GENERAL COMPTROLLER'S OFFICE OF THE REPUBLIC
NATIONAL INSTITUTE OF STATISTICS AND CENSUS

Innovations of the Censuses, decade 2020

XII National Population Census and VIII Housing Census

DIGC

Department of Intelligence and Knowledge Management

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Republic of Panama
GENERAL COMPTROLLER'S OFFICE OF THE REPUBLIC
National Institute of Statistics and Census

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Presentation

This document details how innovative methods and cutting-edge technology have revolutionized the execution of Panama's National Censuses: the XII Population Census and the VIII Housing Census. It details the overhaul of the census methodology used for the past 80 years, introducing a process more attuned to the modern needs of the Panamanian population.

The inception of the most recent National Population and Housing Censuses in 2023 can be traced back to the suspension of the 2020 censuses due to the prevailing pandemic and associated legal constraints. Consequently, the choices made by the National Institute of Statistics and Census (INEC) for these censuses were significantly shaped by the pandemic-ridden environment.

In response to period of high-risk and uncertainty, Panama opted to postpone its population and housing censuses, prioritizing the safety of its people. Accordingly, the focal point in orchestrating the 2023 censuses revolved around mitigating the potential for COVID-19 transmission throughout the enumeration process. INEC's strategies are derived from the challenges presented by the pandemic, coupled with an unwavering commitment to conducting comprehensive censuses that prioritize public health as a paramount concern.

This document initially delves into the paradigm shift in census methodology, particularly the adoption of the De Jure methodology in conducting censuses. It will examine the application of Mobile Capture Devices (DMC) as a superior alternative to traditional paper questionnaires. Additionally, it will detail the integration of state-of-the-art technological systems aimed at streamlining census procedures and accelerating their execution. Moreover, it will discuss the innovative strategies employed in communication and logistical aspects crucial to the census project. These significant changes represent a remarkable milestone in Panama's census history, underscoring the INEC’s adaptability in addressing unprecedented challenges.

Background

In accordance with historical studies, Panama's population was approximately 225,000 inhabitants before the arrival of the Spanish to the continent. Nonetheless, the country's demographic landscape underwent a severe decline attributed to the upheaval brought about by the Spanish conquest. Consequently, it took several decades for the isthmus to recover to its pre-conquest population levels.

The earliest available census data for Panama dates back to 1607, revealing a total population of 12,000 inhabitants, with 5,708 individuals recorded in Panama City alone. Nevertheless, historical records indicate an omission of approximately 13,000 indigenous individuals from this census. Successive censuses yielding similar population counts within the country. It wasn't until 1850 that a notable shift occurred, brought about by significant infrastructure ventures such as the construction of the Interoceanic Canal. These monumental projects attracted an influx of laborers from the Antilles, China, Spain, and various other countries, fundamentally altering the demographic landscape of Panama.

However, it was during the 20th century that the Panama’s population experienced significant growth, largely credited to advancements in healthcare and disease control initiated by the Americans during the construction of the Panama Canal. These measures notably boosted the life expectancy of Panamanians. Between 1911 and 1930, Panama carried out its population census under the De Jure methodology, with enumeration periods of three to four months.

The groundbreaking first census conducted in a single day took place on September 8, 1940, signifying a remarkable innovation for its time. However, despite its pioneering nature, this census encountered scrutiny and questioning due to concerns surrounding the discriminatory policies prevalent during that era.

On December 10, 1950, the first housing census was carried out, conducted simultaneously with the population census, marking a pivotal moment in census-taking practices. Since then, both censuses have been consistently integrated and executed jointly, a practice that continues to this day.

From 1911 to the present day, Panama has conducted a total of twelve population censuses and eight housing censuses. Notably, the 2023 censuses reintroduced the De Jure methodology, spanning a duration of two months, with an extension of three months for the province of Panama. The implementation of various technological innovations during these censuses will be thoroughly elucidated in this publication.

Introduction

A census is a systematic procedure aimed at gathering, compiling, assessing, analyzing, and disseminating demographic, economic, and societal information about a nation’s entire population. Panama's inaugural population census was conducted in 1911, followed by subsequent censuses at ten-year intervals thereafter.

A housing census involves the thorough enumeration of all dwellings within a nation’s territory. This specific census collects data pertaining to the quantity of private households and details regarding the occupants' characteristics. The inaugural housing census was conducted in conjunction with the population census on December 10, 1950, initiating their concurrent implementation. Since then, housing censuses have consistently been conducted concurrently with population censuses.

Population and Housing Censuses form the bedrock for strategic planning and national decision-making processes. These extensive procedures enable the precise assessments spanning diverse sociodemographic, economic, and sectorial dimensions within the nation. The data derived from these censuses plays a pivotal role in the judicious allocation of resources and fundamental services, including the construction of educational institutions, transportation infrastructure, healthcare facilities, and other essential amenities. Moreover, these censuses serve as vital tools for identifying housing-related issues and evaluating the state of dwellings across the diverse geographical regions of the country. They provide crucial insights into the accessibility and availability of essential services, such as electricity and drinkable water, within various localities, thereby facilitating informed policy and development initiatives.

Census information stands as a crucial asset for the successful implementation of programs and policies aimed at mitigating disparities among the diverse communities within the nation. This data offers detailed disaggregated insights encompassing various parameters such as age, gender, migratory patterns, disabilities, ethnicities, geographic distribution, fertility rates, mortality rates, literacy levels, and other key attributes. As a result, censuses facilitate the identification and comprehension of demographic shifts and trends over time. Furthermore, these censuses serve as historical archives, reflecting the cultural identity, origins, and customs of the country’s population.

1. Shift in census methodology

What is a De Facto Census?

In a Fe Facto census, all individuals who have spent the night within the national territory at the zero hour or census moment are registered. Under this methodology, individuals are asked to remain in the place where they spent the night until they are enumerated, regardless of whether they reside there or not. Generally, the De Facto census is conducted within a short period, which can range from a day to a week, and therefore requires a larger number of census takers.

What is a De Jure Census?

In a De Jure census, people are enumerated at their habitual residence, and the operation extends over a longer period than a De Facto census. For Panama, the enumeration process took place over 8 weeks. Unlike De Facto censuses, in De Jure censuses, the criteria for enumerating the population focuses on people's habitual residence, not where they spent the previous night.

1.1. Differences between a De Facto and a De Jure Census

The main difference between the two census methodologies is the subject of study: The term "habitual resident" marks a crucial distinction in the way data is collected. Additionally, the De Jure census methodology involves a longer period of work, spanning weeks or months, allowing census takers to be assigned a substantially larger number of households. On average, each census taker had a workload of 250 to 300 households to enumerate, a figure that represented almost ten times the number of households a census taker used to visit in previous censuses. The increase in the workload of each census taker, due to the extended enumeration period, resulted in a decrease in the volume of volunteers needed to carry out the censuses.

Table 1.1. Differences between a De Facto and a De Jure Census

	De Facto Census	De Jure Census
Implementation Period	The census is carried out within a single day.	The census is conducted over an extended duration, often spanning weeks or months.
Type of Enumeration	The enumeration occurs at the dwelling where an individual spent the preceding night.	The enumeration takes place at the individual's habitual or usual place of residence.
Place of Enumeration	Does not necessarily enumerate the population at their regular or habitual residences.	Enumerates the population at their regular or habitual residences.
Number of volunteers	Requires a higher number of volunteers.	Involves a reduced number of volunteers.
Assignment period	Volunteers dedicate their time for a single day.	Volunteers commit to working for an extended period of time.
Recruitment, selection, and training	Higher resource expenditure.	Lower resource expenditure.
Technological investment	The larger number of volunteers necessitates a higher technological investment.	The reduced number of volunteers necessitates less technological investment
Population lockdown	Requires immobilizing the population.	The population doesn't need to be immobilized.
Duplication or omission	Lower risk of duplication or omission.	Higher risk of duplication or omission.
Ability to react to complications	Complications cannot be addressed or reacted to until the conclusion of the census period.	Complications can be addressed or responded to promptly during the execution of the census.

Table 1.2. COVID-19-induced challenges stemming from the change in census methodology

Complications due to COVID-19		
Complications	De Facto Census	De Jure Census
Ability to react in case of staff contagion	There isn't a means to respond promptly to infected personnel.	Reserves can replace infected personnel if they become infected.
Coordination with security agencies	It becomes more challenging to coordinate with security agencies.	Reduces the challenge of coordinating with security agencies.
Risk of staff contagion	Greater likelihood of staff contagion.	Reduced likelihood of staff contagion.
Sudden changes of residence due to the pandemic	Less adept at reacting promptly to sudden changes in residence.	More adept in responding to abrupt changes in residence.

1.2. Implementation of the De Jure Census

In the strategic planning for the transition in census methodology, the INEC identified a pivotal advantage in implementing a De Jure Census in Panama. This advantage stems from the decentralized structure of the organization and the existence of offices across all provinces of the country. In the pre-census phase, the roles of the staff were meticulously organized to ensure the efficient distribution of workloads. In the context of the 2023 Population and Housing Censuses, a structured framework was introduced to delineate roles among thematic workgroups. A meticulous scheme was formulated, assigning distinct tasks to each workgroup, thereby granting them the autonomy necessary to collaboratively and efficiently plan their respective aspects of the census.

The workgroups were:

- Planning and Coordination
- Recruitment
- Fieldwork Organization
- Training
- Budgetary and Financial Management
- Technology
- Cartography
- Trials and Tests
- Census Logistics

- Monitoring and Evaluation
- Methodological Documents
- Data Analysis and Processing
- Communication

As crucial elements of census planning, two experimental trials, the Experimental Census and Technological Test, were designed. These trials served as scaled-down simulations to thoroughly evaluate the entire operation's capabilities, including administrative, logistical, and technological aspects. The primary objective was to meticulously scrutinize the operation, identifying potential weaknesses and flaws, with the intention of effectuating necessary adjustments and improvements.

The Experimental Census

- Evaluated the formulated processes and plans intended for the implementation of the Population and Housing Censuses.

The Technological Test

- Conducted assessments on the application of Mobile Capture Devices (DMCs), the quality of collected data, server load, data traffic, information security measures, and the efficacy of monitoring dashboards.

Benefits of the methodological shift: The methodological shift of the most recent population and housing censuses brought forth several significant benefits. Moving away from the initial plan of conducting the census into a single day, the censuses extended over a span of two months. This extended duration offered the distinct advantage of adaptability in responding to unforeseen circumstances and complexities arising during census operations. Supported by a robust monitoring system, the INEC could swiftly identify inconsistencies in enumeration, such as an

excess of unoccupied dwellings, an unexpectedly large volume of dwellings in a region, or the discovery of structures previously thought to not be residences. The two-month enumeration period allowed for the timely detection of these situations, enabling the use of necessary measures to rectify discrepancies. Additionally, the extended period facilitated addressing volunteer-related complications, such as replacing census takers and supervisors in instances of resignation or termination, by seamlessly integrating reserve team members into the workforce.

1.3. Important considerations for a De Jure Census

Given Panama's historical adherence to the De Facto census methodology for population and housing censuses, a thorough assessment of several crucial aspects was conducted. This strategic evaluation aimed to guarantee the smooth progress of the various stages encompassing planning, organization, and execution of the censuses.

Technology: The incorporation of state-of-the-art technology in data capture became a key factor for the census project, leveraging the use of Mobile Capture Devices to streamline the process. Additionally, the implementation of innovative systems and the incorporation of virtual educational modules played a pivotal role in efficiently conducting the volunteer training program.

Legal Framework: Following an exhaustive review process, Decree No. 625 of December 26, 2017, governing the censuses slated for the 2020 Decade, underwent significant alterations. As a result of this thorough review, Executive Decree No. 427 was signed on September 20, 2021. Titled "Repeal of Executive Decree No. 625 of December 26, 2017, and Adoption of Measures Applicable to the Censuses Corresponding to the 2020 Decade," this decree encompassed the revised regulations and measures pertinent to the designated censuses.

