

Evaluating a Pilot Electronic Census

Select Topics in International Censuses

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INTRODUCTION

The testing of all elements of a population and housing census operation prior to census enumeration is of critical importance to producing quality data. Furthermore, testing is fundamental when new technologies or methodologies are introduced in a census.

A pilot census is a comprehensive trial that tests all census procedures. It tests personnel, systems, and procedures in an end-to-end “dress rehearsal,” running through the entire process in a select number of enumeration areas. Pilot census data are not expected to be statistically representative of the country’s population. However, pilot censuses produce data that can be useful in identifying potential problems and improving data quality for the full census.

The United Nations (2017) recommends that pilot censuses take place exactly 1 year before the census to match expected seasonal patterns of climate and human activity at the time of the census and to allow enough time to resolve problems and analyze data quality. Before a pilot census, smaller scale tests may be used to test select elements of the census infrastructure such as tests of alternative questionnaires or response modes. This technical note will provide guidance for National Statistical Offices (NSOs) on how to evaluate pilot censuses and benefit from lessons learned with a special emphasis on electronic censuses using Computer-Assisted Personal Interviewing (CAPI).

PILOT CENSUS STAGES

Pilot census activities can be classified into three stages: prepilot enumeration, pilot enumeration, and postpilot enumeration. The sections below list some of the activities that NSOs must conduct in a pilot census. However, this collection of activities is neither intended to be exhaustive nor definitive. Final pilot census plans should be tailored to each country, including activities that consider the NSO’s human and material resources, as well as its data needs.

Prepilot Enumeration

Successful pilot censuses start several months before census takers begin collecting responses during the enumeration phase. Major prepilot enumeration activities involve mapping, human resources, outreach and publicity, logistics, IT infrastructure, and training. Depending on the statistical capacity, budget, and data needs of the country, activities belonging to additional prepilot enumeration categories may be added to—or removed from—this list.

Table 1 presents some of the most important considerations that should be kept in mind when observing the preenumeration stage during a pilot CAPI census.

Table 1.

Prepilot Enumeration Considerations

	Description/Methodology	Quality Assurance	Challenges
Mapping	Countries should digitize their maps and draw enumeration areas (EAs) with a target of roughly 80–150 households.	Up-to-date maps and EA boundaries should follow physical features whenever possible; maps should include accurate structure identifiers and addresses.	If using maps on tablets, resolution of maps should be sufficient to allow for resizing and zooming without pixilation.
Pilot Sample	Purposive sampling should include rural/urban and challenging areas, and special and hard-to-count populations.	Sampling frame and pilot sample design should be reviewed by experts for coverage, efficiency, logistical feasibility, and to determine if the sample size is sufficient.	Old sample frame may result in inaccurate purposive sampling.
Recruitment	Ideally, pilot recruitment should mirror census recruitment; NSOs should hire locally.	Hiring criteria should be objective and publicly advertised; field personnel should reflect ethnic and gender diversity.	Recruitment should be completed before training and account for attrition.
Payroll	Payroll guidance should be clear and compensation disbursed in a timely manner.	All field personnel should be registered on the payroll before training starts; payments should happen on time.	Compensation should be adequate for retention.
Outreach and Publicity	Pilot-integrated, multimedia publicity campaign should mirror that of the census; outreach should include high-profile members of the community.	National Statistical Offices (NSOs) should request feedback from community leaders and representatives of hard-to-count populations on census outreach and the publicity campaign.	Production and deployment of outreach and publicity materials should be done in a timely manner.
Printing	Cartographic, training, or other printed documents should be produced and distributed in a timely manner.	Materials and printing proofs should be reviewed for errors before printing.	Materials should be printed in a timely manner and be cost efficient.
Transportation	NSO vehicles should be tagged for the pilot census; drivers are provided with the means to acquire fuel.	Ratio of drivers-to-vehicles and of vehicles-to-personnel is adequate for all types of regions.	Protocols for breakdowns and accidents should be in place in case needed.
Regional Offices	Regional offices should have adequate electric power, IT equipment, and security measures; census taker and supervisor kits should be procured and delivered in a timely manner.	IT systems should be tested; census taker kits should be complete (see additional guidance below).	Regional offices should be prepared for contingencies such as power outages, theft, or damage of IT equipment.
IT Infrastructure	NSO should have reliable and secure computers, local area network, and Internet connectivity.	NSO should simulate high volume of census data transmission to test the Internet and servers.	NSOs should make sure that there are sufficient arrangements to charge the tablets and power banks in the field.
Telecommunications Infrastructure	NSOs should make sure that data transmission through the telecommunications carrier's network is secure and problem free.	NSOs should make sure that all the contracting laws specific to each country are followed, and contracts with telecommunications companies are well specified and implemented.	Telecommunications infrastructure is an area that requires coordination between NSOs, the government, and the private sector.
IT Security	Pilot data should be treated according to the highest standards of privacy and confidentiality.	NSOs should install a Secure Socket Layer certificate on their servers and data-capture devices, and set up a virtual private network and a private access point name.	If the institutional capacity of the NSO does not allow for developing a cyber security plan in-house, qualified security consultants should be hired to help.

