

UNITED NATIONS SECRETARIAT
Department of Economic and Social Affairs
Statistics Division

ESA/STAT/AC.98/2
07 September 2004

English only

**United Nations Expert Group Meeting to
Review Critical Issues Relevant to the Planning of
the 2010 Round of Population and Housing Censuses
15-17 September 2004
New York**

Alternative Census Designs: An Overview of Issues ^{*}

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INTRODUCTION

1. For most countries conducting a traditional census is one of the most involved civil operations undertaken by governments. A population census is a monumental exercise requiring considerable human, financial and other logistical resources. There are many reasons why countries undertake population censuses, among the most basic reason is to provide population headcount at a national level. For some countries conducting a census is enshrined in the constitution for purposes of delimiting of political constituencies and sharing of financial resources among states in a country (Griffin, 2003). In addition it serves as a statistical portrait of a country profiling, among other things, the composition and distribution and its socio-economic correlates of its population.

2. Concerns regarding prohibitive costs, lack of timeliness of results, undercoverage and in some cases questionable data quality have led some countries to adopt and consider implementing other alternative census designs.

3. This paper presents general features of the traditional and some selected alternative census designs giving reasons for their adoption. Reviews are made, through examples, of the following approaches: the traditional census approach (which is briefly explored here in order to provide a context and contrast); register-based census approach; censuses based solely on sample surveys; registers/administrative records combined with sample survey; and the traditional census supplemented by annual sample surveys. Finally, the paper requests the Expert Group meeting to consider recommending the review of the *Principles and Recommendation for Population and Housing Censuses* taking into account the evolving and varied approaches to census taking.

I. DIFFERENT CENSUS APPROACHES

4. As indicated in paragraph 3 above, there are many approaches to conducting a population census, ranging from the traditional census to the population register-based approaches as well as variants which are combinations of the two approaches, supplemented in some cases by sample surveys.

A. Traditional census

5. The traditional census, for our purposes, is one in which members of the public respond to a census questionnaire or interviewers are deployed to collect information from respondents. This type of censuses is the total process of collecting, compiling, evaluating, analyzing and disseminating demographic, economic and social data pertaining, at a specific time to all persons in a country or in a well-delimited part of a country (United Nations, 1998). The essential features of this approach are individual enumeration, universality within a defined territory, simultaneity and defined periodicity. For interviewer-based censuses, enumerators assigned to different enumeration areas cover all households and persons in the enumeration area during a specified time usually a short period of time. The main advantage of this approach is the snap shot of the entire population at a specified period and the availability of data for relatively small administrative domains.

6. We must, however, mention that it is common for countries to administer short and long forms 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.

7. Traditional censuses have been singled out as the most elaborate, complex and costly data collection activity that national/census offices undertake and it has been argued that these costs are rising (Leete, 2003). In addition to costs, this complex task requires full awareness and agreement of the public to participate in it. In light of the above constraints are we seeing the beginning of the end of traditional census taking?

B. Register-based census approach

8. In a register-based population census results from existing administrative registers are combined at a micro level, using various statistical techniques to produce census type information. A questionnaire is not administered to respondents. In maintaining population registers an individual is registered as resident at the address where he/she spends her time. In general, the register-based census covers all private households and private dwellings where at least one person was registered as resident on the census date.

9. In Norway, for example, a central population register is available and each person has an identification number. Information on demography, education, income, labor market participation and geographic characteristics are all collected from registers (Utene, 2003). The housing census is based on a dwelling and building register. Registers used include: *Central Population Register, Employment Register, Business Register, Dwelling Register and Building Register*. In some countries there are many registers. In the 2000 census, for instance, Finland used thirty administrative sources (Statistics Finland, 2004).

10. It has been consistently argued that register-based censuses reduce costs and respondents' burden to statistical enquiries by asking the public to give statistical information only under the circumstances of public necessity. In addition, the approach maximizes the use of data collected by other government agencies, and not only the statistical office, for statistical purposes (Punch, 2001). Comparability of data is said to be enhanced between census and annual statistics because they use the same sources (Utene, 2003, Bruhn, 2001). In this way census statistics can be an integrated part of a national statistical system.

11. One other advantage pertains to timeliness where census type information can be produced regularly and for most variables on an annual basis. Thus there are prospects for flexibility in terms of reference date and periodicity. In addition, costly field procedures are avoided and most effort is devoted to improving quality of the different registers.

12. A major limitation of this approach is that the data collection is limited to what already exists in the registers. One cannot, for instance, add an item for data collection currently on demand by stakeholders/users. Other limitations include:

- Need for initial investment in setting up registers;
- Need for regular financial and other resources to sustain the registers;
- Completeness of data in registers;
- Harmonization of concepts and definitions between registers.