Cartographic Material: The methodological shift required a thorough reassessment of cartographic materials. This reassessment centered on redefining enumeration areas, categorizing them into urban, rural, and hard-to-reach regions. It also entailed redistributing workload and optimizing routes to streamline and enhance efficiency during the census operation.

Communication and awareness: Strategic communication and awareness efforts played a crucial role in effectively disseminating information about the methodological transition in the censuses. At the core of this initiative was the development of a comprehensive awareness campaign aimed directly at the population. This plan wasn’t just designed to communicate the methodological shift but also to emphasize the significance of census participation for all residents of the country. Additionally, it sought to instill a sense of civic duty among the populace, encouraging active involvement in the census process.

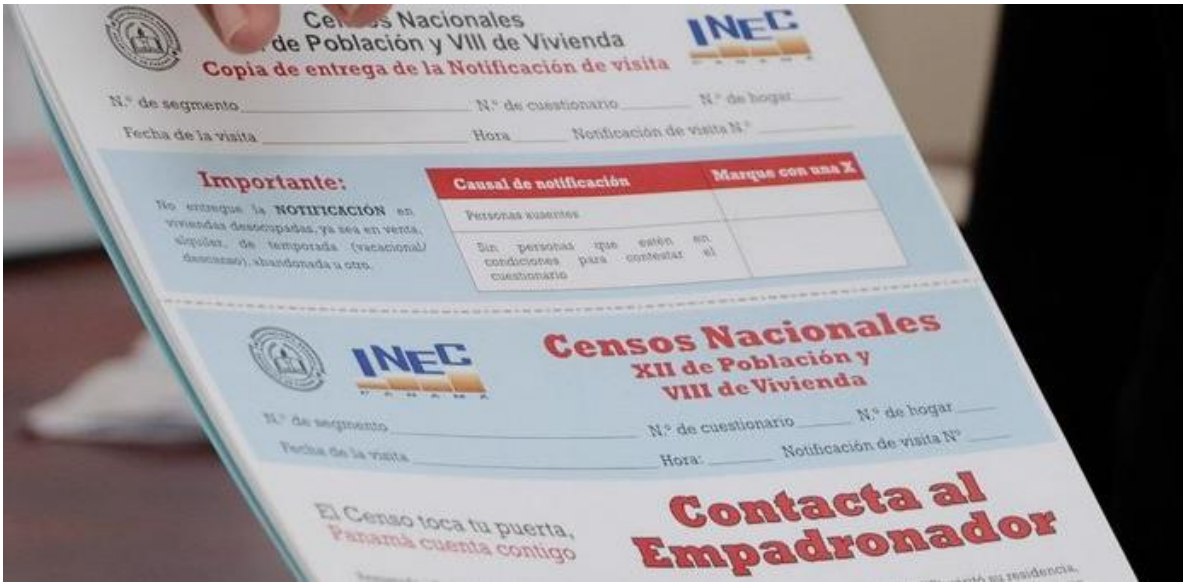
Recruitment: The recruitment process was carefully designed to attract qualified individuals possessing the necessary skills essential for the successful execution of the censuses. The transition to a De Jure census methodology necessitated the recruitment of volunteers for an extended duration, facilitating a more comprehensive distribution of workload. As a result, this transformation led to a noteworthy reduction in the overall workforce, notably decreasing from approximately 120,000 individuals in previous censuses to a streamlined group comprising slightly over 9,000 individuals assigned to supervisory and enumeration responsibilities.

1.4. Challenges of the methodological shift and their solutions

Volunteer retention: The shift in methodology yielded significant benefits but also introduced brand new challenges. One such challenge was retaining volunteers for an extended period, unlike previous single-day operations. To address this, precise projections were made during the planning phase to determine the necessary workforce, including reserve volunteers. To mitigate potential volunteer attrition, a contingency of reserves, ranging from 10% to 20% of the required volunteers, was maintained in each region. This strategic measure ensured readiness to manage any instances of volunteer dropout effectively.

Preparing the INEC's provincial offices: The transition in methodology presented a significant challenge concerning effectively communicating the magnitude of the changes and intricacies of a De Jure census methodology to the INEC's provincial offices. In response, comprehensive planning workshops were organized to raise awareness about the De Jure methodology and the anticipated technological advancements to be integrated. These workshops were instrumental in fostering an in-depth understanding within each provincial office. Additionally, they facilitated the development of individualized work structures by empowering each office to tailor strategies to address the unique specifications and requirements pertinent to their respective provinces.

Dwellings with absent residents: For a De Facto census, residents stay at home to ensure their presence during the census taker's visit. However, in a De Jure census, residents are not required to stay immobile, which may lead to some being absent during the census taker's visit. Under such circumstances, if a suitable informant is available within the household, they can furnish the required information to the census taker. After three unsuccessful visits, a notification sheet is left at the residence. This document includes pertinent information such as the census taker's contact details, the schedule of visits, the hotline for the Census Call Center, as well as contact information for the main and provincial offices of the INEC.



Volunteer program: The main legal challenge stemming from the methodological shift revolved around recruiting the required workforce of 9,000 volunteers, encompassing both census takers and supervisors, without following conventional government employee appointment procedures. To address this, a novel volunteer program was developed in collaboration with the Legal Advisory Directorate of the General Comptroller's Office (CGR). This program introduced a distinct appointment procedure for census takers and supervisors, designating them as volunteers for the census while providing compensation in the form of stipends for their services. Crucial to this approach was restricting the census period to a concise two-month duration to facilitate the program's implementation.

Limited time of enumeration: Despite the allotted two-month enumeration period, certain regions faced unique challenges that might have resulted in incomplete coverage. In areas where, after the initial two months, the percentage of unoccupied or unsuccessfully enumerated dwellings surpassed 10%, an extension in the post-census phase was implemented. This additional month-long extension specifically targeted these regions to improve household enumeration rates. Recognizing the impending necessity for extended efforts, a legal resolution was signed to authorize work specifically during this extension period.

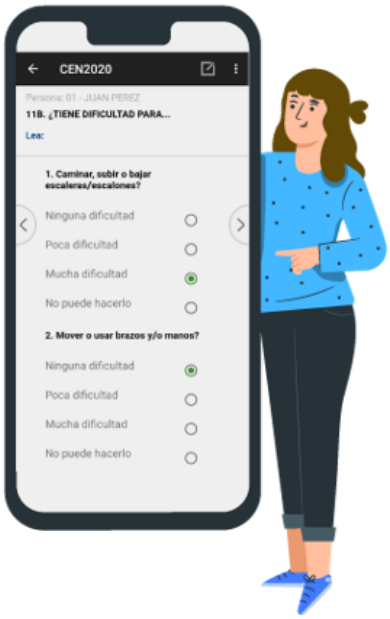
2. Innovations in the census capture method

The data capture method plays a pivotal role in the successful execution of censuses, with its primary responsibility being the collection of data related to individuals, households, and residences. Serving as the cornerstone for information compilation, the accuracy and effectiveness of the chosen data capture method significantly impact the overall validity of the gathered data.

The latest population and housing censuses demanded innovative data collection approaches due to the shift towards the De Jure methodology and the need to mitigate the risk of COVID-19 transmission. As a result, the primary method employed for data capture was the implementation of Mobile Capture Devices.

2.1. What is a Mobile Capture Device?

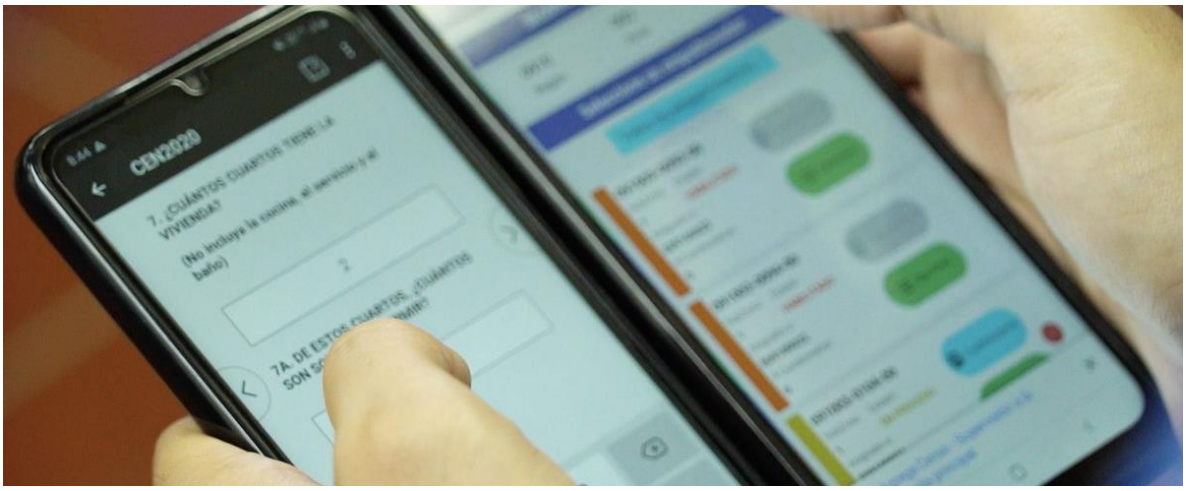
For the most recent population and housing censuses, the decision was made to replace the traditional paper questionnaires with electronic devices, streamlining the recording of data collected by census takers. The chosen instrument for conducting census interviews was the Mobile Capture Devices (DMCs). This technology served as the central tool for data compilation and offered the additional feature of allowing supervisors to oversee and trace the census takers' movements via global positioning system (GPS).



2.2. Advantages of using Mobile Capture Devices

The Mobile Device Management (MDM) service incorporated into the Mobile Capture Devices (DMCs) encompassed two distinct functionalities***:***

- Samsung Knox Manage / Knox Suite: facilitated the extensive monitoring of the devices by enabling location tracking while implementing stringent security protocols. These measures included limitations on what applications the census taker could download to the device and imposing restrictions on functionalities such as capturing photographs or making calls.
- Knox Manage Remote Support: allowed technicians to establish remote connections to the Mobile Capture Devices (DMCs) from their computers. This functionality streamlined the provision of technical support to census takers and supervisors, eliminating the need for physical presence during assistance.



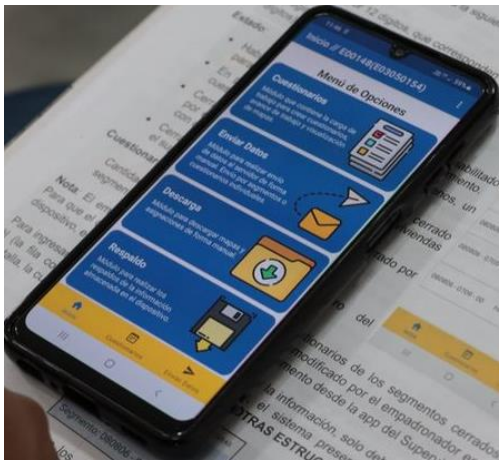
***Ecological census*:** The transition from traditional paper questionnaires to Mobile Capture Devices has notably impacted the ecological footprint of census operations. Paper-based surveys necessitate extensive printing to cover the entire population, including surplus reserves, leading to substantial environmental costs. Moreover, paper questionnaires become redundant once data is digitized, resulting in wastage. In contrast, Mobile Capture Devices are reusable and stored for future use, resulting in a lower carbon footprint compared to paper questionnaires.

Effects on digitization and encoding: The introduction of this device streamlined the process by facilitating the direct upload of information to the INEC servers, consequently diminishing the need for a team of data entry clerks tasked with manually transcribing the information. With data uploaded directly to the servers, the previous practice of waiting for the complete enumeration of the population before encoding was eliminated. This allowed for real-time encoding while census takers were still enumerating, significantly enhancing the efficiency of encoding procedures. Lastly, by distributing the workload over an extended period, it lead to a more expedient and manageable task progression.

