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The Swiss Census System: a comprehensive system of household and person statistics

Note by the Swiss Federal Statistical Office

Summary

The paper outlines the key elements of the new Swiss Census System that was successfully introduced in 2010. The new system is based on a register survey that evaluates existing administrative data. Only necessary information that is not contained in the registers has to be collected with additional sample surveys. The main focus of this paper is an overview on the lessons learned from the first register-based census and on the experiences gathered with an integrated survey system that complements the administrative data collection.

I. The new Swiss Census system

1. The traditional census, which was carried out every ten years with the entire population, has been replaced by an integrated statistical system. This combines the use of existing person and residential buildings and dwellings registers with sample surveys which are carried out and evaluated in an annual cycle. The first reference day for the new census was 31 December 2010. The new system consists of four different surveys which are carried out annually: the register survey, the structural survey (also called Swiss Population Survey), one topic-based survey and the "CH omnibus"[1].

2. The annual register survey is based on the population registers of the communes and cantons, the most important federal person data registers and the National Register of Buildings and Dwellings. Therefore, this survey provides basic information annually about the population and about buildings and dwellings at the smallest spatial resolution. The structural survey is an annual sample survey of 200,000 people. As it is a population survey, it includes important attributes which are not currently available in the registers. The survey covers people living in private households who are aged 15 or over. The interviewees provide information about themselves and their households on paper questionnaires or on a web-based survey.

3. An annual sample survey of 200,000 people allows statistical analyses to be carried out for all the cantons and for groups of 15,000 people with a sufficient accuracy. After five years, it will be possible to make assertions about groups of 3,000 people using data pooling, by combining five consecutive annual structural surveys. Such a method is used for example in the American Community Sample. Within these groups, units of 140 people can be identified after one year and of 28 people after five years. The cantons can supplement the survey within their own area at their own expense to improve the results further[2].

4. Topic-based sample surveys are carried out annually using a sample size of 10,000 to 40,000 people. The following topics alternate on a five-year cycle: "mobility and transport", "education", "health", "families" and "language, religion and culture". Because of the size of the samples, the topic-based surveys allow conclusive results to be produced for the whole of Switzerland and the seven major regions. The survey on mobility and transport will also provide results for the large urban areas. The cantons can also supplement these surveys at their own expense.

5. The survey referred to as the CH omnibus is a new flexible tool which provides rapid answers to current questions. This annual sample survey of around 3,000 people offers interested groups the opportunity to join in by asking specific questions. The survey produces results for the whole of Switzerland which can be rapidly processed and published.

6. Samples can be drawn using information collected in the population registers and the National Register of Buildings and Dwellings. The population statistics play a central role in providing reference figures for estimations based on the sample surveys. The information on the overall population, on population groups and on residential buildings and dwellings is very important for the purpose of planning, weighting and calibration procedures of the sample surveys.

1 The new census http://www.bfs.admin.ch/bfs/portal/en/index/news/02.html

2 A detailed account about the accuracy of the estimates of the structural survey can be found in Ph. Eichenberger, B. Hulliger, J. Potterat (2011): Two Measures for Sample Size Determination. Survey research Methods, vol 5, no. 1, pp. 27-37.

7. The new census can only exploit its full potential if it takes the form of an integrated system. It is more than the sum of the various individual statistics. In order to create an integrated system, integration components are needed which will bring together surveys based on different data sources. The four integration components are as follows:

(a) The base universes (population, households, housing) shared by all the surveys;

(b) The social security number which as a person identifier uniquely identifies a person in different data sources;

(c) The building and dwelling identifiers which allow the formation of households to be identified and the attribution of people and households to buildings and dwellings;

(d) The social core variables which ensure that the results in different surveys are comparable and that the population groups and basic populations are uniformly defined.

8. This new system offers a wide range of benefits. The information is available more frequently, on a wider range of topics and within a very short period of time. The availability of the latest data on an annual basis improves the ability to monitor important, politically relevant, socio-cultural topics on a regular and systematic basis. Moreover, since it is in place, this new system considerably reduces the burden on communes and respondents. The overall costs have been reduced too. The new survey system also implements new mixed mode designs (PAPI, CATI, CAWI and register based surveys).

II. Success factors in the introduction of the census system in Switzerland

9. The Federal Statistical Office (FSO) began as early as the mid-1990s modernizing the census with the aim of making increased use of administrative data registers. As part of the complete revision of the Federal Constitution, on 18 April 1999 a new constitutional article was introduced that explicitly demands the use of registers for statistics:

> Art. 65 Statistics
>
> [1]The Confederation shall compile the necessary statistical data on the status and trends in the population, the economy, society, education, research, the land and the environment in Switzerland.
>
> [2]It may issue regulations on the harmonisation and maintenance of official registers in order to reduce the cost of compiling data.