C. Register/administrative records and sample surveys

13. Some countries obtain census information by compiling data from different administrative registers and results of sample surveys.

14. The Netherlands, for instance, adopted this census approach in their 2001 census called the “**Virtual Census**” based on combined information from different sources available to Statistics Netherlands. The census information was compiled from data sets from registers and results of sample surveys. The data were then combined using personal identification codes. Some of the data sources used are briefly described below as illustrations.

a. Dutch population register

15. This is the source of population and household data generated from automated municipal population registers. These registers include local registers on social security, water and electricity supply, police departments dealing with the foreign population, and the national registers of the old age pension fund system. Household statistics comprise the number of households by household type and persons living in households (Nordholt, Marrijke and Gircour, 2004).

b. Integrated jobs file

16. The file is created in a micro-integration process from different sources, among them: jobs registers, survey on Employment and Earnings; Fiscal Administration Register (FIBASE) and Labour Force Surveys.

17. Since the data come from many sources, before they are tabulated some transformation and adjustment have to be made so that they conform to the concepts and definitions set in the census programme.

18. The method of “repeated weighting” (based on the repeated replication of the regression method to eliminate numerical inconsistencies between table estimates from different sources) is used to generate numerically consistent table sets even if the data is obtained from different data sources.

19. It has been argued that there is an ever growing demand for statistical information. The demand, however, cannot be adequately met by the supply of uncoordinated and partial information. To solve the problem of uncoordinated statistics and to be able to respond urgently to demands for timely and accurate statistics, Statistics Netherlands developed a Social Statistics Database which enables the statistical office to come up with census related results at any chosen

time. Among the merits of this approach are the reduction of the response burden on respondents and the overall cost of statistical activities. In addition, it reduces the probability of publishing contradictory statistics (Everaers and Van Der Laan, 2003).

20. However, there are some limitations associated with this approach. Among them the fact that registers may be kept up-to-date for administrative purposes other than those related to statistics and censuses.

D. Sample Surveys Approach

21. Some countries are contemplating or planning to conduct the next round of censuses based on large-scale continuous annual surveys. It has been argued that such an approach is cost effective and builds professional statistical capacity of the national statistical system especially in the area of quality data collection.

22. France is one of the countries which is adopting the above mentioned approach. They term it a “rotating census”, with annual collection of data, during a five-year period, based on sample surveys providing population data for the administrative districts and annual socio-demographic statistics (INSEE, 2003).

23. The underlying objective of the new census approach is to provide more up-to-date statistical information to users. Before the adoption of this new approach, France had scheduled to conduct a traditional census every five years but such censuses were taken at longer time intervals. For example, censuses were conducted in 1975, in 1982, then in 1990 and finally in 1999. Among the reasons advanced for non-adherence to the five year schedule were cost and complexity of the census operations.

24. This method has been adopted for four main reasons. First, France has no population registers; second, there are several large-scale surveys with results that can be inferred at relatively low domains; third, while administrative data may be available, the files cannot be linked because there are no personal identification number system. Finally, until 1999 there was no legal obligation in France to carry out a census as there was no clear legal framework for conducting a traditional census as is the case now (Desplanques, 2003).

25. The main advantage, which has been advanced, of the rotating census is that it will generate new data on an annual basis. It will also provide annual estimates from a very large sample and eventually annual time series for various administrative domains. It has further been argued that data from rotating censuses would be more useful, especially at local levels where changes are more frequent and data users demand more current information. In addition, the rotating census will be a source of an updated frame that can be used for other specialized surveys. It is also envisaged that this new approach will enhance professionalism among those involved because of the frequency of such census operations.

26. Some limitations of this approach include:

- It does not cover all individuals in a particular locality.
- The building registers may not be up to date and consequently newly built dwellings may be missed;

- Perception that response rates may decrease, especially in large communes with 10,000 and more people because of response fatigue and possible apathy;
- Results for small areas may not be very reliable

E. Traditional census supplemented by annual household surveys

27. Under this census approach a traditional type of census is carried out every ten or five years. The traditional census component only the short form will be administered at one of the above mentioned intervals. During the years prior to the conduct of such a census a number of large-scale annual surveys, collecting varied census type information, will be carried out.

28. We briefly describe below as an example, the United States “**Re-engineered Population and Housing Census**”. The traditional short form census will be complemented by a Community Survey Programme which conducts surveys every year beginning in 2003. These surveys would generate data which in the previous censuses came from the long form.

29. Between 1940 and 2000, the United States of America decennial Population and Housing Census consisted of two parts (Housing and Urban Administration, 2002), namely:

- A *short form* whose main use was to count the population and collect basic demographic and socio-economic characteristics;
- A *long form* that obtained the same information as above plus more detailed demographic, housing and socio-economic information from a sample of households.