Prevention of human error: The transition of the census questionnaire from traditional paper forms to a digital medium markedly reduced the margin of human error during data compilation. This change reduced the necessity for manual digitization, thereby eliminating a stage prone to human-induced errors in data compiling. Utilizing the DMC facilitated a more efficient identification and immediate rectification of errors and inconsistencies in the data, thanks to the accessibility of real-time information.

Data Backup: Data collected through Mobile Capture Devices (DMCs) offers heightened data security compared to paper questionnaires. While physical copies are the sole backup for paper-based surveys, DMCs provide dual backup options: collected data can be backed up in both an alternate folder within the device and on external USB devices. This dual backup approach ensures enhanced data security and redundancy, significantly minimizing the risk of data loss.

2.3. Challenges to using Mobile Capture Devices and their solutions



Internet and electricity requirements*:* The effective use of the Mobile Capture Devices (DMCs) during enumeration hinged upon meeting two key prerequisites within the working environment: the availability of internet connection and access to reliable electrical supply. Internet connectivity posed minimal obstacles due to the availability of internet-equipped census centers nationwide. Additionally, DMCs could temporarily store information for transmission to servers once a network connection was established. However, regions without adequate electrical infrastructure presented limitations for DMC deployment. Consequently, paper questionnaires were retained in 10% of these areas. Data from these questionnaires underwent review, digitization, and subsequent upload to servers, integrating it with the information gathered via the DMCs.

Logistics and security: Managing logistics and security for the Mobile Capture Devices (DMCs) proved considerably more challenging than handling paper questionnaires. Mobile Capture Devices, unlike paper-based forms, hold significant economic value, demanding continuous vigilance and stringent custody protocols. The ease of reprinting paper forms contrasts starkly with the impracticality of replacing lost or stolen DMCs. Consequently, robust security measures were instituted ahead of the census to safeguard the DMCs. These measures included storing the devices in secure facilities, closely tracking their whereabouts, implementing stringent controls during transportation, and assigning responsible personnel for their custody.

3. Innovations in capture systems

Two distinct applications were developed to streamline the enumeration process: one for the census takers and another for the supervisors. Developed internally by the proficient staff of the INEC, these applications were finely tuned to align precisely to the unique requirements of conducting censuses in Panama. Noteworthy for their substantial contributions, both applications offered remarkable benefits for the volunteers. These advantages included a reduction in data processing time, real-time error corrections during interviews, and considerable cost savings attributed to the elimination of printing expenses, among other notable advantages.

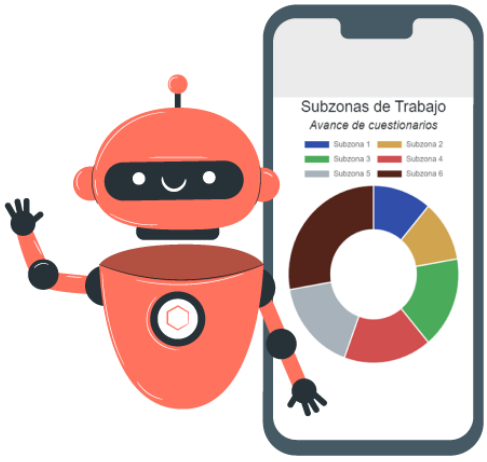
Digital security: Ensuring the optimal functionality and high security in operation for both the census taker and supervisor applications was imperative, given their crucial roles in conducting and overseeing the enumeration. To achieve this, a thorough ethical hacking exercise was carried out to identify potential vulnerabilities within both applications, followed by the necessary corrective measures. Additionally, a standby technical team was readily available to provide remote support to census takers and supervisors, promptly resolving any issues that might arise during application usage. This dedicated support system guaranteed a seamless and dependable performance of the applications throughout the entire process.

3.1. Mobile application for the census taker

The mobile application designed for census takers served as the central tool for managing and overseeing every phase involved in capturing, digitizing, validating, and controlling information related to registered households and individuals. Leveraging the capabilities of Mobile Capture Devices (DMCs), this application guaranteed the attainment of consistent and timely results across all stages of the enumeration process.

The census taker could view a detailed report with information about his respective segment or subzone, including the following details:

- Total households
- Occupied households
- Dwellings with absent residents
- Vacant dwellings
- Additional households
- Total population enumerated
- Total males enumerated
- Total females enumerated



The mobile application for census takers served the purpose of generating census questionnaires for enumeration. Moreover, it provided the census takers the convenience to save ongoing questionnaires,

offering them the flexibility to resume their work at a later time. This feature enabled users to continue a previously initiated questionnaire or review a completed one as needed. Additionally, the application incorporates an option to delete accidentally generated questionnaires, ensuring efficient management of data entries.

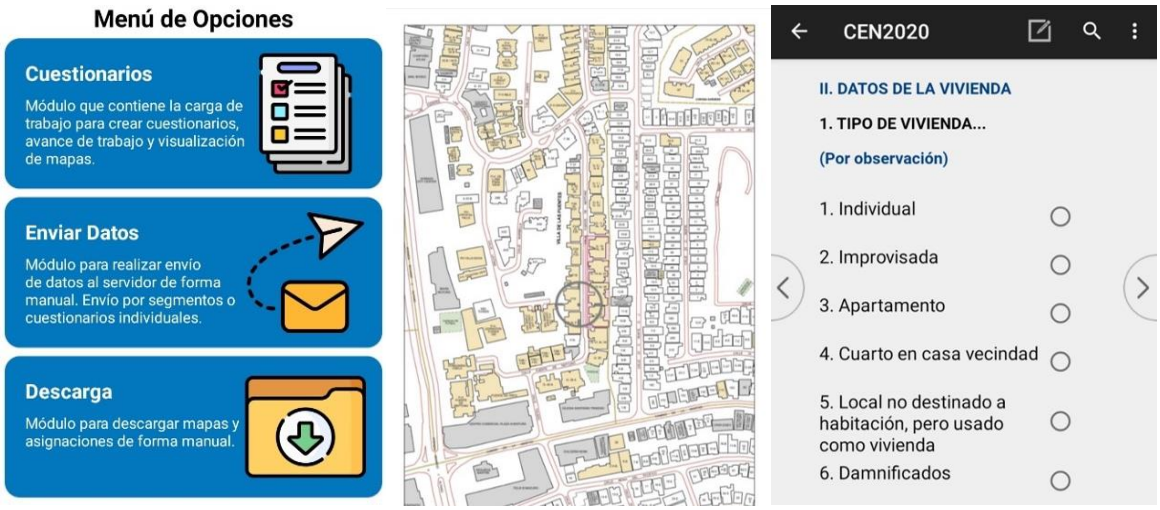
Although the application implemented measures to prevent census takers from inputting values outside those permissible for a question, it did not entirely eradicate all probable errors. Consequently, the application incorporated mechanisms to identify and display a list of inconsistencies within the questionnaire. This feature was designed to uphold the integrity and coherence of the collected data by allowing census takers to rectify or provide justifications for these identified inconsistencies.

The user could download data from the server for various purposes, including:

- Workload distribution
- Maps of each segment corresponding to their work area
- Recovery of questionnaires
- List of inconsistencies in the questionnaires

When dealing with households with absentee residents, the established protocol entailed leaving a visit notification sheet after the third unsuccessful visit. This notice included the census taker's contact details, including their cell phone number. This afforded residents the opportunity to schedule and coordinate a census visit at their utmost convenience. In the event of five consecutive visits without a response, the census taker had the option to generate a code to leave at the residence. This code served as a means for residents to register their information using the E-census platform.

The census taker possessed the capability to upload data directly to the server; however, in areas with inadequate coverage, the system faced limitations in transmitting the data. As a precautionary measure, the system provided an alternative option. This encompassed the ability to generate a backup copy of all data, which could be stored either in an alternate folder within the device or on a portable storage unit.

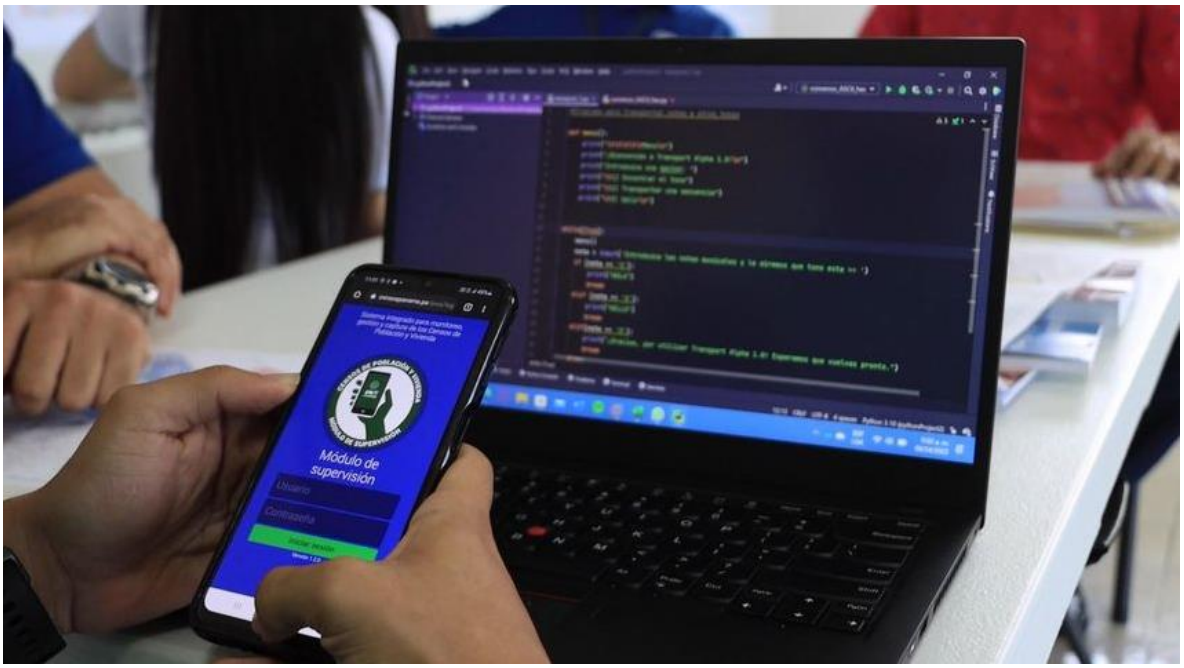


3.2. Mobile application for the supervisor

The mobile application for supervisors offered comprehensive oversight capabilities, enabling them to monitor and manage their team effectively. This encompassed functionalities such as reviewing and approving completed questionnaires, accessing geographical maps of assigned zones and monitoring the precise locations of census takers. Using this tool, supervisors efficiently allocated workloads among their team of census takers. Upon completing household enumerations, the application generated detailed coverage reports specific to subzones within the supervisor's jurisdiction. Additionally, it helped identify and correct inconsistencies within the gathered data, thereby significantly enhancing the accuracy of the census information.

The application equipped supervisors with an extensive array of tools to oversee and manage census takers' activities, enabling them to navigate through a control panel and access system-generated reports. Among their core responsibilities was ensuring the weekly closure of segments, even if some households remained unenumerated. This practice aimed to maintain the uninterrupted flow of the encoding process. When tasks needed to be reassigned to a different census taker, supervisors could execute this change using the 'Assign to another census taker' function.

