تعداد السعودية
SAUDI CENSUS
التعداد العام للسكان والمساكن 2022

2022 CENSUS

Program Progress & Documentation

May 2022

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GLOSSARY

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GLOSSARY

Census:	Is a count of the population.
GASTAT:	Is the official body responsible for providing public entities, private establishments, individuals, and international organizations with official statistics in accordance with statutory procedures; in order to support policy and decision-makers in these entities to move forward in implementing the developmental plans.
Questionnaire:	Describes a research instrument consisting of a series of questions for the purpose of gathering information from respondents.
Self-enumeration:	Self-enumeration refers to the completion of census questionnaire by the respondents themselves.
GIS	Geographic information system.
Census frame:	Refers to the list of units (examples: persons, households, businesses…) in the questionnaire population. Since the selection of the sample is directly based on this list, the frame is one of the most important tools in the design of a questionnaire.
PES:	Can be defined as a complete re-census of a representative sample of the census population, where individuals enumerated in a post-census questionnaire are matched with information from the main census.
Pilot:	Provides important information on the adequacy of field organization, training programs, the extent of the burden placed on interviews, the data processing plans, the accuracy of maps, and other important aspects that are critical to the success of a census.
Enumerator:	A census employee who goes door-to-door to collect census data. Interviewers will collect data from households in rural areas and from households that do not respond by Internet, mail, or phone.
Household:	A household is defined according to the actual count method as an individual or group of individuals who are related to them or are not related to them. They participate in housing and food, reside in the house at the time of count
Head of household:	The person whom the family considers to be its head from the family with whom they reside, usually responsible for the family's livelihood and at least 15 years of age
Supervisor's work area:	Supervisor's work area: It is a geographical area that represents a whole administrative region.

Deputy Chief Operating Area:	It is a geographic area that represents part of the supervisor's area of work
Assistant Supervisor Area of Work:	It is part of the area of work of the supervisor and consists of one or more governorates, cities, or parts of a city
Inspector's work area:	The inspector's area of work consists of one or more residential areas or part of a residential area with an average number of 5000 houses. The inspector's area of work consists of five areas of work of observers on average. The inspector areas are given serial numbers within the area of supervisor starting from 001.
Public housing:	A public house is defined as a real estate unit dedicated to the housing of a group of individuals who are not related to them, but who are connected to the place, and public housing often has common facilities and living arrangements of its own. There are several types of public housing.
Hospital:	Internal departments in hospitals include inpatient wards and group accommodation.
Student housing:	Mass housing for university students, boarding schools, etc.
Hospitality:	Student hostels and youth hostels.
Prisons:	Which include the places of detainees in police stations.
Social welfare role:	These include housing belonging to social welfare institutions.
Labor camp:	These include ports and company locations (Camp).
Other:	Other types of public housing, other than those mentioned, include offshore petroleum platforms, ships, long-way, and market parking ...etc.
Agricultural holding "farm":	A scattered building or group of buildings occupied by a farm owner or farmers and is considered an economic unit for agricultural production in both vegetation and livestock.
Facility:	A project or part of a project, which has a fixed location that performs one or more types of economic activities under one management and has or can have regular accounts, and the project holder may be a natural or legal person.
NIC:	National Information Center
Indicators:	(KPI's) Key Performance Indicators (KPIs) are the critical (key) indicators of progress toward an intended result.



1
INTRODUCTION

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1. INTRODUCTION

Vision 2030 presents an ambitious yet achievable blueprint to transform Saudi Arabia in the long term into an exemplary and leading nation across all aspects.

To achieve this vision, we need an integrated picture of society, covering demographic, social, and economic aspects—a snapshot of the Saudi population down to the most granular administrative and geographical levels. Since our last census in 2010, the Kingdom has grown and changed significantly. Conducting Census 2022 allowed us to update our understanding of the population and its characteristics. This integrated picture provided the insights that allowed us to channel our investments to where they were most effective.

Census 2022 was a national program and every resident was needed to participate to make it a success.

Households in Saudi Arabia were obligated to fill out the Census 2022 questionnaire, as prescribed by the Census Population Act of 1970.Further,to ensure households comply with the mandatory nature of the Census 2022 questionnaire, GASTAT adopted a two-pronged approach to motivate households:

- Awareness campaigns: GASTAT leveraged its large-scale communications campaign to include information dissemination related to the mandatory nature of the Census. Multiple channels of communication were expected to reach a diverse audience, ensuring households were amenable to fill out their information during Census 2022
  - GASTAT defined a clear on-field escalation mechanism, ensuring operational workforce had clear guidance to escalate issues related to uncooperative households to enumeration area supervisors (escalation process included verbal and in-person warnings to demand household cooperation)
  - Supervisors were also authorized to file a violation report form that could be officially lodged with the Ministry of Interior for relevant actions under the approved Census by-laws

Census 2022's mandatory nature is based on the following laws:

- The State's General Statistics laws issued by Royal Decree No. 23 dated 7/12/1379 AH.
- The population census law issued by Royal Decree No. (M/13) dated 23/4/1391 AH.

All individuals (citizens - residents) were obligated to cooperate with the interviewers and provided them with the data and information requested in accordance with the quality requirements, dates, and method determined by GASTAT. It was prohibited to intentionally disrupt the census work, refrain providing the requested information or giving incorrect data.

GASTAT coordinated with the relevant security entities to apprehend violators and impose legal penalties against them.

1.1. CENSUS 2022 GUIDING PRINCIPLES

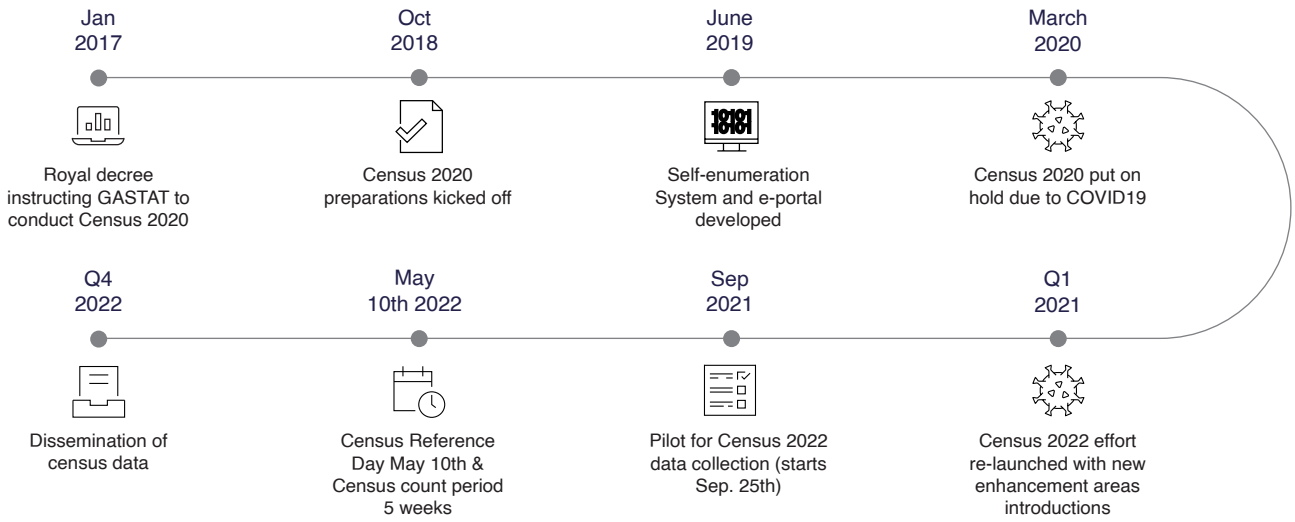
Census 2022 was designed based on 5 best practice guiding principles:

- Apply international census standards: Census 2022 followed international census principles including a focus on individual-level data, inclusion of all residents, and a clear reference to a single date
- Gather high data quality: Census 2022 followed international census principles including a focus on individual-level data, inclusion of all residents, and a clear reference to a single date
- Protect individual data: Census 2022 data was subjected to strict GASTAT privacy rules issued by the National Data Office and the National Cyber Security Authority and was only used for statistical purposes. All data was collected with the express commitment that no individually identifiable data was shared by GASTAT with any third party
- Be sustainable: Census 2022 laid the groundwork for statistical population and housing registers, which are usually the backbone of any future statistical questionnaires, to ensure all necessary population information were continuously updated

EXHIBIT 1A:

THE REFERENCE DAY FOR THE CENSUS REFERENCE NIGHT WAS SCHEDULED TO BE 10 MAY 2022 WITH DATA DISSEMINATED BY THE END OF 2022

Timeline for Census 2022



- Be efficient: Census 2022 deployed new technologies to conduct efficient census operations that were mindful of available resources. It also drew on rich administrative data to cross- validate and ensure high quality data.
- Preparations for the census, which was initially planned for 2020 began in 2018, but the global COVID-19 pandemic interrupted preparations and delayed the census launch. The census was then scheduled to be conducted in May and June 2022, with the reference day of the census being on the 10th of May 2022 (Exhibit 1).

1.2. DOCUMENT SCOPE

This document was created to clearly define the phasing and outcomes of the preparation for the Census 2022 project as of May 10th, 2021. It would also detail the planned implementation moving forward

This document included the following sections:

- Census Overview: Elaborates on the purpose and objectives of Census 2022, addresses how the 2010 Census was conducted, discusses the changes planned for Census 2022, and touches on how the public might be affected by the census
- Census Preparation: The census preparation section provided insights on the preparation work that was in the census, topics included census frame, questionnaire development, stakeholder management, tool development, census model testing, and the pilot plan
- Census Implementation: The Census implementation section provided a deep dive into the planned data collection, processing, and dissemination processes and approaches which were utilized in Census 2022
- Cross-Cutting Themes: This section covered the cross-cutting topics that were significant to the success of the census including the census operational functions, technology requirements, quality assurance, communication plans, and overall program management



2
EXECUTIVE SUMMARY:
CENSUS OVERVIEW

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2. EXECUTIVE SUMMARY: CENSUS OVERVIEW

2.1. PURPOSE AND OBJECTIVES

A population census is considered the most critical source of socioeconomic data for any nation. A comprehensive census provides a complete and accurate count of the population along with information on housing, across all geographic areas and population groups. The information that was collected in Census 2022 was to be used by both public and private sector entities to support informed decision making, and a subset of the information would also be available to the wider population.

The data can be used by the public sector to inform key decisions, including:

- Developing policies, for example, the usage of employment data to inform new job creation and training policies, and housing data to inform new housing policies
- Planning and running public services, and development programs, which includes health and social services, educational services, and roads and public transport
- Developing urban plans
- Allocating budgets to local authorities
- Designing future questionnaires, including the Labor Force Questionnaire, the Household Expenditure and Income Questionnaire, and the Household Energy Questionnaire.

2.2. HOW THE 2010 CENSUS WAS CONDUCTED

The 2010 census successfully met its objective to support national decision making. However, compared to modern censuses globally, Saudi Arabia's 2010 census took a traditional approach across the preparation and implementation phases.

The 2010 census variables were determined by reviewing the international best practices at the time. The final list of variables was then aligned with key KSA decision-making bodies. Next, the questionnaire was finalized in Arabic and English and put through several rounds of testing to optimize it for the census process.

Census 2010 used only one channel for enumeration: face-to-face interviews carried out by interviewers and captured on paper. After receiving completed questionnaires, field supervisors conducted data quality validation and correction, and reviewed the interviewer data. Trained interviewers re-interviewed samples of respondents to identify and correct any issues with data quality.

For dissemination, GASTAT decided which combination of variables would be most relevant to users, and then published this data in tables. This information was made available for download on GASTAT's website in PDF and Excel formats.

The social and technological landscape shifted radically since 2010. This environment prompted a new, innovative approach to ensure the success of Census 2022.

2.3. ENVIRONMENTAL CHANGES AND CHALLENGES SINCE 2010

Since 2010, Saudi Arabia and the world have changed rapidly thanks to major technological advancements and shifts in social behaviors. These changes had several implications on the Census 2022 design choices and also presented multiple opportunities to update the 2010 plans. Major changes included:

1. Population diversity: KSA's population became increasingly diverse as a growing number of expatriates called the Kingdom home. As a result, the questionnaires needed to be available in a larger number of languages

2. Technological advancement: Technology advanced rapidly as did its adoption across KSA. The internet usage rate, for example, was 96 percent in 2022 compared to just 41 percent in 2010. Major changes planned in the census processes included leveraging ubiquity of mobile devices and widespread internet connection in public areas such as malls, community centers, and schools. These advances allowed Census 2022 to offer, among other things, paperless enumeration

3. COVID-19 safety measures: The global COVID-19 pandemic pushed GASTAT to implement new safety measures and rethink operational choices, including the use of online rather than in-person training programs

2.4. CENSUS 2022 INNOVATIONS

Census 2022 was designed to take the successful 2010 census effort to an entirely new level. As a digitally driven project, Census 2022 made use of multiple innovations that brought it in line with best practices observed across international territories.

The 2010 iteration of the census was conducted as a focused effort with effective results that were limited to specific statistics. The data was not part of a seamless workflow and was not always fully granular. Census 2022 deployed new technologies across many aspects of the census process, from planning and data collection to dissemination and beyond. The result was an integrated data solution that extends far beyond population statistics to provide extensive applications across government sectors.

Some of the innovations rolled out included the following:

- New data sources: Census 2022 used geospatial data, including satellite images, electricity consumption and mobile phone data, to improve the accuracy and geographic coverage of address canvassing. This approach captured more granular residential data and enabled a more precise headcount of populations, especially those in remote areas. Administrative data from multiple sources was used to cross-validate collected census data and helped to raise the overall data quality. As a result, more precise data could be used to make more accurate economic predictions that would serve the Kingdom's population.

- De Jure approach: Census 2022 used a De Jure census approach that enumerated people according to their usual place of residence as compared to the previously used de facto approach which enumerated people based on their location at the time of enumeration. Pinning the exact geolocation of people and buildings allowed for detailed georeferenced statistics. This approach provided a more socially accurate

representation of population density since it captured the reality of people's residential habits. This in turn enabled better and more relevant projections for key economic dimensions such as energy needs, healthcare, and food supply.

- Digital first: Census 2022 was the first fully digital enumeration effort in the Kingdom. All residents of KSA were invited to self-enumerate through their mobile devices, laptops or personal computers. To ensure a close-to-full coverage of KSA's residential population, the digital self-enumeration process was complemented by face-to-face interviews, using digital tablets. This thorough approach enabled detailed capture of population data, hastened the enumeration process and reduced statistical errors that would have remained in an analog process.

- Questionnaire innovations: The questionnaire included new variables that brought it in line with international standards and tailored it better to the local context. It expanded the range of the 2010 census datasets with additional social dimensions that enhanced the quality of the data and made the numbers more suitable to broader statistical projections.

- Statistical data registers: Census 2022 was designed to be used as a launchpad for several new secure statistical data registers for population, housing, and businesses. The connectivity of the collected data multiplied its possible applications in an exponential way. In 2010, such connectivity was not a priority and made the collected data more limited in its applications. Building the statistical dimensions into the census effort from the beginning ensured that data was stored in a standardized format that could port to multiple systems and could be used in a variety of contexts. This was particularly strategic as the Kingdom seeks to integrate international tools and solutions into its data management projects

- Modern data dissemination: Census 2022 catered to multiple internal and external stakeholders, enabling them to retrieve and process census data for many different needs. Additionally, collected data has been visualized at granular regional levels. Overall, six main publication products are available - summary reports, infosheets, dashboards, maps and output tables.

2.5. A HYBRID APPROACH FOR THE SAUDI CENSUS 2022

Internationally, there are mainly three methods to conduct a population and housing census: the 'traditional' census, the 'register-based' census, and the 'combined' or 'hybrid' census. The traditional census is based on the direct count of all individuals and the collection of information on their characteristics through the completion of census questionnaires, either in paper form or electronically. The information is collected in the field across the whole country in a relatively short period of time. Questionnaires can be completed either directly by the households or by the enumerators during an interview of the household.

A different approach from the traditional census is the register-based census. Under this approach there is no direct collection of data from the population, and the traditional enumeration is replaced by the use of administrative data held in various registers (population register, building/address register, social security register, etc.) through a matching process, normally making use of personal identification numbers. This approach permits the production of census data at a greatly reduced cost and with relatively limited manpower, once a good quality system of statistical registers has been established.

A pre-condition for a register-based census is a well-established data ecosystem, where the Statistics Office has full access to all administrative data on an individual record basis and where the completeness and quality of statistical registers, based on continuous data flows from administrative data sources, is established way before a census, exclusively drawing on administrative data, is conducted. While there are many advantages of a register-based census, there are limitations as well. In terms of scope, a register-based census can only cover information that is already available in administrative registers, whereas a traditional census can choose to structure the questionnaire according to the information needs of a country. Furthermore, administrative data are not always updated in real time and might lag behind the real situation on the census day. Definitions of administrative data follow administrative needs, which do not always coincide with definitions to be applied in censuses.

Given the situation in Saudi Arabia in 2022, the General Authority for Statistics, like statistics offices in many other countries, has opted to conduct the Census 2022 as a hybrid census, combining both elements of a traditional census, collecting data directly from households, with elements of a register-based census, complementing the collected data with information from administrative records. The hybrid approach has the advantage that a full coverage of the population can be reached and the core information on the entire population can be made available. A compromise had to be made on parts of the information in the census questionnaire where no administrative data exists in Saudi Arabia (e.g. language spoken at home) or was not accessible for GASTAT. Statistical imputation procedures were deployed in order to close those data gaps.

2.5.1. SIGN OF LIFE ANALYSIS

When following a hybrid approach and when the direct population count from households is complemented by administrative records, the statistics office needs to make sure that the resident population definition of censuses is maintained. This means that only people should be part of the population count, who have lived in Saudi Arabia as their usual place of residence continuously for most of the last 12 months (that is, for at least six months and one day), not including temporary absences for holidays or work assignments, or who intend to live in the country for at least six months[1].

In the case of using administrative data to complement the census population the issue of over-coverage of registers require consideration. If, for example, people have not officially declared their emigration, their records may be kept unchanged in administrative registers, and consequently be the cause of over-coverage in the census. In order to avoid the problem of over-coverage, the UNECE, in their Guidelines on the Use of Registers and Administrative Data for Population and Housing Censuses, recommends to conduct a so-called Sign-of-Life analysis. The Sign-of-Life approach is comparing records on individuals from different registers in order to identify any changes, new registrations or de-registrations of the same person within the past 12 months to see whether there is sufficient evidence that the person is actually alive and living in the country.

Before complementing the population count, GASTAT has conducted a Sign-of-Life analysis on an individual record basis, using information from various administrative sources that GASTAT had access to. For example, it was checked whether a person had received a coronavirus vaccination, crossed the border, renewed a driver's license, has a valid health insurance etc. People who were not covered by the census and where there was no evidence of a sign of life in any of the available registers, were not included in the census population.

Given that the register activity of the younger population in Saudi Arabia is only partially covered, the Sign-of-Life analysis was applied to the population of 15 years and above.

[1] See United Nations (2017), Principles and Recommendations for Population and Housing Censuses, Revision 3

2.6. OVERVIEW OF CENSUS 2022 PREPARATION PHASES

There were many preparatory activities conducted prior to the execution of Census 2022, several of which were already concluded. Some preparatory phases were:

- Census pilot and address canvassing: A census pilot was conducted from September to November 2021 to test all public-facing tools and processes, as well as GASTAT's internal processes and operation. During this pilot, GASTAT monitored a comprehensive list of indicators, by leveraging three information sources: (control room dashboards, portfolio reports, and (3 frequent workshops. The learnings generated from these three sources were extensively documented to fulfill two key functions: (1 refining the census approach based on learnings across different functions (e.g., IT, Operations, Communications, and Quality), and (2 optimizing GASTAT's efforts and budget to ensure prioritization of most effective census processes
- Additionally, to prepare for Census 2022, GASTAT conducted widespread address canvassing to make sure all KSA residents were covered by enumeration. This process, which incorporated the Saudi Post dataset of all national addresses in the Kingdom, included fieldwork to verify and confirm all addresses.
  - Verifying all addresses in the country that were collected from Saudi Post's dataset and the geospatial model
  - Numbering and referencing all households with unique QR codes that record key features of the unit (# of residents, head of household's ID, building type, etc.)
  - Introducing the self-enumeration method and registering residents' interest
  - Optimizing capacity planning for the data collection phase by collecting key inputs (e.g. household distribution, interviewer efficiency)
- GASTAT also used a geospatial model to incorporate satellite imagery, electricity consumption datasets, and the geolocation of mobile phone data to identify new residential locations.
- To develop questionnaires, GASTAT selected variables based on international best practices and stakeholder data requirements. The questions were formulated in collaboration with third-party experts and tested rigorously before adoption.
- GASTAT's developers created new technological tools for address canvassing, enumeration, and self-enumeration. These tools were subject to rigorous testing to ensure their design met global best practices and that the user's journey would be as smooth as possible.
- Foreign language assistant interviewers: To ensure data quality of the questionnaire, GASTAT developed best-practice policies for the enumeration of non-Arabic-speaking households. Given that non-Arabic-speaking households comprise ~12% of the Kingdom's population, GASTAT created a multi-part framework to facilitate data capture from households of all languages, including assistant interviewers who would accompany census interviewers to households or communities that do not speak either English or Arabic. Languages requiring foreign language assistant interviewers were prioritized based on the number of speakers in the Kingdom, as well as the concentration of these speakers within certain Observer- or Inspector-level geographies. The languages prioritized under this framework were Urdu, Hindi, Bengali, Tagalog, Rohingya, and Chinese. (English and other European languages were not included in this analysis, because there were many Saudi census interviewers who could speak English fluently.)

2.6.1 OVERVIEW OF CENSUS 2022 COMMUNICATION STRATEGY

The communication strategy for the Census 2022 had five key phases:

1. Address canvassing and public opinion preparation
2. Awareness and conviction
3. Participation
4. Amplification and celebration
5. Reports promotion

The “awareness and conviction” phase, as well as the “participation” phase, are detailed further below.

Awareness and conviction

The communication objective of the awareness and conviction phase was to first announce the census data. Next, an educational outreach process was kicked off to reiterate the importance of sharing accurate and complete information and weed out misconceptions. Messages were focused on the objectives of the Census 2022 and its main target groups, the importance of participating in Census 2022, ways to ensure proper participation, starting date of the census, misconceptions and key barriers, and finally, assuring readers of full confidentiality about their information.

This phase had eight main campaign elements and they were:

1. Outdoor and indoor campaigns

   — The GASTAT launched outdoor teaser campaigns through 1,010 faces covering all regions for three days. The concept of these teaser questions was to address selected questions which can only be answered through census outputs, such as:

   - How many stadiums do we need in this city?
   - How many residential areas do we need in this city?
   - How many public parks do we need in this city?
   - How many doctors are there in your neighborhood?
   - How many entrepreneurs are there in your neighborhood?

These outdoors teasers were followed by an eleven-day revealer campaign that answered all previously advertised questions across KSA.