30. The census conducted in 2000 used two basic types of questionnaires namely, the short form, containing 100 per cent items asked of the entire population and the long form, containing the 100 percent items as well as selected sample items. A national average of about one in six housing units were expected to be enumerated using the long form; the other five-sixth of the housing units were to be enumerated in the short form (Griffin, 2003). It was however, felt that because the long form collected information once in ten years, the data generated from it were out-of-date during most years of the decade.

31. The American Community Survey programme is, therefore, designed to collect long-form type data throughout the decade and to release results every year. The collection of data is done through continuous monthly samples, where each sample has a three-month collection cycle. Each collection cycle has three phases; during the first phase questionnaires are mailed to sample housing units, phase two involves use of computer-assisted telephone interviews to follow up housing units that did not respond in phase two. Finally, in phase three personal interview to a third of non-responding housing units in the two previous phases. The mission is to provide timely, relevant, and high-quality data about people and the economy (Bench, 2004).

a. Benefits for introducing the American Community Survey

32. This approach is expected to benefit the decennial census itself, Interregional Population Estimates program, and a wide variety of data users. Specifically:

- The design of the decennial census will be simplified thereby improving coverage. The staff involved in preparing the census will focus on the constitutional mandate of accurately counting the population and housing. The collection of data through the long form added substantial burden and complexity to the decennial census thus posing additional demands to the staff.
- A continuous flow of information for every county and sub-county will help improve the Interregional Population Estimates.
- Given the rapid growth in population and stakeholders, ongoing surveys will result in more timely data for users. In the 2000 census round, it took about two years to release data from the decennial long form. It is anticipated that results from the American Community Survey will be released in about six months time.

b. Concerns raised about the American Community Survey

33. There are concerns being raised by some users. For instance, the adoption of moving averages is troubling for some users who are accustomed to having data for all geographic areas at one point in time. Also, there needs to be a 3-year and 5-year accumulation of data required for areas with fewer than 65,000 people (Griffin, 2003).

34. Another area of concern is cost. Due to its size and design, the American Community Survey programme will be an expensive undertaking that requires a long term fiscal commitment. A summary of characteristics of selected alternative approaches is given in the annex.

II. PROSPECTS OF PORTABILITY OF ALTERNATIVE CENSUS DESIGNS

35. Are the alternative designs described in the preceding paragraphs portable to countries at different levels of statistical development? After reviewing the various benefits of alternative designs when compared with the traditional census, some countries are seriously considering implementing one of these alternative designs. These designs can be portable, under different circumstances, if basic but important conditions are met. We explore, based on the illustrative alternatives census designs, minimum prerequisites for the successful implementation of some of the designs.

36. For a register-based census to succeed, in the first place, appropriate registers from which census type information can be assembled need to be in place. Such registers should be comprehensive and well maintained. In addition there must be a system where individual persons are assigned unique identification numbers which can facilitate linkages among the various registers. The reliability of census information in this case will depend on completeness of the registration system. In many countries, however, administrative records are not well developed, making them unreliable sources of census type data. In addition, because of their content, they may be more suitable for administrative purposes, than necessarily as sources of statistics (Banda, 2001).

37. The virtual census approach, as earlier stated, bases its information on different sources, including registers, administrative records and household surveys. In order for this model to be applicable, as in the case of register-based census, there is need for comprehensive registers and relevant administrative records which can be sources of requisite census information. In addition, there should be capacity and a good survey programme to generate data which may not be available in registers and administrative records but is considered important as census information.

38. The rotating census approach is mainly sample-survey based. This implies that for a country to adopt this census design there must be exhaustive and regularly updated sample frames. In addition, a continuous sample survey programme must be in place or initiated, to generate requisite data at regular intervals.

39. Many countries have experience in collecting census information through the short and long form. This is complex activity, when and if done concurrently. The census approach which involves the collection of basic population census information every 10 or five years while collecting detailed information on a sample basis during the intercensal period is very attractive. For the programme to be successful, however, there must be long term financial and resource commitments. The development of a durable and sustainable sample survey programme also seems to be a necessary prerequisite. This entails, among other things, the development of sample survey capacity for countries that lack such capacity. It may also be a necessary to initiate intercensal integrated sample survey programme, similar to those advocated under the United Nations Household Survey Capability Programme (NHSCP) which was undertaken in the mid-1980s and disbanded around the mid-1990s. Through this programme many countries developed the capacity to conduct surveys on a continuous basis. Is this a plausible proposition to follow at an international level?