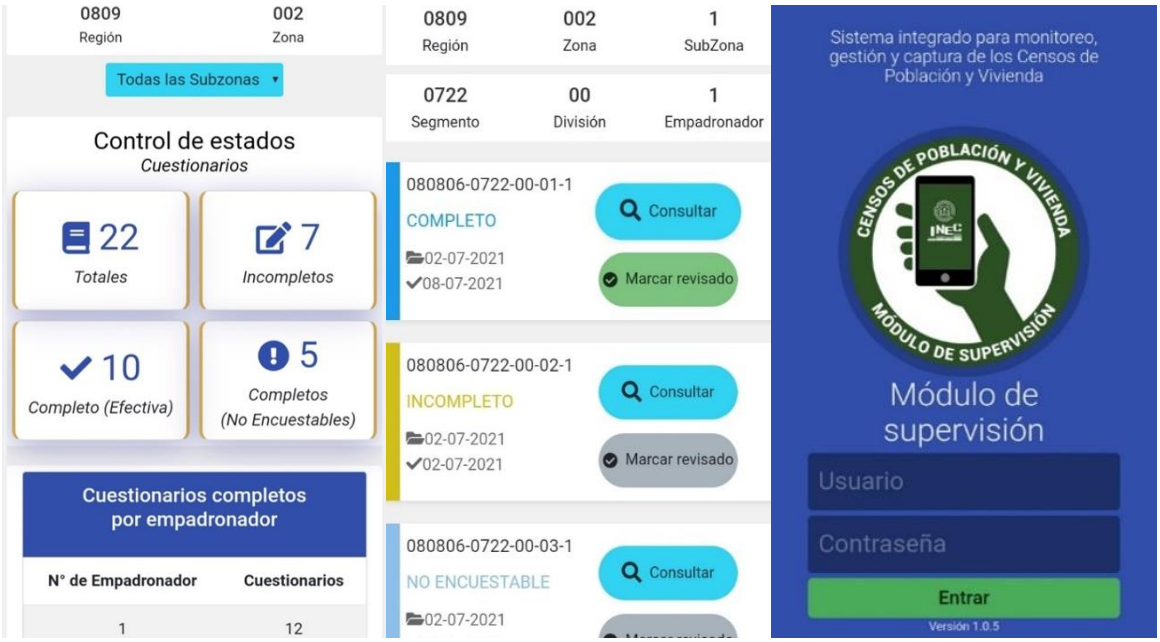
Given the importance of addressing any potential inconsistencies that might compromise the quality of collected data, supervisors were mandated to justify any irregularities arising from legitimate data and make the necessary corrections. This meticulous approach was crucial in maintaining the integrity and precision of census information throughout the process.



The application allowed the supervisor to view reports under the following categories:

- Administrative and demographic divisions.
- Total enumerations.
- Aggregate subzone figures encompassing households, population counts, and questionnaire data, tailored to the chosen report.
- Totals per population segment, households, and questionnaires, as per the census taker's selected report.
- Progress of questionnaires in each zone.
- Progress of households in each zone.
- Categorization of households by occupation.

Additionally, the application provided the supervisor with the capability to conduct a meticulous review of each questionnaire, aiding in the identification of potential errors. For instances where inconsistencies are detected, if they stem from a staff-related error, the supervisor to assigns the responsible census taker the responsibility to rectify the error directly on their device. However, in cases where the identified inconsistency is not attributable to an error, the supervisor retains the authority to furnish a justification for the discrepancy.



3.3. E-census

The E-census served as a supplementary data capture method designed to support the enumeration efforts of the INEC, working in conjunction with the DMC. Initially conceived as a self-enumeration platform to cater to the needs of the Panamanian diplomatic corps abroad, this system facilitated their enumeration through the census website, eliminating the need for census taker visits. Individuals were provided with an access code, allowing them to independently access and complete the questionnaires.

The data collected through the E-census was segregated into a separate database. After undergoing a thorough examination to ensure the quality of the responses, the self-enumeration data was then integrated into the main server, consolidating it with the entirety of the gathered information. This process merged the self-enumerated data with the rest of the census data, enhancing the comprehensiveness of the dataset.

The E-census also served as a last measure for enumeration, stepping in after the fifth unsuccessful visit by a census taker. In this scenario, the census taker would leave a code at the residence, allowing the occupants to independently complete their enumeration through the E-census on the census website.

Moreover, this self-enumeration method was also employed in the post-census phase, particularly targeting Horizontal Properties. These properties notably posed significant challenges for enumeration efforts in urban areas, making the E-census an effective tool in addressing these specific challenges post-census.

Benefits of the E-census: The adoption of an electronic questionnaire for data collection presented a variety of significant advantages. Allowing individuals to

independently complete the questionnaires offered a heightened level of flexibility, enabling self-enumeration at their convenience. Moreover, eliminating face-to-face interviews had emerged as the safest approach, significantly reducing the potential risk of COVID-19 transmission.

Moreover, conducting enumerations over the Internet results in a substantial reduction in census operating costs. This approach significantly diminishes expenses associated with the acquisition, storage, and distribution of materials, as well as the recruitment and management of volunteers. Overall, the transition to electronic questionnaires not only provided convenience but also enhanced cost-effectiveness in the execution of census operations.

Challenges of the E-census: The implementation of the E-census brought forth several notable challenges that merited careful consideration. Firstly, the reliance on a reliable internet connection posed a significant hurdle, as widespread access was not available across the entire territory. Thus only a fraction of the population would be able to be enumerated using that platform.

Moreover, the absence of guidance from a census taker during questionnaire completion increases the likelihood of users making errors, potentially impacting the quality of the data obtained during the census. Additionally, preventive measures needed to be taken to counteract potential website overload, so it was crucial to develop a platform capable of efficiently managing the influx of individuals submitting their responses.

Encouraging the adoption of an electronic census became crucial alongside nurturing public awareness about the significance of supplying accurate and reliable data. This prompted the initiation of national awareness campaigns designed to encourage the populace to participate effectively. Lastly, the implementation of an electronic census introduced the risk of cyberattacks, highlighting the necessity for robust security measures to safeguard the integrity of the collected data. These challenges necessitated a strategic approach encompassing technological advancements, public engagement, and stringent security protocols to ensure the effectiveness and reliability of the E-census implementation.

Addressing the significant challenges of executing an electronic census involved implementing various measures to alleviate potential issues. One pivotal measure was establishing a census service center, serving as a resource for the populace to seek clarifications and guidance regarding the self-enumeration process. This center

offered support and assistance to individuals navigating the electronic census, thereby enhancing both census participation and data accuracy.

While the E-census did not serve as the main data capture method in the most recent censuses, its simultaneous implementation with the DMC significantly bolstered the success of the census project. Notably, the E-census fortified key aspects that were identified as vulnerabilities within the DMC framework. Furthermore, as it wasn't the primary method for data capture, the challenges associated with its implementation were notably reduced. This dual approach leveraged the strengths of both systems, mitigating weaknesses and contributing to a more robust and comprehensive census operation.

4. Innovations in payment methods

In past censuses, the compensation of supervisors and census takers was managed through cash payments, necessitating intricate logistical arrangements and security measures to handle remuneration for a workforce exceeding 100,000 individuals. However, transitioning to the De Jure methodology brought a new challenge despite the decreased number of volunteers: establishing an efficient payment system to manage compensation over a two-month period. To address this challenge, the National Electronic Wallet (BEN) was adopted as the primary method for census-related payments.

In 2020, the National Bank of Panama launched a pioneering financial product known as the National Electronic Wallet (BEN), designed as a platform enabling fund management, transfers, and withdrawals. Leveraging this innovative platform, the INEC capitalized the BEN platform to facilitate a significant portion of payments directed towards supervisors and census takers involved in the Population and Housing Censuses.

4.1. Application of the BEN

The National Electronic Wallet (BEN) played a key role in the census process, streamlining the disbursement of allowances to census takers and supervisors. Its mobile application offered a convenient avenue for volunteers to effortlessly withdraw their compensation from any of the 282 ATMs strategically designated by the National Bank of Panama for this specific purpose.

The application's registration process required only the individual's personal identification number and their mobile phone number. To access their stipend, the application generated a security code for the ATM. Upon its usage, the ATM would send a confirmation code to the volunteer's device. These stringent security measures embedded within BEN effectively mitigated any potential instances of identity theft or payment fraud.

4.2. Benefits of the BEN

Ease of payment: The National Electronic Wallet (BEN) proved to be an indispensable tool in the execution of censuses. Its expertise lay in enabling the INEC's digital management of payments to census takers and supervisors. This system provided individuals the flexibility to withdraw their compensation at their own convenience, granting them the freedom to select both the day and time for withdrawal according to their preferences.

Security: This method of payment, utilizing cash withdrawal from ATMs by supervisors or census takers, notably alleviated the burden on INEC staff by eliminating the need to handle and transport cash, except in areas where BEN was not operational. This approach significantly reduced the risks associated with storing and transporting cash, thereby enhancing the safety of the personnel engaged in these operations.

Oversight: Ensuring the success of the censuses relied on mitigating the risk of mass volunteer resignation arising from issues with the compensation system. Fortunately, the deployment of this robust payment and monitoring system successfully averted this risk. The national electronic wallet emerged as a standout component due to its efficient management, tracking, and supervision of payments. This success was credited to the system's effectiveness and the seamless collaboration between the INEC and the National Bank of Panama.

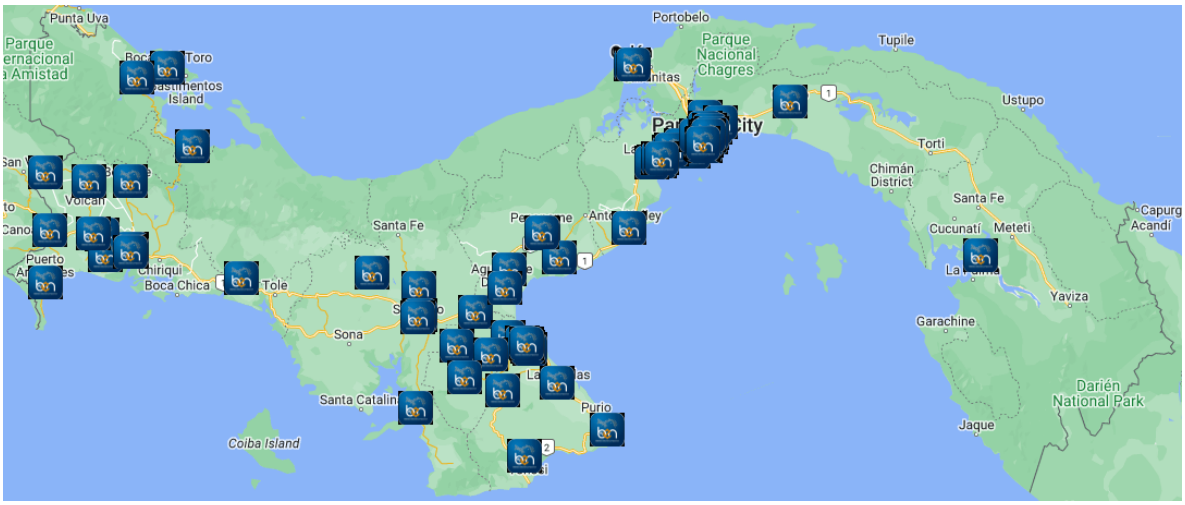
4.3. Challenges of the BEN and their solutions

Uncertainty in managing the volume of users: Concerns regarding the use of BEN stemmed primarily from the uncertainty of handling an unprecedentedly large volume of users, a challenge the platform hadn't encountered before. Its previous experience had not involved managing such a substantial influx of simultaneous users. The census project's success hinged significantly on the effective operation of this system, as any delay in compensating volunteers risked triggering widespread resignation due to payment delays. Despite its known capabilities, this payment tool had never faced a workload of such magnitude. Fortunately, the system encountered no difficulties and effectively managed the increased workload without issues.

Errors in the registration: Ensuring the accuracy of volunteers' data input into the system was crucial for the efficient operation of the national electronic wallet. Inaccurate information had the potential to hinder the successful transfer of their compensation. Fortunately, the Census Operational Evaluation and Selection System provided users with the opportunity to review and rectify their data before final registration. This feature significantly reduced the probability of human error in the registration process.

Availability of ATMs and bank branches: Access to ATMs was critical for volunteers to withdraw their compensation through BEN. Yet, certain regions across

the country lacked these banking facilities. In such areas, INEC personnel, accompanied by a security team, stepped in to provide direct cash payments at the respective location to ensure compensation for the census volunteers. They ensured compensation for census volunteers in these areas by directly providing cash payments at the respective locations.



