged in a census operation.

2.272. It is recommended that, for persons who have had more than one job during the reference period, the questionnaire should ensure the recording both of *total time worked* (sum of *time worked* on all jobs) as well as time worked in the main job for which *occupation* and so forth is being registered.

2.273. The concept of time worked defined in the above paragraphs is that of "actual time worked" during the reference period. Thus for current activity with a short reference period, it is possible that the value of time worked could be zero, for example for persons on vacation during the reference period, or reduced if any part of the reference period is taken off sick or on holidays. Another time worked measure that could be used is that of "time usually worked", defined as the time worked during a normal or typical week (or day) including overtime hours regularly worked, whether paid or unpaid. Days and hours not usually worked and unusual periods of overtime are excluded.

(i) Time-related underemployment

2.274. When data are collected on time *actually* worked[58] , it is possible to consider the measurement of time-related underemployment. The *Resolution concerning the measurement of underemployment and inadequate employment situations*, adopted by the Sixteenth International Conference of Labour Statisticians (October 1998)[59] states that: "Time-related underemployment exists when the hours of work of an employed person are insufficient in relation to an alternative employment situation in which the person is willing and available to engage."

[58] A detailed definition of hours actually worked is given in the Resolution concerning statistics of hours of work, adopted by the 10th International Conference of Labour Statisticians, October 1962 [4] & [2]. This definition may be revised by the resolution on working time that will be considered by the 18th International Conference of Labour Statisticians in 2008.
[59] [4] & [2]

2.275. Time-related underemployment would be more appropriately measured by a labour force survey. However, for those countries without a labour force survey programme, it may be useful to include time-related underemployment as a population census topic.

2.276. Persons in time-related underemployment comprise all persons in employment, as defined in paragraphs 2.236-2.238 above, who satisfy the following three criteria during the reference period used to define employment:

(a) "*Willing to work additional hours*", i.e. wanted another job (or jobs) in addition to their current job (or jobs) to increase their total hours of work; to replace any of their current jobs with another job (or jobs) with increased hours of work; to increase the hours of work in any of their current jobs; or a combination of the above. In order to show how "willingness to work additional hours" is expressed in terms of action, which is meaningful under national circumstances, those who have actively sought to work additional hours should be distinguished from those who have not. Actively seeking to work additional hours is to be defined according to the criteria used in the definition of job search used for the measurement of the economically active population, also taking into account activities needed to increase the hours of work in the current job.
(b) "*Available to work additional hours*", i.e. are ready, within a specified subsequent period, to work additional hours, given opportunities for additional work. The subsequent period to be specified when determining workers' availability to work additional hours should be chosen in light of national circumstances and comprise the period generally required for workers to leave one job in order to start another.
(c) "*Worked less than a threshold relating to working time*", i.e. persons whose "hours actually worked" in all jobs during the reference period, as defined in paragraph 2.272 above, were below a threshold, to be chosen according to national circumstances. This threshold may be determined by e.g. the boundary between full-time and part-time employment, median values, averages, or norms for hours of work as specified in relevant legislation, collective agreements, agreements on working time arrangements or labour practices in countries.

2.277. Among time-related underemployed persons, countries may want to identify separately the following two groups:
(a) persons who usually work part-time schedules and want to work additional hours;
(b) persons who during the reference period worked less than their normal hours of work and wanted to work additional hours.

(e) Selection of "job" to be classified by descriptive variables

2.278. The descriptive variables "occupation", "industry", "status in employment" and "sector" should apply to either current or usual activity, depending on the choice of the main concept for the measurement of economic activity in the census. Individuals can be classified according to these variables only through their relationship with a job. This means that they must have been identified as being either employed or unemployed through the questions on economic activity. Whether economically active according to the *current activity (labour force)* concept or the usual activity concept, a person may have had more than one job during the reference period. For employed persons it is therefore recommended to first establish the "main" job held during the reference period and then, possibly the second job or (if more than two jobs) the second most important job and so on. It is recommended that each country should use the same criterion when ranking all jobs held in the reference periods. The criterion might be either on the basis of the hours usually worked (the preferred option) or on the basis of the highest income in cash and kind. Hence, using the first criterion, the "main" job would be the job at which the person usually worked most of the time among all the jobs held during the reference period, the second (most important) job should be the job at which the person usually worked most of the time among any other jobs held during the same period and so on. When ranking jobs held during the reference period, it is important to consider also jobs from which the person is temporarily absent during the reference period.

2.279. An "unemployed" person should be classified by "occupation", "industry", "status in employment" and "sector" on the basis of the last job, which he/she had. The collection of data on characteristics of the

last job (if any) of the unemployed is particularly important for users to have information on the characteristics of the unemployed in order to identify the specific areas of the economy or particular skills and occupations of unemployed people. The collection of these data is also relevant to countries applying ILO Convention No 160 which requires the preparation of statistics on the structure and distribution of the economically active population (that is, the employed and the unemployed) that are representative of the country as a whole.

2.280. However, such data is of only limited relevance in respect of unemployed people who change jobs frequently or for the unemployed who last worked a long time ago. For the first group, it may be better to ask the characteristics of the type of job in which the person most frequently worked and for the second group, it might be better to set a time limit for past work experience (e.g. during the last 10 years) and only seek information on the characteristics of the last job if it was held within the time limit.

2.281. It is important to design the census questionnaire or the census information taken from registers in a way, which will ensure that the variables "occupation", "industry", "status in employment" and "sector" are measured for the same job. This should be a central concern also for countries, which rely on the use of administrative registrations for the capturing of the correct values of these variables.

2.282. Countries may want to describe in greater detail the type of secondary work carried out by respondents engaged in more than one job during the reference period, in particular if those countries wish to be able to describe the extent and structure of employment in the informal sector. In this case, the questionnaire should allow for the identification of a second, and perhaps even a third job for which information about occupation, industry, status in employment, sector and time worked can be collected and coded. The resources that would be required for collecting and processing this additional information should be taken into account.

(f) Occupation (Core topic)

Recommended tabulations: 6.2, 6.6, 6.7, 7.3

2.283. Occupation refers to the type of work done in a job by the person employed (or the type of work done previously, if the person is unemployed), irrespective of the industry or the status in employment in which the person should be classified. Type of work is described by the main tasks and duties of the work.

2.284. 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, an update to ISCO was in progress and was expected to be released in 2008. Hence, the latest revision available at this time (2006) was the one that was developed by the Fourteenth International Conference of Labour Statisticians (ICLS) in 1987 and adopted by the Governing Body of the International Labour Organization (ILO) in 1988.[60]

2.285. 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.

2.286. Methods for establishing linkages (mapping) between a national classification and ISCO are described in paragraph 2.289 below. An explanation of the differences between the national classification and ISC0 should be given in the census publications in order to facilitate analysis of occupational statistics and international comparison.

2.287. In preparation for the coding of the occupation responses, the organization responsible for the

[60] International Standard Classification of Occupations (ISCO-88) (Geneva, International Labour Office, 1990).

census should prepare a *coding index* reflecting the type of responses that will be given by the respondents.[61] 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.

2.288. To ensure consistent, high-quality coding with a minimum of coding errors, each member of the coding staff should have easy access to the coding index and be given clear instructions to the effect that:

(a) The index should always be used to determine the correct code for a response;
(b) When searching for the correct index entry, the information given in the response should be used according to specified rules;
(c) The coding rules should give clear guidance on when and how use can be made of supplementary information, for example, the response to the "industry" question so as to determine an occupation code when the occupation responses are not sufficient for that purpose, as well as about when problems ("queries") should be referred to supervisors or expert coders for resolution.

The results of the resolution of such queries should be quickly distributed to all coders, so that the coding index may be updated, thus ensuring consistent treatment of similar responses.

2.289. 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, in which case coding should take the form of entering the line number of the selected index entry on the record for each response. 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: 6.3, 6.5, 6.7

2.290. Industry (branch of economic activity) refers to the kind of production or activity of the establishment or similar unit in which the job(s) of the economically active person (whether employed or unemployed) was located during the time-reference period established for data on economic characteristics.

2.291. For purposes of international comparisons, it is recommended that countries make it possible to prepare tabulations involving the industrial characteristics of economically active persons according to the most recent revision of the International Standard Industrial Classification of All Economic Activities (ISIC)[62] 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.

