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DIFFICULT-TO-MEASURE TOPICS

**Topics difficult to measure in a register-based census**

Note by Statistics Norway

Summary

An increasing number of countries in the UNECE region are using or are planning for use of administrative data in their population and housing censuses. So far only a few countries have established a totally register-based solution, but in several countries combination of registers and other data sources is regarded as an interesting option.

In conducting a register-based census it is necessary to combine data from a number of administrative sources on micro level. The set-up of register systems may differ a lot between countries; both concerning what kind of registers that are available and the possibilities to link data from different registers. Which census topics are difficult to measure will of course depend on the coverage and the data quality of the national register systems. In this paper some problems will be discussed that are considered common for countries conducting register-based censuses.

This note is prepared by Statistics Norway and the experiences presented refer mainly to the Norwegian censuses. However, some experiences from other Nordic countries are included in the discussions. Knowledge on other countries is more limited and is mainly restricted to information given at the expert group meeting on implementation of the CES Recommendations for register-based censuses in Astana, June 2007.

In this document some general features of register-based censuses will be first discussed. In chapter II some common types of quality problems in register-based censuses will be considered, and in chapter III the different groups of census topics will be reviewed more in detail.

## **I. GENERAL FEATURES OF REGISTER-BASED CENSUSES**

### **A. Advantages and disadvantages of register-based censuses**

1. The main advantages of register-based censuses are lower costs and reduced response burden. A register-based census is based on the same sources as annual subject matter statistics. Consequently, the marginal costs of producing a census are low compared to a traditional census. The reduction of response burden is substantial since a census is covering the whole population.
2. In a register-based census only variables that are included in registers or could be derived from register variables, are available. This also means that some restrictions are imposed on the definitions of units and variables. In register-based censuses the population is normally counted according to legal place of residence and a private household is defined as all persons living in the same dwelling (dwelling household). For some users, housekeeping units based on de facto place of residence would be more appropriate for their analyses.

### **B. General quality issues**

3. The CES Recommendations identifies the following dimensions of quality in statistics: Relevance, accuracy, timeliness, accessibility interpretability and coherence. In this paper the focus will be on the dimensions of relevance and accuracy when using administrative registers as the source for census data.
4. When conducting a traditional census, using census forms, the statistical office may ask questions directly corresponding to the definitions given in international recommendations. In this way the census data will relate to the concepts that it is desired to describe, in other words the relevance is high. When using register-based data it is always important to bear in mind that the data is originally collected for another purpose than making statistics.
5. To obtain a high degree of accuracy is a challenge independent of data collection methods used, but the types of problems may be somewhat different when using register-based data. Topics that are important for the administrative agencies responsible for the registers are normally recorded with a high degree of accuracy.
6. In general, problems related to relevance may be more difficult to solve than problems related to accuracy when conducting a register-based census.

## II. TYPES OF INFORMATION DIFFICULT TO OBTAIN FROM REGISTER

7. Before looking into the census topic in more detail, some quality problems typical for register-based statistics will be discussed.

### A. Data from recently established registers

8. The following table is taken from the UNECE report “Register-based statistics in the Nordic countries” (UNECE, 2007).

Table. The year of establishing registers/introducing registers in census statistics by type of register and country.

Type of register	Denmark		Finland		Norway		Sweden	
	Established	First used in census						
Central Population Register	1968	1981	1969	1970	1964	1970	1967	1975
Business Register	1975	1981	1975	1980	1965	1980	1963	1975
Dwellings	1977	1981	1980	1985	2001	2011	2008?	2011?
Housing Conditions	1977	1981	1980	1985	2001	2011	2008?	2011?
Education	1971	1981	1970	1975	1970	1980	1985	1990
Employment	1979	1981	1987	1990	1978	2001	1985	1985
Family	1968	1981	1978	1980	1964	1980	1960	1975
Household	1968	1981	1970	1975	2001	2011	2011?	2011?
Income	1970	1981	1969	1970	1967	1980	1968	1975
Totally register-based census		1981		1990		2011		2011?

9. It normally takes some years from administrative registers are being established till the data are satisfying for census purposes. However, there are substantial differences between registers and between countries, and there may be different kinds of explanation.

10. The employment statistics in Norway may be used as an example. A register on employees was established in 1978, but the data from this register was not sufficient to measure employment topics in censuses. In the late 1980ies and the 1990ies several other registers were established (on wage sums, self-employment, unemployment etc) and by combining data from all these sources it was possible to include the employment topics in the 2001 Census, 23 year after the main register had been established.