Table 1.

Prepilot Enumeration Considerations—Con.

	Description/Methodology	Quality Assurance	Challenges
Tablet Preparation	Computer-Assisted Personal Interviewing (CAPI) instrument should be developed; unnecessary applications and Web sites (e.g., entertainment) should be blocked; supervisors and census takers should be prevented from installing applications; NSOs should have administrator-level access to bypass user-created passwords.	CAPI application should be tested; Bluetooth and Wi-Fi should work correctly in all tablets; battery life should be tested and meet specifications.	In case battery life is not satisfactory, NSOs should make provisions for frequent charging in the field (e.g., battery packs or solar chargers).
Training Venues and Transportation	Training venues should be booked in regions near the pilot EAs in a timely manner; large enough to fit all participants; furnished with adequate audio, video, and nonelectronic tools (e.g., markers and boards) to facilitate presentation.	Training venues should be in safe areas; all equipment should be tested in advance.	Venues should have reliable IT infrastructure and technicians on site to solve technical difficulties; if transportation is required during training, adequate arrangements should be made for training participants; adequate and safe lodging or boarding for participants should be arranged, if required.
Trainers and Training Curriculum	The training curriculum should be developed by subject matter experts, cartographers, IT specialists, and field managers.	Curriculum should include mock interviews in all official languages, field practice, tablet practice, exercises, and evaluations.	Adequate time should be scheduled for training; training when multiple languages are used may pose a challenge.

Source: U.S. Census Bureau.

Supervisor and census taker kits should be planned months before pilot enumeration begins. Often, NSOs must go through a procurement process to solicit bids for all the items contained in the kits. At a minimum, supervisor and census taker kits for a pilot CAPI census should include the following:

- Identification badges.
- Uniform, apron, cap, vest, or other garment that serves as an identifier for field staff.
- Tablet and protective case.
- Printed manual, if not included in the tablet.
- Bag to carry materials.
- Pencil and notepad.
- SIM card with adequate data plan for communication (when applicable).
- Mobile phone or SIM card for supervisors (when applicable).
- Supervisory paper and electronic maps.
- Solar chargers or backup power banks.
- Necessary power cords and adapters.

Pilot Enumeration

The enumeration stage in a pilot census is when all systems and operations are tested. In addition, pilot

enumeration activities usually cannot be paused or repeated if something unexpected happens. At this stage, pilot census managers must solve problems in real time. Unanticipated circumstances will often arise during enumeration. This is expected and normal in any pilot. All issues found should be resolved and recorded in a lessons learned document. The lessons learned document is a significant document produced after a pilot census. Each issue identified during the pilot and documented in the lessons learned document should be seriously considered and addressed before the census.

The only opportunity that NSOs will have to do an end-to-end test of their census systems and operations is during pilot enumeration. During this phase, many things should be tested, including:

- Maps and GPS systems.
- Training effectiveness.
- Transportation and communication logistics.
- Deployment of IT systems and effectiveness of CAPI application.
- Teamwork communications.
- Outreach and publicity.

Table 2.