2.292. 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, the questionnaire should ask each active person the main products and services produced or the main functions carried out at the establishment or enterprise in which their job(s) was located. It is recommended that for those who work in fixed places the name and address of this place of work be collected. 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. In preparation for the coding of the industry responses that

[61] The development and use of coding indexes, Ch. XII, [5]
[62] International Standard Industrial Classification of All Economic Activities, Statistical Papers, No. 4, Rev.3 (United Nations publication, Sales No. E.90.XVII.11).

cannot be matched to a precoded 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[63] . 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.

2.293. To ensure consistent, high-quality coding with a minimum of coding errors, each member of the coding staff for the census should have easy access to the coding index and should be given clear instructions that:

(a) The index should always be used to determine the correct code for a response;

(b) When searching for the correct index entry, the information given in the response should be used according to specified rules. Where applicable, one should normally try to find an exact match for the employer's name and address in the compiled list of businesses and so forth before using the information on products, function and activities;

(c) The coding rules should give clear guidance on when and how use can be made of supplementary information, for example, the response to the Occupation question, to determine an industry code when the industry responses are not sufficient, as well as about when problems ("queries") should be referred to supervisors or expert coders for resolution.

The results of the resolution of such queries should be quickly distributed to all coders, so that the coding index may be updated, thus ensuring consistent treatment of similar responses.

2.294. 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. Double coding can be achieved most easily when the coding index carries references both to the national classification and to ISIC, in which case the coding should take the form of entering the line number of the selected index entry on the record for each response. "Mapping" means that, for each detailed group in the national classification, it is indicated to which ISIC group the (majority of) jobs in that national occupational group would be coded if coded directly to ISIC.

(h) Status in employment (Core topic)

Recommended tabulations: 6.4, 6.5, 6.6

2.295. Status in employment refers to the type of explicit or implicit contract of employment with other persons or organizations that the economically active 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 economically active 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"*.

2.296. It is recommended that the economically active population be classified by status in employment as follows:[64]

(a) *Employees*, among whom it may be possible to distinguish between employees with stable contracts

[63] The development and use of coding indexes, Ch. XII, [5]

[64] For further details see resolution concerning the International Classification of Status in Employment (ICSE) in ILO, Fifteenth International Conference of Labour Statisticians, ICLS/15/D.6 (Rev.1), Report of the Conference 19-28 January 1993. Geneva, International Labour Office, 1993.

(including regular employees) and other employees;

(b) *Employers*;

(c) *Own-account workers*;

(d) *Contributing family workers*;

(e) *Members of producers' co-operatives*;

(f) *Persons not classifiable by status.*

It is also recommended to identify separately owner-managers of incorporated enterprises, who normally will be classified among employees, but whom one may prefer to group together with employers for certain descriptive and analytical purposes.

2.297. An *employee* is a person who works in a *paid employment* job, that is to say, 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). Persons in *paid employment* jobs 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. *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.

2.298. A self-employment job is a job where the remuneration is directly dependent upon the profits (or the potential for profits) derived from the goods and services produced (where own consumption is considered to be part of the profits).

2.299. An *employer* is a person who, working on his or her own economic 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. A *self-employment* job is a job where the remuneration is directly dependent upon the profits (or the potential for profits) derived from the goods and services produced (where own consumption is considered to be part of the profits). 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.

2.300. 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). Members of families belonging to a producers' cooperative whose only activity is the cultivation of privately owned ancillary plots or the care of privately owned livestock should be included in this category rather than “contributing family workers”. It is recommended that countries, where the number of persons exclusively engaged in the own-account production of goods for own final use by their households is

significant, should identify such persons separately among own-account workers.

2.301. 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 (i.e. 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 lives in the same household may be relaxed.

2.302. 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 to 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.

2.303. *Persons not classifiable by status* include those economically active persons for whom insufficient information is available, and/or who cannot be included in any of the preceding categories (e.g. unpaid worker assisting a family member in the completion of a paid employment job).

2.304. Countries that include members of the armed forces in the economically active population should show them, as is currently being done, 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.

2.305. 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.[65] Consultations between national accountants and labour market analysts will be necessary to make decisions about the treatment of these groups in a consistent manner.

2.306. In most census questionnaires, the information concerning status in employment will be captured through precoded 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 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 to this group when using a questionnaire may either be excluded from the "economically active population" or be classified to one of the other groups.

(i) Income

2.307. Countries may wish to collect information on the amounts of income received by individual persons and/or households. 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 economically active or not. Income should be measured both for the individual and for the household of which he/she is a member.

2.308. Income may be defined as: (a) income, in cash or kind, received by each household member, and (b) total household income in cash and in kind from all sources. The preferred reference period for income

[65] For a discussion of the treatment of these groups, see the resolution concerning the International Classification of Status in Employment, para. 14, [4] & [2]

data should be the preceding twelve months or past year. The income could be classified as income from: paid employment; self-employment; property and other investment; transfers from governments, other households and non-profit institutions.

2.309. 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 income data in a population 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. Depending on the national requirements, countries may nonetheless wish to obtain limited information on cash income. As thus defined, the information collected can provide some input into statistics that have many important uses.

2.310. The income from employment of economically active persons should include wages and salaries of employees, income of members from producers' cooperatives and the entrepreneurial income of employers and own account workers operating business and unincorporated enterprises. The wider concept of employment-related income includes in addition some transfer income from government and employers that are based on the current or past employment situation of the person.[66]

2.311. In addition to the income from employment of its economically active 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 concepts involved in determining income are not simple to grasp and respondents may be unable or unwilling to provide exact information.[67] 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, 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.

(j) Institutional sector of employment

2.312. The *Institutional sector of employment*[68] relates to the legal organization and principal functions, behaviour and objectives of the enterprise with which a job is associated. 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 (i.e. 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

[66] Resolution on employment-related income, in [4]
[67] Resolution on household income and expenditure statistics, paras. 4-23, Report of the International Conference of Labour Statisticians, ILO, 2003, http://www.ilo.org/stat
[68] See [5]

cultural clubs, charitable institutions, aid agencies) that provide non-market goods and services for households (i.e. 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.

2.313. In most census questionnaires, the information concerning *institutional sector of employment* will be captured through precoded 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.

(k) Employment in the informal sector

2.314. 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. According to the ILO recommendation adopted by the International Conference of Labour Statisticians in 1993, concerning statistics of employment in the informal sector[69], the informal sector is to be defined in terms of characteristics of the production units (enterprises) in which the activities take place. It is to be considered a subsector of that institutional sector of employment called the household sector, that is to say, informal sector enterprises are defined as a subset of unincorporated enterprises owned by households. This subset comprises *(a)* informal own-account enterprises and *(b)* enterprises of informal employers. The distinction between the two categories is based on whether or not there is employment of employees on a continuous basis by enterprises (as contrasted with the employment of employees on an occasional basis and of contributing family workers). Depending on national circumstances, either all own-account enterprises should be considered informal, or only those that are not registered under relevant forms of national legislation. Enterprises of informal employers are defined in terms of one or more of the following criteria: *(a)* small size of the establishment(s) in terms of employment, to be specified according to national circumstances[70], *(b)* non-registration of the enterprise under relevant forms of national legislation and *(c)* non-registration of its employees, defined in accordance with the definition of regular employees in paragraph 2.297 above.

2.315. A separate question will generally be required in a census questionnaire to determine in which of the two subsectors an employed person may fall. The following points may be noted:

(a) The population employed in the *informal sector* comprises all persons who, during a given reference period, were employed (in the sense of para. 2.236 above) in at least one informal sector unit as defined in paragraph 2.314 above, irrespective of their status in employment and whether it was their main or a secondary job;

(b) The definition of informal sector units is complex[71] and includes criteria such as the legal

[69] Resolution on informal sector in [4].

[70] The Delhi City Group on informal sector statistics recommends that for international reporting, a limit of “less than 5” should be used as the size cut-off. (http://mospi.nic.in/report_3.htm)

[71] The "Resolution concerning statistics of employment in the informal sector", adopted by the Fifteenth International Conference of Labour Statisticians, Bulletin of Labour Statistics 1993-2, provides a precise definition of "informal sector" which has been tested in surveys in many countries. That resolution covers a variety of issues relating to the definition of the informal sector and the design, content and conduct of informal sector surveys. The relevance of the resolution goes beyond employment statistics, and its definitional parts were included in the 1993 SNA.

