

Rolling Census: scoping study for Brazil

Andrea Diniz da Silva*

Instituto Brasileiro de Geografia e Estatística, Rio de Janeiro – Brazil
adiniz@ibge.gov.br

The Brazilian Institute of Geography and Statistics - IBGE has embarked on efforts to study and evaluate alternative methods of census to better meet the increasing demand for updated information at the local level. The study focuses on methods that allow to provide more frequent information to support the development and monitoring of local public policies and to serve as inputs for the regular municipal population estimates. Different methodologies debated on the international stage, such as methods based on administrative registers, on household surveys and the combination of sources were considered. However the methodology based on periodic samples, also called Rolling Census, was identified as the most appropriate for Brazil. The scoping study started in 2004 and includes the assessment of methodological, technical and operational aspects. The period 2004-2007 was characterized by discussions involving Latin American countries and other countries such as France and the United States. In addition, experts from different directorates of IBGE conducted thematic studies on different dimensions such as cartography and address file; conceptual design; sampling and estimation; logistic; and integration of census and surveys. From the year 2008 IBGE started a pilot test of the rolling census in four municipalities. The implementation of a rolling census in Brazil should produce annually information on characteristics of the population and households at municipal level, while having the advantage of diluting the cost of the census along the decade to avoid massive concentration of investments in a single year. Besides, better use of knowledge and experience for subsequent years is expected. The assessment of the feasibility of conducting a rolling census in Brazil will support the planning of the 2020 Brazilian census.

Key Words: Rolling Census, Brazilian Census, sample based census, 2020 census round

1. Introduction

The Brazilian Institute of Geography and Statistics - IBGE has embarked on efforts to study and evaluate alternative methods of census, to better meet the increasing demand for updated information at the local level. The picture provided by the decennial census fades as it goes far from its reference date and household surveys do not provide information on all the domains covered by the census, at municipal level. Therefore, the search for new methodologies that enable to provide information in support to the development and monitoring of local public policies, as well as inputs for updated municipal population estimates became urgent.

The studies considered the different modalities of census on the international stage, such as register based, household surveys based, combinations of these two sources and also non overlapping periodic samples, also called rolling census. As a result, the rolling census was considered the most appropriate for the Brazilian context and became the main focus of the studies. IBGE is considering using methodology based on continuous data collection throughout the decade and accumulation of

information instead of a conventional operation concentrated in a particular year of the decade.

Work was conducted in accordance with the calendar of activities of the Statistical Commission and the United Nations Economic Commission for Europe which, considering the need to promote the exchange of information for planning the next censuses around, have been organizing and supporting discussion around the topic. On the international scene, the projects successfully implemented in the 2010 round by the Institut National de la Statistique et des Etudes Economiques - INSEE (France) and the United States Census Bureau (USA), became a reference for countries that are considering new methods of census like Brazil, Canada and the United Kingdom.

The implementation of a rolling census in Brazil aims to enable the annual production of information on characteristics of the population and households, at the municipal level, as well as to allow dilute the cost of the operation along the decade, avoiding massive concentration of investments in a single year. In addition, a better use of knowledge and experience for subsequent years is expected.

The suitability of the new model to the Brazilian context requires an additional effort considering the complexity of the National Statistical System and the availability and quality of administrative records that can serve as additional sources of data. The users' consultation is also an important aspect as it has been current practice at IBGE for the census e other important surveys.

2. History

The scoping study started in 2004 and comprised studies and tests of methodological, technical and operational aspects. The period from 2004 to 2007 was characterized by the debate involving the international and national communities and also by thematic studies conducted by experts from the directorates of surveys and geosciences of IBGE. A pilot test started in 2008 and had its first cycle concluded in 2012. The second cycle of the pilot test will be made cumulating data from 2009 to 2013. Additional studies are in course since 2012 and a simulation test started early 2013.

Three International Seminars on Alternative Methods for Censuses were organized by IBGE in partnership with the National Institute of Statistics and Geography (INEGI), Mexico, in 2004, 2005 and 2006. The goals were to share the experiences acquired on the ongoing projects of the French Census and the American Community Survey of the United States, and also promoting the debate about alternative modalities in Latin America. The attendance of representatives of United States and France, of seventeen Latin American countries, including Brazil and Mexico, and of Spain, in addition to international organizations like the Inter-American Development Bank, United Nations Statistics Division, United Nations Population Fund and Economic Commission for Europe marked this moment. On the national scene, the project was announced by IBGE in the XIV National Meeting of Population Studies - ABEP in 2004 and the ongoing work was presented at the Second National Meeting of Producers and Users of Social, Economic and Territorial, held by IBGE in 2006.

Various aspects to be considered in assessing the feasibility of implementing a rolling census in Brazil were the object of study of five thematic working groups, multidisciplinary. The groups worked on different dimensions, such as cartography, address file, conceptual design of the questionnaire, sampling and estimation, logistic, and census and surveys integration. The working groups gathered about 60 technicians of the research and geosciences directorates, National School of Statistical Sciences - ENCE and operational coordination of the census. The outcomes were presented at the Second Workshop on Alternative Methods for Censuses, held in 2005 in Mexico

(IBGE, 2005) and supported the preparation of an operational model of rolling census for Brazil (IBGE, 2007), which was the basis for the pilot testing started in 2008.

