

**UNITED NATIONS
ECONOMIC COMMISSION FOR EUROPE**

CONFERENCE OF EUROPEAN STATISTICIANS

Seminar on New Frontiers for Statistical Data Collection
(Geneva, Switzerland, 31 October-2 November 2012)

Topic (iv): Data collection using mixed modes and multiple sources

**2010 POPULATION AND HOUSING CENSUS: PLANNING, CONTROL,
AND FOLLOW-UP**

Contributed Paper

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I. Introduction

1. Latest Population and Housing Census in Mexico was carried from May 31st to June 25th, 2010; it was a de jure census combining a short-form and a long-form applied to a sample of the population; the goal of this document is to present its relevant characteristics.

II. General planning

2. General planning work from 2010 Population and Housing Census started in 2007 by identifying information necessities from users and defining aims, goals, methodological basis and general strategies allowing carrying out a census according to the country necessities and conditions.
3. First of all, methodological, conceptual and technical contributions from previous statistical projects in Mexico were assessed, mainly those from the XII Population and Housing General Census 2000 and the 2005 Population and Housing Count, and the experiences gathered in technology matters applied to information collection of 2007 Agricultural Census and from 2009 Economic Censuses.
4. On the other hand, international recommendations on population and housing for 2010 Census round issued by United Nations (UN) and from others worldwide agencies were verified: International Labor Organization (ILO), World Health Organization (WHO), and United Nations Education, Scientific and Cultural Organization (UNESCO), among others.
5. Census was a national task requiring intervention of many actors and in the planning stage, information users' feedback was very important. Based on it, many meetings, consultations and forums with public, academic, private, and social institutions representatives were held; aim at collecting points of view, proposals, and suggestions related to the topics of the form, and also to get the widest possible consensus.
6. Every proposal obtained about census topics, joint with methodological and technical innovations passed over a test process aim at assessing forms functionality, and identifying and correcting possible failures on instruments and procedures which could impact on the project's goals. Thus,

from July, 2007 to October, 2009, five different tests were realized, some of them aim at assessing efficiency when applying innovations in field work organization; others tests aim at evaluating the functionality of mobile computing technology when collecting information; one particular test was for conceptual matters aim at observing and determining feasibility of changes and adds on forms; and another test was to rehearse all census operation, its instruments to collect information and the tools for the follow-up.

III. Legal basis

7. To generate statistical and geographical information, INEGI follows what the Law of the National System of Statistical and Geographical (SNIEG Law) states, which is based on the 26th Article, Section B from the Political Constitution of the Mexican United States. Furthermore, above Law states that information on national census is of national interest, so it confers INEGI to carry out it in its 59th Article. Moreover, the legal regulations ruling State Units from the National System of Geographical and Statistical Information (SNIEG) are recognized aim at identifying socio-demographic variables and indicators impacting on public policies creation and assessment, and as of geographic matters, require be generated for the Population and Housing Census.
8. Additionally, the Agreement of INEGI's Government Board by which is established the basis to coordinate, participate, and collaborate in organizing, uplifting, processing, and releasing 2010 Population and Housing Census was issued in the Federation's Official Journal, dated the 29th day of January, 2010.
9. The international recommendations in population and housing census matters were also identified, and agreements and treaties from which Mexico is a part of aim at identifying census information useful to assess compliance of acquired commitments were checked.
10. To assure confidentiality of information collected in the census, SNIEG Law, specifically in the articles 37, 38, 42, and 47, states that data respondents provided for statistical endings will be strictly confidential and under no circumstance would be used otherwise but statistically. This means Institute should not provide collected data to any person aim at being used to tax, judicial, administrative or any other purposes.