11. The Norwegian dwelling register was established in 2001 and the Swedish dwelling register even later. Accordingly, for the 2011 Census the household and housing topics will be the most difficult to measure for these countries.

#### **B. Data of minor importance for administrative purposes**

12. Data that is not important for administrative purposes will in general have poorer quality than other data. In the Norwegian register on buildings and dwellings some variables are mandatory to up-date for the local administrations. For toilet and bathing facilities, number of rooms and useful floor space the coverage is nearly 90 per cent. For mandatory topics like type of heating and water supply system the coverage is much lower.

13. Another example is information from the Norwegian register of wage sums used to measure employment in census week. "Duration of employment" is a variable contained in this register, but in most cases information is actually given for the whole calendar year. Since the duration is not importance for taxation purposes, this information is not corrected.

#### **C. The "ever-never" problem**

14. Another familiar problem is the lack of data describing the situation before the register in question was established. In censuses this is in particular associated with topics like ever resided abroad and place of birth. This kind of information will often not exist for the period before the population register was established. In Norway the same situation concerns buildings and dwellings built before the building register was established. This type of imperfections is gradually getting less important as years goes by.

#### **D. Data from events abroad**

15. This type of quality problem is mainly relevant for immigrants and is related to what kind of information that is recorded at the time of immigration. A typical example is education taken abroad. In several countries this kind of information is not collected for persons upon immigration and hence information on education attainment will suffer from under-coverage for immigrants.

16. In some countries there are similar problems with other topics, for instance legal marital status if this kind of information is not registered at the time of arrival in the country or the person is not later involved in any kind of event where marital status is normally registered (marriage, divorce, birth of child etc.).

#### **E. Data on topics not relevant for administrative registration**

17. It is not possible, and in some cases not even desirable for the society, to have administrative registers covering all topics relevant for statistical purposes. In most countries there exist no "cohabitation register". This kind of information is only registered when relevant for tax paying, responsibility for common children etc. and do not cover all cohabiting couples. In general, there are no registers that cover people's emotional relationship to each other.

18. Other topics are related to human behaviour and attitudes, examples being mode of transport to work/school and type of energy used for heating. This kind of topics will probably never be covered by register data, and combining data from sample surveys and registers will be the only option.

### **III. TOPICS DIFFICULT TO MEASURE – EXPERIENCES AND POSSIBLE SOLUTIONS**

19. In this chapter the topics that are difficult to measure in the different census areas will be discussed. The focus will mainly be on core topics, but non-core topics will also be used as examples.

#### **A. Population to be enumerated and geographic characteristics**

20. Place of usual residence is a basic element in a census and the way of measuring this topic has great impacts on most census topics, including household and housing topics. Place of usual residence determines the resident population of each country and each region within the country. According to the CES Recommendations place of usual residence could be the place of living at the time of census (de facto address), the legal residence or the residence for voting or other administrative purposes. In a register-based census the legal residence would be the most obvious option. For most people, the legal residential address in the population register will be the same as the de facto address, but for some groups there may be deviations.

21. According to the CES Recommendations only persons who have lived in their place of usual residence for a continuous period of at least 12 months or if not, have the intention of staying there for at least a year, should be regarded as usual residents. In some countries immigrants are registered without reference to their intention to stay for the next 12 months. In other countries the instructions for registration of residential address have similar requirements, but the time limit may be different, for example 6 months in Norway.

22. Administrative rules and practices may not fully comply with the CES Recommendations. In some countries third level students can, according to instructions for population registration, choose where they want to be registered. Depending on the national circumstances there may be incentives for students to register at the place of study or to remain registered at their parents' home address even if they are actually living in a different household.

23. There are similar types of deviations when it comes to people living in institutions. In some countries they are likely to keep their family address as legal residence, especially if they are married.

24. Using the concept of legal residence of course implies that persons staying illegally in the country will not be counted. However, this group will probably be difficult to count precisely in traditional censuses as well. But even some persons staying legally in the country may not be registered as residents in the population register, for instance asylum seekers. If there are other administrative sources covering such groups, they could be included in the total resident population.

25. Homeless people are often not covered in any registration and therefore not included in the total population. In some countries they are covered, but then often registered on a “normal” address.

26. Some people are de facto living in more than one residence. In countries where several address is registered, it may be a problem to decide which one is the usual place of residence. In other countries the problem is more the opposite: The population register have only one address. The possibilities for finding the de facto address, for instance for students, are then more limited.