2. Educational motion graphics and social media content

   Three hashtags were initiated **#نعد لنعد**، #10مايو،**#تعداد_السعودية_2022** to attract more attention and raise census knowledge to the public. The hashtags had a total of 345k mentions with over 1 billion impressions 270k retweets and 83 likes. Neutral sentiments were dominant in hashtags responses mainly due to the high-volume interactions. A total of twelve educational infographics and posts were shared, three motion graphics, and three main visuals across the selected platforms. Customized targeted campaigns were executed through Facebook and Instagram. These shared main visuals and infographics highlighting the importance of census data in seven different language

formats with a target reach of 10+ million people.

3. Introductory film: The campaign intro film had shared through the six most popular social media platforms in Saudi Arabia: Twitter, Facebook, Instagram, YouTube, Snapchat, and TikTok. The video had collected a total of 17.3 million views and more than 80 million impressions as it shared across and promoted through these platforms by partners.

4. Influencers: A list of more than 24 influencers across the selected platforms had participated in promoting Census 2022 with their individual style and method of presenting to their audience in order to gain more attention and participation to the census

5. Joint campaign (census partners): Participating in raising awareness about the census were multiple public and private embassies. Ministry of Learning dedicated a part of the school's morning broadcasts entirely to the census subject. They also used 10 minutes from class time to educate students about the Saudi census. Also, contributions with internal communications by providing access to affiliates communication channels and social media engagements from the embassy of the Philippines and embassy of Pakistan helped raise awareness within the huge expat communities. On the other hand, the main private sector contribution was from Nadec after a Ramadan campaign agreement was signed to advertise the census through their platforms and products

6. Media partnerships: Signed agreements with the Kingdom's leading TV channel SBC helped to educate viewers about the Saudi census. A 6-minute comedy sketch scene on Sukar Zyadah, one of SBC's main shows, was the highlight of this successful agreement. Another partnership was secured with MBC to include two vignettes in their leading comedy show studio 21 and clear all census misconceptions through a brief 30 second comedy style scenes

7. Kiosks: In malls , kiosks were continued until the launch of self-enumeration, aimed at raising awareness, educating the public and driving participation. Kiosks were spread across 25 cities in 29 locations ensuring maximum physical exposure to the public

8. PR activities: Twelve opinion editorial publications from the finest editorial writers in Saudi Arabia were launched . TV appearances by both GASTAT leadership and experts increased transparency and user trust in the census. Also, a total of ten radio appearances composed of interviews and reports were released. In addition, ten press releases were published on multiple different platforms. Finally, press reports and podcasts were also utilized to spread awareness regarding the census

9. Short films and mall campaigns: Four short films were created to help drive participation in self-enumeration. They asked questions from the census questionnaire and tackled the main misconceptions around it Malls were decorated with key visuals that called people to action towards achieving a successful census program.

Participation

The following efforts were made to maximize participation in the census process:

1. The countdown campaign: This effort had a heavy presence on digital screens to increase awareness regarding the census date through daily countdowns prior to Census Day, and to encourage participation in the census through self-enumeration

2. Census kick-off event: Hosted on Census Day with main speakers being HE Minister

of Economy and Planning and the President of GASTAT. This event was attended by HRM the Minister of Interior, HRH the Prince of Riyadh, Census Steering and Executive Committee Members, and many other leaders and prestigious personalities. The event was well-documented and covered live through multiple media channels both in the KSA and internationally.

3. Main campaign video and key visuals launched on different channels announcing the start of the census to increase drive participation rates.
4. Engagement campaign on social media: This involved collaborating with various public figures and influencers as they shared their experience of completing self-enumeration. A unique hashtag was also launched, using which people participated and shared their thoughts and opinions.
5. Unified census hour and partnerships: These ensured participation from both private and public sectors during a pre-determined hour – called 'census hour' - and offer incentives to participants.
6. Radio advertisements: Announced the census start date and raised awareness and participation levels.
7. Non-Saudi campaigns: Highlighted visuals translated into seven different languages and contributions from embassies and their social platform and presence
8. Social media reminders: Promoted content and through public sector developed applications (e.g., Tawakallna and Absher)
9. Mall Kiosks: Utilized across 13 regions to raise awareness and participation levels for self-enumeration. They were used to answer census-related questions.

The risk register had a total of 55 risks that have been identified, of which 18 are active strategic risks. Strategic risks were those that could affect the overall business objectives and classified on a rating mechanism that classifies risks as extreme, high, medium, low, and very low.

2.7. OVERVIEW OF CENSUS 2022 IMPLEMENTATION PHASES

Census 2022 had three implementation phases: data collection, data processing & quality assurance, and dissemination.

- Data collection required conceptual planning and innovation across 3 important categories: address canvassing, development of the self-enumeration tool, and capacity planning for field enumeration.
  - Address canvassing was required to accurately identify units to be enumerated through field visits and self-enumeration. During address canvassing, over 5 million households were visited to facilitate either in-person enumeration during the census questionnaire or self-enumeration. Over 17,000 interviewers of 4 different levels were deployed across 13 regions of the kingdom from September to November 2021 to accomplish these goals. The address canvassing effort resulted in significant learnings for Census 2022 across operations, infrastructure, and communication
    - Self-enumeration allowed individuals to complete the questionnaires

themselves through QR Codes that link individuals to their residences. A tailored enumeration approach was also developed to collect data from those in communal establishments such as hospitals, prisons, or student dormitories. Other specific enumeration approaches were taken for 4 special population groups in KSA:

- Bedouins: Address canvassing and data collection were conducted simultaneously due to lack of stable addresses
- Saudis abroad: Census 2022 utilized administrative data from the Ministry of Education, the Ministry of the Interior, and the Ministry of Foreign Affairs to determine the number of Saudis abroad – however, less information was counted from them
- Military: The Saudi Armed Forces Data were leveraged to determine the number of Saudis in barracks and other military installations
- Diplomats: The Ministry of Foreign Affairs provided data on diplomats abroad

— Capacity planning: The number of households requiring enumeration was estimated based on data gathered from the address canvassing phase and altered based on specific assumptions for number households per vacant property, holiday property, and public house. From this number of households, the number of interviewers required was estimated based on a constant ratio of households-per-enumerator, taking into account their required travel and break time. After estimating the number of interviewers required for the Kingdom's households, the required oversight force was estimated from ideal span of control ratios with subordinates. These ratios considered both the oversight role's responsibilities as well as key learnings on span of control from the pilot. The combination of capacity estimates for interviewers and the oversight force resulted in approximately 31,000 field force workers leveraged for Census 2022

- Data processing included critical inputs from the Central Quality Assurance team (CQA), who were tasked with reviewing, testing, and analyzing the data from Census 2022's data collection phase. The CQA accomplished these goals through 3 sub-teams:

  — Data Quality Analytics: This team was responsible for "Modelling and Research" and "Edit and Imputation"

  - Modeling and Research included leveraging data from the census questionnaire's automated error detection tool to flag re-interviews. They also modeled aggregated incoming data to flag skewed ratios
  - Edit and Imputation (Data Imputation) included fine-tuning and test tool specifications

  — Data Quality Interviewers: This team was responsible for: 1. Validating statistical outliers through re-interviews, 2. Eliminating systematic errors by re-interviewing a sample of respondents from the interviewer tool, and 3. Logging responses and outcomes from interviews

  — Reporting and Documentation: This team had dual responsibilities for reporting and tracking agreed KPIs at pre-defined frequency and documenting methodologies used for data validation and data treatment

- The Census 2022 dissemination process was designed to ensure that data products and services offered met the needs of end-users. GASTAT's dissemination approach

for Census 2022 had four objectives:

- Satisfy the needs of all types of end-users
- Present, or custom develop, data in a visualized way that was easy to understand
- Offer data at granular levels of KSA geography
- Present data by topic to provide easy access to users and topic experts

- The new dissemination approach transformed GASTAT's offering, providing services of varying complexity tailored to different users' needs. These included ready made output tables with key statistics most useful to average users and allows access to Public-Use Microdata Files (PUMF) through the GASTAT Statistical Database (SDB) to access more granular samples of data.
- Disclosure control measures were put in place to prevent the disclosure of personal identification information (PII) and identifiable attributes. After careful evaluation, GASTAT adopted a data record-swapping approach for disclosure control. This approach chose a targeted record considered to pose a disclosure risk, found another record with similar attributes (generally within the locality), and swapped the geographies of the two records. This reduced the risk of any records being identified with individual residents, and – at the same time – fulfilled the criterion of additivity of census aggregates.

Many themes cut across the different phases and processes to support the success of Census 2022, including operational teams, technology, quality, communications, program management, risks, governance, and cybersecurity.

- GASTAT established specialist teams to carry out operations in each area of the census. These included a Census Quality Assurance team, interviewer helpline, public call center, and the interviewer team comprising field force and supervisors
- GASTAT developed targeted learning journeys for the thousands of interviewers as field staff. Training was also offered to many others from GASTAT temporarily functioning as desk staff, quality reviewers, inspectors, and supervisors. These capabilities were built through the development and delivery of over 20 interactive digital training modules, along with practical field training
- The Census 2022 technology infrastructure was hosted in a secure cloud environment on servers in Saudi Arabia. The infrastructure was built for scalability to allow seamless connections for self-enumeration and data collection tools, sufficient back-up levels on all core systems, and a high level of data security
- GASTAT established a Census Quality Assurance (CQA) team to ensure high quality census processes and outputs. This team, which oversaw the census process, had come into full force in preparation for the data processing phases and acted as the command center of Census 2022. Its focus was iterative operational planning, data quality, and leadership progress updates
- Penetration testing and vulnerability assessment were conducted on the Census infrastructure. Architecture Configuration Review (ACR) and Compromise Assessment (CA) was conducted on the environment to increase the cybersecurity posture. All

Census applications, websites, and systems were tested and regularly monitored. The Census infrastructure was monitored 24/7 and infrastructure had built-in security controls such as WAF, NOC, IPS/IDS/NGFW, EDR, EPP and Network Behavior Anomaly detection)

- A communication campaign was launched to inform the public of the purpose of the census and the importance of participation, emphasized data security and privacy, and highlight the need for people to provide complete and accurate data. Mass media and targeted social media campaigns leveraged prominent figures and known influencers to reach various segments of the public. Segment target groups were identified and categorized as the result of a comprehensive qualitative and quantitative research program that classified the public based on their perception and behavior towards the census
- GASTAT had set up an internal and external operating model and governance structure, including roles and responsibilities, required committees, and meeting cadence. A program management process was developed specifically to maintain performance quality and build a delivery assurance operating system. This included different types of periodic reports, each with their own frequency and targeted audience
- GASTAT built an integrated governance model to effectively manage census implementation. This covered four components: organizational structure; roles and responsibilities; interaction model; and meeting cadence. An escalation mechanism was developed that allowed for fieldwork-related matters to raise up to the president of GASTAT, and allowed project-mode escalations to be made through the president all the way to HE Minister of Economy and Planning
- Potential COVID-19 disruptions and lack of sufficient coordination were identified as potential risks to the success of Census 2022. GASTAT actively worked to mitigate these risks through a range of initiatives, including COVID-19 guidelines for field work training, deployment, and governance covering the full range of stakeholders including MOH's Public Health Authority.

2.8. HOW CENSUS 2022 WILL IMPACT THE PUBLIC

1. The public was asked to participate in the address canvassing exercise. This created a complete and accurate address list and spatial database for all census takers in KSA. GASTAT completed this exercise in November and estimated 7.2 million addresses and 5.4 million households across 13 regions of the Kingdom. During Census 2022, field workers aimed to cover all addresses in the Kingdom to ensure address data was accurately updated
2. A census pilot targeting a sample of KSA residents was conducted from September to November 2021. This pilot was conducted across two chronological phases. Phase 1 covered 6,000 households and 5 regions from September to mid-October, and Phase 2 covered 18,000 households across 2 regions in the first 2 weeks of November 2021. Households were provided with the opportunity to self-enumerate during the pilot, though many chose to convert to field enumeration after seeing how convenient the process was for their neighbors. Nevertheless, approximately ~300 households in the pilot program reported their data through the self-enumeration tool.

Across both phases, interviewers collected data on 24,000 households and tested GASTAT's technological tools for Census 2022. The pilot program resulted in important learnings across 9 operational areas, including but not limited to the census questionnaire itself, field operational processes, IT tools, and training processes.

3. A comprehensive national and local communications campaign was launched to ensure the public was informed about the purpose of Census 2022, the importance of participation, and the need for people to provide complete and accurate data. The campaign started approximately 4 months before the Census and ran through Census Reference Night (May 10th, 2022). During this period, the public heard about the census from multiple communication channels, including mass media, targeted social media campaigns, and advertising

4. The five-week Census 2022 collection period was launched on 10th May 2022. During this time, residents received links on their mobile phones and emails with a request to complete the census questionnaire online. Even if they chose to complete the online questionnaire, a subset was still visited by a GASTAT field staff and/or call center agents to validate certain details. If residents did not complete the census online, they were visited by GASTAT field staff to conduct the enumeration for the household

5. Census 2022 included questions about personal circumstances, education, occupation, and housing unit details. On average, a typical household spent around 30 minutes to complete the questionnaire

GASTAT would not disclose to any person or entity identifiable information of any data provided in the census questionnaire. The data collected was guaranteed the highest level of protection using strict statistical disclosure control measures. This method ensured that no personal, identifying information or identifiable attributes were disclosed.

2.9. CENSUS STAKEHOLDERS

Census 2022 required the support of a broad range of stakeholders. To obtain this, GASTAT established census committees to work with external entities to improve governance and drive active participation.

EXHIBIT 1B:
STAKEHOLDERS IN THE CENSUS

Steering Committee

1. Ministry of Economy and Planning (Chairman)
2. Ministry of Interior
3. Ministry of Energy
4. Ministry of Defense
5. Ministry of Health
6. Ministry of Education
7. Ministry of National Guard
8. Ministry of Municipal and Rural Affairs and Housing
9. Ministry of Investment
10. Ministry of Finance
11. Ministry of Commerce
12. Ministry of Foreign Affairs
13. Ministry of Human Resources and Social Development
14. Chairman of Communications & Information Technology Commission
15. General Authority for Survey & Geospatial Information
16. Saudi Data and Artificial Intelligence Authority / National Information Center
17. National Cybersecurity Authority
18. Strategic Management Office
19. King Abdulaziz City for Science & Technology
20. Saudi Post
21. General Authority for Statistics

Steering Committee is ministerial level whose members are ministers or chairmen for the Executive Committee and the census group entities

Census Group

1. Ministry of Interior
2. Ministry of Energy
3. Ministry of Defense
4. Ministry of Health
5. Ministry of Education
6. Ministry of National Guard
7. Ministry of Municipal and Rural Affairs and Housing
8. Ministry of Investment
9. Ministry of Commerce
10. Ministry of Foreign Affairs
11. Saudi Data and Artificial Intelligence Authority / National Information Center
12. National Cybersecurity Authority
13. General Authority of Zakat and Tax
14. General Authority for Survey & Geospatial Information
15. General Authority for Statistics (Chair)
16. Small & Medium Enterprises General Authority - Monshaat
17. Communications & Information Technology Commission
18. General Organization for Social Insurance
19. King Abdulaziz City for Science & Technology
20. Digital Government Authurity
21. Saudi Post
22. Saudi Telecom Company
23. 23. Saudi Electricity Company
24. 24. Saudi Aramco (compounds)
25. 25. Saudi Information Technology Company (SITE)

Executive Committee

1. HE Minister of Economy and Planning, (Chairman)
2. Ministry of Interior
3. Ministry of Health
4. Head of the Strategic Management Office (SMO)
5. Director of the National Information Center
6. President of General Authority for Statistics, Census program general supervisor, (Vice-Chairman)
7. International expert (Mr. David Kalisch)

Decision influencers who also have Supporting Roles as part of Census group

Initial List of Local Committees entities1

Common entities across regions

1. Regional Emirate Offices
2. Regional Police Departments
3. Regional Municipalities
4. Ministry of Education - Education Department
5. Ministry of Health
6. Governorate Offices

Entities in a specific region

7. Ministry of Defense
8. Ministry of National Guard
9. Regional Border Guards
10. Saudi Post
11. Saudi ARAMCO (compounds)

Other entities will be added depending on the region needs…

Safety & security Committee entities

1. General Authority for Statistics
2. Ministry of Interior
3. Ministry of Health
4. Ministry of human resources and social development
5. Center for Communication and Knowledge Prospection
6. Saudi Data and Artificial Intelligence Authority / National Information Center
7. Presidency of State Security

List of media committee entities

1. General Authority for Statistics (Chair)
2. Ministry of Interior
3. Ministry of Sport
4. Ministry of Commerce
5. Ministry of Health
6. Ministry of Education
7. Ministry of Communication and Information Technology
8. Ministry of Media
9. High Media Committee
10. Center for Research and Knowledge Networking
11. Center for Government Communication
12. Saudi Press Agency



3
CENSUS 2022 PREPARATION

تعداد السعودية
SAUDI CENSUS
التعداد العام للسكان والمساكن 2022

3. CENSUS 2022 PREPARATION

3.1. CENSUS FRAME

In the first phase of census preparation, GASTAT updated the national address system to make sure the census could target every KSA resident. It followed a hybrid approach to updating the address database using both geospatial modeling supported by a geographic information system (GIS), and address canvassing by field workers. The hybrid model had robust approach to finding new addresses, especially in rural areas, and could be used to find new addresses for other purposes.

3.1.1. GEOSPATIAL MODELING

For the first time in Saudi Arabia, a geospatial model that identified changes to the Saudi map (new residential buildings, demolished buildings) was used to enhance address canvassing for the housing and population census. The geospatial model leveraged external datasets (geolocations of anonymized mobile phones data, electric meters data, postal data, and satellite imagery) to ensure full geographic coverage of the population. By combining multiple layers of data, the geospatial model could predict residential locations on the map (e.g. newly built structures). Identified locations without a national address were visually confirmed through site visits and added to the database.

The GIS model used open datasets. Rural and urban models were developed using these open datasets to find new addresses. The approach used a decision tree ensemble model to estimate the probability of a building in each 100-meter by 100-meter grid cell by mapping the 10 open datasets.

The model's algorithm – which covered 200 million grid cells – used hyperparameter tuning, cross validation, threshold tuning by geographical area using precision-recall curves, and a probability calibration test.

EXHIBIT 2: AN EXAMPLE HEATMAP OF BUILDING PROBABILITIES

The GIS model was based on high-resolution satellite imagery and a deep learning algorithm developed to find buildings. The deep learning CNN estimated the probability of a building existing in each 100-meter by 100-meter grid cell. The model used ResNet50 and binary cross-entropy, applied to classify around 2 million image chips of grid cells.

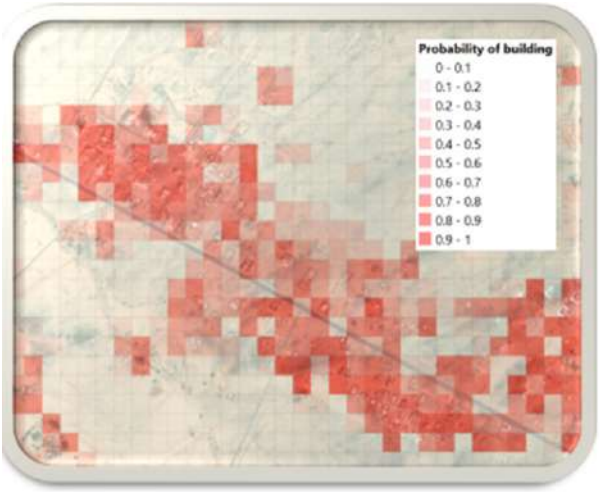


EXHIBIT 3: EXAMPLE OF BUILDINGS DETECTED BY GIS MODEL

More than 40,000 new addresses were identified using the open datasets model for rural areas. This compared to 22,000 potential new addresses for the satellite imagery model used on five cities. The geospatial model was continuously updated in order to provide additional benefit prior to the Census period in May 2022.

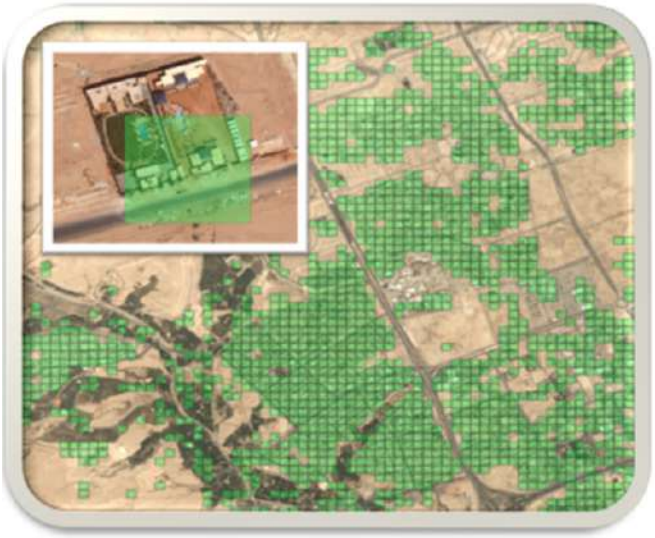


EXHIBIT 4: QR CODE STICKERS PLACED ON THE HOUSEHOLD DOOR



3.1.2. ADDRESS CANVASSING

A detailed, cutting-edge address canvassing approach for Census 2022 was developed. This approach ensured interviewers had a master address list with all valid addresses across the Kingdom.

Address canvassing efforts relied on national addresses provided by the Saudi Post along with the outcomes of the geospatial modeling. All national addresses were then visited and confirmed by field staff prior to the count.

Address canvassing was conducted across the Kingdom with 4 main objectives:

- Verify all addresses in the country that were collected from Saudi Post's dataset and the geospatial model
- Number and reference all households with unique QR codes that record key features of the unit (# of residents, head of household's ID, building type, etc.)
- Introduce the self-enumeration method and register residents' interest
- Optimize capacity planning for the data collection phase by collecting key inputs (e.g. household distribution, interviewer efficiency)

During address canvassing visits, a QR sticker was applied to each unit in the Kingdom, the address was entered into the database, and the QR code was scanned. This created a location reference for each unit. Once the reference was established, basic information including the structure type, building type, National ID of the head of the household, primary contact information, and the number of people living in the household were collected and linked to the same location reference (QR code and address).

The QR code placed on each household's door during address canvassing was required for self-enumeration (for both the head of household and other family individuals). If a resident did not have a QR code on their door, they could request it through the public call center.

3.2. USE OF ADMINISTRATIVE DATA

Administrative data from multiple sources were leveraged in order to cross- validate the information collected throughout the census and support the data collection process itself. Basic information on households was prepopulated on the self-enumeration tool as well as on the interviewers' tablets. At the data processing phase after data collection, administrative data could also be drawn on when imputation was needed on missing variables or statistical units.

Nevertheless, priority was given to data collected directly from people and households over the information available through administrative data.The assumption was that the data collected through the census was more up- to-date and the information provided directly from the statistical unit was more accurate. Given that not all groups of the population were well covered by administrative records (informal society), data consistency of the census was better provided by prioritizing collected census data over administrative data information.