A working group, coordinated by the methodology coordination of the survey directorate, held a discussion on different ways of cumulating information from non overlapping samples. In addition to the bibliography review, the group deepened its knowledge of the ACS and French Census methodologies and the difference of the estimates delivered by each model. The group worked during the first semester of 2012.

A study on the use of balanced sample, instead of the non-balanced used in the pilot test, and a simulation of a rolling census will be carried on 2013.

Permanent contact and technical visits to the Institut National de la Statistique et des Etudes Economiques – INSEE and to the US Census Bureau allowed a follow up of the French Census as well as the American Community Survey.

3. Summary of the operational model for the Brazilian rolling census

The production of updated information at local level on regular basis is the central issue that should guide the change of the Brazilian Census model. The two main aspects considered in the operational model are:

- Produce information equivalent to the census long form more frequently than every 10 years and for small geographical level, at least municipality;
- Ensure the regular update of the municipal population estimates, with information from the municipalities and frequency less than 10 years.

Among the possible alternatives, there was a consensus that the accumulation cycle should be of five years, with results to be published annually from the fifth year on. The estimates should be based on five annual samples and refer to the midpoint of the period.

The proposed sampling model considers the distribution of census enumeration areas in five rotation groups. Each group should be visited in one year, so that about 20% of the enumeration areas would be visited each year. At the end of fifth year all enumeration areas would have been visited. The interviews would be conducted on a sample of housing units in the enumeration areas belonging to the rotation group of the year. The sampling fractions are according to the size of the municipality, as shown on table 1, below.

Table 1 – Sampling Fractions by municipality size (population)

Population	Sampling Fractions
2,500 or less	50%
2,501 – 8,000	33%
8,001 – 20,000	20%
20,001 – 500,000	10%
more than 500,000	5%

Source: IBGE, 2010 Brazilian Census

The update of the address file and the interviews are planned to be simultaneous. The sample shall be drawn according to an algorithm implemented in the hand-held computer. Information obtained in the operation should be used to update the address file and to adjust the weights of the samples.

4. Rolling Census pilot test

The pilot test aimed at providing elements for the scoping study, in addition to theoretical studies and the simulations planned.

The pilot test started in 2008 and had its first cycle completed in 2012. The test was conducted in four municipalities of southeastern and southern Brazil. Table 2, below, shows the municipalities chosen for the rolling census pilot test.

Table2 – Population and sampling fractions by municipality

Municipality	Population (2010 Census)	Sampling Fraction
Além Paraíba – MG	34.349	10%
Porto Real – RJ	16.592	20%
Formigueiro – RS	7.014	33%
Santana do Livramento – RS	82.464	10%

Source: IBGE, 2010 Brazilian Census

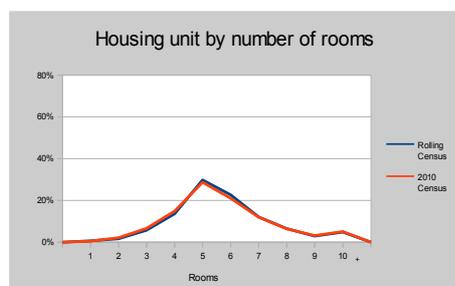
Exploratory data analysis of the first cycle

For the pilot test the accumulation cycle is five years long, so that the complete results include the data collected in the period from 2008 to 2012.

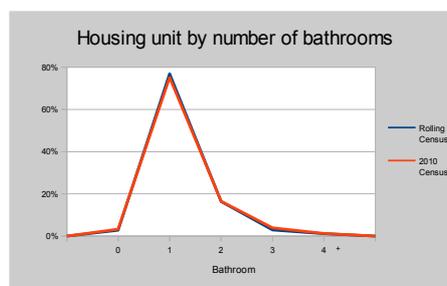
The analysis was performed for the main variables on persons and housing units. Characteristics such as migration, education, work and income, as well as number of rooms and bathrooms, were analysed. To be brief, the paper brings results for the aggregate of the four municipalities.

Figures 1-7 show the pyramid and the distributions obtained from the simple accumulation, *ie* juxtaposition of the expanded value by applying the sample weight.