27. All the examples mentioned above are related to national rules and practices for population registration. The legal address recorded is correct according to the principles of registration, but not always the most relevant for counting the population by usual place of residence. In addition there are some problems to keep registers up-dated, especially for persons moving abroad. Some people tend to keep their legal address in the county of origin, even if they intend to stay abroad more than 12 months. In general there are many incentives to register in a country, but few, if any, to de-register. As a consequence, some people are registered in more than one country. In the Nordic country this problem has been overcome by data exchange between the population registers.

28. The lack of de-registration may especially have an impact of the very old-age population. People leaving a country without sending a notification to the population registrar, will apparently live “forever” in the country of origin. One way of coping with this problem for statistical purposes, is to combine data from several registers. If a person leaves no tracks in any register for a number of years, the person is probably not living in the country any more.

## **B. Demographic, family and household characteristics**

29. The core demographic topics age and sex are not problematic for register-based censuses, since they are considered basis information in the population registers. Legal marital status for immigrants is problematic in for instance Israel (“events taken place abroad”).

30. In a register-based census, private households are normally identified by a combination of personal identification number and dwelling identification number. All persons registered as living in the same dwelling constitutes a household (the dwelling household concept). In order to form households according to the housekeeping concept, a household identification number must be established. This requires an administrative need of this kind of information. At least in the Nordic countries it will probably not be realistic to form housekeeping units based on register data only.

31. Using legal resident address also has consequences for breakdown by type of household, especially in countries where third level students tend to stay registered at their family home address. Compared to using de facto address there will be more households with adult children and less one-person households. Especially when tabulating household income, these differences are clearly demonstrated.

32. Registers do not cover all kinds of relations between household members. In Norway the basic links registered is between children and parents and between spouses. However, some of these links is missing, for example the link between parents and children for children who had left their family home before the register was established. This means for instance that for older people links between siblings may be missing, and even for younger people the link to their grandparents may not be established. This type of imperfections is gradually getting less important as years goes by.

33. A more severe problem is caused by the kinds of relations that will never be covered in registers, for instance cohabitation. Several strategies are developed to determine whether two persons living in the same household are cohabitants or not. In the Nordic countries, information on sex, common children, kinship, mutual age difference and the date of moving into the dwelling is used to estimate the number of cohabiting couples. In countries like the Netherlands and Israel, information from sample surveys (for instance the Labour Force Survey) is used in estimation.

### **C. Migration and ethno-cultural characteristics**

34. For migrants who arrived in the country before the register was set up, there may be problems related to migration status. Topics like ever resided abroad and year of arrival in the country will suffer from under-coverage. If information on country of birth is available, then it is certain that persons born in a foreign country must have resided abroad. But information on year of arrival is still required. For instance in the Nordic countries the population registers were set up in the 1960ies, so if the topic is transformed to “resided abroad after 1970/1980”, the problem will be solved.

35. According to the CES Recommendations country of birth should be collected on the basis of international boundaries existing at the time of the census. Information in population registers is normally referring to the boundaries existing at the time of immigration. This is of course mainly a problem when a previous country has been divided into several new states. If information on place of birth within the country is not available, it is quite difficult to identify the country by current borders.

36. Ethnicity has according to the CES Recommendations necessarily a subjective dimension and should always be based on free self-declaration of a person. In most countries such data is not subject to registration in administrative systems, but there are some exceptions. For instance in Latvia, ethnicity is included in the population register based on self-declaration. In Finland country background is constructed based on information on mother tongue and religion in the population register. In countries like Norway and the Netherlands these variables are not included in the population register and estimation is based on country of birth and country of birth of parents. In the Netherlands the derived topic is called “ethnic background”, in Norway “country background”.

#### **D. Economic characteristics**

37. Most core topics are related to the currently active population; that is persons in the labour force. Typical for register-based labour market statistics is the use of multiple sources. To cover all kinds of activities it is necessary to combine data from several sources. This of course increases the risk of inconsistencies and requires a coherent system for prioritization between sources.

38. Not all sources used holds information on duration of activities. For instance tax registers may only give data for income for the whole calendar year. In such situations the problem is to measure who was for instance employed or in education in census week. In some countries this problem is solved by using the Labour Force Survey to benchmark the information on activities.

39. In general, register-based labour market data is most complete for persons working full time and/or on a regular basis. Temporarily absent persons may be difficult to identify, especially if it is a non-paid leave. Persons working without pay or performing informal jobs will normally not be covered in administrative data. In most countries, even contributing family workers are difficult to identify using register data. However, in Finland data on work pensions gives the necessary information to identify this group.

40. Some of the registers used only include links between the persons and the enterprise and not the local kind of activity unit. This may affect the quality of topics like place of work and industry. In some countries business surveys have been used as a supplementary data source.

41. Persons working abroad will often not be covered in national employment registers. In the Nordic countries the statistical offices are cooperating to exchange data on persons living in one country and working in another.