Establishing a broad range of continuous administrative data streams helped to keep GASTAT's population register, which was created during the census exercise, up-to-date and prepared the ground for accurate population information even between census exercises.

EXHIBIT 5:

ADMIN DATA SOURCES FOR VALIDATION OF POPULATION VARIABLES AND FOR CONSTRUCTION AND MAINTENANCE OF POPULATION REGISTERS

Mapping of data fields to sources

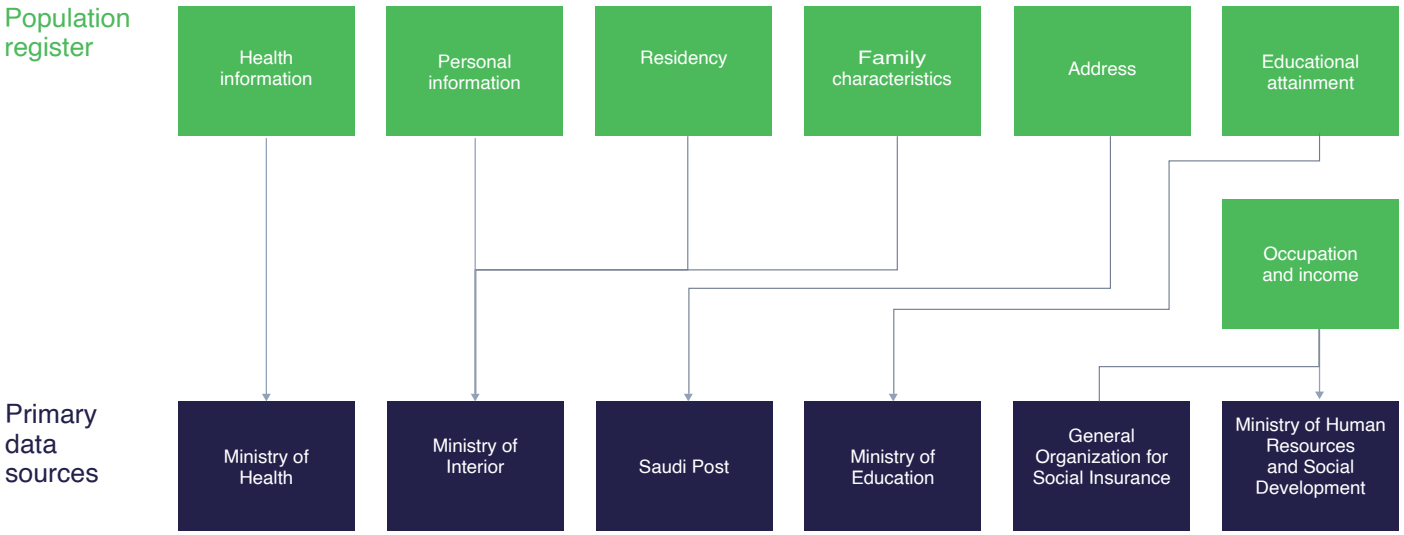
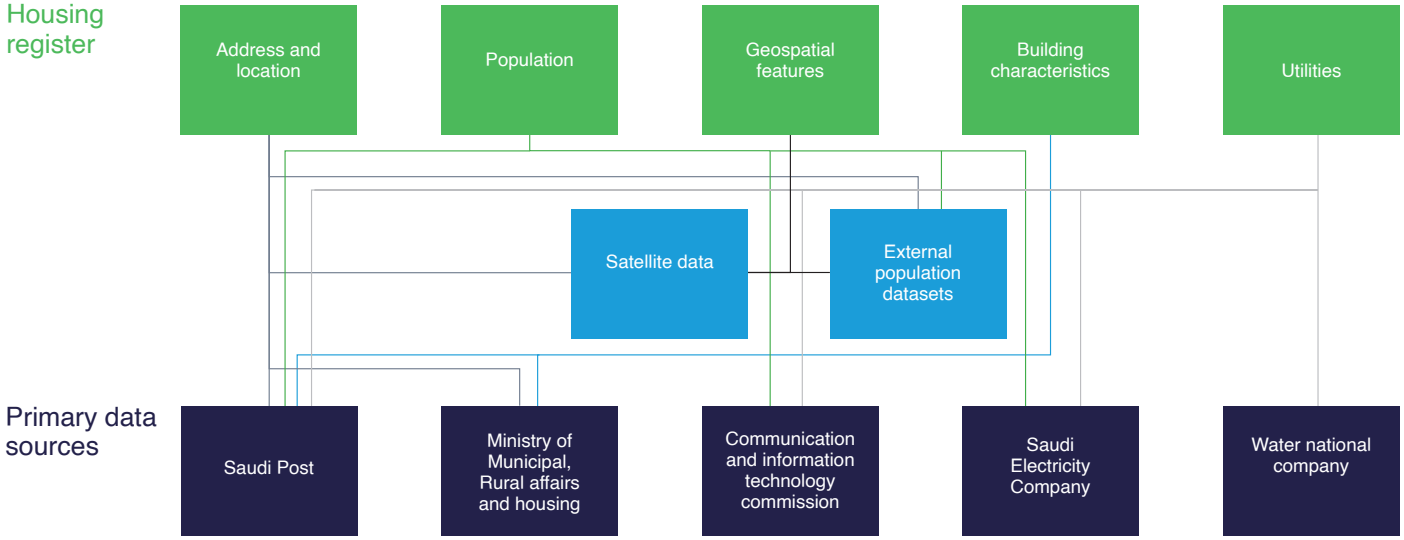


EXHIBIT 6:

ADMIN DATA SOURCES FOR VALIDATION OF HOUSING VARIABLES AND FOR CONSTRUCTION AND MAINTENANCE OF HOUSING REGISTERS

Mapping of data fields to sources



3.3. CENSUS 2022 QUESTIONNAIRE

To complete the development of the census questionnaire, GASTAT defined the variables that needed to be collected from residents. This was done according to international guidelines and standards in order to make data from the KSA census comparable internationally. After these variables were determined and agreed on with key KSA stakeholders, GASTAT formulated questions to be asked of residents, the questions were grouped to cover areas like personal information, education, work status, health, and housing details.

3.3.1. DE JURE CENSUS APPROACH

The questionnaire was developed to ensure that GASTAT conducted census 2022 using a "de jure" approach that enumerates people according to their usual place of residence. The "de facto" census, which was applied in 2010 enumerates people wherever they happen to be on the pre-defined Census Reference Night. The "de jure" approach was usually applied in statistically more advanced countries and had the advantage of providing much more accurate residential information needed for planning and policy purposes. The typical de jure approach was customized for KSA context and the following special cases were defined:

1. The family home was the usual place of residence for a person who worked away from home during the week and returned to the family home on the weekend
2. The family home was the usual place of residence for primary and secondary school students and college or university students who lived away throughout the term, regardless of how often they returned to the family home
3. The family home was considered usual place of residence for members of the armed forces who were residents in barracks and camps
4. For nomads, the place of enumeration was their usual place of residence
5. For a child who alternated between two places of residence (e.g., divorced parents), the place where he/she spent most of his/her time was the usual place of residence. In case of equal time with both parents, the usual place of residence was the place where the child was on the census reference day
6. Public housing institutions (e.g., hospitals, prisons etc.) were the usual place of residence of all their inhabitants if they resided there at the time of the census, or planned to spend twelve months or more residing there
7. Merchant seamen and fishermen who normally resided within KSA but were at sea at the time of the census were included in their family home as the usual place of residence
8. Foreign military personnel, sailors, diplomats, and their families were not counted as residents in KSA regardless of their length of stay in KSA (as their usual place of residence was outside KSA)
9. Saudi military personnel, sailors or diplomats living abroad were counted; They were given the address of their family home in Saudi Arabia (or any virtual address if they did not return to the place from which they left)
10. When passing through a real estate unit with non-resident tourists or foreign diplomats, they were asked only general demographic questions
11. Saudi nationals, who were residents outside of KSA were not part of the census target population and hence were not included in the overall population of residents in KSA. Nevertheless, basic information of this group was collected through administrative data and was made available separately from main census results.

3.3.2. QUESTIONNAIRE DEVELOPMENT AND VARIABLE SELECTION

Extensive research and stakeholder engagement was conducted to finalize the design of the Census 2022 questionnaire variables.

International best practices were reviewed and aligned with key KSA stakeholders prior to taking any action. GASTAT reviewed the censuses of several countries including the US, the UK, Germany, other EU countries, Singapore, and Australia to identify the strengths of each. Answer choices were carefully developed using international guides and classifications (like the ISCED classification of educational attainment), and by consulting with experts who were onboarded on the local Saudi context. The final variables included details on personal information, family members, educational background, work status, housing standards, and health status of family members.

Derived variables were also planned to be introduced for the first time in KSA to expand on the data collected from the questionnaire. This allowed information collected to be expanded and allowed insights to be generated from the direct variables listed above. An example of a derived variable would be the 'age' calculated from the 'date of birth' variable or the 'total duration of residence in country' deduced from the 'date of arrival to the country' a resident provides.

The structure and format of the questionnaire was built directly based on international benchmarks.

The questionnaire was created in the top seven languages (Arabic, English, French, Urdu, Hindi, Bengali, and Tagalog) spoken in KSA to accommodate all residents.

GASTAT took additional measures to ensure the questionnaire flow was smooth:

- For a better user experience, conditional logic was built into the questionnaire to show or hide questions based on answer choices in previous questions
- For both resident and interviewer interfaces, help text was embedded into each question to explain the variable and answer choices
- The languages of the questions were optimized to improve clarity of question and increase quality of data

The variables and questionnaire went through six testing steps (expanded on in the Testing section of this document) to ensure the readiness of the final questionnaire to be used in Census 2022

3.3.3 CATEGORIES OF VARIABLES IN THE CENSUS QUESTIONNAIRE

Census questionnaire contained 6 key categories of variables which were:

1. Personal: These included variables pertaining to demographics of the population and their personal attributes and characteristics. Statistics generated from this data was used to provide decision makers with a broad understanding of the different characteristics of a population when making crucial policy decisions.

   — Variables included:

   - Sex
   - Date of birth
   - Marital status
   - Country of citizenship
   - Place of usual residence
   - Relationship to head of household
   - Spoken language

2. Education & literacy: Included variables pertaining to education enrolment, educational qualification, and literacy level of the population. Statistics generated from this data were used to measure changes in education over time, evaluate the educational attainment of the population, and understand education needs of the population

   — Variables included:

   - Education enrolment
   - Educational attainment
   - Field of study
   - Literacy skills (reading and writing)

3. Migration: Included variables pertaining to migration of residents into and outside of KSA and within KSA. Statistics generated from this data were used to set and evaluate immigration laws, understand the experiences and characteristics of different immigrant groups, and plan for internal and external migration

   — Variables included:

   - Country of birth
   - Country of birth of parents
   - Place of usual residence 12 months prior to the census
   - Residence abroad and year of arrival in the country

4. Employment: Included variables pertaining to labor force, occupation, and job market of KSA. Statistics generated from this data played an important role in estimating the labor force size, developing labor force plans and policies, and monitoring changes & identifying trends in the labor market and workforce

   — Variables included:

   - Monthly total disposable income
   - Labor Force Status
   - Status in employment
   - Occupation
   - Industry/ Economic activity
   - Establishment sector
   - Location of place of work

5. Disability & health: Included variables pertaining difficulties for individuals in conducting tasks due to disabilities and chronic diseases. Statistics generated from this data helped plan and fund programs for people with disabilities and evaluated & implemented government programs and policies to ensure needs of individuals with disabilities and chronic health conditions were met.

   — Variables included:

   - Disability status
   - Chronic health conditions

6. Housing unit: Included variables pertaining the characteristics of the dwelling or housing unit and details about occupancy and ownership. Statistics generated with this data helped measure the development of KSA dwellings and improvements required in facilities for housing units

   — Variables included:

   - Type of housing
   - Type of residence
   - Type of ownership
   - Useful floor space
   - Number of rooms of housing units
   - Internet access
   - Electricity supply
   - Water supply system
   - Main Source of Sewage Disposal
   - Building construction material
   - Ownership of a second private property and construction material

Households Questionnaire of the General Population 2022 and Housing Census

These data shall be kept confidential at the General Authority for Statistics and will only be used for statistical purposes
by Royal Decree NO.(m 13) dated 23 4 1391 A. H.

Administrative Region | Governorate | Centre | Populated area | Building Number in National Address | Real Estate Unit No.

Survey No. | Interviewer | Observer | Inspector | Supervisor

Individual Serial Number

1 Individual's full name

First name | Last name

2 Individual's ID No.

National ID No./Iqama No./Visitor Border No.

3 What is your relationship to the head of household?

- Head of household
- Wife/Husband
- Son/Daughter
- Daughter-in-law/ Son-in-law
- Grandson/Granddaughter
- Father/Mother
- Brother/Sister
- Grandfather/ Grandmother
- Other family relative
- Housekeeping
- No relationship

4 What is your gender?

- Male
- Female

5 What is your date of birth?

Enter the individual's date of birth using a Gregorian or Hijri date
How old are you in years? (For those who do not know the date of birth)

Day | Month | Year | Age

6 What is your place of birth?

If the place of birth is KSA, write the administrative region and governorate below
Write the name of the country for those who were born abroad

Inside KSA | Outside KSA

7 What is your mother tongue?

- Arabic
- English
- French
- Chinese
- Spanish
- German
- Nepali
- Bengali
- Urdu
- Hindi
- Rohingya
- Indonesia
- Tagalog
- Sinhala
- Other (Specify)

8 What is your nationality?

General Authority for Statistics
Kingdom of Saudi Arabia

Households Questionnaire of the General Population 2022 and Housing Census

تعداد السعودية
SAUDI CENSUS 2022

These data shall be kept confidential at the General Authority for Statistics and will only be used for statistical purposes
by Royal Decree NO.(m 13) dated 23 4 1391 A. H.

Administrative Region	Governorate	Centre	Populated area	Building Number in National Address	Real Estate Unit No.

Survey No.	Interviewer	Observer	Inspector	Supervisor

9 What is your marital status?
For male individuals 15 years and above, and female individuals 9 years and above

☐ Never married ☐ Married ☐ Divorced ☐ Widowed

10 What is the number of children you gave birth to during the past 12 months?
For female Individual 9 years and aboveFor married, divorced, widowed women

Male ☐☐ ID ☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Female ☐☐ ID ☐☐☐☐☐☐☐☐☐☐☐☐☐☐

11 What is your father's place of birth?

☐☐☐☐☐☐☐☐☐☐☐☐

12 What is your mother's place of birth?

☐☐☐☐☐☐☐☐☐☐☐☐

13 Are you currently at your usual place of residence?

☐ Yes ☐ No

14 What is your usual place of residence?

If usual residence is within KSA, the administrative region and governorate shall be written below
If the place of residence is outside KSA, write the name of the country

Inside KSA ☐☐☐☐ Outside KSA ☐☐☐☐☐☐☐☐☐☐

15 Has your usual place of residence changed in the past 5 years?

☐ Yes ☐ No If no, go to question 17

16 Where did you reside before moving to your current place of residence?

If country is KSA, write city/town
If not in KSA, write the name of the country where you previously resided

Inside KSA ☐☐☐☐ Outside KSA ☐☐☐☐☐☐☐☐☐☐

17 Have you ever resided outside KSA?

☐ Yes ☐ No If no, go to question 20

18 In which country did you reside before arriving in KSA for your current or most recent period of residence?

☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

تعداد السعودية
SAUDI CENSUS 2022

Households Questionnaire of the General Population 2022 and Housing Census

These data shall be kept confidential at the General Authority for Statistics and will only be used for statistical purposes
by Royal Decree NO.(m 13) dated 23 4 1391 A. H.

Administrative Region | Governorate | Centre | Populated area | Building Number in National Address | Real Estate Unit No.

Survey No. | Interviewer | Observer | Inspector | Supervisor

19 What year did you arrive in KSA for your current period of residence?

Select the year of entry into KSA for the current or most recent period of residence.

Year (Gregorian) ☐☐☐☐

20 On Census Reference Night (10 May 2022/ 9 Shawwal 1443) were you enrolled in any educational institution? (Eg. nursery, school, PhD, etc.)

☐ Yes ☐ No

If no, go to question 22

21 What level are you currently enrolled in?

- ☐ Early childhood education (nursery)
- ☐ Pre-primary education (kindergarten)
- ☐ Elementary without completing a level (elementary grades)
- ☐ Primary education
- ☐ Intermediate education (general)
- ☐ Intermediate education (vocational)
- ☐ Secondary education (general)
- ☐ Secondary education (vocational)
- ☐ Associate diploma (general)
- ☐ Associate diploma (vocational)
- ☐ Intermediate diploma (general)
- ☐ Intermediate diploma (vocational)
- ☐ Academic bachelor's degree (3-4 years)
- ☐ Academic bachelor's degree (5 years)
- ☐ Bachelor of Arts (5 years)
- ☐ Higher diploma
- ☐ 6-year undergraduate program
- ☐ Master's degree
- ☐ PhD

22 What is the highest educational level you obtained?

For Individuals 3 years and above

- ☐ No Qualification
- ☐ Early childhood education (nursery)
- ☐ Pre-primary education (kindergarten)
- ☐ Some primary education without completing the level
- ☐ Primary education
- ☐ Intermediate education (general)
- ☐ Intermediate education (vocational)
- ☐ Secondary education (general)
- ☐ Secondary education (vocational)
- ☐ Associate diploma (general)
- ☐ Associate diploma (vocational)
- ☐ Intermediate diploma (general)
- ☐ Intermediate diploma (vocational)
- ☐ Academic bachelor's degree (3-4 years)
- ☐ Academic bachelor's degree (5 years)
- ☐ Bachelor of Arts, 5 years
- ☐ Higher diploma
- ☐ 6-year undergraduate program
- ☐ Master's degree
- ☐ PhD

23 Can you read and write in any language?

☐ Yes ☐ No

General Authority for Statistics
Kingdom of Saudi Arabia

Households Questionnaire of the General Population 2022 and Housing Census

تعداد السعودية
SAUDI CENSUS 2022

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by Royal Decree NO.(m 13) dated 23 4 1391 A. H.

Administrative Region | Governorate | Centre | Populated area | Building Number in National Address | Real Estate Unit No.

Survey No. | Interviewer | Observer | Inspector | Supervisor

24 In which field of study did you obtain your highest educational level?
Individuals 15 years and above
For individuals who have secondary certificate or above

25 In the last 7 days, did you work for at least one hour?
Individuals 15 years and above

Work for wage, salary, or any commission, or work in any private activity owned or partly owned by him or assist in a family-owned business

☐ Yes ☐ No If no, go to question 32

26 What is your type of employment?
Individuals 15 years and above

- ☐ Paid employee
- ☐ Employer (with hired employees)
- ☐ Self-employed (without hired employees)
- ☐ Helper (without pay) in a family business
- ☐ Paid apprentice
- ☐ Other type of employment

27 What is your current occupation?
Individuals 15 years and above

28 What is the name of your employer?
Individuals 15 years and above

29 What is the main economic activity associated with your employer?
Individuals 15 years and above

30 Whatbest describes the sector of your employer?
Individuals 15 years and above

- ☐ Government sector
- ☐ Public sector enterprise
- ☐ Private sector enterprise
- ☐ Agricultural sector
- ☐ Domestic worker
- ☐ Non-profit organization
- ☐ International organizations or foreign embassy
- ☐ Other sectors (please specify)

31 Where is your place of work?
Individuals 15 years and above

If in KSA, specify the city and neighborhood. If not in KSA then, write the name of the country

Inside KSA | Outside KSA

32 During the past four weeks, did you actively look for a job, followed up on a submitted job application or try to start a business?
Individuals 15 years and above

☐ Yes ☐ No

33 If a job or business opportunity became available, could you have started it during the week before the visit or the two weeks after the visit?
Individuals 15 years and above

☐ Yes ☐ No

تعداد السعودية
SAUDI CENSUS 2022

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Administrative Region | Governorate | Centre | Populated area | Building Number in National Address | Real Estate Unit No.

Survey No. | Interviewer | Observer | Inspector | Supervisor

34 Have you ever worked before?
Individuals 15 years and above

☐ If yes, go to next question

35 When (what month of what year), did you stop working?
Individuals 15 years and above

Month ☐☐ Year ☐☐☐☐

36 Which of the following best describes what you are currently doing?
Individuals 15 years and above

- ☐ Studying
- ☐ Taking care of the home/family
- ☐ Doing an unpaid apprenticeship, internship
- ☐ Farming or fishing to produce food for the family
- ☐ Retired, pensioner
- ☐ Long term illness, injury, disability
- ☐ Doing unpaid voluntary, community, charity work
- ☐ Other (specify)

37 On average, how much money do you have available per month?

- ☐ No income
- ☐ 1 - 999 SAR
- ☐ 1.000 - 2.999 SAR
- ☐ 3.000 - 4.999 SAR
- ☐ 5.000 - 9.999 SAR
- ☐ 10.000 - 19.999 SAR
- ☐ 20.000 - 29.999 SAR
- ☐ 30.000 - 39.999 SAR
- ☐ 40.000 - 59.999 SAR
- ☐ 60.000 - 79.999 SAR
- ☐ 80.000 SAR and more

38 Do you have any health difficulties such as mobility, vision, hearing, etc.?

☐ Yes ☐ No

39 Do you have any difficulties, when you do the following activities:

	Some difficulty	A lot of difficulty	Cannot do it at all
Seeing (even if wearing glasses)	☐	☐	☐
Hearing (even if using hearing aids)	☐	☐	☐
Walking or climbing stairs	☐	☐	☐
Remembering or concentrating	☐	☐	☐
Personal Hygiene (washing or dressing)	☐	☐	☐
Communication (understanding or being understood)	☐	☐	☐

40 Do you have any chronic diseases like diabetes, blood pressure, clots, etc.?

☐ Yes ☐ No

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Administrative Region	Governorate	Centre	Populated area	Building Number in National Address	Real Estate Unit No.

Survey No.	Interviewer	Observer	Inspector	Supervisor

41 Have you ever been diagnosed by doctors with any of the following chronic diseases or health problems?

- ☐ Arthritis
- ☐ Asthma
- ☐ Cancer (all types of cancer)
- ☐ Dementia (including Alzheimer's)
- ☐ Diabetes (excluding gestational diabetes)
- ☐ Kidney failure
- ☐ Heart disease (including heart attack, angina, or cardiac insufficiency)
- ☐ Lung condition (including COPD or emphysema)
- ☐ Mental Disorder
- ☐ Stroke
- ☐ Obesity
- ☐ Autism
- ☐ Blood pressure
- ☐ Nervous system disease (including multiple sclerosis and epilepsy)
- ☐ Any other long-term health condition(s) (Specify)

42 What type of housing unit is your current dwelling?

- ☐ Villa
- ☐ Floor in a villa
- ☐ Traditional house
- ☐ Floor in a traditional house
- ☐ Apartment in a multi-story building
- ☐ Apartment in a villa
- ☐ Apartment in a traditional house
- ☐ Tent
- ☐ Encasement/Shack
- ☐ Other (specify)

43 What type of residence is your current dwelling?

- ☐ Permanent residence
- ☐ Seasonal residence (a period of the year)
- ☐ Temporary residence

44 What type of residence is your current dwelling?

- ☐ Owned without mortgage or loan
- ☐ Owned with mortgage or loan
- ☐ Rented
- ☐ Provided by government employer
- ☐ Provided by private employer
- ☐ Provided by charities
- ☐ Provided by a family member
- ☐ Provided by philanthropist
- ☐ Other (specify)

45 How many rooms are there in your current dwelling?

Number of bedrooms	
Number of other rooms (living rooms, extra rooms)	
Number of kitchens	
Number of bathrooms	

Respondent:	Mobile Number:	E-mail:

تعداد السعودية
SAUDI CENSUS 2022

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Administrative Region	Governorate	Centre	Populated area	Building Number in National Address	Real Estate Unit No.