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;

(c) The scope of the informal sector is restricted to household unincorporated market enterprises, and therefore households producing exclusively for their own final use are to be excluded. An exception can be made, however, in respect of households employing paid domestic workers who may be included in the informal sector depending upon national circumstances and the intended uses of the statistics. Countries may also wish, for practical reasons, to consider keeping agricultural activities produced for the market outside the scope of the informal sector;

(d) Given the complexity of the definition described above, it may be difficult to precisely apply some of its criteria in a population census. It should be possible for many countries to derive from the census reasonably good estimates of the population employed in the informal sector by using information collected on the following topics: activity status, institutional sector of employment, occupation, status in employment and industry (and number of employees employed on a continuous basis or, alternatively, total number of employees or total number of persons including the enterprise owner(s) and contributing family workers employed in the enterprise during the reference period (this topic is not covered in these recommendations));

(e) It should be noted that, although countries may wish to use the population census in order to collect information that will make it possible to estimate the number and characteristics of the jobs in enterprises in the informal sector and of the persons employed in them, the census may yield unreliable estimates for several reasons. Informal sector activities are characteristically difficult to enumerate and such enumeration could only be carried out through the presentation of a series of carefully formulated questions, for which special surveys are better suited. Furthermore, some of the information needed to determine whether or not an individual is in the informal sector may be reliably provided only by the owner of the informal unit rather than by its other workers. Another issue to be considered is that, although classification by institutional sector in the population census is to be applied to the primary job, in many countries where the informal sector is an important component of the labour market, a significant number of these activities are undertaken as secondary activities of persons with a main job outside the informal sector. One prerequisite of obtaining a reasonably accurate estimate of informal sector employment from a population census is the collection by the census of data on the characteristics of the secondary jobs of persons as well as on the characteristics of their main job. Nevertheless, collection of information on informal sector activities in a census is very useful for obtaining an area sampling frame for subsequent household surveys.

2.316. In order to increase the number of *informal sector* and *household sector* activities actually captured by the census, it will usually be necessary to make special effort to capture activities that might otherwise go unreported, such as unpaid work in small family enterprises, activities undertaken by women on their own account at or from home, undeclared self-employment activities of persons registered as unemployed, pensioners or other persons, and informal sector businesses conducted as secondary jobs by government officials, employees of state-owned enterprises, craftsmen, and so forth.

(i) Informal employment

2.317. The 17th International Conference of Labour Statistics, in November 2003, considered the related concept of informal employment[72] and established a set of *Guidelines concerning a statistical definition of informal employment*. Under these Guidelines, informal employment comprises all informal jobs as defined below, whether carried out in formal sector enterprises, informal sector enterprises, or households, during a given reference period.

2.318. Informal employment includes the following types of jobs:

(i) own-account workers employed in their own informal sector enterprises;

[72] See http://www.ilo.org/public/english/bureau/stat/download/guidelines/defempl.pdf

(ii) employers employed in their own informal sector enterprises;
(iii) contributing family workers, irrespective of whether they work in formal or informal sector enterprises;
(iv) members of informal producers' cooperatives;
(v) employees holding informal jobs[73] (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, etc) in formal sector enterprises, informal sector enterprises, or as paid domestic workers employed by households;
(vi) own-account workers engaged in the production of goods exclusively for own final use by their household, if considered employed as defined in para. 2.236;

Producers' cooperatives are considered informal if they are not formally established as legal entities and also meet the other criteria of informal sector enterprises specified in the Resolution concerning statistics of employment in the informal sector adopted by the 15th ICLS.

2.319. Informal employment outside the informal sector comprises the following types of jobs:
(i) employees holding informal jobs (as defined above) in formal sector enterprises or as paid domestic workers employed by households;
(ii) contributing family workers working in formal sector enterprises;
(iii) own-account workers engaged in the production of goods exclusively for own final use by their household, if considered employed as defined in para. 2.236 above.

2.320. Countries that exclude agricultural activities from the scope of their informal sector statistics should develop suitable definitions of informal jobs in agriculture, especially with respect to jobs held by own-account workers, employers and members of producers' cooperatives.

2.321. It should be noted that the informal employment concept is complex and so accurate data on it can only be collected through household surveys.

(l) Place of work

2.322. *Place of work* is the location in which a currently employed person performed his or her main job, and where a usually employed person performed the main job used to determine his/her other economic characteristics such as occupation, industry, and status in employment (see paras. 2.283-2.306).

2.323. The following response categories, or a variation thereof necessitated by national circumstances, are recommended:

(a) Work at home: This category includes those whose economic activities are conducted 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, 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, etc.

(c) With a fixed place of work outside the home: this category will include the remaining employed population. To this group should also be classified persons who do not have a fixed place of work but who report to a fixed address at the beginning of their work period (for example, bus drivers, airline pilots and stewards), as well as operators of street or market stalls which are not removed at the end of the work day.

[73] The operational criteria for defining informal jobs of employees are to be determined in accordance with national circumstances and data availability.

This group may also include individuals who travel to work, on a regular basis, across the border to a neighbouring country. Persons working at changing sites, for example, in construction, should give the location of their current worksite rather than the address of their employer's place of business, if appearance at this site will be required for at least one week.

Selection of this response category should lead to a request for the precise location (e.g. street address and locality) of the place of work or the reporting place during the reference period. Coordination with the name (and address if given) of the enterprise or establishment collected for the "industry" variable is recommended. To devise an appropriate coding procedure for places of work abroad to which respondents travel regularly, it is recommended to use geographic reference files from the neighbouring countries.

While information on the geographic location of the place of work can be used to develop area profiles in terms of the employed labour force (as opposed to demographic profiles by place of residence), the primary objective is to link the place of work information to the place of residence. Therefore, the geographic location of the place of work should be coded to the smallest civil division in which the economic activity is performed in order to establish accurate commuter flows from the place of usual residence to the place of work.

2.324. It is likely that for some activities or 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 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.

7. International migration characteristics

2.325. Interest in the movement of people across national boundaries, namely, international migration, has steadily grown among .The present section, on international migration, is intended to supplement and expand the topic geographical and internal migration characteristics, which is covered in paragraphs 2.44-2.88 above. Definitions of international migration and specific ways of applying them in population censuses are presented in this section.

2.326. The United Nations *Recommendations on Statistics of International Migration, Revision 1*[74] deal on the one hand with migrant flows and on the other with immigrant stock. Population censuses are underscored as being the best source for collecting data on the immigrant stock and its characteristics and therefore this section is concerned chiefly with the topic of immigrant stock. Three core topics are identified in relation to measuring international migration: country of birth, country of citizenship, and year or period of arrival.

2.327. Given the general definition of "international migrant" presented in the revised *Recommendations on Statistics of International Migration* (para.32), the logical definition of the stock of international migrants present in a country would refer to the set of persons who have ever changed their country of usual residence. However, data useful for studying the issues related to international migrants are citizenship-specific. It is therefore common to find that the need for information relates not to the generality of international migrants as characterized above, but rather to those who do not have the citizenship of the country where they live and possibly to those who, despite having acquired citizenship in that country, were not part of its citizenry from the beginning of their lives.

2.328. Consequently, for the study of the impact of international migration using the population census,

[74] United Nations publication, Sales No. E.98.XVII.14.

two sub-groups of the population are the focus of interest. The first group consists of foreigners living in the country and the second comprises persons born in a country other than the one in which they live at the time of the census (the foreign-born). Consequently, two items must be recorded in the census: (*a*) country of birth, and (*b*) country of citizenship. In addition, it is also important to record year of arrival so as to establish length of stay in the country of international migrants.

(a) Country of birth (Core topic)

Recommended tabulations: 7.1, 7.2

2.329. The country of birth is, in the first instance, the country in which the person was born. 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 in paragraphs 2.331-2.336 below. The collection of information distinguishing between persons born in the country where the census is taken (natives) and those born elsewhere (foreign-born) is necessary even in countries where the proportion of the foreign-born population is small. It is therefore recommended that place of birth be asked of all persons first to distinguish the native-born from the foreign-born population. The collection of additional 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 name their country of birth, at least the continent or region where that country is located should be ascertained.

2.330. For purposes of both internal consistency and international comparability, it is preferable that information on the country of birth be available according to national boundaries existing at the time of the census. In addition to collecting detailed information on the actual country of birth, it is essential that the coding of information on the country of birth be done in sufficient detail to allow for the individual identification of all countries of birth that are represented in the population of 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-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 subregional classifications identified in the above-mentioned publication be adopted.

(b) Citizenship (Core topic)

Recommended tabulation: 7.2

2.331. Citizenship is the legal nationality of each person. A citizen is a legal national of the country of the census; a foreigner or alien is a non-national of the country. Because the country of citizenship is not necessarily identical to the country of birth, both items should be collected in a census. Data on citizenship are needed because of their policy relevance.