5. Innovations in administrative systems and field operations

It is important to highlight the cutting-edge technological advancements developed internally by the INEC´s team for their use in the most recent population and housing censuses. While these developments demanded substantial investment in financial resources and human capital, the benefits derived outweighed the higher cost. The creation of proprietary technological systems allowed the precise tailoring of each system and application, aligning them precisely with the specific requirements and goals of the INEC. Furthermore, this internal development equipped personnel with the necessary skills to efficiently troubleshoot and resolve any potential system mishaps. This ensured the dependable performance of all technological tools utilized throughout the censuses.

The Technology Test served as a comprehensive evaluation to assess the DMC, as well as the applications and systems designated for the censuses. One of its objectives was to ensure the seamless operation of the servers throughout the census process. Following its conclusion, it became apparent that the server would require a boost in its processing capacity and memory to prevent overload during the enumeration process. Consequently, a specialized company was hired to perform stress and load tests aimed at evaluating and improving the performance of the servers.

5.1. *Budget management system*

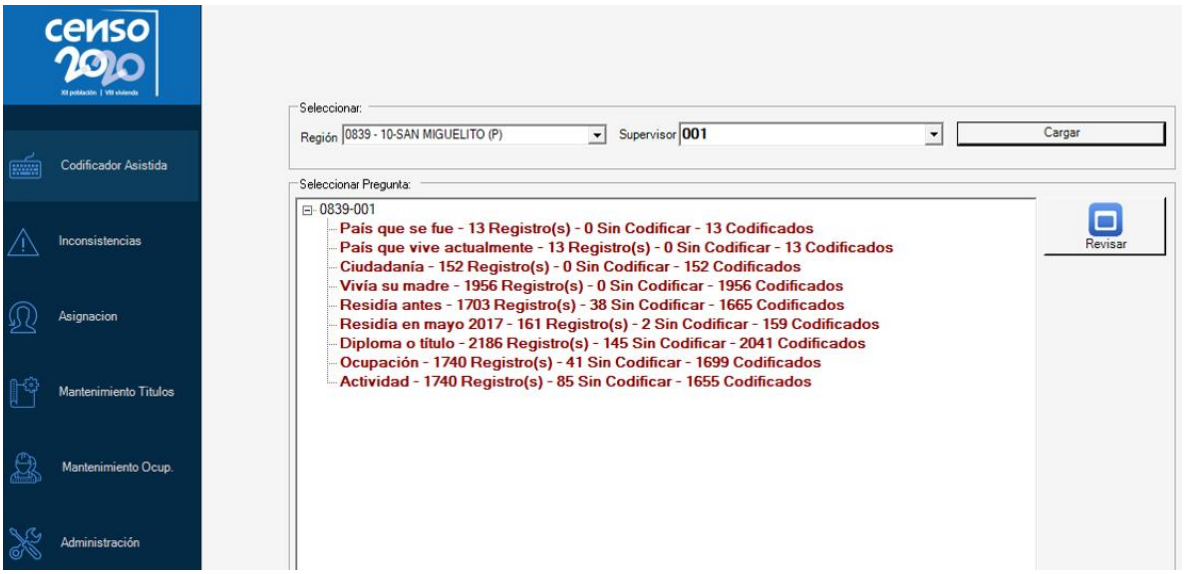
The system facilitated precise documentation and allocation of the budget across all census regions. This meticulous approach enabled rigorous oversight and supervision of the designated budget for each area, thereby ensuring a judicious and efficient use of the available resources.

5.2. *Account monitoring system*

The system facilitated real-time oversight and monitoring of the census bank accounts, providing up-to-date insights into the expenditure status within each census region. It offered a detailed overview of budget utilization in each area, showcasing the spent amount and the remaining balance, enabling the precise tracking of financial allocation and expenditure.

5.3. *Systematized encoding*

Implemented to bolster the efficiency of data collection and processing, this system aided encoders by assigning numerical values provided given in open-ended questions featured in the census questionnaire. By standardizing this process, it considerably streamlined the analysis of the gathered information.



5.4. *Transportation management system*

The system was specifically built to oversee the vehicles allocated for the census operation. Its functionalities encompassed registration of user details for location reference including their contact information. Additionally, it documented specific vehicle details and provided a comprehensive list of all vehicles acquired for the census activities.

5.5. *Census operation coverage monitoring and census results progress system*

The system provided instantaneous, real-time data to managerial staff, coordinators, regional inspectors, and other authorities overseeing census coverage. Notably, the system excelled in categorizing regions based on identified inconsistencies and delays, promptly notifying the respective regional inspector of any anomalies

detected. This rapid communication allowed inspectors to swiftly justify the detected inconsistencies and make the necessary corrections. Furthermore, its dashboards offered comprehensive oversight of census progress, enabling the creation of reports across different geographic tiers and ensuring robust monitoring of data quality and operational performance.

In cases where a high number of unoccupied dwellings were identified, the system was instrumental in flagging potential errors. It helped pinpoint instances where residences with occupants who weren't present during multiple census taker visits might have been mistakenly categorized as unoccupied dwellings. This functionality enabled swift detection of such discrepancies by the INEC team, facilitating efficient resource allocation to address and rectify these complications promptly. This proactive approach enabled the swift resolution of issues related to misclassification, ensuring the accuracy and reliability of census data.

By leveraging the database information, the system generated comprehensive field operation indicator reports for managerial review. These reports played a vital role in identifying regional trends and gauging the necessity for additional resource allocation in specific areas. They provided a detailed array of metrics, encompassing the daily average of enumerated dwellings and individuals per region, the variance between estimated and actual dwelling counts, as well as comparisons between dwellings with absent occupants and unoccupied dwellings, among other pertinent data points. These detailed reports proved invaluable in guiding well-informed decision-making throughout the census operations.

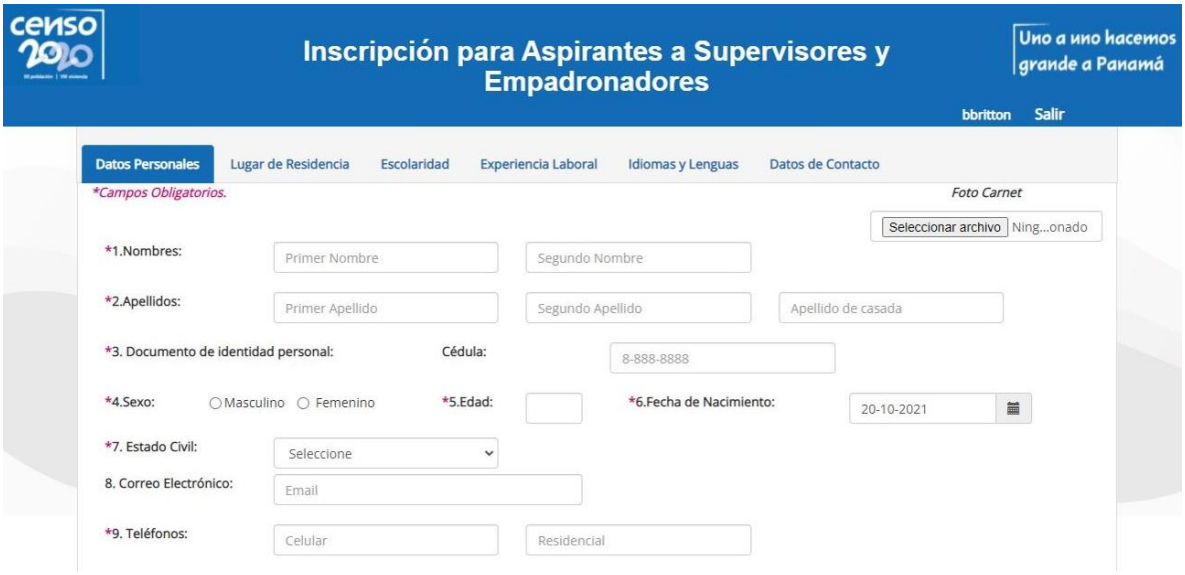
6. Innovations in recruitment

Securing a sufficient number of census takers and supervisors was crucial for the successful execution of the censuses. The shift in census methodology required several adjustments to the recruitment process. Although the overall count of required volunteers decreased, there emerged a more specialized recruitment demand: candidates willing to undergo extensive training and commit to an extended two-month work period. This refined selection criteria aimed to ensure a higher level of expertise among the recruited individuals, aligning with the specific demands of the revised census methodology.

6.1. Registration system for supervisor and census taker applicants

The system functioned as the primary platform for enrolling candidates applying for census taker and supervisor roles in the censuses, drawing a total of 117,000 applicants. Most applications were filled out through the dedicated census website. Equipped with comprehensive dashboards, the system facilitated INEC staff to pinpoint regions with below adequate registrations. These dashboards offered detailed insights by collating applicant addresses down to precise geographic details, including town, district, and street levels. This granularity enabled the identification of areas with insufficient applicant participation.

Projections were formulated to determine the required count of registrations nationwide and, consequently, the essential registrations needed for each distinct census region. These projections stemmed from comprehensive assessments that factored in several elements, including the anticipated count of applicants expected to be filtered out due to not meeting the criteria for census volunteers and the provision for the requisite reserve volunteers for each region. This approach enabled foresight into the volume of reserves required, facilitating the implementation of strategic measure to ensure sufficient volunteers across all census regions.



6.2. Targeted recruitment

To address recruitment shortfalls, a targeted initiative was implemented wherein INEC staff conducted recruitment tours aimed at bolstering registrations in deficit areas. This focused effort concentrated on regions facing unique challenges, such as remote areas, locations with limited internet access, island territories, indigenous areas, and high-crime districts. Teams composed of three to four recruitment agents undertook these essential visits to conduct the registration of people in these deficient regions.

6.3. Filters in the recruitment system

After the closure of the recruitment phase, a meticulous filtering process was initiated within the database. Its primary objective was to discern applicants who did not meet the specified criteria for supervisor and census taker positions.

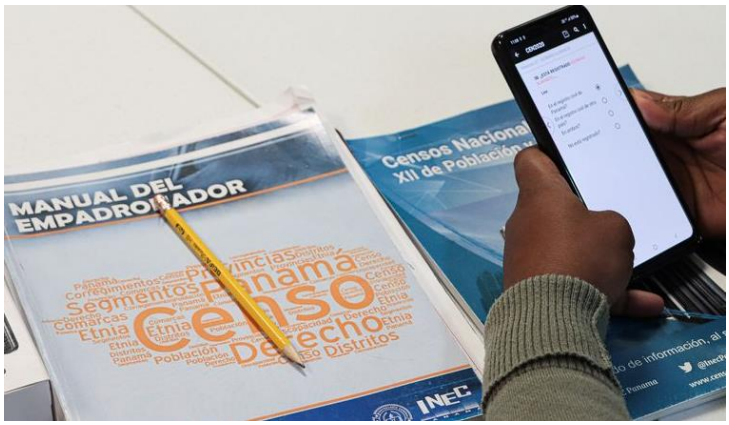
These requirements were:

- Age between 18 to 55 years.
- Panamanian nationality.
- Proficiency in using a cell phone and tablet.
- Good physical and mental health.
- No criminal record.
- Census takers with completed high school education.
- Supervisors with university degrees or at least the first year of a bachelor's or technical education completed.

In around 10% of the areas where paper questionnaires were utilized for enumeration, proficiency in using cell phones and tablets wasn't mandated. As well as, in regions classified as hard-to-reach or areas with deficient registration metrics, the educational prerequisites for both census takers and supervisors were adjusted to accommodate the specific conditions and needs of those locales.

While the system allowed for anyone to apply as a volunteer, it incorporated filters that significantly streamlined the identification of eligible candidates for the training program while effectively screening out others. However, upon analysis, it was found that nearly 5,000 registrations were submitted by individuals who did not meet the prerequisites required for the roles or census taker or supervisor. Consequently, staff undertook verification procedures to ensure that applicants did not have any unresolved legal charges.