Survey No.	Interviewer	Observer	Inspector	Supervisor

46 Do you have Internet access in your dwelling (such as DSL, Fiber, Router, mobile internet 3G, 4G, 5G etc.)?

☐ Yes ☐ No

47 What is the main source of electricity in your current dwelling?

☐ Public network provided by Saudi Electricity Co.
☐ Other private company
☐ Personal owned generator
☐ Other (specify)
☐ No source of electricity

48 What is the main source of water in your current dwelling?

☐ Public network ☐ Tank ☐ Well ☐ Other (specify)

49 What is the main source of sewage disposal in your current dwelling?

☐ Public network ☐ Septic tank ☐ Private network ☐ Other (specify)

50 What is the main type of building material of your current dwelling?

☐ Concrete ☐ Block/brick ☐ Clay ☐ Stone ☐ Other (specify)

51 Do you own another house in the Kingdom?

☐ Yes ☐ No

52 What are the languages of communication at your home?

☐ Arabic ☐ English ☐ French ☐ Chinese ☐ Spanish
☐ German ☐ Nepali ☐ Bengali ☐ Urdu ☐ Hindi
☐ Rohingya ☐ Indonesian ☐ Tagalog ☐ Sinhala ☐ Other (specify)

Date:	Interviewer:	Inspector:

EXHIBIT 7:
BENCHMARKS USED TO ESTABLISH THE QUESTIONNAIRE FORMAT AND STRUCTURE

Mapping of data fields to sources

Characteristics	Length of survey	Format of questions	Categories of questions
	Number of questions in the census questionnaire were minimized and solved for only the desired inputs that cannot be obtained from registers	Majority of questions were either multiple choice (or /yes /no where applicable), unless unavoidable	Categories of questions focused on data that contributed to census objectives and information which could not be obtained from registers
Example countries			

3.4. STAKEHOLDER INVOLVEMENT

GASTAT played the central role in organizing and implementing Census 2022, but it required the support of a broad range of stakeholders. Stakeholders and success partners included those engaged in field work support, administrative support, communication support, IT and digital support, strategic support, and data provision. In addition to providing specific functions and services, these stakeholders sat on various groups and committees that helped govern and advise the census process.

GASTAT had established an interaction model with those external entities by creating census committees. These committees improved governance and drove active participation from all key stakeholders. These committees included:

- Steering Committee: An advisory committee that supported the census project in accordance with the roles required by the member entities. It also provided institutional and political support to GASTAT to ensure the achievement of the objectives and implementation of the results of the census project as per approved plans
- Executive Committee: An advisory committee that supported GASTAT in conducting an accurate census and provided the necessary vision, perspectives, and expertise to oversee the planning, implementation, risk mitigation, and success of Census 2022
- Census Group: The group provided the necessary support to GASTAT in conducting an accurate census and provided expertise and support on specific aspects of the census program as representatives of member entities (e.g., SDAIA and NIC as partners for administrative data to enhance collected data accuracy and optimize data collection process, Wiqaya through MOH provided health protocols for field workers, etc.). It also supported local committees to implement their mandates and roles and briefed the Steering Committee on updates and potential risks, where necessary.

- Local Committees: The committees served as a coordination body, providing support to overcome any difficulties faced by workers when implementing the field work of the census program. They also provided human and material support to leverage the capabilities of members for the success of the general population and housing census in each region
- Media Committee: The committee coordinated communication to stakeholders and oversaw national public and private sector communication channels execution of the awareness campaign. It determined the roles and responsibilities of the entities according to their potential, increased the cross-sector focus on the census based on the census strategy, and ensured that the media was aligned with census operational requirements

3.5. TECHNOLOGICAL TOOLS DEVELOPMENT

GASTAT had already built enumeration tools. These tools were built using a four-step process: define business needs, design the system, develop the tools, and finally test and launch the tools. These tools included:

- The “Census interviewer” tool was used by the field force to conduct, support, and monitor field activities, such as address canvassing and data collection. The census interviewers accessed the tool via both a tablet app and a URL
- The “Self-Enumeration” tool was used by the general population to self-submit the questionnaire, and was accessible through a URL from multiple online devices

GASTAT had already assessed the tools across eight dimensions:

1. Architecture: How was the overall architecture structured? Were presentation layers and core systems decoupled? Did a standard catalogue of reusable IT services exist?
2. Availability: What was the availability level of core systems? What was offered in terms of quality of service (vs. required SLA)?
3. Scalability: What was the scalability level of current technologies?
4. Capabilities: Were the current capabilities sufficient to implement the solution
5. Data management: Did a single repository/golden source for data exist? Was the data qualified for decision making?
6. Security: What were the security measures in place? Was our system secure against cyberattacks?
7. Testing: How mature was the testing methodology and test environment?
8. Development: How modular and up to date was the development of the application?

3.5.1. INTERVIEWER TOOL

The census interviewer tool was a tablet-based application that was used by interviewers to collect questionnaire results from respondents. The 2022 Census was the first time fully digital enumeration was used in the Kingdom.

EXHIBIT 8:
ASSESSMENT CONDUCTED ACROSS 13 CRITERIA FOR USER-FRIENDLINESS OF TOOLS DEVELOPED



1. Transparency: The solution always provided appropriate visual and/or substantive feedback to inform users about what is happening
2. Easy-to-understand language: Content in the solution was written for the level of the intended users and was structured in a clear and recognizable way
3. Flexibility: Users were able to cancel, reverse, correct, or and skip over actions if possible. It was easy for a user to save progress and return to it later
4. Efficiency: Users were able to operate the solution with as little difficulty as possible. Redundant actions were avoided and repetitive actions were comfortable or automated
5. Relevance: The solution was structured to assist the users in their most important actions or tasks. Interactions were simple and focused – no superfluous content or functionality
6. Consistency: Users were able to discover and become familiar with the solution, content and functionality. The structure encouraged learnability and reduce confusion
7. Error prevention: The solution structure prevented situations in which errors were likely. It would warn users and ask them to confirm important choices when necessary
8. Support to correct errors: Error handling and feedback were formulated in easy-to-understand language, describing the problem precisely, and proposing a constructive resolution
9. Add itional information: When necessary, the solution provided additional information to complete difficult or complex actions or tasks
10. Responsivity to end-user's device: The design, functionality, interaction elements and controls of the solution adequately adapted to the devices that the user is operating from
11. Assistive technologies: Where possible, the solution was easily accessible by users of varying abilities (or disabilities) and varying technological expertise
12. Attractive design: The look and feel (design) of the solution was visually appealing and make its inherent functionality understandable
13. Legibility: The application presented information and actions in easy-to- read fonts structures

A series of tests and analyses were carried out to ensure a smooth user experience (UX) with the enumeration tool, including a UX analysis based on Nielsen's Heuristic evaluation method and in- depth user testing. The user testing included scenario and use- case testing (based on user type) and error testing (creating errors in input to discover feedback and messaging flow).

3.5.2. SELF-ENUMERATION TOOL

The self-enumeration approach was developed as a digital innovation to keep up with the technological and social changes within the Saudi population. GASTAT ensured the success of the tool by taking into consideration the complete self-enumeration journey with a focus on questionnaire access touchpoints and the linkage of individuals to households.

A series of tests and analysis were carried out to ensure a smooth user experience (UX) with the enumeration tool including: UX analysis based on Nielsen's Heuristic evaluation method and in-depth user testing. The user testing included scenario and use-case testing (based on user type) and error testing (creating errors in input to discover feedback and messaging flow). The tool concept designs were developed taking into account learnings from UX analysis.

Once the self-enumeration process was completed, several validations running in the background were set to trigger a field visit. Validation errors included inability to link to household, address not matching, or data quality errors that the quality call center was unable to correct. Alongside the developed enumeration approaches, kiosks and call centers were set up to encourage collaboration for the census and provide support for both enumeration channels.

EXHIBIT 9:
EXTRACTS FROM THE INTERVIEWER'S TOOL

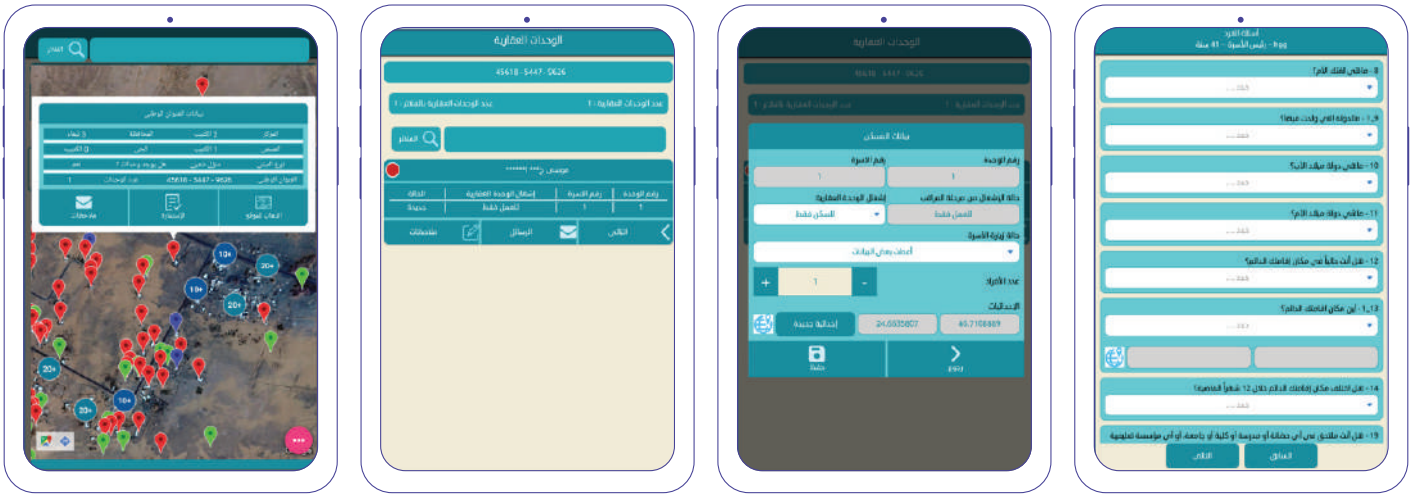
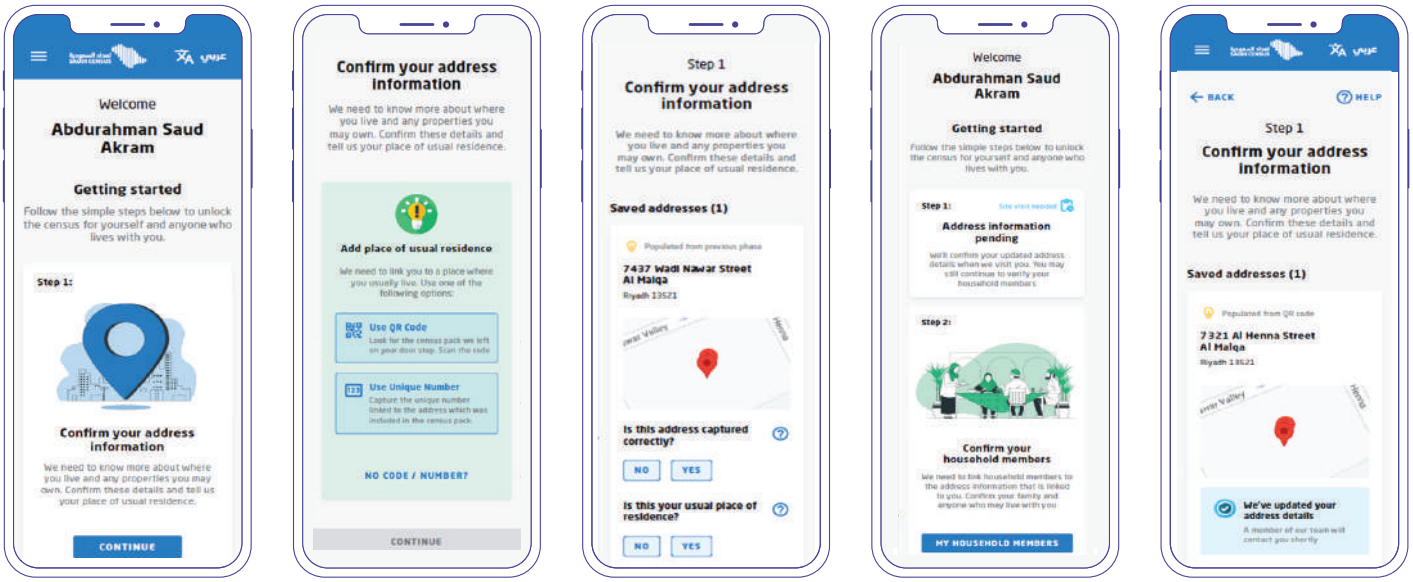


EXHIBIT 10:
EXTRACTS FROM THE SELF-ENUMERATION TOOL



3.5.3. CONTROL ROOM AND DASHBOARDS

The Control Room was conceived as a decision-making and coordinating body that supervised and supported execution of Census 2022. In this capacity, the Control Room had 5 main objectives:

- Monitor data during the collection phase: The Central Quality Assurance team was responsible for reviewing incoming information during the census and ensuring that overall data collection efforts were meeting their targets
- Direct daily ground operations: The operating team monitored the day-to-day operations of interviewers through regional supervisors that helped Operations update interviewers' functions based on emerging priorities
- Support both on ground and technical teams: The Operations and IT Support teams provided guidance and proactively supported by analyzing trends and reports on incoming data. They were also responsible for offering immediate on-ground support to interviewers and technical teams that submitted support requests
- Engage the control room with external and internal parties: The control room facilitator enabled the control room to become an integrative department that integrated various internal and external stakeholders (e.g. MoH, MoL, MoE) if needed for various operational and administrative needs
- Monitor all-flash alerts: The Security Operations Center team was responsible for reviewing and tracking all-flash alerts during the census and ensuring that all required security issues were fixed.

The Control Room's overall structure was designed to achieve these objectives via well-defined roles and responsibilities for both Leadership and the Control Room Team.

— Leadership responsibilities were centered on taking strategic decisions for the overall Control Room team

- Census General Supervisor: The census general supervisor was responsible for taking important strategic decisions that may affect the course of the census program. In addition, the general supervisor would act as the main point of contact for the Control Room's communications with the GASTAT's leadership and external entities

- Census Program Manager and Deputy Program Manager: The program manager and his deputy were responsible for leading Control Room operations and for taking important on-the-ground decisions. These decisions were the result of critical operational problem-solving sessions with the Operations team. Program managers would also escalate any strategic issues to the Census General Supervisor. Also, they were responsible for creating a summary report to the GASTAT leadership about the daily operations.

- The Control Room Team's responsibilities concern the day-to-day running of the Control Room's operations and tactical completion of its adjectives. However, these responsibilities vary across 4 roles:

  - Control Room Facilitator: Room facilitators oversaw the process of informing program managers by submitting daily reports and escalations. They would also facilitate and promote cross functional coordination between teams. In addition, room facilitators would support operating and controlling room dashboards

  - Operations Team: This team was responsible for monitoring on-ground operations providing directions and support. Also, they may escalate barriers through control room screens and daily meetings to leadership.

  - IT Support: The IT support team were focused on monitoring the IT infrastructure to ensure it was running during data collection hours with all the IT metrics updated on the control room dashboards. IT support also solved IT related issues and aided technical teams as needed.

  - Data Quality Analytics: This group's primary objective was to monitor data quality collected through its various streams (Self, Field) and check for hard and soft errors that needed immediate actions. They also drew daily sample questionnaires, analyzed data, and coordinated with operations on corrective actions while ensuring quality metrics were updated on control room dashboards.

  - Communications: This group monitored public call center indicators and ensured calls were answered and requests were satisfied. In addition, communications also updated call center metrics on the control room dashboards

- To help monitor progress of the census count, the Control Room displayed illustrative dashboards with KPIs that were selected for both ease of implementation and impact on improvements to the census count. The dashboards that monitored progress via these KPIs were created across 4 categories:

  - Operations (e.g., the number of submitted questionnaires per head of household or individual, the number of partially completed questionnaires, and the number of rejections)

  - Call center (e.g., number of calls by type, average call duration, average answer speed)

  - Information Technology (e.g., number of errors or crashes on interviewer and self-enumeration tools, average issue resolution time)

  - Quality (e.g., number of sampled questionnaires, number of identified hard or soft errors).

EXHIBIT 11:
KPIS COVERED THREE CATEGORIES, EACH WITH A SET OF COMPONENTS COVERING SEVERAL INDICATORS (1/2)

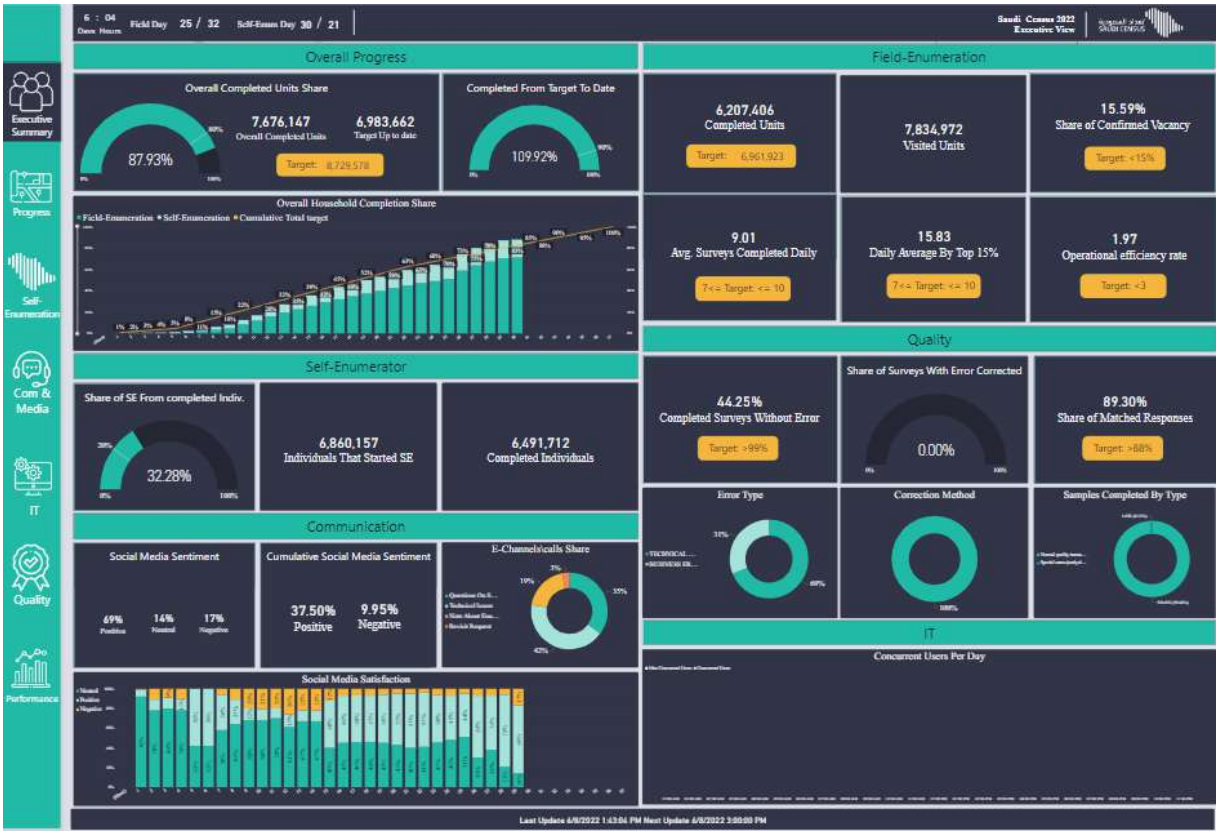
Category	Component	Indicators	Pilot vs. census	Frequency	Data source
Population facing processes, tools and systems	Field force operations	Total number of responses collected through field enumeration by geography (provinces, EAs, urbanicity1, operational difficulty1)	◆◆	Near-real time	Interviewer tool
		Total number of responses collected through kiosks by geography (provinces, EAs, urbanicity1, location)	◆◆	Near-real time	Interviewer tool
		Total number of responses collected per Census Interviewer	◆◆	Near-real time	Interviewer tool
		Average time taken to complete questionnaire	◆	Daily	Interviewer tool
		No. of incidents reported by type (e.g., refusal to enumerate)	◆◆	Daily	Report to supervisor
		No. of incidents resolved by type	◆◆	Weekly	Report to supervisor
		Satisfaction rate of Interviewers	◆	Once	Interviewer tool
		Inputs from Interviewers on field work challenges	◆	Once	Interviewer focus group
		Perception of public towards field enumeration process	◆	Once	Resident focus group
	Self-enumeration tool	Total number of responses collected through self-enumeration by geography (provinces, EAs, urbanicity1)	◆◆	Near-real time	Self-enumeration tool
		Average time taken to complete questionnaire	◆◆	Daily	Self-enumeration tool
		Total number of residents that accessed survey link	◆	Daily	Self-enumeration tool
		Number of registration errors	◆◆	Daily	Self-enumeration tool
		Percentage of residents who successfully registered after accessing survey link	◆◆	Daily	Self-enumeration tool
		Number of accessed surveys that were not completed	◆◆	Weekly	Self-enumeration tool
	Call center	Average time taken to complete questionnaire	◆◆	Daily	Self-enumeration tool
		Incoming call pick-up rate	◆◆	Daily	Self-enumeration tool
		Average time to resolve an incident	◆◆	Daily	Self-enumeration tool
		Percentage of questionnaires completed following phone conversation	◆◆	Daily	Self-enumeration tool
		Number of incidents reported by callers by type (e.g., tool crashed, question not clear, etc.)	◆	Daily	Self-enumeration tool
		Number of accessed surveys that were not completed	◆	Weekly	Self-enumeration tool
		Average number of follow-up calls required per respondent until self-enumeration was completed	◆◆	Weekly	
		Feedback from callers	◆◆	Daily	
	Technology	Number of errors / crashes on Interviewer tool by type	◆◆	Daily	Interviewer tool
		Number of errors / crashes on self-enumeration tool by type	◆◆	Daily	Self-enumeration tool
		Average time to resolve errors / crashes by type	◆◆	Daily	Technology team
		Average time for prepopulated data to load on Interviewer tool	◆◆	Near real-time	Interviewer tool