2.332. Information on citizenship should be collected so as to permit the classification of the population into (*a*) citizens by birth, (*b*) citizens by naturalization whether by declaration, option, marriage or other means and (*c*) foreigners. In addition, information on the country of citizenship of foreigners should be collected. It is important to record country of citizenship as such and not to use an adjective to indicate citizenship, since some of those adjectives are the same as those used to designate ethnic group. 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*.[75] 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 on the foreign population among countries. If countries decide to combine countries of citizenship into broad groups, it is recommended that the

[75] Statistical Papers, No. 49, Rev.3 (ST/ESA/STAT/SER. M/49/Rev.3).

standard regional and subregional classifications identified in the above-mentioned publication be adopted.

2.333. In some cases people may have more than one citizenship and where there are needs for this information to assist informed decision-making within a country details could be collected of all citizenships held. If this information is to be published care will have to be taken to explain to readers of the table how the possibility of people being included in the table more than once affects the marginal totals on the table.

2.334. For countries where the population includes a significant proportion of naturalized citizens, additional questions on previous nationality, method of naturalization and year of naturalization are useful if very detailed information on this subject is required.

2.335. 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 has only recently become important. As an aid to the analysis of the results, notations indicative of the likelihood of these or similar causes of misstatement should accompany tabulations based on citizenship. For the purpose of preparing tabulations on citizenship, all countries should be shown separately to the extent possible and a category of stateless persons should be presented.

2.336. Enumeration and processing instructions should indicate the disposition to be made of stateless persons, persons with dual nationality, persons in process of naturalization and any other groups with ambiguous citizenship. The treatment of these groups should be described in the census reports.

(c) Year or period of arrival (Core topic)

Recommended tabulation: 7.3

2.337. Recording the calendar year and month of arrival of a foreign-born person to the country of enumeration permits 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 tabulations in which the variable appears, in terms of the actual year of arrival.

2.338. It is possible to collect information on the date of initial arrival in the country or the date of the most recent arrival. It is likely that migrants will require most support services during the period immediately after their initial arrival in the country. It is therefore preferable to collect information in respect to the initial date of arrival. Attempting to collect information of date of most recent arrival presents a number of difficulties including ascertaining the duration of, and reason for, the absence leading to a re-entry.

2.339. Note that information on the year and month of arrival is requested only of 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. Persons born in the country of enumeration would not be asked the question at all.

2.340. Information on time since asking how many years have elapsed since the time of arrival, instead of in what calendar year the person can also collect arrival arrived. However, use of such a question is not recommended because it is likely to yield less accurate information.

8. Disability characteristics

2.341. 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 on-going surveys, the census can be the only source of information on the frequency and distribution of disability 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 the broader concept of disability based on the International Classification of Functioning Disability and Health (ICF) as described below. Census data can be utilized for planning programs and services (prevention and rehabilitation), monitoring disability trends in the country, evaluation of national programs and services concerning the equalization of opportunities, and for international comparison of the disability prevalence in countries.

(a) Disability status (Core topic)

2.342. Disability status characterises the population into those with and without a disability. Persons with disabilities are defined as those persons who are at greater risk than the general population for 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, 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 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 jeopardise their current levels of participation.

2.343. It is recommended that the following 4 domains be considered essential in determining disability:

i. Walking;
ii. Seeing;
iii. Hearing; and
iv. Cognition.

A comprehensive measure would include all domains (see paragraph 3.363).
If countries wish, then self care and communication may also be considered as domains.

(b) Disability framework and terminology

2.344. In 2001 the World Health Organization (WHO) issued the International Classification of Functioning, Disability and Health (ICF)[76] which is the successor of the International Classification of Impairments, Disabilities and Handicaps issued in 1980 (ICIDH).[77] The ICF is a classification system offering a conceptual framework with terminology and definitions of the terms, and classifications of contextual components associated with disability including both participation and environmental factors.

2.345. The 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); and
(1.2) Activities (limitations) and participation (restrictions).
(2.0) Contextual factors which include the components:
(2.1) Environmental factors
(2.2) Personal factors

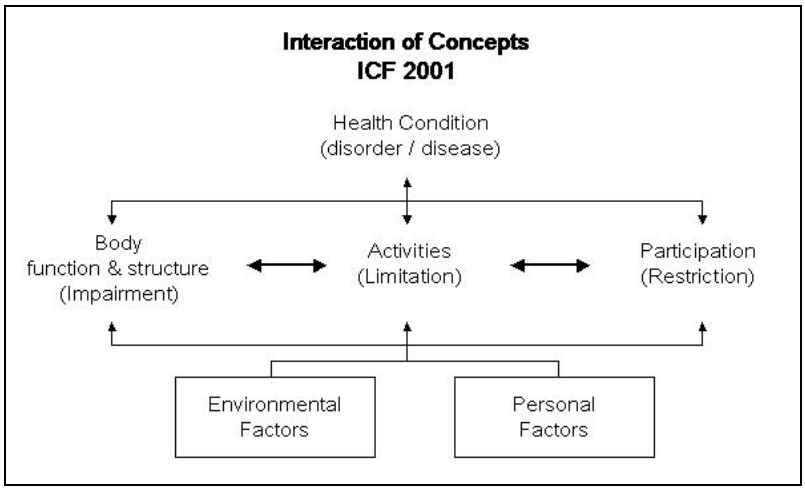
2.346. The ICF provides classification schemes for all these elements except for personal factors.

[76] International Classification of Functioning, Disability and Health (ICF), Geneva, World Health Organization, 2001.
[77] International Classification of Impairments, Disabilities and Handicaps (ICIDH), Geneva, World Health Organization, 1980.

Interactions between components of the ICF

2.347. The interactions between the parts and components are shown in the chart below.

Interaction of disability concepts



2.348. The main structure of the classification is reported in Appendix I.

Use of the census to measure disability at aggregate level

2.349. A census format offers only limited space and time for questions for one topic such as disability. Since the 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 are being developed and tested.[78] The aim of the recommended sets is to improve comparability of disability data across countries.

2.350. The World Programme of Action concerning Disabled Persons (WPA)[79] 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.

2.351. Three major classes of purposes for measuring disability in a census are:

(a) To provide services, including the development of 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. Monitoring levels of functioning includes estimating rates and analyzing 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;

[78] The Washington Group on Disability Statistics (WG), a UN City Group which focuses on proposing international measures of disability is developing these questions. See www.cdc.gov/nchs/citygroup.htm for updates on the questions.
[79] Programme of Action concerning Disabled Persons, United Nations, New York, 1983.

(c) To assess equalization of opportunities. The assessment of equalization of opportunity involves monitoring and evaluating outcomes of anti-discrimination laws and policies, and service and rehabilitation programs designed to improve and equalize the participation of persons with impairments in all aspects of life.

2.352. The intent of these purposes for measurement is consistent with that of the WPA, which outlines major goals for policy formulation and program planning, internationally. 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.

2.353. The assessment of equalization of opportunity is the purpose that can be best achieved in a census. It is this purpose that is being measured in the topic Disability Status.

2.354. The definition outlined in disability status (see paragraph 2.342) requires that disability be defined in terms of limitations in basic activity functioning, and not by 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 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 problems.

2.355. 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 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.*

2.356. 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 of the risk of participation restrictions.

2.357. Given the sensitivity and the complexity of disability it is recommended that several activity domains be identified where people can be asked about their ability to perform in such domains rather than enquire about a general disability status.

Essential domains:

2.358. The set of domains should capture the definition of disability that is being operationalized. 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 domains. These include the areas of walking, seeing, hearing and cognition. In addition, if space permits, two other domains have been identified for inclusion, self-care and communication.

2.359. *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.

2.360. 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.

2.361. 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 even *with* the use of glasses if they are usually worn and difficulty hearing *with* the use of hearing aids if these devices are used.

2.362. 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.

Additional domains:

2.363. There are additional physical functioning domains that could be included in a set of Census questions depending on the space available. Other domains that might be incorporated include upper body functioning of the arms, hands and fingers and 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.

Census questions

2.364. 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 the people with disabilities. Each domain should be asked through a separate question.[80] 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.

2.365. The information that results from measuring disability status (see paragraph 2.342) is expected to:
(a) Represent the majority, but not all persons with limitation in basic activity functioning in any one country;
(b) Represent the most commonly occurring basic activity limitations within any country; and
(c) Capture persons with similar problems across countries.