IV. Methodological basis

11. The 2010 Census was developed under following methodological basis:
 - (a) Observation units were usual residents on nation boundaries, and private dwellings and collective living quarters.
 - (b) Census-taking was de jure, this is, persons were censused in their place of usual residence.
 - (c) Coverage was nationwide, which means information was collected all over the country.
 - (d) Census-taking period was from May 31st to June 25th, 2010. The reference moment of information considered is zero hours of June 12th, 2010.
 - (e) Proper respondent was the household head whether he or she, his/her spouse or a person aged 15 years and over inhabiting in the dwelling and able to provide requested information.
 - (f) To census population, two forms were used: a short-form and a long-form; latter include the questions from the first and added others aim at deepening on topics. One only form was applied per dwelling.

- (g) Interview was face-to-face and in some cases, when population decided to, telephone interview or Internet self-interview was activated, this was done always under coverage territorial control by INEGI.
- (h) Special operatives were carried out aim at identifying and collecting information of population living in collective living quarters as of work, education, health, security, or other reasons; Mexican Foreign Service, and homeless population, latter sleeps in public places.
- (i) Furthermore, census staff collected information on some characteristics of urban infrastructure around blocks of localities of 5 thousand inhabitants and over, and of existing infrastructure and services in localities under 5 thousand inhabitants.
- (j) To measure dwellings and persons census coverage, from July 22nd to August 6th, 2010, a Post-enumeration survey was carried out.

V. National Geo-Statistical Framework

- 12. National geo-statistical framework (MGN) designed by INEGI, is a sole system of nation nature which provides location of federal entities, municipalities and localities in the country, and allows matching statistical information from censuses and surveys with corresponding geographical places.

VI. Census sample statistical design

- 13. Aim at deepening the knowledge on private dwelling characteristics and its inhabitants, a long-form was designed which included, among others, all the questions from the short-form. Around 2.9 million of dwellings were censused which were selected by a probabilistic sample, thus assuring this sample allows making inferences on characteristics of the total population.
- 14. Census sample was design to obtain estimates for most of the indicators of the long-form, with proper accuracy and confidence in following geographic disaggregation levels:
 - (a) National.
 - (b) Federal entity.
 - (c) Federal entity with four pre-defined locality sizes.
 - (d) Municipality or borough.
 - (e) Localities of 50 thousand inhabitants and over.
- 15. Sample design was probabilistic, stratified, and by clusters in a sole stage. Sample units were full geographical areas, either blocks or localities, selected by a simple random sample.
- 16. In every municipality, stratum were formed as dwellings groups with following characteristics:
 - (a) Dwellings in the 125 municipalities with the least Human Development Index (HDI)¹.
 - (b) Dwellings in the municipalities with:
 - Less than 1,100 dwellings.
 - From 1,100 to 4,000 dwellings.
 - Over 4,000 dwellings.

¹ The 125 municipalities with the least HDI included in the Strategy 100x100 from Federal Government.

- (c) Dwellings in localities with less than 250 inhabited dwellings.
 - (d) Dwellings in localities of 50 thousand inhabitants and over.
17. In the case of municipalities with 1,100 inhabited dwellings and the 125 municipalities with the least HDI, the total of dwellings was censused with the long-form. In the other municipalities the sample size was of at least 800 dwellings.
18. Within the results of the 2010 Census sample, the other details about design can be consulted.

VII. Operative method

19. Operative method of 2010 Population and Housing Census was designed based on conceptual definitions, results of census tests, problems in several regions of the country about accessibility to dwellings, security of population, and weather conditions during census period.
20. Every process, task, and action established in the activities program related to Census performance, were planned and implemented to comply following aims and goals.
21. Aims:
- (a) Assuring the widest geographical coverage and
 - (b) Obtaining a high-quality level of collected information.
22. Goals:
- (a) Visiting all the dwellings and quarters in nationwide to identify existence of usual residents and census them.
 - (b) Identifying the occupancy status of dwellings.
 - (c) Obtaining full and true information on inhabited dwellings and resident population.
 - (d) Obtaining information on urban environment of blocks from localities of 5 thousand inhabitants and over, and about infrastructure and socio-economic characteristics of localities of less than 5 thousand inhabitants.
23. To be in conditions so as to comply above, operative method was divided into three stages:
- (a) Operative planning.
 - (b) Logistics and Census preparation.
 - (c) Census-taking, information flow and control.