EXHIBIT 11:
KPIS COVERED THREE CATEGORIES, EACH WITH A SET OF COMPONENTS COVERING SEVERAL INDICATORS (2/2)

Category	Component	Indicators	Pilot vs. census	Frequency	Data source
Population facing processes, tools, and systems	Comms	Total number of reach by communication channel	◆	Daily	Comms vendor
		Total number of reach by geography	◆◆	Daily	Comms vendor
		Number of clicks / views for digital communication channels	◆	Daily	Comms vendor
Internal processes, tools, and systems	Staff[1] training	Number of staff and supervisors hired vs. planned	◆◆	Once	
		Number of staff and supervisors scheduled to be trained	◆◆	Once	
		Number of staff and supervisors that completed training	◆◆	Daily	
		Staff and supervisor dropout out rate from trainings	◆◆	Daily	
		Number of staff and supervisors vaccinated for COVID	◆◆	Daily	
		Feedback from staff on effectiveness of training	◆	Once	
	Field force command and control	Feedback on command and control structure from field force and supervisors	◆	Once	Field force and supervisors
	Targeted address canvassing	Total number of target addresses visited by geography (provinces, EAs, urbanicity1, operational difficulty1)	◆◆	Near-real time	Address canvassing tool
		Total number of target addresses visited by field staff	◆◆	Near-real time	Address canvassing tool
		Inputs from field staff on address canvassing challenges	◆	Daily	Field staff
	Technology	Number of errors / crashes on address canvassing tool by type	◆◆	Daily	IT team
		Average time taken to resolve errors / crashes by type	◆◆	Daily	IT team
		Average time taken for data processing from Interviewer tool, self-enumeration tool and address canvassing tool to GASTAT	◆◆	Daily	IT team
		Average time taken for data from self-enumeration to refresh on Interviewer tool	◆◆	Daily	Modelling team
	Data quality	Missing data and errors by Interviewer, admin area, region, overall	◆◆	Daily	Modelling team
		Deviation of dataset against comparators, overall forecasts	◆◆	Daily	Modelling team
		Non-response rate by Interviewer, admin area, region, overall	◆◆	Daily	Modelling team
		Number of data outliers (flagged as per business rules)	◆◆	Daily	Modelling team
		Error detection rate as per re-interviewed respondents	◆◆	Daily	Modelling team
GIS model	GIS tool	Number of hits / misses of model outcomes (accuracy of model)	◆	Daily	Maps team
		Number of addresses changed by category (e.g., added, merged, separated, removed, etc.)	◆◆	Daily	Maps team
		Average time taken to make the changes to the GIS	◆◆	Daily	Maps team
		Number of addresses from kiosk enumeration not in the GIS model	◆◆	Daily	Maps team

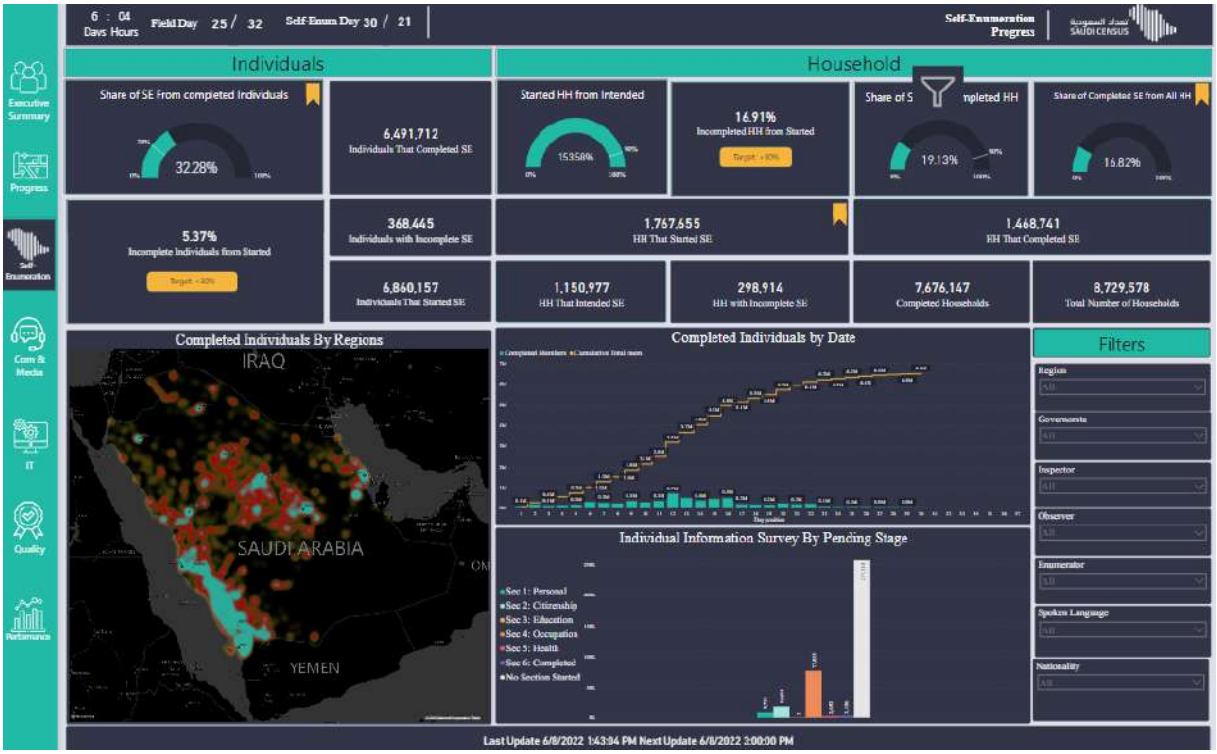
EXECUTIVE SUMMARY:

The executive summary dashboard showcased an overall view of all the main figures from all the other dashboards. Information from the progress, self-enumerator, communication, quality, field-enumeration, and IT dashboards were all compiled in one summarized view that gave users a direct view on the status of the program. Each dashboard summary was also aided by visuals that made the process of deriving valuable insights easier.



SELF-ENUMERATION:

The self-enumeration dashboard tracked enumeration progress from both household and individual perspectives. On the individuals side it tracked individuals that completed SE and those who have started SE and the number of individuals that started but haven't completed the form. The dashboards also gave the same information in a percentage format so that KPIs can be tracked easier. In addition, a heat map of Saudi Arabia is provided to visualize completion rates by region alongside other visualization graphs that helped users quickly understand the current state of individual SE. All visualization tools could be controlled with filters as users could customize their graphs depending on their needs. The filter gave users the ability to choose regions, governorates, inspectors, observers, enumerators, spoken language and finally nationality. The dashboard also provided the same depth and level of analysis to analyze households.



PROGRESS:

The progress dashboard tracked overall, field, and self-enumeration progress. In the overall progress section, information regarding completion of target to data, the percentage of error free completed units, and the total number of completed units are showcased. Under field progress section, we could easily track the overall number of visited units alongside other specific metrics. In this section we could analyze the percentage of units completed at first visit, operational efficiency, and the daily completion rate per enumerator. Also, users could view the confirmed and unconfirmed vacancy rates. Finally, this dashboard also summarized information regarding self-enumeration like total number of completed individuals and the share of SE from the total number of completed individuals. The dashboard also had visualization properties like heat maps and graphs that allowed users to visualize data depending on their required filters.



PERFORMANCE:

The performance dashboard tracked both census completion and enumeration completion at any period that the user would like to analyze. It could also provide information separately or for both types of enumeration either field or self-enumeration. It could also present data in either a cumulative or daily and has visualization properties that made data easily interpreted. All visual supporting tools could be controlled using filters that allowed users to specify their analysis all the way down to the enumerator level.



3.6. TESTING

3.6.1. CENSUS QUESTIONNAIRE TESTING

GASTAT extensively tested the census questionnaire and enumeration tools to gather insights from both respondents and interviewers to enhance quality and usability.

GASTAT tested three formats of the questionnaire: an online version, a self-enumeration tool, and an interviewer tool. The testing followed six rigorous steps to prepare it for the pilot census:

- Prepare the variables for the census: This step developed the variables used in the census questionnaire to meet census objectives. It was used to guide the questionnaire's structure and the output dissemination processes
- Develop a preliminary questionnaire: The team developed a draft version of the questionnaire from the variables. This was used as a guide for internal teams and experts to help formulate the questionnaire

EXHIBIT 12:
TESTING DEMOGRAPHICS CONSIDERED 11 SEPARATE SUB-CATEGORIES

Demographic characteristics	Distribution for testing				Applicable testing population
Age range	1 15-29 - 30%	2 30-44 - 40%	3 45-59 - 20%	4 60+ - 10%	All testing sessions
Sex	1 Male - 60%	2 Female - 40%			All testing sessions
Marital Status	2 Married - 60%	1 Other (nevermarried, divorced, widowed) - 40%			All testing sessions
Nationality	1 KSA - 70%	2 Non KSA - 30%			All Arabic testing sessions
	1 KSA - 20%	2 Non KSA - 80%			All English testing sessions
	1 India - 100%				All Hindi testing sessions
	1 Pakistan - 100%				All Urdu testing sessions
	1 Bangladesh - 100%				All Bangladesni testing sessions
Family status	1 With children - 60%	2 Without children - 40%			All testing sessions
Place of usual residence	1 KSA, rural areas - 20%				All testing sessions
	1 Residential homes - 80% (e.g. villa / apartment)	2 Other - 20% (labour camp, retirement home, etc.)			Online questionnaire / self-enumeration tool testing sessions
	1 Residential homes - 50% (e.g. villa / apartment)	2 Other - 50% (labour camp, retirement home, etc.)			Interviewer tool testing sessions
Resided abroad	1 Resided abroad - 30%	2 Did not reside abroad - 10%			All testing sessions
Educational errolment	1 Enrolled - 60%	2 Not enrolled - 40%			All testing sessions
Educational attainment	1 Lower than high school - 30%	2 Highschool or equivalent - 40%	3 Bachelors or higher - 30%		All testing sessions
Labour force status	1 Unemployed - 5%	2 Employed - 55%	3 Not participating in labour force - 40%		All testing sessions
Disposable income range	1 < SAR 12K - 40%	2 SAR 12K- 30K - 50%	3 > SAR 30K - 10%		All testing sessions with employed individuals

- Construct the questionnaire for pre-testing: The team conducted qualitative testing of respondents' understanding and perception of the questionnaire's topics and self-enumeration tool design. This was done in parallel with questionnaire construction and used as input to finetune the content
- Pre-testing the question concept and tool design: The questionnaire was then translated into target languages and the questions were loaded onto the self-enumeration tool
- Pre-testing the questionnaire: The full questionnaire was then tested to gather feedback on tool design, format structure, and the language of the questions. This was an iterative process with changes made to the questionnaire throughout
- Develop the final census questionnaire: The team worked with experts to incorporate recommendations from the pre-testing phase before developing the final questionnaire content and format

The initial format used had questions uploaded into an online questionnaire platform and was tested with participants. This was useful in the early phases of testing to capture respondent's feedback on topic concept, questionnaire's content, and structure. These online questionnaire test tools were not used for the census but were used as a digital vehicle for the census questionnaire.

GASTAT tested the questionnaire on two of the Census 2022 enumeration tools: the self-enumeration tool and the census interviewer tool. The questionnaire was uploaded onto the tools and tested for usability, content, and structure. Respondents were the testing audience for the self-enumeration tool and interviewers were the testing audience for the census interviewer tool.

These tests were conducted in one of 4 ways:

- Engaging focus groups (controlled group interviews) led by a facilitator to capture collective feedback
- One-on-one cognitive interviews to capture feedback on the questionnaire's content and structure
- One-on-one interviews to capture feedback on website usability, app usability, and on the questionnaire's content and structure
- A methodical review by questionnaire methodologists and questionnaire design experts

To obtain quantitative insights, small-scale individual online questionnaires were conducted and sent to a target sample.

One additional approach—respondent debriefing—captured both qualitative and quantitative insights. In this approach, respondents completed the questionnaire and then provided qualitative feedback in one-on-one interviews.

3.6.2. QUESTIONNAIRE TESTING

Testing sessions were structured to gather both qualitative and quantitative insights.

The qualitative insights tested for were:

- Understanding of topic concept
- Feedback on clarity of language in understanding questions, answers, and help text
- Helpfulness of help text for clarification
- Ease in selecting the right answer
- Sensitivity related to the questions
- Feedback on flow of questionnaire
- Feedback on design of questionnaire – fonts, icons, layout, interaction features, etc.

The quantitative insights tested for were:

- Response time for each question
- Response time for questionnaire
- Questionnaire abandonment rate
- Number of abandoned questions for each questionnaire
- Number of references to help text (embedded in tool for each census question)
- Time taken to read question
- Time taken to select or enter response

The questionnaire was tested with a sample audience carefully selected to represent all major demographic profiles in KSA. These included representative populations across age, gender, marital status, nationality, family status, type of residence, resided abroad, educational enrollment, educational attainment, labor force status, and disposable income range.

3.6.3. TECHNOLOGICAL TOOLS TESTING

Testing and validating was completed on all census applications and tools and on the supporting infrastructure.

- Census applications/tools were tested in three phases:
  - Cyclic internal testing to verify functionality and ensure requirements have been implemented
  - User-acceptance testing scenarios were simulated with the operations units to mimic census activities per application/tool
  - All applications/tools were assimilated and tested simultaneously as part of the integration testing phase

- A variety of tests were conducted to validate preparedness of infrastructure:
  - Performance load, testing speed, reliability, real-world load under various scenarios to determine infrastructure behavior and opportunities for improvement
  - Stress testing connectivity between GASTAT and National Information Center databases to ensure efficient flow of data
  - Reviewing environment design and efficiency to validate pre-defined requirements
  - Security testing census infrastructure
    - Penetration testing to identify security vulnerabilities that attackers could exploit
    - Architecture and configuration review testing combined various software and hardware to find the best configuration under which the systems and applications/ tools operated without flaws or issues while matching functional requirements
    - Compromise assessment to questionnaire the network and devices to discover unknown security breaches, malware, and signs of unauthorized access

3.7. PILOT

In addition to rigorous testing, a large-scale integrated Census 2022 pilot was carried out during September, October, and November 2021 across several phases. This started with training the pilot field force on the needed address, canvassing and data collection processes for the pilot, and ended with a review and evaluation of learnings/data.

3.7.1. PILOT OBJECTIVES AND LEARNINGS

The pilot helped the team test strategies, plans, and software in a real-time, census-like situation. It was a key project within the program allowing the team to measure the quality of data to be gathered during the census. The pilot had four main objectives:

1. Test the Census 2022 design and operating model across the execution phases of pre-address canvassing, address canvassing, data collection, data processing and quality assurance, and dissemination
2. Validate operational components across the execution phases were successful and integrated
3. Evaluate GASTAT's ability to scale up the tools, systems, processes, and operational components implemented in the pilot to deliver a full census
4. Develop clear action plans to ensure recommendations for improving the tools, systems, processes, and operational components were incorporated into the full census

Three testing areas, including several testing sub-areas, were defined for the pilot. These testing areas were:

1. Testing population-facing process, tools, and systems
   - Effectiveness of the field's force and understanding the field's operational challenges
   - Adoption of self-enumeration and the effectiveness of the self-enumeration approach
   - Call center effectiveness and the capacity required to conduct tasks

- Connectivity and functionality of the systems/tools

2. Testing internal processes, tools, and systems
   - Effectiveness of staff training and monitoring training phase gates
   - Command and control structure of the field force
   - Effectiveness of address canvassers and understanding field's operational challenges
   - Enumerator's helpline capacity and effectiveness
   - Quality of responses and approaches to improve census's quality
   - Connectivity and functionality of the systems/tools
3. Testing GIS model accuracy and coverage
   - Rural addresses model and urban addresses model (from open data)
     - Human desktop review
     - Pre-pilot ground check
     - Pilot ground check
     - Prepare final results
   - Urban addresses model
     - Model execution
     - Human desktop review
     - Pre-pilot ground check
     - Pilot ground check
     - Prepare final results

GASTAT used three guiding principles to develop a set of indicators and targets to test the sub-categories. These results were used to develop recommendations from the pilot to use in the final census design. The guiding principles were: (1) pilot performance indicators must be directly linked to pilot testing categories to ensure the pilot success was measurable; (2) indicators tracked and measured must lead to clear corrective actions and decisions—either tactical corrections during the pilot or fundamental changes in preparation for the full census; and (3) indicator targets for the pilot must be mostly aspiration based, with assumptions or benchmarks in some cases.

Indicators tracked for testing sub-areas enabled specific corrective actions during the pilot. For example, in the first sub- area (testing effectiveness of field force and understanding field operational challenges), corrective actions adjusted the operational plan to improve the quality and efficiency of field work, adjusted capacity of the field force, better train, and prepared the field force for the census.

3.7.2. PILOT PHASES

The integrative pilot was conducted from late September to mid-November to test the full census plan on seven selected areas with unique characteristics representing the whole Kingdom. This allowed all teams such as IT, operations, and training to work together to gain a better understanding of on-the- ground performance.

The pilot was conducted across two chronological phases, each corresponding to specific areas of the country:

- Pilot Phase 1 covered approximately 6,000 households across five regions (Riyadh, Eastern Province, Makkah, Asir, and Tabuk), and was conducted from late September to mid-October
- Pilot Phase 2 covered approximately 18,000 households across two regions (Al-Ula and Al-Diriyah), and was conducted from early to mid-November.

Each phase of the pilot was broken down into four phases. Each phase started immediately upon completion of the previous one:

1. Pilot initiation: This phase included planning and executing the trainings—online and in-person—and covered all management layers across census personnel. It also covered logistics, ensuring that the devices and materials developed were delivered to staff, enumeration areas were assigned to the field force, and equipment was set up for regional offices. Additionally, this phase activated the communication strategy and the census quality assurance process
2. Address canvassing: This phase covered many actions, including:
    - Prepared master address lists for address canvassers
    - Visited selected households and units and updated data collected in 2020
    - Flagged specific areas for full address canvassing
    - Updated enumeration areas based on household's count and occupancy status
    - Updated master address list based on canvassing outcomes
    - Activated public inbound call center to answer questions about census and address canvassing
    - Expanded quality assurance
3. Data collection: This phase covered the following actions:
    - Activated self-enumeration
    - Activated field enumeration
    - Activated public outbound call center and interviewer helpline
    - Expanded census quality assurance
    - Sent automated communication to encourage self-enumeration

3.7.3. PILOT LEARNINGS

Pilot learnings were extensively documented to fulfill two key functions: (1 refine the census approach based on learnings across different functions (e.g., IT, Operations, Communications, and Quality), and (2 optimize GASTAT's efforts and budget to ensure prioritization of most effective census processes. The documentation of these lessons was essential for the refinement of the census's approach and the optimization of GASTAT's efforts and budget.

Four key steps were executed to capture and document pilot learnings:

1. Teams were assigned to apply learnings from pilot insights

   Four teams were engaged to apply insights from the pilot:

   a. The Census Quality Assurance team oversaw and tracked the pilot's indicators, compiled, shared periodic reports, and extracted insights
   b. The portfolio teams generated on-the-ground insights via interviews with field forces and Saudi residents
   c. The portfolio leaders provided qualitative assessments of learnings from the pilot, prioritized those learnings, prepared the pilot report, and planned the incorporation and execution of learnings
   d. Census leadership approved prioritization, took decisions about what would be incorporated in full census, and mobilized resources to implement decisions

2. Sourced and compiled insights to develop pilot learnings

   Two sources were used to compile learnings from the pilot:
   (a) the pilot's indicators tracking; and (b) qualitative inputs from portfolio teams.

   i. A command center (with a live dashboard and predefined pilot indicators) was set up to be monitored throughout the pilot. The Census Quality Assurance team tracked and reported on the command center's key performance indicators, which helped in understanding root causes and generated fact-based insights on all issues surfaced
   ii. Key inputs from portfolio teams were used to understand the root causes of certain lagging indicators and understand their perspective on what went well during the pilot and what needed further improvement. These inputs facilitated the development of actions in preparation for the full census

3. Prioritization and ranking of key learnings and recommendations

   Proposed recommendations were prioritized and incorporated into the census based on their feasibility and impact. The highest priority was given to recommendations that had a high impact on response rate, data quality, and operational efficiency, along with the highest feasibility, in terms of implementation, testing timeline, budget and resources, and mitigated rollout risk

4. Summary of actionable learnings from pilot for full Census 2022

   Several workshops were convened to align on prioritized learnings and developed actionable next steps. The outcomes of the workshop were:

   - Business rules: Many hard errors were detected related to the changes in business rules during data collection, resulting in clarified governance for the error detection tool in the full census
   - Census questionnaire: Several technical / User Interface-related inconveniences were identified and improved before rollout of the full census (e.g., additional fields

for certain questions, improved pin-dropping functionality for location selection)

- Field operations:
  - Various minor physical or logistical issues were uncovered and improved (e.g., increasing stickiness of QR stickers, adjusted daily targets for interviewers in more rural areas with difficult terrain)
  - Turnover issues for interviewers in rural areas were identified, resulting in potential changes to the interviewer compensation and/or target package in rural areas
  - It was recognized that many households do not speak one of the pre-translated questionnaire languages, resulting in the development of the Foreign Language Assistant interviewer program
    - Governance: KPI definitions used in the control room dashboards were sometimes unclear, occasionally leading to misunderstands. This was repaired by using a single source of truth for all KPI numbers
    - IT Tools & Systems:
      - UX / UI of the questionnaire tool was improved to shorten filling time to facilitate the process for both census interviewers and self-enumerators
      - A backup option for retrieving QR codes was added in case the QR sticker was lost or misplace
    - Self-enumeration: Awareness campaigns were boosted to educate the populace on the existence and efficacy of self-enumeration
    - Training: The number of training centers were increased based on pilot bottlenecks and e-learning was incorporated



4
CENSUS IMPLEMENTATION

تعداد السعودية
SAUDI CENSUS
التعداد العام للسكان والمساكن 2022

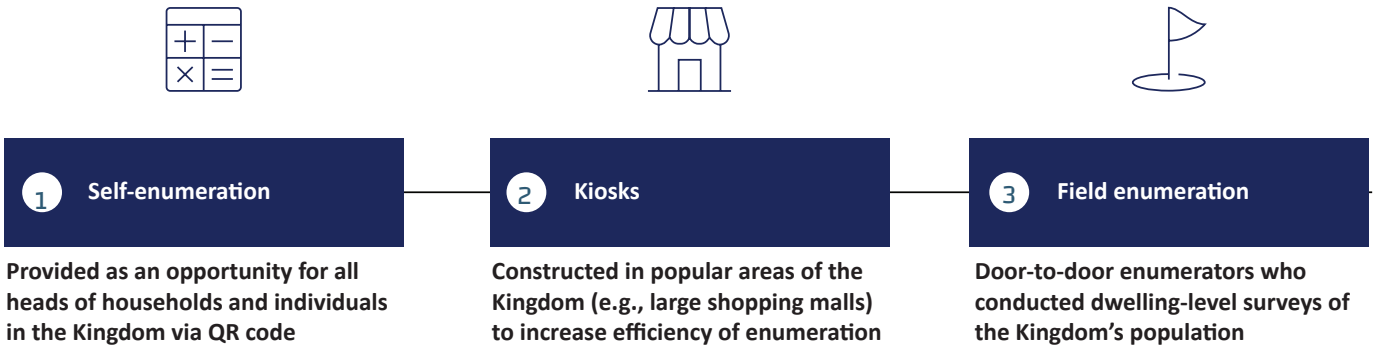
4. CENSUS IMPLEMENTATION

4.1. DATA COLLECTION

In the data collection phase of census implementation, each household unit was identified during address canvassing and the public was approached directly to gather the data necessary to ensure the highest accuracy of the required fields. The data collection phase covered both the self-enumeration and field enumeration approaches. The self-enumeration approach allowed for a head of household or an individual to complete the questionnaire on their own using one of the available platforms.