[80] 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.

2.366. The questions identify the population with functional limitations 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 versus those without 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. 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.

(c) Use of Census to screen for disability and follow-up with other surveys

2.367. 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[81] are minimized, while false positive[82] should be less of a concern.

2.368. Within the framework of the 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.

2.369. The same recommendations highlighted in paragraphs 2.364-2.366 should also be considered when a screening module is designed.

2.370. Before embarking in 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.

9. Agriculture

(a) Introduction

2.371. 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 in the population and housing census information that would facilitate the preparation of the frame of agricultural holdings in the household sector, for a subsequent agricultural census (see also para. 1.48).

2.372. 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 usual place of residence or elsewhere. With the second topic, at the individual person level, information is collected to identify persons involved in agricultural activities during a longer period, such as a year.

(b) Own-account agriculture production

2.373. 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

[81] Persons who have disabilities but are not identified in the census as having disabilities.
[82] Persons who are identified with disabilities in the census but in reality the do not have disabilities (as assessed in the largest instrument used in the follow-up survey).

any form of own-account agricultural production activities.

2.374. Where possible, information should be collected separately on the type of activity under the broad headings of crop production and livestock production. For countries where household level agriculture is particularly important, additional information on the size (area) of the agricultural holding and the numbers of livestock by type may also be collected in the population census.

2.375. Where aquacultural production is important at the household level, information can also be collected on whether 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

2.376. 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

2.377. 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, but can be expanded to identify main or secondary occupation and time worked.

2.378. 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 (topic reference code), for use as a frame for an agricultural census. It can also provide additional data for agriculture-related analysis of the population census.

2.379. 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.

2.380. 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).

Appendix I: Main concepts, terms and definitions of the international classification of functioning, disability and health

1. The main concepts, terms and definitions of the ICF are:

Body functions	are the physiological functions of body systems (including psychological functions).
Body structures	are anatomical parts of the body such as organs, limbs and their components
Impairments	are problems in body function or structure such as a significant deviation or loss
Activity	is the execution of a task or action by an individual
Activity limitations	are difficulties an individual may have in executing activities
Participation	is involvement in a life situation
Participation restrictions	are problems an individual may experience in involvement in life situations
Functioning	is the umbrella term for body function, structure, activity and participation
Disability	is the umbrella term for impairment, activity limitation and participation restriction
Environmental factors	make up the physical, social and attitudinal environment in which people live and conduct their life
Personal factors	are the particular background of an individual's life and living and comprise features of the individual that are not part of a health condition or health states, such as gender, race, age, fitness, lifestyle habits, coping styles, social background, education, profession, etc. The ICF does not include a classification of personal factors
Contextual factors	represent the complete background of an individual's life and living including two components, being environmental factors and personal factors which may have an impact on the individual with a health condition and that individual's health and health related states.

One level classification

2. In order to get a better idea of the content of the ICF we mention the first-level or parent categories of classification (chapter headings) of each of the classifications included in the ICF.

Body functions:

(1.0) Mental functions
(2.0) Sensory functions and pain
(3.0) Voice and speech functions
(4.0) Functions of the cardiovascular, haematological, immunological and respiratory systems

(5.0) Functions of digestive, metabolic and endocrine systems
(6.0) Genitoury and reproductive functions
(7.0) Neuromusculoskeletal and movement related structures
(8.0) Functions of the skin and related structures

Body structures:

(1.0) Structures of the nervous system
(2.0) The eye, ear and related structures
(3.0) Structures involved in voice and speech
(4.0) Structures of the cardiovascular, immunological and respiratory systems
(5.0) Structures related to the digestive, metabolic and endocrine systems
(6.0) Structures related to the genitourinary and reproductive systems
(7.0) Structures related to movement
(8.0) Skin and related structures

Activity and Participation[83]:

(1.0) Learning and applying knowledge
(2.0) General tasks and demands
(3.0) Communication
(4.0) Mobility
(5.0) Self-care
(6.0) Domestic life
(7.0) Interpersonal interactions and relationships
(8.0) Major life areas (such as education, work and employment, economic life)
(9.0) Community, social and civic life

Environmental factors

(1.0) Products and technology
(2.0) Natural environment and human-made changes to environment
(3.0) Support and relationships
(4.0) Attitudes
(5.0) Services, systems and policies

3. Personal factors are mentioned as important factors but are not classified in the ICF. For health conditions (disorder, disease, injuries and congenital causes of disability) reference is made to the ICD-10[84] and the ICECI [85].

4. In order to specify the functioning and disability situation of a person, qualifiers are available to indicate the extent and level of functioning/disability and the environmental factors as being facilitators or barriers. The advantage of the ICF is the broad spectrum offered from the body function/structure (impairment) point of view up to the participation one including the influence of environmental factors. It is recommended to use this broad spectrum as often as possible.

[83] At the time the revision process of the ICIDH was in a final stage it seemed to be possible to distinguish activity and participation at the level of definitions. However it was not possible to reach agreement about the related classifications. For this reason there is one classification for activity and participation (domains) with four suggestions how to use this in an activity or participation mode

[84] International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Vols. 1-3, Geneva, World Health Organization, 1992-1994.

[85] International Classification of External Causes of Injuries, Geneva World Health Organization, 2004.

Part Three: Census Products and Data Utilization

VIII. Census Products and Services

3.1. 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 have been covered in part one. With the availability of microcomputers, some data users may prefer to obtain census products in computer media rather than in printed form. However, there are still many users who would prefer to receive census results in printed form. Since the cost of producing census products in various formats, for example, printed, in computer media or on-line, can be high, it is recommended that countries consider very carefully the forms in which the census results are disseminated. If a cost-recovery scheme is being planned from the dissemination programme, early study and analysis of the potential data users and their requirements are particularly important.

3.2. Some data users will need specialized products that the census organization is not planning to produce as part of the general census programme. In such cases, it is recommended that the census organization establish a service to meet such specialized requests, usually on a cost reimbursement basis. Consultation with data users is recommended prior to deciding the type of services that may be required by the data users. Consultation will also assist the census organization in determining the cost that the users are prepared to pay for the services required. For example, if the third level of administrative area is the lowest unit of aggregation for the dissemination of certain characteristics, users who require more detailed disaggregation may be charged for the services required to produce these tabulations. Sometimes a major user or user group may contract prior to the census for a specific census product. Such an advance contracting will greatly facilitate census planning and may mean, as a result, that the census organization can provide the product at reduced cost. However, it is important for the creditability of the census organization that the authorities continue to give priority to general census products funded by general government funding over such specially funded outputs.

3.3. Not all of the processed material need be published. Tabulations required by only a few users, such as certain government offices or specialized research organizations, can be supplied in unpublished form (that is to say, unpublished hard-copy tables or tabulations in machine-readable format). Some data may not be tabulated until they are required. Computers provide the opportunity to produce a greater number and a wider variety of tabulations than was the case with previous tabulation procedures. The data stored in the census database represent a rich source of information, which allows fast and relatively inexpensive production of additional tables as they are requested. On-line access or dissemination of such micro- and/or macro-databases on computer media can greatly contribute to an enlarging of the user base and thus to the demand for census data. Two cautionary notes are important to keep in mind, however. First, certain cross-tabulations may be of questionable value from a substantive viewpoint because of response, sampling or processing errors or because of processing or imputation procedures. The census authorities will 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 to "sophisticated users", but this type of policy of differentiating among users may not be permissible in some countries. Even where it is permissible, it may cause more problems than it solves. In any case, the census organization should have 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. 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.

3.4. An increasing number of statistical organizations make a clear distinction between delivering basic information to the public and delivering information to specific users. In the case where cost recovery is

applied, census product users requiring customized information or a copy of a product are charged. The prices of the products and services are generally established to cover all expenses related to production costs, marketing costs and standard agency overhead, including support. Production costs do not include costs of collecting and processing the data since these activities are performed in the conduct of surveys and censuses driven primarily by public policy needs.

A. Publication of Census Results

1. Provisional results

3.5. To maintain interest by the public in its census and upcoming results and products, census offices ought to ensure a steady supply of data and information following the release of a preliminary population count, as soon as the enumeration is completed (1.208). This can take the form of a staggered release of key census data via simple, descriptive one-page summary fact sheets covering a country's major geographical divisions, until such a time that the first descriptive reports and comprehensive tabulation are released.

2. Tabulations

3.6. 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 almost universal use of modern computer equipment for the processing of census data, the time required for processing has been greatly reduced in comparison with that for older forms of processing and the processing cost of each tabulation and the relative cost of processing additional tabulations represent a much smaller fraction of the total census cost than in the past. 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.