10. In 1998, the FSO began to develop a centrally managed National Register of Buildings and Dwellings (RBD) covering the whole of Switzerland. The RBD was built between 1998 and 2003 with data from the Buildings and Dwellings Survey of the 2000 Census. The relevant statutory provision came into force on 1 July 2000. The ongoing update of the RBD is based on the building permit and building approval process and is therefore linked to administrative processes that ensure that the register is continually updated. The legal basis stipulates that the FSO manages the RBD and that the Confederation may use the data from the register only for statistical, research and planning purposes. Thus, the purposes to which the data can be used are limited at the federal level (for data protection reasons). The cantons and communes, on the other hand, also make their data available for the discharge of statutory duties. This was a key success factor for the implementation and updating of the register. At the same time as the National Register of Buildings and Dwellings, a uniform identification system for all buildings and the dwellings they contain throughout Switzerland was introduced. These identifiers are now

used for the register-based household statistics. The building and dwelling identifiers are also variables in the registers of persons.

11. Based on Article 65 of the Federal Constitution mentioned above, between 2002 and 2006 the Law on the Harmonisation of Registers (LHR) was drafted and adopted by Parliament. The aim of the LHR was to ensure that in communal and cantonal population registers the keeping of registers, the content of registers, the definition of variables and the exchange of data when people move are standardised, and that data on foreign nationals and civil status are harmonised in federal registers of persons. A key success factor was that the harmonisation of registers is not only of benefit to statistics, but also makes a significant contribution to more efficient administration and to the promotion of e-government. As part of the implementation of the LHR, the FSO developed a central IT platform ("sedex"; secure data exchange). This IT platform not only enables cantons and communes to transmit their register data to the FSO for statistical purposes, but can also be used for the secure and legally required exchange of administrative data between communes, cantons and the Confederation. With the new LHR, it was also stipulated that the new social security number would be introduced in the registers affected by the LHR and that it can be used for statistical purposes. Thus, the register harmonization project benefits not only statistics, but as a result of investments in the development of an e-government infrastructure, also administrative bodies at all federal levels in Switzerland.

III. The new register-based statistics

12. The implementation of two basic statistics of the population census, i.e. the "Population and Household Statistics" and the "Buildings and Dwellings Statistics", requires the use of different registers. Some are national, such as the Register of Buildings and Dwellings or the Central Migration Information System, and others cantonal or even communal (registers of residents). This survey method presents a number of challenges.

13. In the first phase, involving data on persons, the register managers prepare extracts from the registers and send them to the FSO via the sedex platform. Once the data files reach the FSO, they are subjected to a validation procedure. Each record goes through a series of controls relating to the minimum content required, compliance with definitions and classifications, and correct coding of the characteristics. If a file contains some fatal errors (e.g. wrong digital format, missing data), the register manager is asked to correct the file and send it again. To meet production deadlines it is, therefore, crucial that the processes be very well organised.

14. The people to be registered, particularly foreign nationals, can appear in several registers. Therefore, for each category of persons, it is necessary to select the source on which the number of people to be counted is to be based. Timeliness, completeness, reliability and other factors are critical to prioritise the sources. Thanks to the introduction of the social security number in the various registers of persons, it is possible to link the records of one individual in different sources in order to define the basic universe and to avoid duplicates. The characteristics relating to an individual can differ from one register to another. Depending on the task or the position of the register in the administrative process, from a statistical point of view it can be assumed that the quality of some of the characteristics entered is better or more coherent in some registers than in others. Consequently, it is useful to prioritise the sources for the modalities of certain characteristics.

15. A register is alive and is continuously updated. Some time always elapses between the point in time when an event (birth, death, migration) is reported to the authorities and when it is registered in the various registers. It is also possible for a person to be registered

at an address although the corresponding building is not yet registered in the Register of Buildings and Dwellings. Thus, some information may not be included in one or several registers at the time when the data are sent to the FSO for the reference day (i.e. on 31.12). To the extent possible, the numbers are adjusted based on information received subsequently.

16. One of the results of the combination of different registers and the cleansing of the data is that the final statistical data published by the FSO differ from that provided by the registers. However, some federal and regional offices tend to quickly disseminate raw results drawn from their register. Such results are bound to differ from those published by the FSO. It is difficult but necessary to explain to the public why such discrepancies exist.

IV. The new survey-based statistics

17. The structural survey was designed as a survey of persons in which randomly selected persons provide information about themselves and other members of their household. A household survey would result in a cluster effect for certain variables (language, religion, etc.), which would considerably reduce the accuracy of the survey. In implementing the structural survey as a survey of persons, it is crucial to ensure that only one person in the household is included in the sample and that the same household is not surveyed in consecutive years. By using the new social security number, the sample can be adjusted in such a way that those persons who have been selected for a survey will no longer be interviewed in the years that follow. Another critical point is the proxy interviewing of household members. Although in the structural survey respondents have a duty to disclose information about themselves and the persons they are legally representing, the use of the proxy-interview, in which the respondents have to provide information about their household members, entails a certain amount of uncertainty and usually causes further enquiries to the respondents. Compiling the list of household members and recording the relationships between them is particularly problematic (see question 26 in the questionnaires[3]). For some respondents, it is difficult to indicate relationships correctly and to provide the additional information required.