The enumeration approaches comprised: (1) field enumeration through field work; or (2) self-enumeration via online platforms. These approaches were developed using the experience of the past cycles of the census partners with the best practices worldwide, and in collaboration with multiple portfolios such as IT, quality, and operations.

EXHIBIT 13:
THREE TYPES OF DATA COLLECTION FOR CENSUS 2022



4.1.1. SELF-ENUMERATION

4.1.1.1. SELF-ENUMERATION APPLICATION

Fully digitized self-enumeration was an innovation for Census 2022. It allowed individuals to fill out the census questionnaire themselves, without the need for a field visit. Two access channels were made available to the population: URL links were sent out to head of household's mobile number or email address, and links were available on the GASTAT website for all KSA residents.

The following key principles were applied to the development of the self-enumeration tool:

- Two registration and identity verification options were allowed: The National Identity Authentication Management system (Nafath) and GASTAT's own verification system
- Heads of households or individuals within households could self-enumerate. While the head of household could submit a response for all household members, individuals could only submit a response for themselves
- The housing unit section of the questionnaire was only available for the heads of households to complete

- The head of household was allowed to submit a response for multiple household units
- If both the head of household and the individual submitted responses on the individual's behalf, the individual's submitted response overrode that of the head of household. All submitted data was maintained

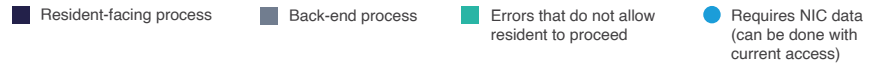
The self-enumeration journey consisted of two steps. A self-enumerator must have:

- Registered and verified their identity through either Nafath's or GASTAT's verification system
- Completed and submitted the questionnaire. Once registered, a resident was classified as either head of household or individual. Then, both the head of household and individual were asked to scan the QR code placed on their household's door to access the self-enumeration landing page. (A head of household with multiple units was asked to fill in the national ID of each wife under each address if applicable. Family members of the head of household were prepopulated with the ability to add/remove as necessary)

EXHIBIT 14:
TWO OPTIONS WERE PROVIDED FOR USERS TO REGISTER TO ACCESS FOR SELF-ENUMERATION

1 Nafath verification system

2020 plan for using Nafath registration



2 GASTAT own verification system

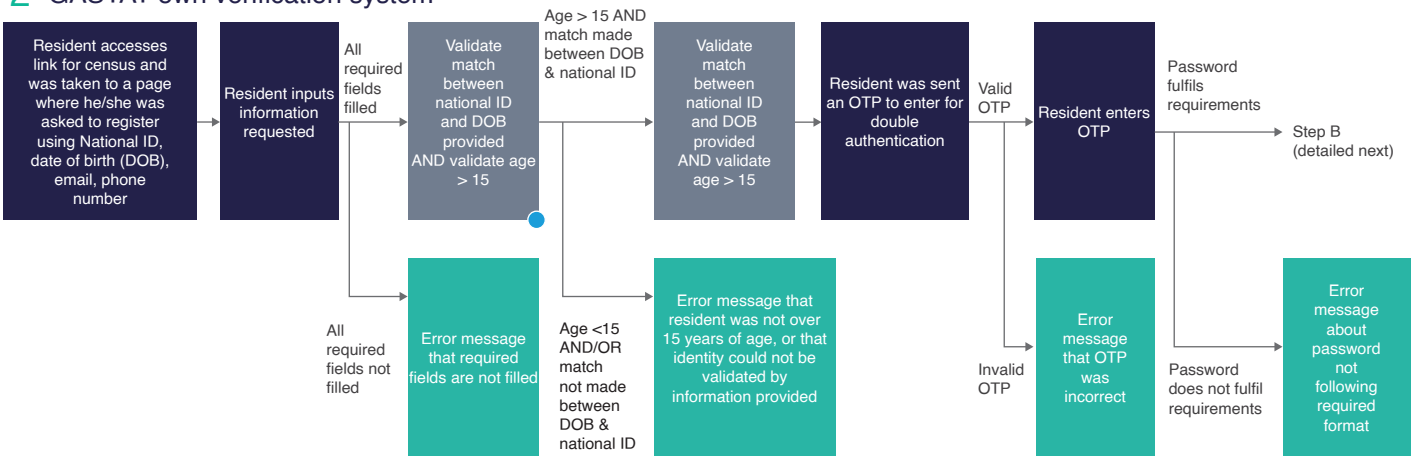
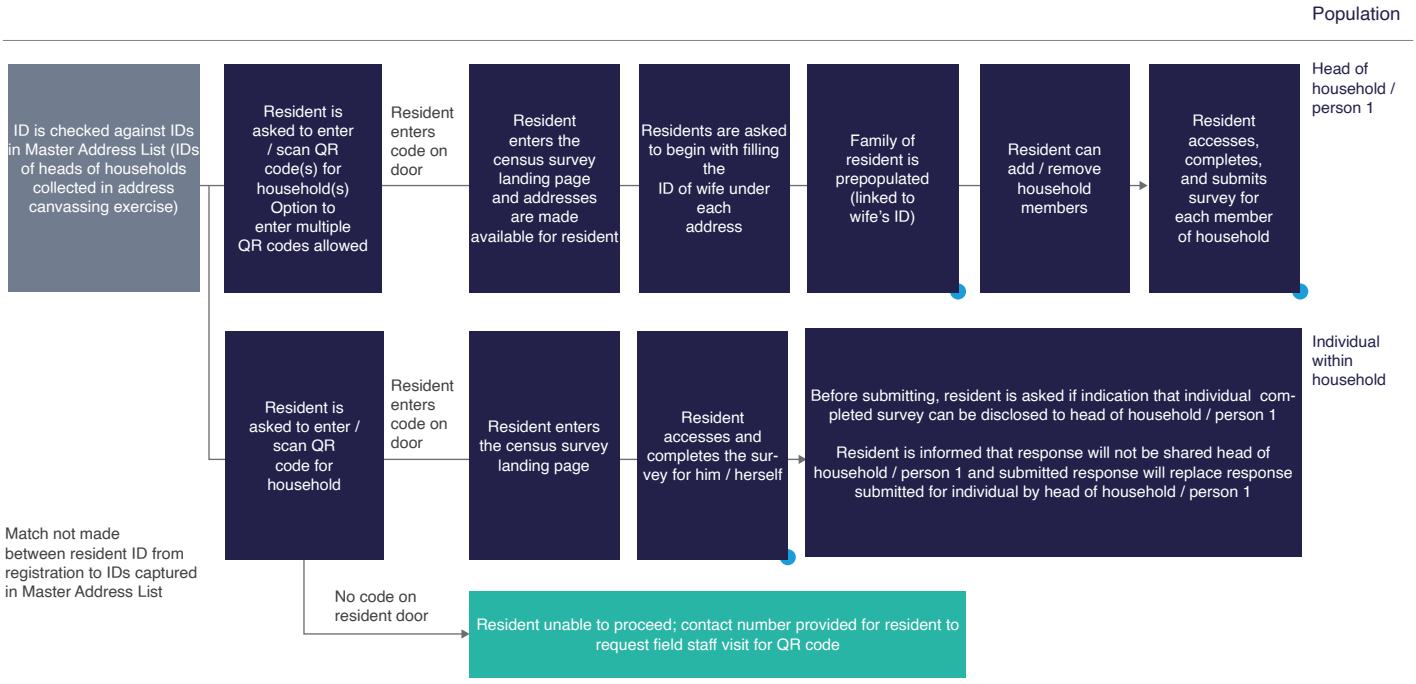


EXHIBIT 15:

PROCESS FLOW TO IDENTIFY RESIDENTS AS HEAD OF HOUSEHOLD OR INDIVIDUALS WITHIN HOUSEHOLD AND ALLOWING THEM TO COMPLETE THE QUESTIONNAIRE





Note: Head of household / person 1 definition to be detailed; steps in journey may change depending on definition of head of household / person 1

4.1.1.2. KIOSKS

GASTAT established kiosks in crowded places like central shopping malls. A kiosk was an info point with informed – mainly female- staff to provide any information on the census, as well as assist in self-enumeration. These kiosks on the one hand raised awareness of the population to participate in the census. Any information needed on the census was made available. A second function of the kiosks was to assist residents in self enumeration. This especially helped women to self-enumerate in case they did not want to receive a personal interviewer at home, when, at the same time, they felt they wanted to get technical assistance in self-enumeration.

4.1.2. FIELD ENUMERATION

4.1.2.1. FIELD ENUMERATION APPROACH

In addition to self-enumeration, field enumeration also took place, which allowed researchers to visit households who were not participating in self-enumeration and ensured they remained a part of the census count. This enumeration took place for a period of approximately 1 month starting from May 10th 2022, and was guided by the following key principles:

- The full field workforce was trained in detail to conduct all aspects of their roles; this included supervisors, inspectors, observers, and interviewers
- The full process was paperless and conducted using the field enumeration tool that was developed
- The tool was used to split areas in neighborhoods assigned to inspectors and into enumeration areas assigned to interviewers
- Each interviewer was able to access the locations and details of the full list of units assigned to them through their tool
- Additional units/households could be added at this phase even if they were missed during the address canvassing phase
- Enumerators moved from unit to unit in an orderly manner, ensuring no units were missed and they collected census information from the head of house-holds present

4.1.2.2. FIELD ENUMERATION CAPACITY PLANNING

To determine the optimal number of census interviewers, it was necessary to conduct a capacity planning estimation.

The number of households requiring enumeration was estimated based on data gathered from the address canvassing phase. From this number of households, the number of interviewers required was estimated based on a constant ratio of households-per-enumerator, taking into account their required travel and break times.

After estimating the number of interviewers required for the Kingdom's households, the required oversight force was estimated from ideal span of control ratios with subordinates. These ratios considered both the oversight role's responsibilities as well as key learnings on span of control from the pilot. The combination of capacity estimates for interviewers and the oversight force resulted in approximately 31,000 field force workers.

4.1.2.3. FEMALE CENSUS INTERVIEWERS

The KSA Census 2022 was the first census in the Kingdom to deploy female interviewers. This approach was in line with the Vision 2030's ambition to strengthen the role of women in the Saudi society. It also helped to have a more balanced impact on the data collected, as female interviewers found easier access to households where only women live.

In order to guarantee safety and security of female interviewers, a safety protocol is put in place by the Census Safety and Security committee.

4.1.2.4. FOREIGN LANGUAGE ASSISTANT INTERVIEWER APPROACH

To ensure data quality of the questionnaire, GASTAT developed best-practice policies for the enumeration of non-Arabic-speaking households. Given that non-Arabic-speaking households comprise ~12% of the Kingdom's population, GASTAT created a multi-part framework to facilitate data capture from households of all languages.

GASTAT devised three key solutions for enumerating households without Arabic speakers in concentrated areas (e.g., neighborhoods with large amounts of Hindi- or Tagalog-speakers).

- For English-speaking households, GASTAT hired English-speaking Saudi interviewers to carry out field data collection efforts end-to-end for all non-Arabic-speaking households that speak English as a native or secondary language. GASTAT assumed that European nationals residing in the Kingdom speak English in addition to their native languages.
- For households that did not speak English or Arabic, GASTAT leveraged foreign assistant interviewers to support the enumeration of households in concentrated areas that speak certain common languages (Urdu, Hindi, Bengali, Tagalog, Rohingya, and Chinese). These assistant interviewers accompanied observers when visiting households that spoke these languages across multiple enumeration areas.

Additionally, GASTAT identified three solutions to support the enumeration of households in lower-concentration areas that did not speak Arabic.

- Expansion of self-enumeration: GASTAT expanded self-enumeration to be open to all individuals residing in the Kingdom. Multiple media campaigns were conducted to ensure that all residents were aware of this option, permitting them to facilitate their own questionnaire.
- Pre-translated questionnaires were available on all interviewers' tablets: Questionnaires were pre-translated into English, as well as five other common languages in the Kingdom (French, Urdu, Hindi, Bengali, and Tagalog).
- Instant translation applications: In cases where a foreign language assistant interviewer was not present and the household did not speak one of the pre-translated languages, the interviewer could use instant-translation apps for immediate translations for all languages the application supports.

Languages requiring foreign language assistant interviewers were prioritized based on the number of speakers in the Kingdom, as well as the concentration of these speakers within certain Observer- or Inspector-level geographies. The languages prioritized under this framework were Urdu, Hindi, Bengali, Tagalog, Rohingya, and Chinese. (English and other European languages were not included in this analysis, because there were many Saudi census interviewers who can speak English fluently.)

Given the concentrations of non-Arabic-speaking households across the Kingdom, GASTAT estimated the number of foreign language assistant interviewers that would be needed based on a constant ratio of households-per-assistant-enumerator. This analysis predicted a need of approximately 1,000 assistant interviewers across the Kingdom of Saudi Arabia.

- These approximately 1,000 assistant interviewers were recruited across four main channels:
  - Leverage community groups of different nationalities via community heads to identify interviewers for respective languages
  - Engage local district centers who are aware of multi-lingual individuals in their specific areas of the country
  - Conduct outreach to workers at Islamic centers across the Kingdom due to their high frequency of multi-lingual employees (e.g., a bilingual Arabic and Urdu speaker)
  - Reach out to individuals enrolled in Arabic language institutes (particularly in universities) to identify non-native Arabic speakers whose native language may be common in the Kingdom

After potential assistant interviewers were recruited, they were trained on their responsibilities as assistants during the enumeration process and were evaluated with a related training assessment. Those who passed this evaluation process were deployed to assist census interviewers in communicating with non-Arabic-speaking households across the Kingdom

4.1.3. ADMINISTRATIVE DATA COLLECTION

The KSA Census 2022 collected information from a variety of sources to present an accurate picture to the Kingdom's people. A big part of this exercise was collecting data from respondents directly through the self-enumeration and field-enumeration efforts described above. However, in the case of incomplete or missing information, administrative data was frequently utilized to fill gaps.

Administrative data is information that is usually collected by government agencies while conducting business or offering services, e.g., health, education, or registering for births, deaths, and marriages. It could also be a record of transactions or events, for instance, tax payments or overseas journeys. To maintain accuracy, administrative data must be gathered from dependable sources of the highest quality.

In KSA Census 2022, administrative data was used to impute non-responding households in areas with low response rates. Since this information was provided to the government by reliable sources, such as SDAIA (Saudi Authority for Data and Artificial Intelligence) and NIC (The National Information Center), it met the highest quality, privacy, security, and confidentiality standards.

The SDAIA and NIC held key administrative data at the individual level across areas such as education, work, income, and health gathered from a range of government agencies. Examples of the administrative datasets used can be found in exhibit 20

4.2. DATA PROCESSING AND ANALYSIS

The collected data was subjected to GASTAT's Census Quality Assurance (CQA) team's review to ensure the quality of census processes and outputs. This oversight team was fully activated during the data collection and data processing phases and acted as the Census 2022 command center. The CQA had three objectives:

- Iterative operational planning: It enabled iterative operational planning in the form of daily operational decisions, and longer-term capacity and timeline decisions. Additionally, the team allowed for periodic steering refinements based on findings from monitoring census operations
- Data quality: It enabled and implemented clear quality improvement actions by identifying red flags—for example, missing values and errors in responses—and understanding the root causes of quality issues
- Leadership progress updates: It provided daily and weekly progress updates to the executive team and other key stakeholders, covering key census metrics by geography. This allowed leadership to oversee the processes and helped GASTAT make longer-term capacity and timeline decisions.

4.2.1. DATA QUALITY ENHANCEMENT

A holistic quality framework was developed for GASTAT to cover four main categories:

- Institutional quality: How well GASTAT functioned as an organization and its adherence to professional independence and impartiality
- Design quality: The degree to which census design met its intended objectives
- Process quality: The degree to which processes operated according to their design with minimum friction, bottlenecks, or delays
- Output quality: The quality of the final data and data products:
  - Relevance: Whether the information met user needs
  - Accuracy: Whether the census data correctly described the phenomena it is designed to measure
  - Timeliness: The delay between the end of the count period and the date that census

outcomes became available

— Accessibility: Transparency in data dissemination

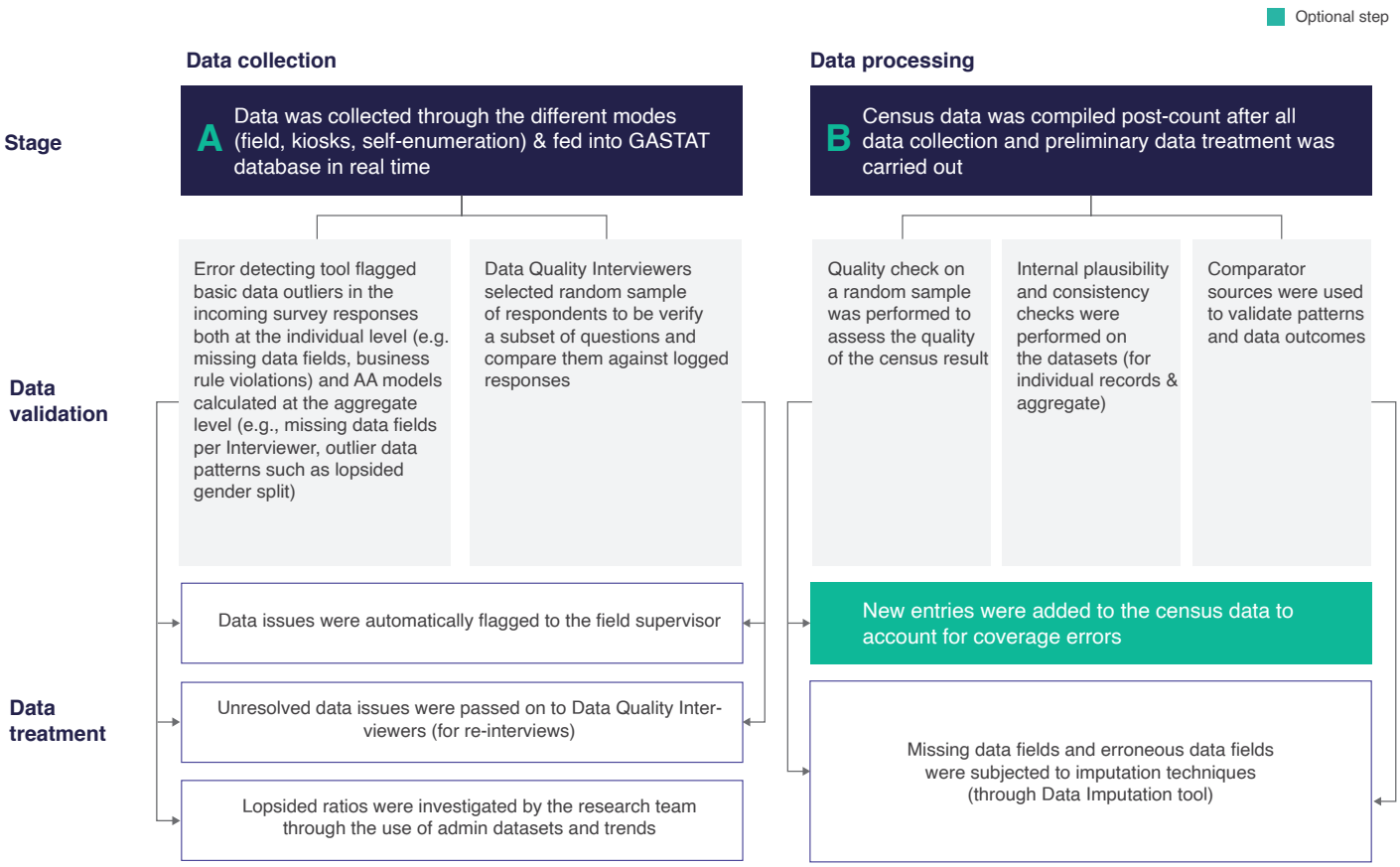
— Consistency: Coherence of census outcomes, internal and external consistency, and comparability

— Interpretability: Availability of supplementary information necessary to understand, analyze, and use census data appropriately

These data quality enhancements were obtained through key activities during data collection and data processing. Data quality activities during data collection included:

- Tracked operational progress of census (field and self- enumerations)
- Conducted analytics on operations/census progress data to capture insights and generate recommendations
- Oversaw census returns through CQA and flag data outliers

EXHIBIT 16:
DATA VALIDATION & TREATMENT OCCURED BOTH DURING DATA COLLECTION AND DATA PROCESSING



- Conducted follow-ups or re-interviews with respondents
- Generated predictions of outcomes based on early returns
- Treatment of interactive data

Data quality activities during data processing included:

- Conducted random sample check done by the quality interviewer team
- Conducted internal plausibility and consistency checks—was census data internally consistent?
- Processed edits and imputations
- Conducted data quality assessment using comparator sources—was aggregated census data consistent with other data sources?

4.2.2. DATA QUALITY TECHNOLOGICAL TOOLS

In data collection, the census variables were collected from the different approaches (field and self-enumeration) and fed into the GASTAT database in real time. The data validation process that occurred during data collection was via an error detecting tool that aimed to flag basic data outliers in the incoming questionnaire responses. These flags were highlighted both at the individual level (e.g., missing data fields, business rule violations) and, using AA models, at an aggregate level (e.g. missing data fields per interviewer, outlier data patterns such as lopsided gender split.)

Once these flags were highlighted, the data was treated. Data issues were automatically flagged to the field supervisor and unresolved issues were passed on to data quality interviewers (to re-interview respondents). Data quality interviewers selected a random sample of respondents to verify by a subset of questions and to crossmatch to logged responses. Lopsided ratios were investigated by the research team through the use of admin datasets and trends.

Data collected through both field enumeration and self- enumeration and fed into the GASTAT database in real time. This led to two processes. First, the error-detecting tool flagged basic data outliers in the incoming questionnaire responses, both at the individual level (e.g., missing data fields, business rule violations) and at the aggregate level (e.g., missing data fields per interviewer and outlier data patterns such as lopsided gender split). Second, data quality interviewers selected random samples of respondents to verify a subset of questions and compared them against logged responses to flag any erroneous responses not caught through the error detection tool.