3.7. The population and housing censuses tabulations shown below and illustrated in annex I 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.

3.8. 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.

3.9. Some countries may also collect additional questions in the census questionnaire to ascertain developments for specific concerns. For example, whether or not the birth of an individual is registered, the age a woman first marries or the vocational and technical skills. In other cases, detailed tabulations for special population may be required for use in planning or evaluation of programs. 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

3.10. Many countries prepare different types of thematic or analytical reports. These 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; 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 and the elderly population. 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. Partnership and external cooperation with academic institutions and other specialists in subject matter, which can facilitate such work and strengthen collaborations, should be sought whenever possible.

3.11. 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.

4. Other reports

3.12. 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.

3.13. 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. Procedural report

3.14. 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. The report may include the following topics: a brief history of the census in the country, legal basis for conducting the census, budget requirements and control, census committees and their activities, census organization and personnel structure, quality control procedures, census calendar, census cartographic work, development and design of the questionnaires, enumeration methodology of each census, field organization, manual editing and coding, data-processing development and organization, data capture, computer editing and imputation procedure, computer hardware and software used, census evaluation, publication and data dissemination programme. The census administrative report is very useful both for the users and for the census organization itself. Given the long lapse of time between censuses and the likelihood of changes in personnel, particularly in the upper echelon, the administrative report is an essential product for the planning of future censuses.

3.15. With the developments in information technology, the census data files and publications have become increasingly available in computer media. A description of the procedure in the development of these data files may also be included in the procedural report. Consideration for a separate volumes of procedural report for the processing and dissemination phases maybe considered to ensure the completion

of the planning and field operations phases immediately after the census enumeration.

B. Census Mapping

1. Basic mapping

3.16. Published analogous and digital maps are tools that make the census results more understandable and easier to use. 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 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.

3.17. 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 with in 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 should 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.

3.18. There are three major types of area identification maps that are commonly used in most census publications: (*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.

3.19. The purpose of statistical maps is to present the results in term 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.

2. Thematic mapping

3.20. 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.

3.21. Maps are an invaluable aid in meaningfully comparing sub-national results with national values or with other international and regional norms. Desktop mapping and desktop publishing software provides 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 are an effective means of presenting census information. On the other hand, some care should be exercised in respect of producing complex printed maps involving several variables, as such maps are often difficult to reproduce clearly and the general user may find them difficult to understand.

3.22. 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. Several census organizations have produced this kind of product, sometimes in cooperation with a commercial company. Many users require small area data for 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.

3.23. 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. 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.

3.24. 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 census bureau 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

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

3.25. 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.

3.26. The development of village population size maps by regions is of particular value. These maps combine two types of information: village population statistics and village locations in each region or subnational area. More information can be presented on, for example, the village location within the district and the region, habitable and non-habitable areas, densely populated villages, areas with no villages, and the proximity of villages. Village population size maps can also be used as base maps for additional information on village services and activities, and on location and distribution of villages without specific services, such as primary schools, dispensaries, piped water, and so forth.

C. Interactive Digital Outputs

1. Overview

3.27. It is of paramount importance that census data and information produced are widely disseminated and communicated, and that agencies involved in this process have a pronounced customer/client and stakeholder focus, place more emphasis on providing a service than merely providing products, and be guided by user-relevance and user-friendliness in all its operations, rather than by tradition in producing tables, graphs and reports they have always produced.

3.28. While statistical tables or census records, printed or digital maps and atlases, including the provision of some dynamic mapping capability can be conveniently disseminated through various forms, including different types of computer media, growing demands by users for an ever growing variety of census data outputs are most effectively and efficiently met by enabling and empowering census data users, to be able to access census data themselves, and build their own customized tables or spatially configure data outputs according to varying spatial requirements. Access to census data on national statistical office websites and through CD ROMs, and innovative communication and analytical tools like encrypted electronic databases and Population geographic information systems are good illustrations of recent developments putting census data and outputs at the fingertip of users.

2. Geographical information systems

3.29. Geographical information systems 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, a 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.

3.30. In practical terms, such systems may range from simple desktop mapping facilities to complete GIS systems capable of solving complex planning and management problems or producing detailed geo-referenced inventories. 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, 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 geo-referenced 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.

3.31. 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 a national statistical organization. Collaborative arrangements with other agencies, such as national mapping and survey agencies, should be pursued particularly with regard to the acquisition and maintenance of base maps and digital databases, which should not become a responsibility of national statistical organizations. Along similar lines, any GIS development by statistical organizations should be compatible with systems that might already exist in other public sector agencies, and where the role of the statistical agency would consist in primarily supplying census data and other important statistics useful for policy-makers across a broad range of sectoral applications, at levels and in formats compatible with such systems. National statistical offices should only proceed with their own GIS development and applications when, *inter alia*, it is feasible to maintain such systems and applications during the inter-censal years, where there is no dependence on continued external technical support, and where there are explicit demands from users in the public and private sector for such developments and outputs.

3.32. 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 policy makers 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.

3.33. To achieve maximum efficiency gains, GIS applications should also be capable of generating additional geographical delimitations beyond those used in the census, such as school and health districts, water and other biophysical catchment areas, 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 (EA). 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 organisations 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.

3.34. Being a rather complex technology and requiring some specialised technical resources, national statistical organisations, particularly in developing countries, ought to approach the introduction of GIS systems gradually and with care, and at all times ensuring compatibility with other systems possibly in circulation elsewhere. 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 analysing large amounts of spatial data. Widespread dissemination of databases can then be achieved by creating a version of the finished databases using a lower-end mapping software format for distribution at low cost, as is currently developed in some countries.

3.35. Apart from providing national statistical organisations with a very effective means to disseminate and increase the utilization of census data, geographical information systems, more than any other data management system, provides 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; it allows governments to effectively monitor development progress across different sectors at village, municipality and sub-regional 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.

D. Customized Products and Services

3.36. 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.

3.37. 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 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.

3.38. 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. Checks for breaches in confidentiality could also be made automatically by computer.

3.39. 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 or on-line) for dissemination according to the users' requirements.

3.40. 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 license. The license 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.

3.41. 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.

E. Popular Publications and Special Audience Reports

3.42. The traditional approach to the publication of census information is through release of cross classified tabulations. This is not however easy for non-expert users to access. As these traditional forms of data on Population and Housing Census are being published, there are diverse ways to disseminate census data in a more accessible format and thus increase the utilization of the information collected.

3.43. It should be noted that the following material can only be effective in encouraging the use of census information if they are prepared in a timely and professional manner. This will require specialist skills from people used to writing for these audiences, use of high quality materials and considerable planning. As such resources are often expensive any country planning to undertake such campaigns must allow for the costs of such activities when planning their budget.

1. Posters

3.44. One of the most common ways to disseminate census information consists in publishing posters highlighting key facts such as - How many are we? Where do we live? - 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 population, seniors, and women's groups, among others where there is a clear channel for accessing the group.

3.45. Since the objective of a poster is to catch the eye at a distance relatively few facts should be presented and in a way that the key message is immediately visible. Posters can be greatly enhanced by the addition of a well designed graph and use of fonts to increase the readability and comprehension of the key message.

2. Brochures

3.46. Professionally designed brochures are another way to disseminate basic census data. These brochures should be written in a very easy and comprehensive 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 relevant issues on population. They are particularly suitable for preparation as give-aways for people attending events such as the launch of more traditional materials or including on display racks in libraries of Government offices.

3. Special audience reports

3.47. Information generated by census is by definition of use to a wide range of users of a wide range of

statistical expertise.

3.48. Due to these attributes National Statistical Offices may wish to prepare specific analytical reports for special audiences. While these reports may not require the attention-attracting features of the posters and brochures they will need to 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 analyzed. In some cases it might be seen as desirable or necessary to undertake the analysis as collaboration with academic institutions or other specialists.

3.49. The target audience might be any part of the census user audience interested in the topic. Criteria used in establishing the topics chosen will have to be set by the country concerned but could include such factors as the importance of the topic to the country; 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

3.50. The use of graphics such as charts or maps included on videotapes; Compact Disc (CD) or Digital Video Disc (DVD) format are media useful to promote the 'story behind the numbers and thus increase use of census data. These might indicate how census data can assist policy makers, 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

3.51. Instructional material in an easy to understand form can be prepared for the general public, indicating 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.