7. Innovations in the training program



The shift to the De Jure methodology marked a considerable decrease in the required workforce but emphasized the need for extensive training, given the extended two-month duration of volunteering. In past censuses under the De Facto methodology, an estimated 120,000 individuals underwent training to fulfill various roles. However, for the 2023 censuses, this number significantly dwindled to a mere 8,000 census takers and 1,000 supervisors. Such a substantial reduction in volunteers not only led to significant cost savings but also streamlined resource allocation, space management, and training time.

Manuals developed by INEC staff for use during and after training:

- Census taker's Manual
- Supervisor's Manual
- Regional Inspector and Auxiliary Inspector’s Manual
- Instructor's Manual
- Manual for Field Work Strategies
- Technical Support Guide
- Manual for the Mobile Application for Census takers
- Manual for the Mobile Application for Supervisors

Anticipating the unfeasibility of using DMCs in certain regions lacking readily available electricity, a decision was made to retain the traditional format of paper questionnaires for enumeration purposes in 10% of the census areas. Consequently, in these specific regions, the training provided to supervisors and census takers was entirely focused on utilizing paper questionnaires as the sole means of data collection.

At the conclusion of the training period, every participating volunteer who completed his training received an individual certificate of completion. This certificate, more than just an acknowledgment, held significant value as a tangible addition to their professional portfolios. The intent behind providing these certificates was to incentivize volunteers to successfully finish their training and, in turn, fulfill their responsibilities during the

censuses. Implementing such measures aimed to reduce the risk of volunteer resignation by providing tangible recognition and encouragement.

7.1. Cascade training methodology

The staff training for the Population and Housing Censuses was structured around a cascade scheme designed to facilitate the efficient dissemination of knowledge. This hierarchical method enabled the gradual transmission of information, starting from higher-tier personnel and cascading down through subsequent levels. Such an approach significantly optimized the allocation of time and resources during the training phase. At the outset, the initial level of training focused on educating the instructors themselves, equipping them with the tools to communicate the changes brought about by the shift to the De Jure methodology and to impart the necessary skills required for the execution of duties to the next tier of personnel.

The training process was structured into multiple hierarchical levels, each tailored to specific personnel within distinct regions. Initially, the second tier of training exclusively convened in Panama City, gathering together provincial coordinators, regional inspectors, automated encoding coordinators, assistant inspectors, technical support staff, and IT specialists. Their curriculum was designed not only to enhance their expertise but also to equip them with the necessary knowledge to effectively instruct their staff across their respective regions.

Following this, the third tier encompassed the training for supervisors, census takers, and encoders, conducted within their residing regions. This localized training ensured a more targeted approach, addressing the specific needs and challenges within each area. Finally, a fourth cascade level was established, dedicated solely to the training of encoders, constituting a specialized segment within the comprehensive training framework.

One of the limitations of preceding censuses pertained to the implementation of this cascade training program as it required striking a balance between resource optimization across multiple tiers and the potential information dilution across hierarchical levels. Historically, a fifth tier existed where supervisors were responsible for training census takers. However, for the most recent population and housing censuses, this approach was found inadequate. Instead, a more efficient method was adopted. Supervisors and census takers were jointly instructed, superseding the previous tiered approach. This strategic shift represented a deliberate effort to streamline the training process, enhancing efficiency and

coherence while mitigating the risk of information loss or distortion as it traverses hierarchical strata.

7.2. Census Operational Staff Evaluation and Selection System (Sespoc)

The inception of the Census Operational Evaluation and Selection System stemmed from the fundamental objectives aimed at streamline the intricate procedures involved in the recruitment, selection, training, and deployment of supervisors and census takers critical to the success of the censuses. Over time, the system underwent a progressive expansion, dynamically adapting to evolving demands. This iterative development ultimately led to an enhanced iteration of Sespoc, meticulously tailored to accommodate an array of indispensable functions imperative to conducting censuses, including:

- Illustrating the progress in the recruitment of supervisors and census takers.
- Facilitating the review and selection of candidates for supervisor and census taker positions for the training program.
- Documenting and producing information on the outcomes of training processes.
- Managing procedures for selecting and assigning supervisors and census takers to different census regions.
- Issuing honorary appointment resolutions and resolutions revoking appointments due to resignations or non-compliance.
- Providing essential information for the payment process through the National Electronic Wallet (BEN).
- Supplying the required data for the insurance policy for field personnel.

The Sespoc served as an instrumental platform managing a substantial pool of over 100,000 candidates vying for the roles of census takers and supervisors. The Recruitment team conducted a rigorous screening process, assessing and filtering applicants based on their individual profiles. This sophisticated system efficiently cataloged and organized the scores obtained in evaluations, simplifying the intricate task of selecting volunteers for pivotal roles within the census operation. Upon completion of this rigorous selection process, the system allowed for the review of the profiles of the candidates chosen for the training program. Moreover, promptly informing selected candidates of their status within the census operation.

To streamline the appointment procedures, INEC's Director and the Deputy Director of Sociodemographics authorized the usage of holographic signatures within the Sespoc system. This decision considerably expedited the appointment processes, a crucial measure given the significant volume of volunteers designated for roles as

census takers and supervisors. In cases involving resignations or terminations, the Sespoc documented the precise date of these actions and issued resolutions to annul the appointment of the respective volunteer. Simultaneously, records were precisely maintained for newly appointed volunteers to these roles, capturing their start date and delineating the specific responsibilities associated with their positions.

Throughout the training phase, candidates provided their personal information to the auxiliry inspector, facilitating the issuance of the insurance policy to all volunteers. Subsequently, this data was entered into the Sespoc to be reviewed and compiled, ensuring all necessary details were available for the insurance company. This process was critical in guaranteeing that every census taker and supervisor received adequate coverage under the policy right from the onset of the enumeration period. The insurance policy itself was carefully devised to offer thorough coverage, encompassing contingencies such as potential medical emergencies, damage, or theft of the DMC. The policy extended to every census region, aiming to mitigate potential risks that could affect field personnel across diverse geographic areas.

The system's main vulnerability lay in the potential for inaccuracies arising from applicants erroneously inputting their information during registration. These inaccuracies required manual correction within the system, given its connection to the appointment processes, insurance policy administration, and the national electronic wallet. The utmost precision in maintaining all records was crucial, especially concerning insurance-related details, as any discrepancies could potentially lead to substantial complications in the event of an incident. Similarly, inaccuracies within BEN-associated data could result in the system's failure to provide compensation to the respective volunteer. Hence, instituting a rigorous and meticulous review process for scrutinizing and rectifying information submitted to Sespoc became a critically essential measure.

7.3. Virtual training

The onset of the COVID-19 pandemic forced educational institutions in Panama to adopt a virtual education model as an essential necessity. Once quarantine measures had been lifted, numerous institutions opted to maintain a hybrid system, combining traditional in-person instruction with virtual classes. Leveraging these insights, the INEC capitalized on the opportunity to develop a hybrid training program. This initiative involved developing a virtual classroom, reflecting an adaptation to evolving educational paradigms and the integration of diverse instructional methods into their training endeavors.

A new dual training approach was introduced, blending both virtual and in-person teaching methodologies. Trainees were given access to a virtual classroom structured into modules designed to instruct them on their roles within the census operations. Notably, participation in these modules was not compulsory, acknowledging potential limitations faced by individuals interested in participating in the census but lacking reliable internet access. Moreover, examinations were conducted using the mobile capture devices that then uploaded the results to an automated system responsible for grading and categorizing candidates based on their attained scores. This approach aimed to provide learning flexibility while maintaining a consistent and fair assessment for all participants.

A series of 8 to 10 instructional videos were developed as essential components of the virtual training modules. These videos served a dual purpose, not only do they outline the procedural guidelines for census takers to follow during interviews but also sensitize them to address sensitive topics encompassing disability, Afro-descendent identity, and indigenous ethnicity in a tactful manner. Given the delicate nature of these questions, the training emphasized a nuanced and respectful approach to ensure utmost consideration for interviewees. Additionally, the videos highlighted the importance of communicating to citizens that any information disclosed to census takers would be kept confidential under the principles of statistical secrecy.

Statistical secrecy constitutes the fundamental obligation within the National Statistical System, mandating public entities to maintain absolute confidentiality regarding individual data obtained from informants. This protocol ensures the anonymity of respondents and stipulates that the data is exclusively utilized for statistical purposes. This strategic approach aimed to alleviate potential concerns or hesitancy among individuals regarding participation in the enumeration process.

The INEC's Department of Cartography and Statistical Information System played a crucial role in preparing for the census by creating instructional videos. These videos were tailored to elucidate the alterations in the data capture process brought about by the revised census methodology. Specifically designed for the cartographic teams in provincial offices, these videos offered comprehensive guidance and facilitated repeated review, ensuring a thorough understanding of the new processes. Moreover, their remote accessibility proved advantageous, enabling staff to access the content at their convenience. These videos served as an exemplary demonstration of the efficacy of virtual instructional methods in facilitating seamless execution of census activities.

8. Innovations in the communication strategy

The primary communication goals revolved around securing public cooperation in providing census data and ensuring continuous awareness of this significant event during the enumeration period. To effectively achieve these aims, an intricately designed communication strategy was put implemented. This comprehensive approach was anchored in an extensive awareness campaign crafted to establish a deep connection between citizens and the census undertaking. The overarching objective of the campaign was to develop a strong sense of engagement and resonance within the population, aiming to cultivate a collective understanding of the significance and relevance of their active participation in the census process.

8.1. Informing about the census methodological shift

INEC's communication strategy previously focused solely on a reminder campaign for Census Day. However, the shift in methodology demanded a broader dissemination of information about new procedures and the prolonged duration of the De Jure methodology, spanning two months. Panama's long-standing tradition of conducting the census in a single day for almost a century meant that familiarizing the populace with this shift was a significant challenge. To address this, the INEC launched the "Open the door to the censuses" advertising campaign, intricately designed to echo nationwide. This comprehensive initiative included multilingual messages and posters in English, Spanish, and Mandarin. The strategy aimed to effectively reach diverse segments of the population and ensure widespread understanding of the new census methodology.

An extensive spokesperson tour, featuring INEC personnel, including the Director, was orchestrated across various media platforms, encompassing press interviews, radio appearances, and active engagement on digital channels. This concerted effort aimed to consistently disseminate information to the public regarding the transition in methodology, particularly highlighting the censuses under the De Jure methodology. This extensive outreach initiative translated into an astounding 28

hours of airtime and held an estimated economic value in advertising amounting to 2.5 million dollars, all accomplished without incurring expenses, signifying a substantial contribution offered for free.

The INEC collaborated with the expertise of an external advertising agency to strengthen the advertising endeavors for the censuses. This partnership resulted in several pivotal contributions: the agency facilitated the procurement of airtime at discounted rates, streamlined the purchasing process for advertising materials, and actively participated in developing promotional audiovisual content tailored for the census campaigns. The joint efforts resulted in the production of 100,000 brochures and 10,000 posters, complemented by a series of impactful messages and videos strategically disseminated across various social media platforms. Additionally, the printed materials were meticulously replicated and distributed to the Provincial Offices of the INEC for extensive use. The strategic use of social media platforms, particularly Instagram accounts managed by the censuses, the General Comptroller's Office (CGR), and the INEC, notably contributed to broadening the reach of advertising materials. This fostered increased visibility and engagement within the target audience.

To raise awareness about the censuses among younger demographics, specially designed informational materials aimed at children were precisely constructed. These specialized materials encapsulated crucial details about the censuses, marking a significant milestone as they were distributed to every public school across the country. This marked a pioneering initiative in census education, representing the first comprehensive effort to integrate census-related knowledge into primary school education nationwide. The overarching objective of introducing census education at an early age had two main goals: to raise awareness among citizens about the importance of censuses and to cultivate a statistical culture within the nation, fostering a more informed and engaged populace.

The INEC's Communication team physically visited:

- 1595 churches
- 254 schools
- 46 health centers
- 747 businesses
- 155 gas stations

Simultaneously, a thorough nationwide recruitment campaign was carefully conducted, aiming to incentivize and encourage the population to sign up as census takers and supervisors. This extensive recruitment initiative targeted key locations such as metro stations, public transportation hubs, bustling shopping centers, universities, and municipal offices. These were specifically chosen in regions identified as experiencing a deficit in registrations. By concentrating efforts in these areas, the campaign aimed to bolster the recruitment drive, addressing specific regions where there had been a shortfall in registered volunteers.