EXHIBIT 17:
EVALUATION OF DISCLOSURE CONTROL APPROACHES

	Non-perturbative approaches		Perturbative approaches		
	Suppression	**Variable recoding**	**Data swapping**	**Rounding**	**Cell perturbation**
Information loss	Information is lost for suppressed cells	Granularity is lost for recoded variables	Information loss can be set to small	←	Information loss can be set to small →
Data structure	Data structure is preserved	Data structure changes as variables are recoded	Data structure is preserved	←	Data structure is preserved →
Additivity / consistency	For suppressed variables, additivity & consistency is be lost	Can be additive and consistent	Tables from same protected microdata are additive	←	Creates non additivity OR inconsistency in tables →
Implementation complexity	Easier to set parameters and implement than perturbative methods (although significant effort required to ensure disclosure through differencing is protected against)	Easier to set parameters and implement than perturbative methods (although requires effort in identifying all variables to recode for complex table structures)	Requires statistical experience & capabilities to execute (e.g., identification of high disclosure risk records, determining logic and criteria for swapping, etc.)	←	Requires time, effort and statistical experience & capabilities to execute (although easier than data swapping) →
Ease of understanding of approach for users	One of the easiest approaches for users to understand	One of the easiest approaches for users to understand	Easy for users to understand (more complex than non-perturbative)	Easy for users to understand (more complex than non-perturbative)	Typically complex for users to understand
Implication on functionality for users	← Could potentially limits the no. of variables users can combine in tool to protect against differencing and maintain consistency →		Largely functional; however user analyses on localities with high swap rates may yield non-indicative results		Largely functional; slight noise only has minimal effect on user analyses

4.2.3. DATA IMPUTATION

Efforts to capture high-quality data for the census extended beyond the field. In the data processing stage, imputation techniques were employed to manage missing data from field responses. Imputation is an established method that statistical organizations across the world use to assign value to missing data in surveys. For instance, in an area with incomplete field responses, accessible records and historical trends could be used to assign information from a responding household to a non-responding household, thus completing the dataset to improve statistical significance and standard of results.

GASTAT used five approaches to impute errors in KSA Census 2022

- **Rule-based imputation**: Imputed values were determined by rules, based on the values of the other fields
- **Deductive imputation**: Used when a unique set of values existed that caused the imputed record to satisfy all the edits
- **Model-based imputation**: Predictions of missing values were derived using explicit models

- **Donor-based imputation**: Missing values were replaced with observed values from another record (e.g., administrative data)
- **Interactive treatment**: Data was adjusted by a human editor

Erroneous data entries can be addressed in two ways. In single imputation, missing data is filled using one of the aforementioned imputation approaches and the completed dataset is used to make inferences. In multiple imputation, values for a given subject and timeframe are predicted using statistical modelling of available data, introducing variability of imputed data to find a range of possibilities to work from. After evaluating both techniques, GASTAT chose to use single imputation.

The KSA census used administrative data to impute non-responding households in areas with low response rates, and where the administrative data were of sufficient quality to generate reliable population counts. It is important to highlight that such administrative datasets contain information already provided to the government, and meet the highest quality, privacy, security, and confidentiality standards.

For instance, administrative data from the Ministry of Education was used to fill gaps or verify information about education levels, while utility data was used as a second source for housing variables. Exhibit 20 further captures examples of different administrative datasets that were used in the imputation process.

EXHIBIT 18:
EXAMPLE OF ADMINISTRATIVE DATA THAT COULD BE LEVERAGED FOR VALIDATION CHECKS IN THE DATA IMPUTATION PROCESS

Entity		Administrative datasets of interest	Relevant census questions
1	Ministry of interior	Personal information and identification variables for individuals	1, 2, 9 , 10, 11, 24
2	General Organization for Social Insurance	Occupation and income data, Business employment variables	15, 16, 17, 18
3	Ministry of HR and Social Development	Occupation and income data, Business employment variables	15, 16, 17, 18
4	Saudi Post	National addresses and geospatial polygons	21, 25
5	Saudi Electricity Company	Electric meter connections and electricity consumption	31
6	Ministry of Municipal & Rural Affairs	Building and structure variables (e.g. construction permits, land plots), Business activity variables (e.g. municipal icenses)	15, 16, 17, 18
7	Ministry of Health	Overall health statistics, disability surveys	22, 23,
8	Ministry of Education	Educational attainment variables	5, 6, 7, 8
9	Ministry of Justice	Marital status trends	3
10	Social Security Agency	Income data for individuals	15
11	Public Pension Agency	Income data for public sector employees	20
12	Saudi Authority for Data and Artificial Intelligence	Primary residence information through Tawakkalna App	4

4.2.4. DATA VALIDATION

Data validation is a process that is used to ensure the final or published data complies with various quality standards. For the purpose of the census, "quality" referred to how suitable the data is to the end user's needs.

KSA census data validation involved analyzing data, weeding out errors and making the necessary corrections, wherever applicable. This process was based on rules expressing acceptable combinations of values - if the data satisfied the rules, it was considered valid for final use. Examining statistical trends and outliers and comparing them to other sources of truth, was another critical aspect.

The census data was validated across four broad categories:

- Comparisons to admin data
- Data integration, imputation and SDC
- Statistical data checks
- Demographic data checks.

Details on each of these categories are presented in the exhibit below.

EXHIBIT 19:
CENSUS DATA WAS VALIDATED ACROSS 4 BROAD CATEGORIES
Data validation by categories

Category	Subcategory	Types of analyses
Comparisons to admin data	SDAIA and LFS	• Comparisons of distributions, quantiles, means and variance (t-tests, qq-plots, etc) of numerical and categorical variables and indicators (e.g. employed by nationality and gender) • Estimate potential overcounting and undercounting
	Address canvassing	• Vacancy analysis
Data integration, imputation and SDC	Comparisons before imputation, after imputation and after SDC	• Comparisons of distributions, quantiles, means and variance (t-tests, qq-plots, etc) • Comparisons of spatial distributions and spatial correlations
Statistical data checks	Numerical variables	• Measure distributions smoothness (e.g. age distributions by regions-gender) • Find out abnormal distribution shapes • Detect significant outliers in the data and significant outlier-distributions (box plots)
	Categorical variables	• Find out abnormal distribution shapes • Detect significant outliers in the data and significant outlier-distributions
	Other variable types	• Measure distributions of structured variables (e.g. family structure diversity)
	Spatial distributions	• Detects outliers (e.g. abnormal pop density) • Measure consistency of spatial distribution of data (e.g. electricity supply type)
Demographic data checks (global trends)	Numerical correlations	• Apply correlation analysis (Pearson correlation) to find out abnormal trends: — Income vs. (age, number of rooms, urbanicity, working sector, gender), Household size vs. number of rooms, Age vs. education
	Categorical correlations	• Apply correlation analysis (Cramer's V or equivalent) to find out abnormal trends: — Nationality vs. spoken language, Income vs. house type, Migrant workers by collar vs. (health disability, household size), Urbanicity vs (literacy rate, education rate, income, family size)
	Other checks	• Review male to female ratios at ages 5-0 and +80

4.2.5. DISCLOSURE CONTROL (SDC)

4.2.5.1. Non-GIS SDC

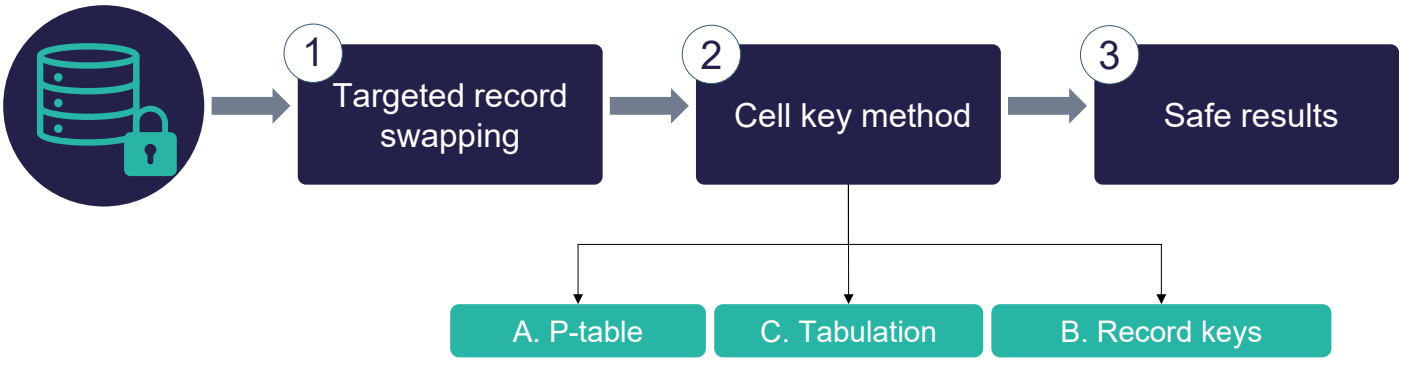
Statistical disclosure control (SDC) includes measures to protect information about individuals, households, businesses, and their attributes from being identified. Due to recent technological advancements that made it incredibly easy to acquire information about people and profile them (for example, through social media self-disclosure), SDC practices have become even more prominent.

As part of the census effort, SDC was used to maintain a balance between utility (the value of the census data to users) and disclosure risk (the risk that an individual record is identified).

SDC was implemented by limiting the details published for different levels of geography. For example, for higher levels of geography, educational attainment was expressed in distinct numbers, whereas for the lowest levels of geography, data was summarized more and provided as ranges. Further, GASTAT evaluated several approaches, including both perturbative and non-perturbative, to control disclosure risk. In the former, identities were protected by removing selected information or aggregating variables and in the latter, identities were protected by suppressing table cells and data or collapsing some categories of variables into a single variable.

After careful assessment, GASTAT adopted data-swapping, a perturbative approach for disclosure control. As part of this approach, targeted records considered to pose disclosure risk were identified. For each of these records, another record with similar attributes was found, generally within the locality. The geographies of the two records were then swapped.

EXHIBIT 20:
SUGGESTED OVERARCHING APPROACH TO SDC



4.2.5.2. GIS SDC

The census dissemination strategy deployed geospatial data that could be easily transformed into a tabular format – hence, most of the SDC methods mentioned above proved to be applicable. However, since GIS data is presented on a map that could be overlaid with satellite imagery, GASTAT enforced the quadtree method to ensure additional security.

The quadtree is a data structure where each parent node has four children. The method employs a geographical aggregation algorithm allowing multiple resolutions of data in one visualization. The algorithm begins with the highest granularity level grid (i.e., 100m * 100m) and defines grid cells as sensitive if they contain a population under a pre-defined threshold. Sensitive grid cells are then aggregated with their neighbors to form a cell of a lower granularity level (200m * 200m), stopping the algorithm once they are above the threshold. Next, to ensure that data is available at a uniform granularity, a smoothing algorithm is applied to disaggregate the data back to the highest resolution (100m x 100m).

4.2.6. DATA ANALYSIS AND INSIGHTS

Apart from recording facts and figures about the Kingdom's population, the census also produced statistical analysis to highlight key trends and insights. This was done to offer meaningful and updated information that would help users inform decisions on future policies and services. Such insights covered a wide range of topics and involved information about diverse subpopulations.

EXHIBIT 21:

DEMOGRAPHIC, HOUSING AND HOUSEHOLD VARIABLES WERE USED IN WAVE 1, WHILE REMAINING CENSUS VARIABLES WILL BE USED IN WAVE 2

Census variables

Demographic
- Date of birth
- Usual place of residence
- Nationality
- Marital Status
- Relationship to head of household
- Number of births during the past 12 months
- Gender

Housing
- Type of housing
- Type of residence
- Type of ownership
- Number of rooms of housing units
- Internet access
- Electricity supply
- Water supply system
- Main Source of Sewage Disposal
- Building construction material
- Ownership of a second private property

Household
- Household size
- Household composition

Demographic
- Mother tongue
- Spoken languages at home

Migration
- Place of birth
- Father's place of birth
- Mother's place of birth
- Change of usual place of residence (5y)
- Residence before moving to your current place of residence
- Ever resided outside KSA
- Country of residence before arriving to KSA
- Year of arrival to KSA

Education
- Enrolled in educational institution
- Level currently enrolled in
- Highest educational level obtained
- Field of study of highest educational level
- Literacy

Labour
- Work during last 7 days
- Type of employment
- Current occupation
- Name of employer
- Main economic activity
- Sector of employer
- Place of work
- Actively looking for a job
- Availability within 2 weeks
- Ever worked before
- Date of stop working
- Current activity
- Monthly disposable income

Health & Disability
- Disability status
- Disability status - details
- Chronic diseases
- Chronic diseases - details

GASTAT produced the insights by conducting exploratory data analysis (supported by international demographic best practices) and summarizing key findings into formats that were simple to understand: summary reports, infosheets, and stories (refer to the section on dissemination).

The analysis was based on 99 output tables across 7 different topics - demographics, households, housing, migration, labour markets and income, education, as well as health and disability. It leveraged several techniques to produce rich insights:

- Univariate analysis and visualization of each field in the raw dataset, with summary statistics
- Bivariate visualizations and summary statistics that allowed users to assess the relationship between any 2 variables in the dataset
- Multivariate visualizations, for mapping and understanding interactions between different variables in the data

4.3. DISSEMINATION

KSA Census 2022 was an elaborate exercise encompassing efforts from several stakeholders. The main goal of the dissemination process was to ensure that census, it's geography products and services met the primary needs of the end data users. After finalizing the census data in November 2022, GASTAT began designing an effective dissemination plan, which was founded on 6 guiding principles:

1. Brand census products: The dissemination strategy and schedule were designed to create recognition and recall for the census products and build user confidence in them.
2. Enable user experience: The products were designed to drive high user adoption, catering to a range of stakeholders in the system as per their knowledge level and usability.
3. Protect data integrity: The analysis and interpretation were deeply rooted in data and purely fact-based with no compromises made to achieve results.
4. Highest data quality: Best-in-class statistical and quality control measures were applied to produce high-quality data
5. Maintain confidentiality: Great efforts went into ensuring the protection and complete anonymity of the individuals who responded to the census program.
6. Syndicate dissemination process: All relevant internal and external stakeholders were consulted and aligned with before finalizing dissemination of the results

EXHIBIT 22:
WE APPLIED 6 GUIDING PRINCIPLES TO ENSURE HIGHEST STANDARDS ACROSS DISSEMINATION

BRAND CENSUS PRODUCTS

Brand Census products to ensure recognition and build user confidence in products

ENABLE USER EXPERIENCE

Brand Census products Design products to drive high user adoption, catered to stakeholder needs in the ecosystem

PROTECT DATA INTEGRITY

Ensure analysis and its interpretation are rooted in data, with no compromise on results



HIGHEST DATA QUALITY

Apply leading statistical and quality control practices to produce high quality statistics

MAINTAIN CONFIDENTIALITY

Take all measures necessary to protect anonymity of individuals who have responded to the Census

SYNDICATE DISSEMINATION PROCESS

Align on the dissemination process with internal and external stakeholders before finalizing dissemination

4.3.1. DISSEMINATION PLATFORM AND PRODUCTS

The dissemination plan was a result of in-depth consultations with various stakeholders and leveraged top-notch products and a state-of-the-art census portal.

EXHIBIT 23:
MULTIPLE DISSEMINATION CHANNELS WERE IN PUBLICATION

3 digitally interactive products

Census portal



- Website with overall info about Census
- Will host additional amended products (e.g., inc GIS maps, Tableau, etc.)

GIS maps



- Interactive visualization for maps
- Allows users to visualize Census data at a 100/100 m grid level inside Census portal

Statistical database (DB)



- SDB is for users to access Microdata tables

6 other products

1. Topical summary reports
2. Press release
3. Infosheets
4. Microdata tables
5. Thematic reports
6. Stories

4.3.1.1. CENSUS PORTAL

The census portal contains all the data and digital content produced in connection with the KSA Census 2022. It was created to enhance user experience and to house all the key data at a single location.

The platform boasted several features, including a slew of data tools and products (such as output tables, microdata files, and GIS maps, among others) that could be accessed through a user-friendly, searchable platform. Each of the products was designed with the users' needs, and level of knowledge in view. For example, GIS maps provide granular spatial demographic data like population by gender, nationality etc. through varying grid levels.

4.3.1.2. OUTPUT TABLES

Census output tables are the most basic form of census data where variables are presented in a tabular format. The data was presented as simple statistics – in uni- and bi-variate tables - and was most useful for average consumers of the census. These readymade tables ranged in complexity and were available on region, governorate and city levels including the most frequently requested social, economic, housing, and demographic data along with convenient data profiles summarizing the information for each geographical area covered (by province, governorate and city).

Based on international best practices, the tables included several features to enhance their usability. For example, several data filters allowed users to sift through and digest information quickly. Additionally, a feature such as switching between data listed as a percentage of total or absolute, made consuming these tables a user-friendly experience.

4.3.1.3. GEOSPATIAL / GIS MAPS

GIS/Geospatial maps were an important part of the dissemination strategy and gave decision-makers and users a quick visual representation of geographically referenced population patterns, trends, and relationships from the census data. Businesses and researchers use GIS maps to investigate location- and spatial-based trends regarding the demographics of a particular village.

The GIS maps show the spatial distribution of demographic indicators for standard geographic areas in the form of administrative boundaries and different levels of grids (starting from 100x100 grids to 25x25 grids). Users customized these interactive maps as per their needs.

4.3.1.4. STATISTICAL DATABASE

The statistical database (SDB) was a unified channel that provided access to all Census related data outputs, along with other statistical indicators published by GASTAT. Going forward, the only Census-related product on the SDB will be the Public-Use Microdata Files (PUMF), while the remaining Census products will be available on the GASTAT Census Portal.

4.3.1.5. THEMATIC REPORTS

Users could pick from four categories of reports available on the portal:

- **Topical summary reports**: These contained the most frequently requested data on a number of themes and served as an excellent starting point for users looking for structured insights. Each report included commentary on a particular geographic location and offered data in the form of estimates as well as percentages. Each summary also included univariate tables, encompassing data from a single variable, for instance, education or general health. Areas covered by the summaries were released in an order that was consistent with the overall dissemination plan.
- **Deep-dive reports**: These took a deeper lens on select topics, shedding light on the broader trends and impact of the census findings. Targeted at advanced data users, each report outlined the methodology used to arrive at the data, the findings, and the broader implications of those findings to help the Kingdom develop appropriate policies in response.

After reviewing the major categories of information requested for the Census 2022, GASTAT zeroed in on the following topics for deep-dive reports:

  - Demographics
  - Housing
  - Family
  - Migration
  - Health
  - Disability
  - Education
  - Labour (gender equality and disability in the labour force).

- **Stories**: These are short, analytical reports that could be derived from the census data. Covering a range of topics, each story contained a narrative profile with commentary and bar charts. Areas covered in KSA Census 2022 included:

  - Demographic – Ageing populations
  - Housing – Vacancies, Urbanization and sprawling cities, new cities
  - Households – Families and living arrangements
  - Migration – International and internal migration
  - Health – Persons with disability
  - Education – Child well-being
  - Labour – Employment trends, income and poverty, gender inequalities

- **Infosheets**: These infographics presented a visual summary of key findings from each sub-category under the main topics. Eye-catching and easy to consume, they ran no longer than a page and were designed to cater to users from non-technical backgrounds. Topics covered included:

  - Demographic – Demographic characteristics, marriage and fertility

- Housing – Housing type and tenancy
- Households – Household Size and Living Arrangements
- Migration
- Health
- Education
- Labour

4.3.1.6. MICRODATA FILES

GASTAT leveraged microdata public use files to offer data users greater flexibility to create customized estimates/tables that were not otherwise available in the pre-made formats. Microdata public use files are records of persons and housing units comprising individual, non-aggregated data (without compromising personalized information). The data in the files is an excellent resource for those wishing to build models or run statistical regression analyses e.g., policy analysts, pollsters, and social researchers.

The identity of individuals and the confidentiality of their information were protected in several ways. For instance, only a portion of the entire census sample was used to create the microdata files. Names, addresses, and other details that could be used to identify a particular housing unit, group quarters unit, or person were excluded. Further, a small number of records were “swapped” with comparable records from nearby areas, while others were truncated using extreme values as a part of the top and bottom coding.

4.3.1.7. CENSUS DASHBOARDS

Census dashboards are tableau-based tools that help users visualize variables across different topics, presenting them in an eye-catching, easily digestible format. They are especially useful in monitoring changes in a data set over time and were used to assist users such as business owners, researchers, and managers, in understanding critical insights derived from the data.

4.3.1.8. PRESS RELEASE

Press releases furnished high-level details on critical statistics, remarks from GASTAT executives, and an analysis of the census findings and their potential implications. Targeted mostly at members of the press community, the releases ensured timely news coverage of the census. They included links to the census portal and sources for more detailed information, such as info sheets and summary reports.

4.3.1.9. RESTRICTED MICRODATA REQUESTS

Census microdata was a sample of anonymized census records. This data was valuable for research, but carried a disclosure risk and could not be made freely available to users. The disclosure risk was managed and controlled by only allowing access to the microdata files for approved researchers working on approved projects. Additionally, the approved researchers could only access the microdata files on a GASTAT-controlled environment, using tools provided by GASTAT, and could only remove the results of analyses after

disclosure checking and approval by GASTAT staff.

The process for requesting microdata sets followed three steps, with an important role played in determining access rights through the evaluation of the user's research proposal. The three steps were: request submission; request evaluation and approval; and provide access to microdata files.

Requests for microdata could only be made by registered and approved entities following GASTAT-defined access rights. A request can be submitted through the Microdata Center (http://95.177.209.2/en/micro-data/main).

There were three evaluation steps:

1. Data availability: The availability of the data was checked to ensure it was possible to meet user specifications and requirements.
2. Evaluation of research proposal: The research proposal was carefully evaluated to determine the legitimacy of the request and objectives for dissemination of the resulting analysis.
3. Capacity availability: The data dissemination team identified the capacity and effort needed to execute the request and prepared the microdata sets. Team capacity was then checked to ensure that the data could be delivered within the requested timeframe.

After this process, the request was approved by GASTAT's management for a specified timeline or rejected.

Once a request was approved, there were four steps to give the user access to the microdata:

1. The data was anonymized to ensure there was no dissemination of personal identification information (PII)
2. The user signed a contract agreeing that access to confidential data was only for the agreed purposes and to guarantee the security of intermediate analyses based on microdata
3. Data access was provided through Etaha.