3.52. A particular implementation of instructional material 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 will encourage the use of evidence based analysis through out 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.

IX. Census Data Utilization

A. General Uses of Population and Housing Censuses

3.53. Population censuses are traditionally used for public and private sector policy-making, planning, administrative and research purposes. 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.

3.54. 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 over all 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.

1. Uses of population censuses

3.55. 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 may be obtained in the following United Nations publications: *General Principles for National Programmes of Population Projections as Aids to Development Planning*;[86] manuals on methods of estimating population: *Manual I: Methods of Estimating Total Population for Current Dates*;[87] and *Manual X: Indirect Techniques for Demographic Estimation*;[88] *Projection Methods for Integrating Population Variables into Development Planning*, vol. I: *Methods for Comprehensive Planning*, *Module One: Conceptual issues and methods for preparing demographic properties*, and *Module Two: Methods for preparing school enrolment, labour force and employment projections*;[89] *Indicators of Sustainable Development Framework and Methodologies*;[90] and *Principles and Recommendations for a Vital Statistics System, Revision 2*.[91]

3.56. The total population 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 migration, together with fertility and mortality, are needed to prepare population estimates for planning purposes and for determining policies on migration and for 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;*[92] *Manual VI: Methods of Measuring Internal Migration*[93] (manuals on methods of estimating population); *Internal Migration of Women in Developing Countries*;[94] and *Recommendations on Statistics of International Migration, Revision 1*.[95]

3.57. 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*;[96] and *Handbook of Population and Housing Censuses, Part II : Demographic and Social Characteristics*.[97]

[86] United Nations publication, Sales No. E.65.XIII.2.
[87] United Nations publication, Sales No. E.52.XIII.5.
[88] Population Studies, No. 81 (United Nations publication, Sales No. E.83.XIII.2).
[89] United Nations publications (ST/ESA/SER.R/90 and Add.1).
[90] United Nations publication, Sales No. E.96.II.A.16.
[91] United Nations publication, Sales No. E.01.XVII.10.
[92] Studies in Methods, No. 54 (United Nations publication, Sales No. E.91.XVII.9).
[93] United Nations publication, Sales No. E.70.XIII.3.
[94] United Nations publication, Sales No. E.94.XIII.3.
[95] United Nations publication, Sales No. E.98.XVII.14
[96] United Nations publication, Sales No. E.73.XIII.2.
[97] Studies in Methods, No. 54 (United Nations publication, Sales No. E.91.XVII.9).

3.58. 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;*[98] *Compiling Social Indicators on the Situation of Women*[99] (manuals on the situation of women and men); *Manual II: Methods of Appraisal of Quality of Basic Data for Population Estimates*;[100] (manuals on methods of estimating population); and *Handbook on Social Indicators.*[101]

3.59. 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*;[102] *Handbook of Population and Housing Censuses, Part II: Demographic and Social Characteristics;*[103] *Manual III: Methods for Population Projections by Sex and Age*[104] (manuals on methods of estimating population); and *First Marriage: Patterns and Determinants, 1988*.[105]

3.60. 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: *Manual X: Indirect Techniques for Demographic Estimation*;[106] *Step-by-Step Guide to the Estimation of Child Mortality*;[107]; *Handbook of Population and Housing Censuses, Part II: Demographic and Social Characteristics;*[108]; "Assessing the effects of mortality reduction of population ageing";[109] and *Socio-economic Differentials in Child Mortality in Developing Countries*.[110]

3.61. Education has historically been one of the key factors determining the quality of life, and interest in education continues today in most of the countries of the world, where the emphasis is on improving access to and the quality of education, and broadening the scope of basic education.[111] 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

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[98] United Nations publication, Sales No. E.05.XVII.7
[99] Studies in Methods, No. 32 (United Nations publication, Sales No. E.84.XVII.2).
[100] United Nations publication, Sales No. E.56.XIII.2.
[101] Studies in Methods, No. 49 (United Nations publication, Sales No. E.89.XVII.6).
[102] United Nations Development Programme, New York, 2004.
[103] Studies in Methods, No. 54 (United Nations publication, Sales No. E.91.XVII.9).
[104] United Nations publication, Sales No. E.56.XIII.3.
[105] United Nations publication (ST/ESA/SER.R/76).
[106] Population Studies, No. 81 (United Nations publication, Sales No. E.83.XIII.2).
[107] United Nations publication, Sales No. E.89.XIII.9.
[108] Studies in Methods, No. 54 (United Nations publication, Sales No. E.91.XVII.9).
[109] Article by Shiro Horiuchi in Population Bulletin of the United Nations (New York), Nos. 31/32 (1991). Sales No. E.91.XIII.18.
[110] United Nations publication, Sales No. E.85.XIII.7.
[111] Education for All Summit of Nine High-Population Countries, New Delhi, 12-16 December 1993: Final Report (Paris, UNESCO, 1994).

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, 2003*;[112] *Human Development Report, 1996*;[113] *Report on the World Social Situation, 2005;*[114] and *Education For All: Global Monitoring Report, 2006*.[115]

3.62. 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.

3.63. Statistics obtained from different sources (for example, labour-force surveys, agricultural survey, 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";[116] *Methods of Analysing Census Data on Economic Activities of the Population*;[117] *Handbook of Household Surveys (Revised Edition);*[118] and *Handbook of Population and Housing Censuses, Part IV: Economic Activity Status*.[119]

3.64. 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[120] and *Recommendations on Statistics of International Migration, Revision 1* (ST/ESA/STAT/ SER. M/58/Rev.1).

3.65. 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 United Nations publications: *The Standard Rules on the*

[112] New York, Oxford University Press, 2003.
[113] New York, Oxford University Press, 1996.
[114] United Nations publication, Sales No. 05.IV.5.
[115] Paris, United Nations Educational, Scientific and Cultural Organization, 2005.
[116] Technical Report by the United Nations Statistics Division and International Labour Office, 2002 (ST/ESA/STAT/119).
[117] United Nations publication, Sales No. E.69.XIII.2.
[118] Studies in Methods, No. 31 (United Nations publication, Sales No. E.83.XVII.13).
[119] Studies in Methods, No. 564 (Part IV) (United Nations publications, Sales No. E.96.XVII.13).
[120] 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).

Equalization of Opportunities for Persons with Disabilities[121]; *World Programme of Action Concerning Disabled Persons*;[122] *Manual for the Development of Statistical Information for Disability Programmes and Policies*.[123]

2. Uses of housing censuses

3.66. 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 - the space, degree of crowding, facilities, surroundings, 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 Local Area Data

3.67. While census data may be used to study large regions or entire nations, they are also aggregations of data for many individual small areas. Data for small areas enable the user to obtain statistical information about individual 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. 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.

3.68. 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.

3.69. 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

[121] Adopted by the United Nations General Assembly, forty-eighth session, resolution 48/96, Annex, of 20 December 1993.
[122] Adopted by the United Nations General Assembly at its 37th regular session on 3 December 1982, by its resolution 37/52, contained in United Nations document A/37/51, Official Records of the General Assembly, Thirty-seventh Session Supplement No. 51.
[123] Statistics on Special Population Groups, No. 8 (United Nations publication, Sales No. E.96.XVII.4 and Corr.1).

situation the availability of census databases with mapping capability is of great importance.

3.70. 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, 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.

C. Cross-cutting Social Issues

3.71. Reflecting the concerns and priorities among countries around the world, the United Nations convened, between 1990 and 1996, a series of global conferences -- on children, education, environment, human rights, population, social 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;[124] the Programme of Action of the International Conference on Population and Development;[125] the Copenhagen Declaration on Social Development and the Programme of Action of the World Summit for Social Development;[126] and the Platform for Action[127] adopted by the Fourth World Conference on Women. 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.[128]

3.72. 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 this 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 as well as the international level. 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

[124] A/CONF.157/24 (Part I), chap. III.
[125] 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.
[126] 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.
[127] 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.
[128] 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.

with those in use for the entire population.

3.73. 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 such as 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. However, in the census operations, 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, youth and the elderly, and people with disability so as to assist in the preparing of detailed tabulations and databases according to international standards.

1. Statistics on gender

3.74. 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 statistics and statistical methods related to gender should be an important priority at all stages of work on the census -- in planning, data collection, analysis and dissemination -- and in all topics.

3.75. In addition to the more general problems of the quality of census data, two other types of problem, which apply particularly to women and stem from sex-based stereotypes and sex biases, have been noted. The first type is based, for example, on the idea that women are simply homemakers and therefore not part of the economically active population. 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.