Activities to Observe and Document During Pilot Enumeration

Activities	Practices to Observe, Monitor, and Document by Observer
Field Staff Preparedness	Tablets should be fully charged and kept safe and clean; field staff should always wear their uniforms and badges and have a complete census taker/supervisor kit.
Interviewing Skills	Census takers should introduce themselves using the standard official script including privacy and confidentiality provisions; seek and receive verbal consent for the interview; ask questions verbatim; ask probing questions; always be polite and professional.
Teamwork Communication	Census takers should report to their supervisors at least once a day; should transmit their work to their supervisors or to headquarters as instructed. Supervisors should report to headquarters periodically—ideally on a daily basis; should conduct spot-checks of data received.
CAPI Application	Census takers: logging in should be easy; mapping application should load quickly; geocodes/other census-level unique identifiers should be linked, properly handled, and behave as expected within and between census applications; Computer-Assisted Personal Interviewing (CAPI)-device map accuracy and zoom levels should be sufficient; GPS accuracy should be captured with required degree of precision; there should be no issues with tablet screens becoming unresponsive; order of questions and skip patterns should work as designed; response categories or ranges should be adequate for each question; if interviews are interrupted, census takers should be able to easily put them on pause and resume at a later time; corrections should be allowed in the CAPI application and easily performed; the application should prompt census takers about consistency checks to review and revise the response. Supervisors: assignment of households, linkage to map applications, and review of interviews should work as designed.
Effectiveness of Outreach and Publicity	Posters and banners intended for the pilot should be visible in the pilot census areas; respondents and local leaders should be aware that their area was part of the pilot census.

Source: U.S. Census Bureau.

If there are challenges during these operations, they should be noted as issues to be eventually addressed. It is important that pilot field work observations are conducted in a systematic way by unbiased observers. It is crucial that pilot field work observers accompany randomly selected census takers to their interviews and take detailed notes about their engagement. Observers' notes should then be compiled and analyzed to identify and resolve issues to be incorporated into the lessons learned document.

It is a good idea for the observers to have a systematic way of observing the pilot census. At a minimum, observers should observe and document: (1) preparation for fieldwork, (2) interviewing skills of census takers, (3) teamwork, and (4) effectiveness of outreach and publicity campaigns. Some of the most important activities to observe during a pilot are summarized in Table 2.

Postpilot Enumeration

Data Analysis and Evaluation

Once enumeration in a pilot census has concluded, NSOs should compile collected data and check the quality. This serves several important purposes. First, by compiling pilot census data, NSOs can test transmission, storage, security, and other IT systems. Second, by checking pilot census data (and field personnel and observers'

feedback), problematic questions or inconsistencies in the questionnaire can be identified and corrected before the census. Finally, pilot census data can be used to test the NSO's data editing and imputation programs using actual data and a sizeable dataset. Below, we discuss two activities that should be performed during a pilot census in more detail.

Editing and Imputation

Data editing is defined as the process of detecting and correcting errors in data, while data imputation is the process of replacing missing data with substituted, plausible values. The United Nations Statistics Division (2020) recommends performing the activities presented in Table 3 during the editing process.

Documenting Lessons Learned

Capturing accurate lessons learned and implementing solutions in a pilot census is crucial for a successful census. Developing a lessons learned document is an international best practice that represents organizational commitment to making improvements. This document should be produced after data from the pilot census have been analyzed. At a minimum, a lessons learned document should include insights from the preenumeration, enumeration, and postenumeration activities mentioned above. In a comprehensive lessons learned document, both positive

Table 3.

Editing Process Steps

Steps	Activities
Planning and Designing	Form editing team (include subject matter experts and data processors).
Developing and Testing	Develop editing software applications for each collection mode.
Correction of Critical Errors	Detect and fix errors that may block further data processing (critical errors).
Identifying Inconsistent or Missing Values	Identify values that produce invalid or inconsistent results (noncritical errors), whether from unedited data or corrected values from critical errors; values are deemed inconsistent when they violate edit rules.
Imputation	Implement imputation procedures to handle edit failures or missing data.
Review and Validate	Identify potential problems, errors, and discrepancies introduced during editing and imputation; this step also includes analysis of the impacts of imputation.
Macro Editing	Compare aggregate data with results of previous censuses and other relevant data sources such as household surveys and administrative registers. If methods used for validation of outputs give unusual or unexpected results, then it is possible to go back to the microediting procedures.

Source: United Nations Statistics Division, 2020.

and negative experiences of a pilot census should be detailed. This way, repeating shortcomings can be avoided while project successes can be leveraged.

CONCLUSION

Census tests are of critical importance for a census. The most comprehensive and important of census tests is the pilot census. In a pilot census, NSOs should implement an end-to-end test of all their systems and procedures. In this technical note, some of the most important activities that should be managed and evaluated during a pilot are discussed. The ultimate goals of conducting a pilot census is to identify areas of improvement and note them in a lessons learned document for resolution before the full census.

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