8.2. Strategic Alliances

Forging widespread support across the populace was pivotal, particularly in the wake of pandemic-induced shifts in census methodology. Recognizing this, strategic collaborations with diverse ethnic, religious, and national groups were imperative. These alliances sought to foster openness and acceptance toward census takers, especially within minority communities. The objective was to establish trust and receptivity toward the census process, fostering inclusivity and ensuring a comprehensive enumeration within society.

Religious communities: Additionally, efforts were made to incorporate endorsement messages for the censuses into the parish messages of the episcopate. This holistic approach aimed to cultivate mutual understanding and collaboration between the census team and diverse religious groups, highlighting the importance of their participation and support in the census activities.

The Mama Tatda religion: A significant breakthrough during the 2023 Population and Housing Censuses was the historic enumeration of specific segments within the Mama Tatda religious community. Established in 1962, this religious group follows practices that prevent its members from registering births and deaths with local authorities. They also refrain from utilizing Panamanian identity cards, educating their children in foreign schools, and maintain a strict isolation from outsiders. Among their defining characteristics is a deep-seated distrust of governmental entities and a firm resistance to any form of state intervention within their territory. Before the 2023 census initiative, achieving a successful enumeration of their members had never been accomplished since the foundation of the religion.

The latest Population and Housing Censuses marked a pivotal moment in the government's relationship with the Mama Tatda community, indicating a significant shift as the INEC formed a strategic alliance with leaders from specific Mama Tatda communities. This partnership enabled the successful enumeration of specific segments within the community. Through this arrangement, the INEC delivered specialized training to selected members of the community, authorizing them to conduct the enumeration within their respective congregations. Following the data collection, the staff conducted a thorough review before commencing a comprehensive process involving digitization, encoding, and integration of the data into the census database. This focused effort allowed for the enumeration of the previously uncounted Mama Tatda community facilitating their inclusion in the larger census dataset.

The Afro-descendant community: The Afro-descendant community expressed strong dissent over the representation of Afro-descendants in the 2010 Population and Housing Censuses. Consequently, by 2023, a palpable lack of governmental trust and a diminished acceptance of the census process were prevalent within this community. To uphold the integrity of the national censuses and rebuild trust within this ethnic group, the National Secretariat for the Development of Afro-Panamanians (Senadap) took a proactive step by establishing the Afro-Census Technical Table (METACENSO) in 2016. Comprising experts from diverse disciplines, this committee aimed to steer the collection of statistical data to properly reflect the reality of Panama's Afro-descendant population. Its objectives encompassed fostering self-recognition within this demographic, as well as conducting in-depth analyses of statistical data to delineate the strengths, weaknesses, and opportunities present within the Afro-Panamanian community.

The Senadap actively participated as an observer during the Experimental Census and made substantial contributions within a collaborative working group alongside INEC and the Afro-Census Technical Table (METACENSO). This platform provided a space for in-depth discussions on communication strategies aimed at raising awareness among the populace and training census takers. Through these concerted efforts, trust was restored within the Afro-descendant community regarding the censuses' enumeration process. This renewed trust served as a cornerstone, fostering increased participation and promoting a deeper understanding of the reality of the Afro-descendant population within Panama's landscape.

The enumeration of Horizontal Properties: The enumeration of Horizontal Properties has consistently posed a recurring challenge in conducting censuses across Panama, particularly concerning the enumeration of gated communities. This persistent challenge was notably evident during the 2023 Population and Housing Censuses, as indicated by the Technological Test, which documented a substantial rejection rate for enumeration within these properties. To address this issue, an agreement was forged with the Association of Professional Administrators of

Horizontal Properties (Adepa PH). This coordinated effort played a crucial role in ensuring that building administrators were adequately informed about the methodological changes and their consequential responsibility to provide census takers access to their communities for enumerating its residents.

During the census execution, assistant inspectors actively collaborated with Horizontal Properties administrators and residential complexes that were equipped with security gates. Their collaborative efforts aimed to determine the most optimal day for enumeration. A joined effort ensued, assembling a team of census takers and supervisors to efficiently enumerate the numerous residences within these communities over one or more sessions. This initiative, known as Targeted Sweep, aimed to reach 120,000 households, but significantly surpassed this goal by enumerating 285,598 households. Most of these households were located in Panama City, with 185,598, while the remaining 100,000 were distributed across the more rural areas of the country. Lastly, in the post-census phase, residents residing in these communities were granted access to the E-Census platform, enabling them to partake in self-enumeration. These multifaceted processes were indispensable to overcome the inherent complexities associated with enumerating such challenging community setups.

Association of Naturalized Residents (Arena): Played a crucial role in encouraging active participation among the foreign resident community in Panama during the Population and Housing Censuses. In addition to the primary goal of enumerating as many people as possible, the census questionnaire notably included two critical questions concerning an individual's citizenship and country of origin. The accuracy of these two questions hinged significantly on the acceptable engagement and participation of Panama's foreign population. A lack of substantial involvement from this demographic would have hindered the comprehensive portrayal of the country's demographic reality within the census results.

The primary message aimed at addressing this concern prominently emphasized the assurance of safeguarding census responses through the principle of statistical

secrecy. This crucial protocol ensured that the information provided would solely serve statistical purposes and would not be used for legal matters. Consistent emphasis was crucial in conveying that the census questionnaire did not inquire about an individual's migratory status. This sensitive matter, particularly concerning the foreign population, required reiterated clarification that the census process refrained from requesting such information.

In order to effectively disseminate this message, a strategic alliance was forged with the Association of Naturalized Residents of Panama (Arena). Through this collaboration, its director affirmed the non-intrusive nature of the census questions and underscored the paramount significance of the censuses as an instrumental tool to provide insights into the circumstances of foreigners residing in Panama. This partnership acted as a channel to convey the non-intrusive nature of the census inquiries and highlight the broader importance of the census in comprehensively understanding the situation of foreign residents within Panama.

8.3. National trust and transparency

The spokesperson tour served a dual purpose, acting not only as a means to communicate the methodological changes but also as a platform to address any uncertainties or inquiries related to the censuses during media engagements, substantially boosting national confidence. The INEC's technical team, well-versed in the intricacies of the census, was thoroughly prepared to serve as spokespersons. This ensured that the most proficient and knowledgeable individuals disseminated pertinent information. As part of the transparency strategy, the census questionnaire was publicly released for the first time ever before the enumeration began. This proactive disclosure allowed the INEC to address any queries or concerns raised by the media or the general public in advance, fostering an atmosphere of openness and transparency well before the enumeration period began.

A dedicated section was established on the census website to facilitate the verification of census takers participating in the field operation. This feature enabled users to input the census taker's ID number and then access their associated information. It significantly enhanced security measures for citizens, allowing them to verify the authenticity of individuals collecting their personal and familial data as genuine members of the INEC team. This heightened security measure helped alleviate any concerns the population might have had about providing their personal information to census takers.

8.4. Crisis Communication Guide

One of the most relevant documents in managing the communication strategy for population and housing censuses was the "Communication Crisis Guide," which allowed the INEC and the CGR to be prepared for any eventuality and have processes in place to address any crisis that might have arisen. This was particularly crucial as these censuses represented a critical mission for national statistics. The guide outlines how to determine the magnitude of a crisis and, in the event of its inevitability, how to mitigate its scope. It also addresses the identification of crisis aggravating factors, along with establishing actions to take that would contribute to crisis reduction and actions to avoid, as they could exacerbate the situation.

Categories of possible crisis scenarios:

- Communication scenarios: Encompasses to the management of information and institutional communication.
- Operational scenarios: Arise as a result of operations and activities carried out by the institution.
- Slander scenarios: Result from actions that directly or indirectly seek to harm the institution's reputation.

During a crisis, the protocol entailed forming a designated committee consisting of relevant personnel assigned to handle and resolve the crisis. This specialized team took on the responsibility of overseeing and orchestrating all necessary measures for effectively resolving the situation, even extending their efforts beyond standard working hours if necessary. The guide's framework included a comprehensive catalog outlining potential crisis scenarios, their associated aggravating factors, and the prescribed actions to be taken, all integral parts of its structure. Furthermore, the

guide includes explicit examples of customized communication messages intended for media dissemination.

9. Innovations in census logistics

Logistics covers a comprehensive array of operations strategically focused on planning, supervision, and regulating material storage and transportation within a supply chain. In previous census efforts, logistical operations were fragmented across different departments within the INEC. This fragmentation resulted in a lack of cohesion in their execution, as each department had to manage its logistical operations independently.

A crucial initiative introduced for the latest population and housing censuses was the centralization of logistical management under a singular umbrella term, "Census Logistics." This consolidated workgroup took on the responsibility of coordinating the allocation of all necessary facilities, overseeing the storage of essential supplies, and managing transportation logistics between intermediate points and census centers in a cohesive and organized manner. This strategic consolidation aimed to guarantee the smooth and uninterrupted progression of the national censuses. Due to the complexities of material distribution, a meticulously structured delivery schedule was established with designated dates. This ensured the efficient and punctual dissemination of materials. Furthermore, multiple facilities were procured to facilitate the execution of the censuses. These included census centers equipped with computers and Wi-Fi access. These centers served the dual purpose of monitoring census operations and offering technical support in utilizing DMCs.

Census Organization:

- 10 provincial offices
- 17 provincial coordinations, including for indigenous regions
- 136 census centers
- 257 census sub-centers
- 385 training rooms nationwide
- 399 auxiliary inspections

9.1. Logistics of Mobile Capture Devices

Logistics encompasses a comprehensive array of operations strategically focused on planning, supervision, and regulating material storage and transportation within a supply chain. It involved devising contractual arrangements for network services necessary for field deployment. A total of 8,800 devices were procured for the execution of the censuses. As part of this acquisition, a subset of 150 units consisted of Samsung A12 models were specifically earmarked for utilization during the Technological Test. After the completion of the Technological Test, the remaining 8,650 devices were designated as Samsung A22 models. This decision was based

on the identified need to enhance the devices by selecting models with a superior internal storage capacity.

A standardized protocol was precisely devised to coordinate the distribution of

DMCs. This protocol regulated the allocation of devices to users based on their respective census workload, ensuring proper distribution. Upon the initial reception of these devices, thorough inspections were conducted to assess their quality and functionality. Following these inspections, the devices were securely stored within designated rooms within the INEC facilities. In the event that discrepancies or inconsistencies were identified upon receipt, a comprehensive technical report outlining the issues was promptly communicated to the designated personnel within the supplying company for immediate resolution.