VIII. Operative planning stage

24. As in every planning process, the corresponding to 2010 Census considered following topics:
- (a) Staff² required to conclude the census-taking in time and due form.
 - (b) Proper³ control sections so as to assure supervision according to field conditions.

² This refers to the amount of persons to be in every position of the census project.

³ This refers to the proper amount of persons necessary so as to form work groups, in such a way so as they to be efficiently supervised and managed by an immediate supervisor.

- (c) Type and amount of materials to be used, required infrastructure, and number and characteristics of census offices.
 - (d) Necessary actions to maximize confidence of field structures and at the same time minimize insecurity perception and environment the nationwide population had.
 - (e) Operative strategies, processes and procedures to be implemented during every census stage, and tools or computing apps necessary to optimize time and increase quality of census processes.
 - (f) Complementing structure necessary to carry out administrative processes demanded by operative structures, follow-up and control quality of information collected in field.
25. The development of every topic was integrated in a work program started in January, 2009 with cartographic updating, and ended in August, 2010 with delivery of Post-enumeration forms to data entry areas.
 26. Follow-up on files flow generated by the Responsibility Areas Forming System (SICAR-2010) during planning stage was made by Planning Follow-up and Validation System (SISVAP) which showed in controls boards the forming of operative structure made in SICAR.
 27. Another module of the System allowed enumeration coordinators to create the list of census materials collection centers, by entering addresses of coordination offices.

A. Updating cartographic products used in field operative

28. Geographical and statistical cartography is the graphic expression of the National geo-statistical framework which constitutes a primary input for 2010 Census planning, data collection, geographic coverage follow-up and control, data processing, and outcomes release; so coverage, update, availability and timeliness of cartographic products impact directly on all the quality stages from census process.
29. Aim at assuring census geographic coverage, from January, 2009 to June, 2010 a comprehensive cartographic updating process was carried out. From satellite images and primarily with field work, according to 2005 Population and Housing Count new urban developments were identified, modifications were made to already existing urban developments, maps of rural localities from 250 to 2,499 inhabitants were updated, and maps of rural localities from 100 to 249 inhabitants were created. Furthermore, street names, new blocks, and localities were incorporated into the National geo-statistical framework. This process took advantage of the cartography from 2007 Agricultural Census, and from 2009 Economic Censuses.
30. Activity was developed both by Cartographic Technician, helped by a computer app called Census Cartographic Module (MCC), and the self census operative structure. This allowed making adjustments on planning, and keeping the Statistical Cartographic Catalogue updated which worked as an input to field operative follow-up. MCC integrated also detailed reports on detected cartographic updates and eased following updating of collection instruments geographical and statistical keys.
31. This way, around 2.4 million of areas, blocks, or localities without blocks located in 2,456 municipalities or boroughs from 32 federal entities making country up were identified.
32. Based on the conformation process of each position responsibility areas and the control traces defined in the organization structure, several copies of cartographic products used in planning, census-taking, and field validation of information stages were established and generated. It was necessary to reproduce around 728,788 copies of this material.

B. Responsibility areas assignment

33. Between November, 2009 and April, 2010 the responsibility areas assignment process (blocks or localities without blocks) for every operative position aim at avoiding superimposes or omissions was carried out. Following inputs were then considered: digital cartography, nodal network of localities in the country boundaries⁴, dwellings reported by 2009 Economic Census and 2007 Agricultural Census, estimations on dwellings reported by cartographic updating in blocks and new localities, and the calculation of staff necessary for the coverage of estimated dwellings.
34. Criteria applied for the assignment of responsibility areas were as follows:
 - (a) To start the process of responsibility areas assignment by high-level of operative structure.
 - (b) To keep, as possible, control traces of four persons per each supervision position.
 - (c) To make areas responsibility assignment independently for the structure of special operatives.
 - (d) To make a cascade process which implied a supervisor to plan responsibility areas of personnel directly subordinated to him/her.
35. Conformation and assignment of responsibility areas was made helped with the Responsibility Areas Conformation System (SICAR) which automatically grouped geographical units from the National geo-statistical framework, thus assuring balance of workloads and none block and locality to be out of planning.
36. Final product of the system was a detailed coverage program including canvass order, start dates, and ending of census-taking for each work area and other statistical data from area.