42. According to the CES Recommendations one criterion for being classified as unemployed is “seeking work”. A register-based census will normally include persons seeking for a job by registration at employment offices only. For instance persons with no right to unemployment benefits may not find it worthwhile to register at the employment office and the result may be under-coverage. On the other hand, some persons registered as unemployed at the employment offices may consider themselves as for instance “retired” when asked in a survey.

43. For persons who have not been working for a number of years, it may be difficult to identify the group never worked before (the “ever-never problem”) and also to classify them by occupation etc. if they ever had a job.

44. The population not currently active may also be difficult to classify using registers. One problem is to identify students that are active in census week. Using data on enrolled students from registers may result in over-coverage.

45. Most certainly, no countries have complete registers on household activities. Hence, homemakers may only be identified indirectly from the presence of children in the household or by benefits for taking care of disabled, elderly etc. In most countries there will be a problem to separate homemakers from the group others (persons receiving private support etc).

## **E. Educational characteristics**

46. The main problem seems to be covering educational attainment for persons who have received their education abroad. For persons receiving public grants for studying abroad, information on educational attainment will most often be available. For migrants arrived in the country after completing their education, this information will in several countries not be included in registers. Statistics Norway has for a number of years encouraged the immigration authorities to register educational information when persons arrive in the country. So far no register gives a sufficient coverage and Statistics Norway has conducted statistical surveys in conjunction with the censuses in 1990 and 2001. A similar survey is planned for the 2011 Census.

47. In some countries there may also be a problem to measure educational attainment for older people; that is persons who completed their education before the registers were set up. In some countries census data is used as supplementary information. In Norway the 1970 Census was used as a basis for establishing a statistical register on education.

## **F. Housing topics**

48. Using legal resident address has consequences not only for measuring the total population, but also for housing topics. Housing arrangements is a basic topic covering the whole population. In the population registers most people are registered as living in conventional dwelling. In some countries it is possible to register in housing units other than conventional dwellings, for instance houseboats in the Netherlands. In other countries this is not possible. Normally only few persons are registered as homeless (with “no fixed abode”) in the registers, and in some countries they are not registered at all. If covered in the population register, most de facto homeless persons is registered at a “normal” address, for instance with friends or relatives. They may have some sort of connection to this household, but they do not spend most of their daily rest there.

49. Even if registers may give the information that persons are living in a non-conventional dwelling, there is normally little information about living quarters other than conventional dwellings. In some countries there exists some information on summer cottage etc, but not surprisingly information on caravans etc is non-existent.

50. In a register-based census occupancy status of conventional dwelling will normally be based on legal residents according to the population register. If nobody is registered as residents in a dwelling, it will be classified as vacant. For instance, a dwelling inhabited by students with their legal addresses in the family home, will be classified as vacant. In general it is difficult to identify if a dwelling is reserved for seasonal/secondary use or if it is actually vacant.

51. The availability of topics characterizing housing standards, very much depends on the nation registers. For dwellings built before the register was set up, this kind of information may not be included. For countries with a building or dwelling register, data will probably be of high quality by the time the unit is initially registered (the time of construction). Up-dating very much depends on the administrative needs. For instance in Norway, useful floor space will normally be updated, but number of rooms will often be updated only if the total floor space is changed.

52. Some topics like electricity and piped gas will normally not be included in a general dwelling or building register. This kind of topics can be measured only if some specialized register on these topics exists.

53. Type of heating may, at least in principle, be covered by dwelling registers since this topic describes technical characteristics of the dwelling. Main type of energy used for heating characterizes the behaviour of persons living in the dwelling and is therefore not well suited as a register variable.

54. In general, in countries with a dwelling register, it will be possible to produce a housing data for occupied, conventional dwellings. For other types of living quarters, the coverage will normally be rather poor.

#### **IV. CONCLUSIONS**

55. Which census topics that are most difficult to measure using register data will depend very much on the set-up of the national register systems. In this paper some problems were discussed that may be common for register-based censuses. The solutions may indeed also depend on national circumstances. One solution is of course to look for supplementary administrative sources and in general to combine data from several sources on micro level. Furthermore, several countries are using data from statistical sample surveys for benchmarking or in estimation of topics not available from registers. And at least in the Nordic countries, exchange of data between countries has proved fruitful to improve statistics on topics like migration and commuting.

56. In this document the focus was on topics difficult to measure. Topics that are not difficult to measure have in general not been mentioned. So even if there are a lot of problems to discuss, it must not be forgotten that most census topics can actually be measured with good quality in register-based censuses.

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