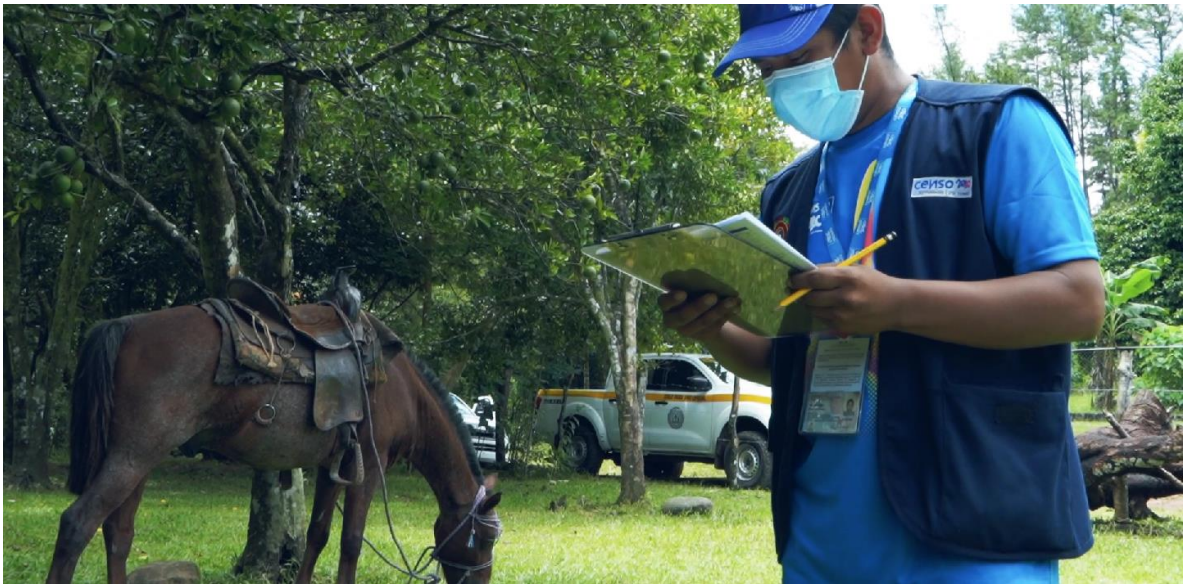
To systematically store and distribute the DMCs, dedicated security facilities were leased in each province. These facilities were meticulously equipped with the necessary measures and protocols to properly safeguard the devices. These warehouses were fortified with surveillance cameras, reinforced glass doors, and robust locking mechanisms. Access was permitted solely under the strict supervision of designated security personnel overseeing the storage premises. During the transfer of the DMCs, a rigorous inspection regimen was enforced to ensure the devices were in optimal condition before transportation. Upon concluding the transfer process, the established security procedure mandated staff to conduct a comprehensive post-transfer inspection. This involved precisely verifying each device's presence in its designated box and ensuring its pristine, undamaged state.

During the training stage, the auxiliary inspector was accountable and financially liable for any instance of theft, robbery, or loss of a DMC under their custody. Subsequently, as the enumeration commenced, the accountability for each device shifted to its respective census taker and supervisor. To mitigate the financial impact of device theft, an insurance policy specifically designed to cover losses resulting from the theft of the DMCs was implemented.

9.2. Other instances of census logistics

Transport: Transportation was a crucial aspect meticulously managed during the latest Population and Housing Censuses, utilizing a fleet of over 520 vehicles dedicated to the operation. This represented a significant increase from the initial inventory of only two vehicles owned by the INEC. This extensive fleet was managed through a sophisticated transportation management system that ensured comprehensive oversight of each vehicle. It allocated them to the assigned staff and charted predefined routes for their optimal deployment. Consisting of vehicles owned by the CGR, rented vehicles, and contributions from various government institutions such as the Ministry of Social Development and the Ministry of Labor and Workforce Development, this diversified fleet enabled efficient mobility throughout the census operation.

In remote and hard-to-reach areas across the national territory, active engagement with the National Aeronaval Service and the National Border Service was sought to facilitate the transportation of both personnel and equipment. Their invaluable support extended to transporting materials through boats or helicopters, particularly in regions with significant access challenges. Furthermore, in specific rural areas where conventional transportation methods were impractical, the necessity arose to procure pack animals, such as horses, to facilitate the enumeration process.



Security: A coordinated framework was established through collaboration with the National Police, National Air-Sea Service, and the Border Service to strengthen the safety of INEC staff. This strategic alliance proved essential in ensuring the safety of census takers, especially in regions characterized by precarious safety conditions and inherent risks. In areas identified as hotspots for elevated criminal activity, proactive measures were adopted, including requesting the National Police to conduct patrols both before and during enumeration activities. This concerted strategy significantly enhanced personnel safety without requiring police escorts, which might have inadvertently caused resistance from the populace in providing crucial information for the census.

Biosecurity: The onset of the COVID-19 pandemic heightened attention to public health concerns and the well-being of both the populace and governmental entities. Acknowledging the inherent nature of the field operation, which involved visits to residences, required establishing robust biosafety protocols. These were aimed at mitigating the risk of contagion among staff. Collaborative efforts with the Ministry of Health led to the formulation of comprehensive preventive protocols, backed by their invaluable support for COVID-19 monitoring initiatives. To equip census takers and supervisors with sufficient protective measures, a range of biosafety equipment was procured, including alcohol, masks, face shields, liquid soap, and atomizers. Despite the reduced transmission risk of the virus by 2023, the continuous availability of these safety provisions remained paramount as a precautionary measure to safeguard the well-being of the personnel involved in the census operation.

Printing: While the primary data capture tool used in the Population and Housing Censuses was the DMC, a strategic decision was made to retain the traditional method of enumeration using paper questionnaires in 10% of the census areas. At the same time, there was a notable increase in the quantity of manuals required for

the census operation. Acknowledging the INEC's limitations in printing the required volume of questionnaires and manuals within the stipulated timeframe made collaboration with external institutions imperative. Significant support was received from institutions like the National Bank, Electoral Tribunal, Technological University of Panama, and the University of Panama. Together. This collaborative effort played a crucial role in ensuring the smooth execution of the census operation.

Training program: Due to the need for in-person training sessions, 385 rooms were employed across the country to accommodate distributed learning spaces. In past census endeavors, training sessions were typically held during the summer, utilizing available school facilities for these instructional activities. However, due to the shift in the training period, school classrooms were no longer a viable option. As a result, formal agreements were established with esteemed educational institutions like the University of Panama, the Technological University of Panama, and the Specialized University of the Americas, among others. These agreements enabled the use of their facilities for the training program. These institutions not only offered the necessary spaces but also enlisted volunteer students to support the Training team during these sessions. In acknowledgment of their invaluable support, these student volunteers received recognition for their contributions, adding to their social service hours in return. This collaborative partnership played a pivotal role in ensuring the successful execution of the training program.

9.3. Inverse logistics

In conventional logistics, products usually move from their point of origin to a final destination. However, within the scope of reverse logistics, the process operates in an inverse manner, directing the return of these products from their last point of destination back to their initial point of origin. The core objective underlying reverse logistics is to execute this process with maximum efficiency, placing a premium on minimizing the environmental footprint incurred throughout the entire operational cycle.

The seamless integration of reverse logistics into the strategic framework of the census project mandates a prudent allocation of resources to sustain its operational efficiency. Upon the receipt of products, a meticulous assessment of their condition was undertaken. Specifically, for DMCs, a comprehensive technical evaluation was performed by a team comprising the regional inspector, auxiliary inspector, supervisors, and technical support staff. The efficacy of reverse logistics was particularly underscored in the process of returning the DMCs to the INEC, as well as in reinstating the 520 vehicles utilized for transporting personnel and materials during the census to their respective institutions. This systematic application of reverse logistics ensured the effective and streamlined retrieval of materials and equipment, optimizing the post-census operational closure.

Incorporating reverse logistics wasn’t just crucial for the census's success due to the widespread geographical distribution of materials needing to be returned to their initial locations; it also offered substantial advantages in resource management. Setting up a reverse logistics chain allowed for the thorough retrieval of all DMCs, effectively reintegrating them into the INEC's inventory. This systematic approach to reverse logistics ensured the efficient recovery and reintegration of essential materials, optimizing inventory management processes post-census.

This systematic approach enabled the recycling of devices for future censuses and surveys, promoting sustainability in resource utilization. Besides facilitating material reuse, the effective implementation of reverse logistics played a crucial role in reducing the environmental impact associated with censuses. By reducing material and resource consumption, it significantly contributed to the broader objective of minimizing the environmental impact linked to the census operations.

The efficient implementation of reverse logistics goes beyond product handling; it required meticulous management of the census logistics chain to facilitate the necessary functions inherent in this process. The process of retrieving materials demands the same level of attention and strategic planning as the initial distribution of supplies. Efficient coordination is essential to seamlessly manage both the transportation and storage of inputs, encompassing their distribution and the subsequent return process. This collective effort guaranteed a seamless and organized reversal of materials within the census operational framework.

Conclusion

This document elucidates the profound impact of innovative advancements in census methodologies and the integration of state-of-the-art technology in reshaping the implementation of Panama's XII National Population and VIII Housing Censuses. The outcomes obtained from these comprehensive censuses play an indispensable role in informing crucial decision-making processes related to national policies, strategies, and initiatives. These outcomes are pivotal in guiding public investments, especially in areas such as education and healthcare. They also contribute to improving essential services like electricity and potable water while evaluating various aspects of the nation, including rural development and the complexities of urbanization. Moreover, this information is indispensable for enterprises and industries, by facilitating the assessment of service and commodity demand, thereby fostering an in-depth comprehension of prevailing trends and their potential ramifications.

In a constantly evolving era, marked by ongoing transformation and advancement, the role of innovation becomes pivotal in propelling progress forward. Stagnation in methodologies and technologies becomes a barrier to growth, underscoring the crucial need to adapt to changing circumstances and reinforce these systems and technologies. The shift towards a De Jure census methodology and the utilization of the DMC has notably enhanced the efficacy of conducting censuses, aligning more closely with the specific requirements of the Panamanian populace, particularly in response to the challenges posed by the COVID-19 pandemic crisis.

The integration of the DMC has significantly enhanced data capture precision by enabling real-time monitoring of data flow and streamlining report generation, thereby enabling the identification of deficiencies and optimal resource allocation. This heightened level of oversight has substantially bolstered the data's integrity, establishing the DMC as a valuable and reusable asset for forthcoming surveys and censuses. Notably, this advancement has also yielded a favorable outcome in minimizing the censuses' environmental footprint, underscoring the pivotal role of innovative data management strategies within dynamic societal landscapes and census procedures.

These innovations stand as a testament not only to their efficacy in addressing the evolving needs of the Panamanian populace but also as a significant stride in the evolution of data management methodologies and census procedures. In a world marked by unceasing advancement, innovation emerges as the guiding force crucial to the success of censuses.

Glossary

Census Region: refers to the defined territorial unit utilized for segmenting and allocating fieldwork responsibilities during census operations. The division of workload into these regions serves to streamline organizational aspects, ensuring effective control and management throughout the census-taking process.

Census Taker: refers to the person responsible for visiting assigned households to collect vital data for the census. Their main role involves conducting interviews with household residents and administering the census questionnaire to gather necessary information.

Supervisor: assumes the role of overseeing and coordinating census activities within a specified area. This individual is tasked with guiding a team of census takers, the size of which fluctuates based on the area's characteristics, be it rural, urban, or difficult to access.

Pre-census Phase: denotes the inaugural phase within a census project, dedicated to the formulation and development of all procedures preceding data capture. This comprehensive phase encompasses the entirety of the census project's design, the establishment of objectives, budgetary considerations, activity schedules, and the delineation of the project's organizational framework.

Post-census Phase: represents the phase subsequent to the data collection period within a census project. In this phase, the gathered information undergoes meticulous scanning, digitization, and processing to render it ready for subsequent dissemination to the public in the future.

Encoding: is the systematic procedure through which numerical codes are allocated to responses obtained from open-ended questions in a questionnaire. This method serves the purpose of standardizing and categorizing these responses, thereby streamlining the analysis and interpretation of the gathered information.

Digitization: is the systematic procedure employed to convert information obtained through analog methods, such as paper questionnaires, into a digital format. This systematic process categorizes and standardizes data, resulting in improved accessibility, storage, and utilization, thereby facilitating more effective handling of the collected information.

Self-enumeration: denotes the census data collection method wherein individuals autonomously record their information utilizing a system specifically designed for this purpose. This approach empowers the population to independently input their data, fostering a streamlined and efficient means of data collection within the census framework.

Horizontal Properties: represent a legal framework governing the organization and division of real estate properties spread across multiple floors or within gated

residential complexes featuring shared common areas. This legal institution serves as a regulatory mechanism ensuring the structured management and delineation of ownership rights within such multifaceted real estate arrangements.

Unoccupied Dwellings: encompass residences that remain uninhabited during the data collection phase of a census. This status can arise due to diverse circumstances, including properties listed for sale or rent, undergoing repairs or construction, designated as vacation homes, or remaining vacant for other specific reasons. This classification encompasses a range of situations where residences are temporarily or semi-permanently unoccupied during the census data collection period.

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