18. In the structural survey only persons who are aged 15 or over and live in private households are interviewed. Consequently, the results are not directly comparable with those of previous censuses, because it is first of all necessary to restrict these data collections to the above-named sub-population. For the users of the structural statistics, working with the new data involves a readjustment. The FSO will ensure a harmonized formation of series from 1970 to 2010.

19. The Mobility and Transport Microcensus, involving approximately 60,000 respondents, was already carried out in 2010; its results were published in May 2012. The results of the Microcensus add further depth to and complement the results of the structural surveys. In 2011, the Education and Training Microcensus was carried out with a sample of 10,000 people; its results will be published at the end of 2012. In 2010 and 2011, omnibus surveys were conducted on the topics of IT use in Switzerland (2010) and the environment and physical activity (2011). The results have already been published.

3 Structural survey questionnaire translation aid: http://www.bfs.admin.ch/bfs/portal/en/index/news/02.html

V. The system of household and person statistics - risks and opportunities of the implementation

20. A central feature of the new system is the integration of the various surveys through the integrating elements (universes, identifiers and core social variables; see section I). In particular, a key aspect of the new system is the linking of demographic data from registers of persons with data from the structural survey via the social security number. This concept is very promising in the long term, because the investments are sustainable and the system was designed to allow further development. For example, new information requirements can be integrated into the survey system and additional registers or administrative data can be easily incorporated into it. This has been confirmed by initial experiences.

21. During introduction and development of the system, it was inevitable that a small number of people were not yet assigned a social security number or that their number had to be subsequently corrected. In such cases, links to the register data are either not possible or difficult, because they have to be made, for example, through the family name, first name, date of birth and address. The processing of remaining cases, which cannot be linked through identifiers, is usually very time-consuming.

22. The development of the infrastructure and the necessary IT systems and applications for the census surveys was a big challenge for everyone involved. The conceptual survey design and the requirement definitions and specifications of the necessary IT applications had to be carried out in parallel for the census surveys. A time-delayed approach would have been more convenient, but this was not possible due to the tight deadlines for the Census 2010.

23. The scheduling of the development of the IT systems was too optimistic which, in turn, led to delays in system deliveries. As a consequence, in some instances special solutions and workarounds had to be found, because the applications that had been planned originally were not fully ready for production or could not be adequately tested or because their implementation turned out to be too complex. The architecture of the structural survey's IT system consists of several components and interfaces, all of which are based on a number of technologies (SAS, Informatica PowerCenter, Oracle, .NET). The interfaces represent risks of instability in the system which will in addition have to be minimised during its further development and ongoing operation.

24. Today, all surveys can be conducted with high quality standards using the IT systems that have been developed. However, a number of optimisations and improvements were planned and implemented between the first and second survey cycle (31.12.2010 and 31.12.2011). First of all, the validations were refined and optimised and, secondly, new functionalities were developed and existing functionalities were improved for the users of the systems. In addition, the systems underwent several performance enhancements and stabilisations. Additional optimisations with lasting effectiveness are being made to ensure that the final status of the systems is user-friendly and stable.

VI. Conclusions and outlook

25. In conclusion, it can be said that the changeover from the old system of a census every 10 years to a new, modern and sustainable system has been worthwhile for all involved. Although some information is no longer available at the finest level of regionalisation, the benefits of a data base available on an annual basis outweigh the disadvantages.

26. The changeover process to a register-based census takes time. First of all, the legal bases have to be established and incentives have to be provided to the authorities maintaining the registers to obtain not only a statistical benefit but also a wide range of value-added benefits. The authorities maintaining the registers – in Switzerland, the cantons and communes – have to be persuaded of the advantages of such a system and supported in the operational implementation. This requires a high level of technical know-how, which must be developed before the project is implemented. In terms of deadlines, methodology and the technical aspects, the implementation was a major challenge for the FSO and the participating authorities that maintain the registers. For the partners at all federal levels (communes, cantons and the Confederation), centralised project management and control, which took account of the different needs and implementation methods at the cantonal and communal level, was crucial to ensure the successful implementation of the project.

27. New and current statistical results from the new census system have been continuously produced since April 2011. The possibility for the cantons to supplement the samples of all the surveys in the system, in accordance with their own needs, has proven to be correct and is being widely used. The FSO is continuing to optimise how the results are disseminated. For example, on the FSO website the users of the statistics are increasingly able to evaluate the results themselves and obtain results on all topics of the census system. In order to measure the quality and comprehensiveness of the register survey, a census quality survey is also planned for 2013.

28. There are many opportunities in integrated output systems to use the newly available data bases in intelligent and multiple ways in various dissemination products.

VII. References

Data collection programme of the Federal Census, 2008.

Federal Act of 22 June 2007 on the Federal Census (Census Act); SR 431.112.