IX. Logistics and census preparation stage

37. A timely, complete, and proper availability of resources operative staff needs to do its job is a critical issue for the project. To comply this, three means were implemented: cascade distribution of most of centrally acquired or produced resources; this is, they passed through several positions from headquarters to person needing them; acquisition or coordination with local government agencies or even private companies (buildings and office equipment); and local production of some materials (for instance cartography).
38. These activities of generation, procurement, or distribution lasted from December, 2009 to June, 2010 which implied around 8,500 census offices wide nation where materials were distributed. 139 different types of resources as spreading materials, stationary's items, uniforms, handbooks, census files, telephone and Internet services, computers, vehicles, furniture, and buildings were included. Everything was controlled by Logistics Follow-up System (SISEL 2010) which allowed accounting with reports on material resources distribution, and acquisition of physical spaces and furniture at all levels.

X. Census-taking stage, information flow and control

39. Under premises of full coverage and high-quality information, in 2010 three field operatives were planned, organized, performed, and controlled:
 - (a) Enumeration Operative, carried out from May 31st to June 25th with two additional weeks for lags recovering.

⁴ It is referred to connectivity existing between localities within the country in means of communication matters.

- (b) Verification Operative of uninhabited dwellings or seasonally vacant, carried out from June 14th to July 16th.
- (c) Post-enumeration Survey, carried out from July 22nd to August 6th.

A. Enumeration operative

- 40. A central input of the different census-taking strategies was the Operative Risks Map (MRO) which assigned a contingency level to every block or locality due to situations as hard or restricted access to blocks or localities, remote localities, vulnerability to natural phenomena, and status of indigenous language speakers, so operative area knew about the kind of problem that would arise and thus how to prevent it; in fact, based on above Risks Map following additional information collection strategies were prior established to traditional visit of the interviewer:
 - (a) Availability of census promoters in those inhabitation areas where access of interviewers was restricted. Such promoters were neighbors in the same housing unit and were endorsed by it; they worked as interviewers⁵, thus residents were confident about being censused by a neighbor.
 - (b) Self-enumeration process in dwellings where face-to-face interview was not accepted even with census promoter; in this cases a self-enumeration form was used which was left in the dwelling to be answered by the household head then it was picked-up.
 - (c) Enumeration by Call Centers (CAT) or Internet for the population who preferred to provide census information by means of a call center operator or by filling-in the form in the webpage specifically made for such an ending, which was controlled by keys interviewers provided.
- 41. Enumeration area was in charge of planning, operating, supervising, and following-up the data collection process. Thus, following processes were fully carried out:
 - (a) Prior canvass of supervisors to identify and to know every block and locality within country boundaries, thus making cartographic updating, classifying areas risk for operative, and applying urban environment form in blocks from localities of 5,000 inhabitants and over, and in localities of less than 5,000 inhabitants, researching by means of the locality form. This activity was carried out from May 10th to 21st, 2010.
 - (b) Making up a Building List and applying census forms. During information collection, enumeration area carried out systematic canvasses in every block and locality within country boundaries. In all cases, everything was recorded in such a list, the total of dwellings, quarters, and vacant sites; besides, occupancy status of visited dwellings was set-up, and the amount of visits made to make interview was controlled.
 - (c) In dwellings where usual residents were identified, a face-to-face interview to a proper respondent was carried out based on the corresponding form to area: long-form, if area was in a block or locality of census sample, otherwise, the short-form was used. About outstanding dwellings due to inhabitant's absence or negative attitude, they were visited four times in different days and hours aim at interviewing.
- 42. In order to have more supervision and control elements, operative used three kinds of labels for dwellings classification: green to identify the censused dwellings, peach for outstanding dwellings, and white with small logos of census to identify uninhabited or seasonally vacant dwellings. Furthermore, enumeration structure organized and performed special operatives to census homeless population, usual residents in collective living quarters, and staff from Mexican Foreign Service.