III. IMPLICATIONS OF ALTERNATIVE CENSUS DESIGNS FOR THE PRINCIPLES AND RECOMMENDATIONS FOR POPULATION AND HOUSING CENSUSES

40. The *Principles and Recommendations for Population and Housing Censuses* guide countries in the planning design and implementation of censuses. These guidelines mainly focus on the traditional census. It is, however, clear from the preceding paragraphs that a census is an evolving and dynamic concept. Some of the alternative designs reviewed above do not strictly embody the essential features of a census (United Nations, paragraph 1.5 page 3, 1998) with respect, for example, to individual enumeration, where each individual and each set of living quarters is enumerated separately. It is stated, however, in the *Principles and Recommendations* that individual enumeration does not preclude the use of sampling techniques in obtaining specified characteristics, experts should deliberate on whether it is appropriate to expand the definition of a census to include designs such as the rotating censuses.

41. Another dimension which experts may wish to discuss is simultaneity. Given the emphasis on simultaneity in the traditional census approach, what is its relevance today? In several alternative designs, such as the rotating census and the survey component of the

American Community Survey, data collection activities are staggered over a period of five and ten years, respectively.

IV. CONCLUSION

42. Alternative census designs are adopted by countries for many different reasons among these: cost-effectiveness vis-à-vis the traditional census; timely and quality census results and reduced burden to respondents. It is evident, however, that for these alternative approaches to be successful undertakings, certain necessary conditions need to be fulfilled. This may mean that, for countries not yet ready but eager to adopt some of the alternative designs, efforts should be made to first build the requisite infrastructure and capacity to conduct such censuses.

43. In view of the above, is there a need to revise the *Principles and Recommendation for Population and Housing Censuses* to accommodate the evolving and dynamic definition of a census? Should the varied aspects of alternative census designs be covered? In addition, the Expert Group Meeting is requested to advise how to approach further work on alternative census designs.

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ANNEX. SUMMARY OF CHARACTERISTICS OF DIFFERENT TYPES OF ALTERNATIVE CENSUS DESIGNS

Type	Sources of data	Periodicity	Potential advantages	Possible Constraints	Prerequisites for adoption
I. Register-based census	Administrative registers	Flexible	<ul style="list-style-type: none"> i. Reduced costs compared to traditional census. ii. Flexibility both in periodicity and reference date. iii. No respondent burden iv. Quicker to produce results. 	<ul style="list-style-type: none"> i. Data to be collected is limited to what is already available in registers. ii. The census authorities have to rely on other organization for maintaining and updating the registers. iii. Complex data merging and cleaning 	<ul style="list-style-type: none"> i. Availability of comprehensive and relevant registers. ii. Having a stable and unique identity of each record, through the Personal Identification Number.
II. Combination of registers and sample surveys (e.g. Virtual census)	<ul style="list-style-type: none"> i. Registers ii. Administrative records iii. Sample surveys 	Flexible	<ul style="list-style-type: none"> i. Reduced costs compared to traditional census. ii. Availability of timely census information. iii. Reduced burden on respondents. 	Same as above	<ul style="list-style-type: none"> i. Same as above with an additional prerequisite of ii. a good survey programme and frame to supplement register-based information.
III. Sample survey based censuses (e.g. Rotating census)	<ul style="list-style-type: none"> i. Sample Surveys 	Annual	<ul style="list-style-type: none"> i. Data available annually. ii. Developing and updating of frames for other specialized surveys. iii. Enhances professionalism for those involved because the census is a regular operation. 	<ul style="list-style-type: none"> i. Does not cover all individuals in a particular locality. ii. Exclusion of new buildings in the frame a possibility. iii. Estimating procedures of linking five year data series may be challenging. 	<ul style="list-style-type: none"> i. Good sample frames. ii. A solid infrastructure for conducting sample surveys with good statistical capacity.

<p>IV. Traditional census (short form) and annual large-scale surveys during the intercensal years (e.g, Re-engineered Census)</p>	<ul style="list-style-type: none"> i. Traditional census for short form ii. Sample survey (for long form type of information) 	<ul style="list-style-type: none"> i. Every ten years for short form. ii. Annually 	<ul style="list-style-type: none"> i. Will reduce operational complexity of the decennial census. ii. Complete and accurate addresses (updated frames) will simplify census design and improve quality and coverage. iii. Timely and quick release of data. iv. On going operational improvement of survey methods and professionalism for those involved (regular operation). 	<ul style="list-style-type: none"> i. High financial commitments for the surveys component. ii. The estimation procedures may be somewhat complex and the users will have to be accustomed to the concept of moving averages as opposed to having data for all geographic areas at one point in time. 	<p>As in 3 above with long term financial commitment to the survey programme.</p>
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