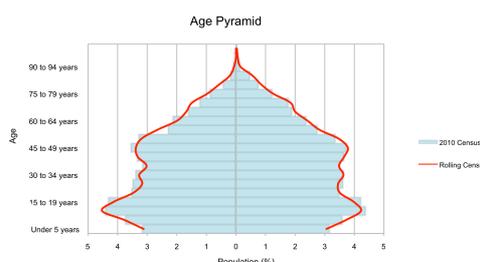
Graphs 1 to 3



Source: IBGE, Rolling Census Pilot Test

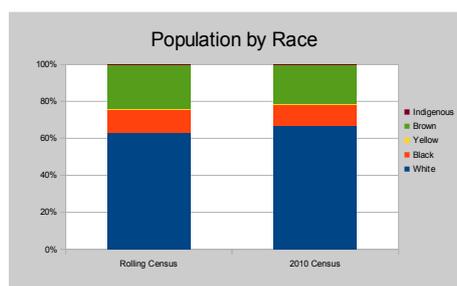


Source: IBGE, Rolling Census Pilot Test

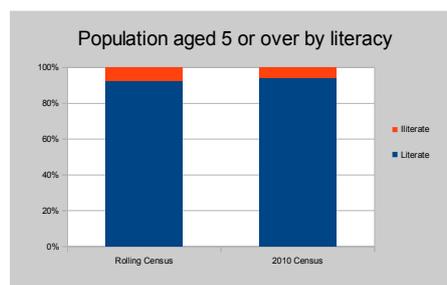


Source: IBGE, Rolling Census Pilot Test

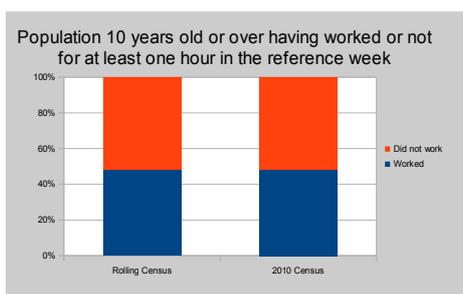
Graphs 4 to 7



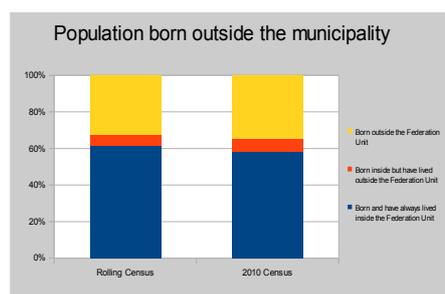
Source: IBGE, Rolling Census Pilot Test



Source: IBGE, Rolling Census Pilot Test



Source: IBGE, Rolling Census Pilot Test



Source: IBGE, Rolling Census Pilot Test

5. Final remarks and future work

Conclude the scoping study for a rolling census in Brazil requires complete the analysis of the results of the pilot test and the simulation exercises, as well as the studies of methodological, technical and operational aspects.

An exploratory data analysis of the pilot test showed that the distributions of a selected set of variables of persons and housing units have patterns that are similar to those obtained from the 2010 Population Census. In addition, statistical tests are being performed to compare the estimates produced by the accumulation of annual samples with results obtained in the 2010 Census, however the results of such tests are not yet available.

Simulation exercises and study of methods to accumulate information from the rolling samples are part of the ongoing methodological study. The logistic aspects of conducting either a continuous data collection throughout the year or an annual collection with fix reference date are activities planned to be concluded this year.

Users consultation is planned and meetings and forums with internal and external users are scheduled, in order to allow to present and discuss the project's progress and mainly listen to users of Census data. Adjustments in the project can be done based on the users' demand.

The conclusion of the scoping study is scheduled for 2014.

References

- Alexander, C. H. (2001). Still Rolling: Leslie Kish's "Rolling Samples" and the American Community Survey. Proceedings of Statistics Canada Symposium. Ottawa: Statistics Canada.
- Durr, J. M. (2004). The New French Rolling Census. Proceedings of the UNECE Seminar on New Methods for Population Censuses. Geneva.
- Durr, J. M. & Grosbras, J. M. La rénovation du recensement français : principes et méthode. Paris: Direction générale de l'Institut national de la statistique et des études économiques.
- IBGE. (2005a). Modalidades Alternativas para Censos Demográficos: reflexões sobre a base territorial e cadastro de endereços - 1a. Versão. Rio de Janeiro
- _____. (2005b). Modalidades Alternativas para Censos Demográficos: desenho conceitual. Rio de Janeiro.
- _____. (2005c). Modalidades Alternativas para Censos Demográficos: distribuição das agências – 1ª versão. Rio de Janeiro.
- _____. (2005d). Modalidades Alternativas para Censos Demográficos: aspectos de integração das pesquisas domiciliares - 1ª versão. Rio de Janeiro.
- _____. (2007). Censo Contínuo: uma proposta de modelo operacional para implantação no Brasil. Diretoria de Pesquisas, Rio de Janeiro.
- _____. (2009). Estudos de modalidades alternativas de censos demográficos: aspectos de amostragem. Textos para Discussão número 33. Diretoria de Pesquisas. Rio de Janeiro.
- _____. Estudo da Modalidade de Censo Demográfico Contínuo. http://www.ibge.gov.br/home/estatistica/populacao/censo_continuo/default.shtm.
- Kish, L. (1979). Samples and Censuses. International Statistical Review, Vol. 47, No. 2. Published by: International Statistical Institute (ISI)
- Kish, L. and Verma, V. (1986). Complete Censuses and Samples. Journal of Official Statistics. Stockholm: Statistics Sweden.
- US Census Bureau. (2009). Design and Methodology: American Community Survey. Washington, DC, U.S: Government Printing Office.