⁵ Housing units, either vertical or horizontal, where access is restricted and blocked by a gate, a barrier arm, a chain or any other device. In many cases there is a caretaker controlling access.

43. Note that for the first time in a census, structure in charge of obtaining information by special operatives had full areas as workloads, this is, blocks or localities where there were collective living quarters, and also private dwellings under following criteria: pertained to hotel or industrial zones, having at least one collective living quarter and up to five private dwellings, private dwelling occupying all the block or that the block or locality had a collective living quarter of classes 7, 10, 11, or 13⁶ which were censused by agreement.
44. All forms and building lists with census information passed through processes of validation to identify omissions and inconsistencies solved in-situ for the self operative staff.

B. Verification operative

45. Verification operative was carried 16 days after enumeration operative and was done by different staff to eliminate biases self-checking of field results causes. It lasted four weeks and activity consisted of verifying uninhabited or seasonally vacant dwellings to be rightly classified in urban zones that prior operative has declared as closed⁷, otherwise they proceeded as basic. Furthermore, it made an additional effort to interview outstanding dwellings, this is, those dwellings where enumeration didn't get to contact a proper respondent or such a respondent denied providing information for any reason.
46. Verifier used different labels to the ones used by enumerator to point out the dwellings as verified. This way, around 2 million of uninhabited or seasonally vacant dwellings were verified, and an interview was carried out in approximately 140 thousand dwellings.
47. All staff in Enumeration and Verification areas used Operative Incidences System to record robbers, loss of material and computers; aggressions or threats to operative staff; accidents or incidents; and kidnapping or disappearance of any person in the structure.

C. Post-enumeration survey

48. When ending Verification process, the same staff carried out the Post-enumeration survey in two more weeks which allow determining the census coverage level when visiting a dwellings sample.
49. So, verifier created the Building list of selected blocks and localities, and carried out an interview in inhabited dwellings, collecting information on the Post-enumeration card. When this process was finished, a match between coverage obtained by Enumeration operative and the coverage obtained by Post-enumeration survey was made. If differences appear between both operatives, staff from both structures come-back to the place to corroborate the actual situation.
50. The Post-enumeration sample design was probabilistic, stratified, and by conglomerates, and provided national, state, and rural and urban level results. Two different stratum by structure were defined, sample primary units selection and definition. These are:
 - (a) Stratum 1. Corresponds to the group of blocks or localities without blocks in every municipal coordination having assigned interviewer. Sample primary units are following conglomerates:
 - Localities with less than 250 dwellings.
 - Blocks in localities with 250 dwellings and over.
 - (b) Stratum 2. Corresponds to group of blocks or localities without blocks of federal entity where there is no assigned interviewer. Sample primary units are the same than those for the stratum 1.
 - (c)

⁶ Collective living quarter, class: 7. Lodging house or rooming house; 10. Jail, prison, penitentiary, correctional institution; 11. Correctional institution for minors; 13. Military camps and other camps.

⁷ Enumeration operative declared a block to be released in urban zones or in a locality within an urban zone, when interviewers or supervisors have made the four visits or more to dwellings and their activities were reported as ended.

51. Based on operative costs and scope of entity level estimations, the sample size was considered to be about 1.2 million of dwellings. Size determination and the way to select sample areas were done independently in each stratum.

D. Validating process (quality control)

52. Once interviewers delivered collection forms, data on geographical identification from building lists and forms were checked to be right and complete; the type of dwelling, information on sex and age for all the persons were verified to be assigned, and that all 12 years old-women and over had answered questions on Number of children born alive and Dead children. Besides, for the long-form the section on International migration was validated.
53. Lastly, match-clerk also was in charge of getting the total of occupants from every form and integrating figures after would be input to follow-up population coverage.