3.76. 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 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.

3.77. 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* [129] and *Methods of Measuring Women's Economic Activity: Technical Report.* [130]

[129] Studies in Methods, No. 33 (United Nations publication, Sales No. E.84.XVII.3).
[130] Studies in Methods, No. 59 (United Nations publication, Sales No. E.93.XVII.6).

3.78. Important statistical series and measures on the status of women can be readily obtained based on the topics listed 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" [131] and *Handbook for National Statistical Data Bases on Women and Development.*[132] The household and family status classifications presented in paragraph 2.112 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.

3.79. 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.

3.80. 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,*[133] 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.*[134]

2. Statistics on children and youth

3.81. 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.

3.82. 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.

3.83. 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.

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[131] Statistics and indicators on women and men available at: http://unstats.un.org/unsd/demographic/products/indwm/indwm2.htm.
[132] Social Statistics and Indicators, No. 6 (United Nations publication, Sales No. E.89.XVII.9).
[133] United Nations publication, Sales No. E.05.XVII.7
[134] 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.

3.84. 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.

3.85. 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.

3.86. 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.

3.87. 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*.[135]

3. Statistics on the elderly

3.88. For the elderly also, extensive data are available in population and housing censuses but may need detailed age-sex classification, as described below.

3.89. The elderly 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 84, instead of including them in the single broad age category 60 and over. Furthermore, countries that use a 10-year group, covering ages 55-64, may consider dividing this group into ages 55-59 and 60-64 in order to compile comparable statistics and indicators on the elderly.

3.90. For the purpose of developing statistics and indicators on the elderly, 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.

3.91. The statistics needed for studies of the elderly are disparate, depending as they do on national policies and circumstances. Internationally, no illustrative list of indicators is available to ensure appropriate tabulations from the censuses. For some guidance in this area, see *Handbook on Social Indicators* [136] and consult regional recommendations, where available.

4. Statistics on persons with disabilities

3.92. 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.

3.93. 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

[135] Statistics on Special Population Groups, No. 1 (United Nations publication, Sales No. E.85.XVII.12).
[136] Studies in Methods, No. 49 (United Nations publication, Sales No. E.89.XVII.6).

Disability Statistics,[137] 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. A brief treatment of this topic is given below to highlight issues involved in preparing detailed census tabulations on people with disability.

3.94. 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 attendance, (*g*) activity status, (*h*) status of employment, (*i*) industry and (*j*) occupation.

3.95. 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 with 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*[138] *and Manual for the Development of Statistical Information for Disability Programmes and Policies* [139].

D. Development Indicators

3.96. The Statistical Commission, at its twenty-eighth session (held in New York, 1995), responding to the demands of the global conferences of this decade, as indicated in paragraph 3.59, established an Expert Group on the Statistical Implications of Recent Major United Nations Conferences.[140] Among the main objectives of the Expert Group were to:

(a) Consider the programmes of action adopted by the International Conference on Population and Development, Cairo, 1994; the World Summit for Social Development, Copenhagen, 1995; and the Fourth World Conference on Women, Beijing, 1995;

(b) Agree on a number of critical policy domains;

(c) Identify relevant statistical indicators arising from such policy domains.

3.97. The meeting of the UN General Assembly in 2000 set the development agenda for the next fifteen years with the declaration of the Millenium Development Goals (MDGs), the principal component of which was to reduce world poverty by half by the year 2015. The monitoring of the achievement of these goals has been mainstreamed into almost all statistical activities including the census. The objectives, goals and indicators outlined in the MDGs largely embrace the development agenda of the previous decade. The most recent meeting (35th session) of the UN Statistical Commission (held in New York in 2005) emphasised the importance of the MDGs. The most recent meeting of the UN General Assembly (September 2005) assessed progress that had been made in achieving the MDGs five years after the declaration. A few months earlier at the annual meeting of the G8 countries in Gleneagle Scotland a decision was taken to cancel the debt of some countries. This was in response to a clarion call to eliminate and make poverty history.

3.98. International financial institutions such as the IMF and the World Bank have also made the issue

[137] For more information on the Washington Group, go to: http://www.cdc.gov/nchs/citygroup.htm.
[138] Statistics on Special Population Groups, No. 10 (United Nations publication, Sales No. E.01.XVII.15).
[139] Statistics on Special Population Groups, No. 8 (United Nations publication, Sales No. E.96.XVII.4 and Corr.1).
[140] See Official Records of the Economic and Social Council, 1995, Supplement No. 8 (E/1995/28), chap. XI.

of poverty reduction a major feature of their agenda. They have encouraged developing countries mainly in Africa to develop Poverty Reduction Strategy Papers (PRSPs) as the cornerstone for development assistance. A feature of these PRSPs is their huge data demands for the monitoring and evaluation of internationally agreed development indicators. Data from censuses constitute an important component of the data requirements especially because such data is available for very small geographic units. Mapping of such units shows the distribution of poverty for all parts of a country.

3.99. On the basis of its review of recommendations adopted by these conferences, the Expert Group identified broad policy themes and main areas of social concern as a subject-matter framework for further work in statistics to monitor achievement of the goals of the conferences. The themes are (*a*) population and development; (*b*) eradication of poverty; (*c*) expansion of productive employment and reduction of unemployment; (*d*) social integration; and (*e*) status of women and men. The areas of concern arising from the first three themes --for example, crime and criminal justice, economic resources, training, health, expenditure, material well-being and working environment -- are not all covered in censuses. On the other hand, the population groups implied in the last two themes, social integration and the status of women and men, cut across almost all topics dealt with in censuses. It is therefore important that censuses place priority on the collection of data on these groups, particularly with a view towards informing policies on social integration, giving particular attention to such groups as children, youth, the elderly and disabled persons, as well as on women and men. The concerns of these groups have been systematically expressed in the international conferences.

3.100. Suggestions for improving data on these and other population groups have been discussed in the relevant sections of this publication. In addition, some specific issues on classifications and tabulations have been highlighted in this chapter. The relevance of population and housing censuses for the development of the indicators proposed by the Expert Group as constituting the MNSDS has also been noted.

3.101. The Expert Group identified a number of indicators that may be used to monitor or assess progress towards development, and recommended a basic list of 15 indicators that would make up a minimum national social data set. The Expert Group emphasized the need for national statistics offices and funding agencies to support the development of national social statistics capabilities, within the context of the recommendations of the World Summit for Social Development.

3.102. The Statistical Commission, at its twenty-ninth session, endorsed the MNSDS with the substitution of an indicator on the contraceptive prevalence rate for the indicator on birth weight. The Commission stressed that the indicators in the MNSDS should be regarded as constituting a minimum not a maximum list, and invited users to build upon it to meet national needs and circumstances, and requirements in specific fields.[141]

3.103. For a large number of countries, population censuses are a major source of social statistics and in particular of benchmark data for the proposed social data set. It is therefore important that the revised Principles and Recommendations for Population and Housing Censuses take into account the emerging needs for social statistics implied in the global conferences. While it may not be possible to include additional topics in the census, there may be other avenues for meeting the data requirements of these international recommendations which need to be considered. For example, many of the data items required are best obtained from surveys. Therefore, in countries where surveys (and use of long forms) are planned as part of the census exercise, some of the required topics might be investigated through these surveys.

3.104. As a first step towards ensuring the availability of relevant data on the suggested indicators, in particular the MNSDS, special effort needs to be made to produce the required tabulations for early release or for dissemination in the final set of tables.

[141] Ibid., 1997, Supplement No. 4 (E/1997/24), para. 67.

E. Promotion of, and Training on, Uses of Census Data

3.106. The entire 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 to users.

3.107. 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 and/or how to find the information they require within the systems of that office.

3.108. 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:

1) 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.

2) The proposed courses or materials should be fully integrated into the overall Census advocacy or training program. 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.

3) 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 which (a) identify those areas in which the statistical office wishes to participate (eg dealing with lifeline clients; topics on which the statistical office has particular knowledge or expertise); (b) establish partnerships with other bodies to provide training in other cases; (c) use of approaches other than classroom training to provide learning-at-a-distance opportunities (eg use of self help facilities on CD-ROM); (d) a pricing regime to cover costs where this is seen as desirable.

3.109. The possible list of target audiences and topics for such training is very much a matter for decision by 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 the census data at the broadest level. 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, provide an ideal framework for local officials to address the most pressing issues of their constituents, such as location of schools, utilities and so forth.

3.110. 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 generating an awareness of the census in 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.