E. Follow-up and control process

54. As in previous censuses, 2010 Census considered a strategy to timely detect progress, coverage, and quality issues of information collected in field, and to control the flow of documents up to the data entry and information verification areas.
55. Analysis follow-up units were blocks or localities without blocks, dwellings and population counted.
56. To carry out follow-up, field staff integrated a report accounting blocks and localities visited, and dwellings enumerated which were classified according to the interview results and its occupancy status. The report was daily sent to municipal coordination offices for data to be captured and then processed.
57. For information capture and processing, a computer tool called Verification, Progress, and Coverage System (SIVAC) was applied, which generated reports on visited areas, the areas outstanding according to the planning of censused dwellings, the uninhabited or seasonally vacant dwellings by responsibility area of operative structure, and geographic and statistical area level. Additionally, it provided information on censused population and the geo-positioning issues of documents. All this allow timely intervening when low productivity or sub-coverage was identified.
58. For special, verification and post-enumeration operatives, a similar strategy was followed by means of using the same formats and reports as these had the possibility to distinguish the operative they come from.
59. Furthermore, system had an aspect or reports that allowed headquarters census directors to analyze aggregated information in municipal and state levels, with which the progress could be analyzed up to the municipal coordination level.
60. In conclusion, this allowed observing the right coverage progress of more than 2.4 million of blocks and localities in the country boundaries by simple, trustable and timely information that as a consequence, helped to immediately know any issue presented during progress of field operative.

XI. Information treatment

61. Once field operative collected, verified, and validated information of collection forms, the information treatment stage was made which comprises following processes:
 - (a) Reception and storage of collection forms.

- (b) Data entry.
 - (c) Coding open questions.
 - (d) Automatic validation.
 - (e) Updating cartographic key in collection forms.
 - (f) Results generation.
62. Aim at controlling and monitoring the information flow per process, a follow-up app in web environment was applied, which made it possible to account with information online of the several processing stages and to timely establish necessary preventive or corrective measures. Every process on treatment stage is generally described below.
- A. Releasing results**
63. 2010 Census final results are disaggregated by federal entity, municipality, and locality according to INEGI's National geo-statistical framework (MGN).
64. Periods to generate census products were defined according to planned schedule for releasing databases, thus depending on the moment when final information is available. Four stages in the releasing process of census information are taken into account:
65. In the first stage, tabulations of preliminary results related to total of population segregated by sex, and the total of dwellings inhabited per federal entity, municipality, and borough in nation boundaries, and, for the first time, for metropolitan zones were released within INEGI's webpage.
66. In the second stage, after eight months information collection was concluded, presentation of final outcomes by releasing following products was started:
- (a) Tabulations for the short-form, national with federal entity breakdown.
 - (b) Tabulations for the short-form, federal entity series and municipality breakdown.
 - (c) Basic tabulations for the long-form, national with federal entity breakdown.
 - (d) Main results by locality (ITER).
 - (e) Tabulations on infrastructure and socio-economic characteristics of localities of less than 5,000 inhabitants⁸.
 - (f) Main results, national series, and by federal entity.
 - (g) Methodological and conceptual summary.
 - (h) Socio-demographical Overview, national series and by federal entity.
 - (i) At Mexico... ¿How many are there like you?
67. Third stage continues by disseminating final results with following products:

⁸ It is referred to localities having less than 5 thousand inhabitants in the 2005 Count.

- (a) Basic tabulations of long-form, state series with municipality breakdown.
 - (b) Methodological document of census sample.
 - (c) Database of census sample.
 - (d) Database on infrastructure and socio-economic characteristics of localities of less than 5,000 inhabitants.
 - (e) Methodological document and main results of post-enumeration survey.
68. Fourth stage provides products about:
- (a) Geomatics apps for consultation of census information.
 - (b) Outcomes on urban environment characteristics in localities of 5 thousand inhabitants and over.
 - (c) Census monographs.