EXHIBIT 24:
TEMPLATE FOR RESPONDENTS TO SUBMIT DETAILS ON A RESEARCH PROPOSAL

	Sections	Information to be Requested
1	Identification of the researchers who will have access to the data	Personal information and identification variables for individuals
2	Purpose of the research proposal	Title, description, objectives, and purpose of the research project, and explanation of why the research cannot be fulfilled using publicly available data
3	Datasets to be used	Variables required for each dataset requested, time period of each data set requested, methods of statistical analysis to be used
4	Results of the statistical analysis	Describe the expected outcomes of the statistical analysis of the data, explanation of how the results of the research will be published or otherwise disseminated, and through which channels

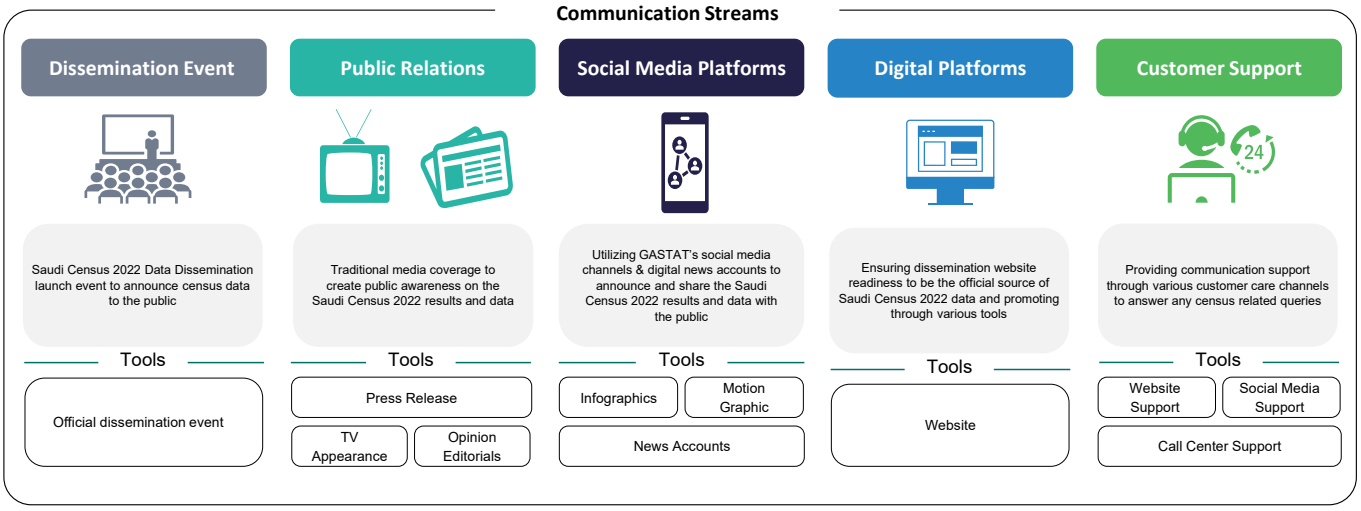
4.3.2. DISSEMINATION APPROACH AND COMMUNICATIONS

GASTAT designed an elaborate communication strategy that utilized key digital channels to create awareness and engagement about the census data.

OUTREACH CHANNELS FOR DISSEMINATION

- **Dissemination event** - An official platform to launch the census data to the public, partners, local beneficiaries, and international audiences. The event also involved an official press conference with key census stakeholders sharing comments on the entire census exercise with international media, newspapers, websites, television, and radio channels.
- **Public relations** - Effective PR strategies, including launching an official press release, setting up TV interviews and op-eds in local newspapers, were designed to create awareness about the census data among the public.
- **Social media** - A key channel to reach the general public as well as international audiences, GASTAT's social media accounts were leveraged to present infographics, videos, animation about the data. Partnerships with social media accounts of news channels and websites also strengthened presence and generated engagement.
- **Digital platforms** - The census portal housed all the relevant data on the KSA Census 2022 and underwent numerous checks and updates to ensure top-notch user experience and functionality.
- **Customer support** - No communication would be complete without ensuring users had a way to raise queries and provide feedback to GASTAT. A dedicated customer care support team was put together to answer all enquiries raised through the census website, the official phone number as well as the GASTAT social media accounts.

DATA DISSEMINATION COMMUNICATION STREAMS





5
CROSS-CUTTING THEMES

تعداد السعودية
SAUDI CENSUS
التعداد العام للسكان والمساكن 2022

5. CROSS-CUTTING THEMES

5.1. CENSUS 2022 PERSONNEL

GASTAT established several teams to carry out the operations in each area of census implementation:

- Census Quality Assurance (CQA) team: This team ensured the quality of census processes and outputs. This oversight role came into full force during the data collection and data processing phases with CQA acting as the command center of Census 2022. The team had a range of functions including iterative operational planning, maintaining data quality, and providing leadership progress updates
- Public call center: This team answered inquiries from the public and provided help completing the census. The center also conducted follow-up calls to encourage higher participation and helped reach completion rates. Call center staff estimations were tested during the pilot with the total number of staff to be scaled based on population proportion
- Enumeration staff (field force, supervisors). This team managed all field operations:
  - The field force – male and female interviewers – visited residents to conduct field enumerations and field visits for data validation when necessary
    - The field force was supported by Foreign Language Assistant interviewers to facilitate enumeration of households that spoke priority languages (French, Hindi, Urdu, Bengali, Tagalog) but did not speak English or Arabic
  - Supervisors were responsible for monitoring the progress of field enumerations and validating submitted responses of field enumerations
  - Census interviewer and supervisor estimations were tested with input from address canvassing and the census pilot with the total number of staff based on

5.1.1. TRAINING OF FIELD STAFF

The census required the participation of thousands interviewers, to a large extent part-time employees from the Ministry of Education, and many others from GASTAT temporarily functioned as desk staff, quality reviewers, inspectors, and supervisors. Significant effort was needed to train these employees on the updated tools, technology, and approaches used in Census 2022. The training model was developed taking international benchmarks into account.

EXHIBIT 25:
TEMPLATE FOR RESPONDENTS TO SUBMIT DETAILS ON A RESEARCH PROPOSAL

Approach		Examples	Key learnings	
Train the trainer	Dedicated training staff across dissemination	2011 • Trainings, recruitment and payroll conducted by external supplier • All trainers trained as trainers	• Ability to ensure and monitor consistency in training methods • In the event that trainers dropped out and couldn't be replaced quickly, supervisors had to step in, but had limited capacity to provide proper training	Trainers can be trained in-house, or by an external agency In-hous training allows for highest degree of quality control, however, will require more resources from GASTAT
		• Trainings and recruitment conducted in-house by Statistics Canada • All trainers trained as trainers • Supervisors guide Interviewers in early days, but do not provide formal training	• Ability to ensure consistency in training methods • Allows for high degree of quality control • Logical option due to existing set-up—StatsCan has established set of offices across the country who operate household surveys and can be scaled for the census	
	Train supervisors to conduct training	2001 • Census HQ trained and provided training materials to supervisors (inc. plan, videos, etc.) • Trainings for enumeration staff conducted by supervisors	• Significant variability in quality and methods of training by supervisors • Particularly challenging in areas where it was also hardest to recruit qualified staff (i.e. remote areas) • Difficulty tracking/monitoring trainings for consistency	
		2018 • Supervisors trained to conduct training for Interviewers	• Significant variability in quality and methods of training by supervisors • Difficulty tracking/monitoring trainings for consistency	

To ensure the workforce was properly set up for success, census workers underwent a training program ranging from four to ten days depending on their role (e.g., census interviewers, supervisors, etc.).

The following training objectives were established to ensure the required level of focus during training development. These included:

- Ensure the trainees developed the technical and people skills required to effectively carry out enumeration and other responsibilities
- Create responsibility and accountability across supervisors and interviewers to ensure optimal results and professionalism during the census
- Contribute to achieve the authority's objectives and provided support to policy makers and decision makers

Once the objectives were put in place, GASTAT addressed 6 key questions to further develop training requirements and plans.

1. Who should require training and what capabilities do they need to develop?
2. What should be the curriculum for each group (i.e., which courses should each group take)?
3. What should be the format of each course (i.e., lecture vs. hands- on learning, online vs. in-person)?
4. What should online or in-person training look like?
5. Who should conduct training (across online and in-person and for different groups)? What measures should be taken to ensure quality control across training?
6. What is the duration of each course and when can each group receive training?

Comprehensive targeted learning journeys were developed for each type of census worker to ensure development of specific capabilities for each worker group. This material covered knowledge, technical skills, and soft skills.

EXHIBIT 26:
TARGETED LEARNING CAPABILITIES PER WORKER GROUP

Group	Sub-group	Key capabilities
Supervisors, deputies and assistants		• Manage working team • Conduct in-person training for inspectors and oversee trainings for observers and Interviewers • Nominate inspectors, observers and Interviewers • Communicate effectively with team • Monitor team performance and action relevant KPIs • Submit periodic reports on census activities
Inspectors		• Manage working team • Conduct in-person training for observers and oversee trainings for Interviewers • Nominate observers and Interviewers • Communicate effectively with team • Audit performance of field work and support when needed • Utilize reference manuals and brief documents on Census activities to support field staff
Observers		• Manage working team • Provide training content to Interviewers • Nominate Interviewers • Communicate effectively with team • Audit performance of field work and support when needed • Verify and update national addresses and collect households data • Use smart devices and technologies • Utilize reference manuals and brief documents on Census activities to support field staff
Interviewers / awareness kiosks staff	General segments	• Visit households to collect data • Collect data accurately • Update national addresses • Communicate and interact with respondents • Use smart devices and technologies
	Special segments (prisons, hospitals, etc.)	• Same as general segments • Fill out the census for special segments • Communicate and interact with special segments' respondents
Call center employees		• Collect data accurately • Communicate and interact with respondents • Use smart devices and technologies • Provide support and answer questions from respondents • Conduct follow up calls to ensure that population census forms are filled out
Data quality interviewers		• Conduct re-interviews to validate accuracy of responses, capture missing responses and correct errors in responses • Collect data accurately • Communicate and interact with respondents • Use tool to record responses / outcome of call • Monitor productivity of Interviewers and observers

EXHIBIT 27:
TRAINING CURRICULA HAS BEEN DESIGNED TO DEVELOP REQUIRED CAPABILITIES ACROSS EACH WORKGROUP

Common training curriculum subjects	Contents	Supervisors	Inspectors	Observers	Interviewer/ kiosks	Call center agents	Data quality interviewers
Purpose of the Census	• Importance of the Census • How data can be used • Confidentiality of information collected	■	■	■	■	■	■
Roles and responsibilities (incl. administrative tasks)	• Job requirements and expectations • Place in the Census organization • Relationship with the respondents • Census Legislation • Procedures to be followed in enumeration • Hours of work/ Absenteeism • Allowances paid and payment conditions • Claiming pay and checking pay amounts • Staff requirements on administrative l matters • Forms to be filled on completion of work • COVID19- safety procedures to follow • Selection and recruitment of Census Interviewers • Conducting of training sessions for inspectors/ / observers/Interviewers • Measuring Interviewers performance	■	■	■	■	■	■
Content of the questionnaire	• Overview of questionnaires and information to be collected • Concepts and definitions that are used • How to correctly fill in/answer questions	■	■	■	■	■	■
Using tools required to carry out role (e.g. enumeration tool, monitoring tool, etc.)	• How to use tools to collect data • How to use tools (e.g. tablets, GIS model, routing tool) to find the addresses to enumerate • How to record outcomes (e.g. completed interview, no-one home, refusal, etc.)	■	■	■	■	■	■
Engaging with respondents (e.g. answer clarifying questions, avoid resistance, etc.)	• How to make appointments • From whom to obtain information • Techniques for conducting a good interview • Overcoming objections from respondents to provide information • Safety measures to take during visits • How to conduct calls to obtain missing information	■	■	■	■	■	■
Accessing addresses	• Proper identification of addresses • How to access different residence types	■	■	■	■		■

Weighting of each course was assessed when creating the schedule. Some course (e.g., concepts and definitions used) required more weight than others

A training curriculum was developed for each workgroup based on their different learning requirements.

These capabilities were built through more than 15 interactive digital training modules in addition to field training, allowing trainees to apply the digital learnings on the ground in a practical environment.

EXHIBIT 28:
TRAINING CURRICULA HAS BEEN DESIGNED TO DEVELOP REQUIRED CAPABILITIES ACROSS EACH WORKGROUP

Common training curriculum subjects	Example contents	Lecture	Practical	Rationale
Purpose of the Census	• Importance of the Census • How data can be used • Confidentiality of information collected			Can be taught through lectures
Roles and responsibilities (incl. administrative tasks)	• Job requirements and expectations • Place in the Census organization • Relationship with the respondents • Census Legislation • Procedures to be followed in enumeration • Hours of work/ Absenteeism • Allowances that would be paid and conditions attached to payment • Claiming for pay and checking pay amounts • Staff member requirements on administrative matters • Forms to be filled on completion of work • COVID19- safety procedures to follow • Measuring Interviewers performance • Selection and recruitment of Census Interviewers • Conducting of training sessions for inspectors /observers /Interviewers			Primarily taught through lectures with some practical exercises e.g. assess trainees people and technical skills
Content of the questionnaire	• Overview of questionnaires and information to be collected • Concepts and definitions that are used • How to correctly fill in/answer questions			Includes some practical exercises e.g. filling questionnaire, explaining variables)
Using tools required to carry out role (e.g. enumeration tool, monitoring tool, etc.)	• How to use tools to collect data • How to use tools (e.g. tablets, GIS model, routing tool) to find the addresses to enumerate • How to record outcomes (e.g. completed interview, no-one home, refusal, etc.)			Instructions can be lecture based but practice on tools is required through practical trainings
Engaging with respondents (e.g. answer clarifying questions, avoid resistance, etc.)	• How to make appointments • From whom to obtain information • Techniques for conducting a good interview • Overcoming objections from respondents to provide information • Safety measures to take during visits • How to conduct calls to obtain missing information			Requires practical trainings that replicate real-life scenarios (e.g. role play); instructors need to observe trainees in person to assess people skills
Accessing addresses	• Proper identification of addresses • How to access different residence types			Requires practical, on the field training

EXHIBIT 29:
LECTURE BASED TRAININGS WERE CONDUCTED ONLINE WHILE PRACTICAL TRAININGS WERE IN-PERSON

	Online	In-person	Rationale and key considerations
Lecture ~75%[1] of training hrs.	✓		• Eliminates concerns related to the spread of Covid19- during training • Reduces costs (i.e. venue, printed material, etc.) • Larger class sizes can reduce the total number of trainers required • Will require all participants to have a stable internet connection • Require video cameras to be turned on by all trainees to keep them engaged
Practical ~25%[1] of training hrs.		✓	• Can require planning logistics for trainings (e.g. blocking calendar dates, transportation for participants, etc.) • Covid19- pre-cautionary measures will need to be in place • Set capacity limit on class size to increase level of engagement and optimize level of attention from trainers • Can require sufficient space/classrooms to safely accommodate trainees • Adjust required equipment and supplies based on practical trainings

modules in addition to field training, allowing trainees to apply the digital learnings on the ground in a practical environment.

EXHIBIT 30:
KEY MEASURES WERE TAKEN TO ENSURE THE EFFECTIVENESS OF ONLINE TRAININGS

Key measure	Description
Training material	Send materials in advance with a reminder to participants just prior to the start Develop a mix of live and pre-recorded materials combining audio with visuals to improve knowledge retention Include supplemental links and online resources for additional readings and reference material
Engagement of trainees	Keep video cameras on to keep participants engaged and energized Use online input tools (e.g. polling, chat) to facilitate effective input gathering Use virtual breakout rooms to drive effective participation from all
Monitoring performance	Use metrics such as test scores, course completion rate, etc. to measure the effectiveness of trainings Collect feedback from participants on content, delivery and technical expertise to identify areas for improvement
Platform	Setup virtual learning application that supports a large number of participants (~+50) to join Develop support tools (e.g. social media groups, online discussions, FAQs, etc.) to give participants the opportunity to interact with each other and trainers
Training material	Develop a mix of pre-training , training and post-training material (e.g. pre-qualifying screening quiz, manuals, brief videos, supplemental links etc.) in advance to send to participants on time
Class size	Approximate capacity of 15 people for practical trainings to encourage engagement amongst participants and allow trainers to interact and provide feedback to all trainees, while ensuring social distancing
Location	Supervisor trainings can be conducted at HQ and on the field Trainings for all other groups can be in regional offices and on the field
Equipment	Functional training equipment and supplies (e.g. internet connection, tablets, projector, etc.) can be set up to ensure sessions run smoothly
COVID-19 safety measures	Seating in training rooms to follow COVID precautionary measures (2m distance between seats, sanitizers, no to limited group activities, protective gear provided to all attendees)
Logistics	Plan and schedule training logistics (e.g. transportation for participants, block calendar dates) ahead of time to avoid any delays

A number of key measures ensured that training was delivered to a consistently high quality:

- Centralized training. Centrally designed training programs (i.e., curriculum, format, material, etc.) to ensure consistency in quality
- Trainer selection. Professional trainers were selected to conduct online training. Supervisory layers were required to meet a key set of criteria
- Sufficient trainer capacity. Supervisors and inspectors acting as trainers had capacity to properly conduct trainings on top of other responsibilities
- Trainings from HQ/regional offices. Online sessions were delivered from HQ, and in-person training was delivered in regional offices or in the field
- Performance monitoring. The effectiveness of training programs was measured using metrics such as test scores, course completion rates, impact on KPIs, and qualitative and quantitative feedback collected from participants

The Saudi Electronic University (SEU) was selected by GASTAT to develop the training modules and platforms. SEU developed a dedicated learning portal to host the digital trainings and the university managed the logistics and set-ups for the in-person practical workshops. COVID-19 safety measures were strictly followed for all in-person trainings (i.e., 2m distance between seats and limited group activities. Hand sanitizers and protective gear are provided to all attendees).

5.1.2. ADDRESS CANVASSING AND ENUMERATION PERSONNEL

The field force was critical to the successful implementation of Census 2022.

Around 17,000 field force workers conducted address canvassing in autumn of 2021. They undertook the following roles:

- Regional head/Supervisor:
  - Identified work areas and reviewed boundaries
  - Assigned work areas to be overseen by Deputy and Assistant Regional Supervisors
  - Engaged and coordinated with local government agencies for support (e.g., provide workplaces and identify workforce)
  - Conducted field trainings for inspectors and oversaw training for observers and interviewers
  - Submitted periodic reports on census activities
  - Nominated inspectors, observers, and interviewers

- Deputy Regional Supervisor:
  - — Supported regional supervisors across all their duties
  - — Assigned work areas to Assistant Regional Supervisors
  - — Assisted Regional Supervisor:
  - — Identified work areas and reviewed boundaries
  - — Assigned work areas and oversaw Inspectors
  - — Engaged and coordinated with local government agencies for support (e.g., provided workplaces and identified workforce)
  - — Submitted periodic reports on census activities
  - — Conducted field trainings for inspectors and oversaw trainings for observers and interviewers

- Inspectors:
  - — Assigned work areas to Observers
  - — Provided devices/tools to Observers
  - — Managed Observer's team progress on daily basis
  - — Reviewed address canvassing exercise and data samples
  - — Conducted field trainings for observers and oversaw training for interviewers
  - — Nominated inspectors, observers, and interviewers

- Observers:
  - — Updated and assigned QR codes to household units already existing in MAL (Master Address List: a GASTAT database containing all officially listed addresses in KSA)
  - — Added household units missing from the existing MAL
  - — Provided devices/tools to Census interviewers
  - — Divided areas among Census interviewers for data collection
  - — Coordinated and supervised data collection progress on daily basis
  - — Reviewed data collection completion of all questionnaires and initial quality checks

(without editing)

— Conducted field training for observers and for interviewers

Approximately 31,000 additional staff were required for field enumeration. They had the following responsibilities:

- Regional/Head Supervisor:
  - — Identified work areas and reviewed boundaries
  - — Assigned work areas to be overseen by Deputy and Assistant Regional Supervisors
  - — Engaged and coordinated with local government agencies for support (e.g., provide workplaces and identified workforce)
  - — Conducted field training for inspectors and oversaw trainings for observers and interviewers
  - — Submitted periodic reports on census activities
  - — Nominated inspectors, observers, and interviewers

- Deputy Regional Supervisor:
  - — Supported regional supervisors across all their duties
  - — Assigned work areas to Assistant Regional Supervisors

- Assistant Regional Supervisor:
  - — Identified work areas and review boundaries
  - — Assigned work areas to, and oversee Inspectors
  - — Engaged and coordinated with local government agencies for support (e.g., provide workplaces and identify workforce)
  - — Submitted periodic reports on census activities
  - — Conducted field trainings for inspectors and oversaw training for observers and interviewers

- Inspectors:
  - Assigned work areas to Observers
  - Provided devices/tools to Observers
  - Managed Observer's team progress on daily basis
  - Reviewed address canvassing exercises and data samples
  - Conducted field trainings for observers and oversaw trainings for interviewers

- Observers:
  - Updated and assigned QR codes to household units already in MAL
  - Added household units missing from the existing MAL
  - Provided devices/tools to Census interviewers
  - Divided areas among Census interviewers for data collection
  - Coordinated and supervised data collection progress on daily basis
  - Reviewed data collection and completion of all questionnaires and initial quality check (without editing)
  - Conducted field trainings for observers for interviewers

- Census interviewer:
  - Conducted data collection within assigned areas (incl. follow-up visits and address validation)
  - Shared daily progress and observations

- Foreign Language Assistant interviewer:
  - Supported Census interviewers in areas with high concentrations of households that do not speak English or Arabic

5.2. TECHNOLOGY

The 2010 census relied on paper questionnaires which were completed by interviewers and scanned on Codex machines. Optical character recognition (OCR) technology was used to extract numerical data from the images, which was then compiled and saved

in both numerical and image formats on a SUN mainframe. The derived data was then distributed through simple Excel spreadsheets. Census 2022 was completely digital, using tablet devices, applications, and digital tools to collect population data. GASTAT developed a number of tools to manage the phases and functions of the census: address canvassing, census count, quality assurance, and reporting. The digital census consisted of:

- Device provision: Over 40,000 tablet devices were prepared and delivered to regions for interviewers to use for data collection. These devices contained only the necessary tools required for data collection and were managed through a remote management system. Tools updates were implemented remotely via MDM System, a remote management system

- Address canvassing tool: interviewers used this tool to collect the address information of all buildings within Saudi Arabia through a pre-designed questionnaire. The tool linked each address to a GPS location and a QR code, which was later used during self-enumeration. It also identified the number of household members linked to each address for later verifications

- Data collection tool: interviewers used this tool to view assigned addresses and number of household members using powerful mapping technology. The tool collected census questionnaire data from all household members, identified if a household had completed a self- enumeration questionnaire, received feedback on the questionnaire from supervisors and the quality team, and submitted census questionnaire data

- Supporting tools: Supporting tools included the administrative system (that was used to assign interviewers to areas, monitor workforce completion, and provide administrative privileges), device logistics (that were used to track where and who had each and every tablet and managed the transfer of devices), and tech support (that was used by interviewers to request support from technicians with issues on the tools or with the tablet devices)

- Self-enumeration tool: This tool was used by the general population to self-submit the Census 2022 questionnaire. It was accessible through a URL from different types of devices, including PCs, smartphones, and tablets

- Quality tools: Census 2022 used several quality tools:

  — Error-detection tool detected and flagged potential errors in census questionnaire responses in real time

  — Quality interview tool rectified potential errors in the questionnaire received from the error-detection tool by scheduling interviews with households to confirm submitted questionnaire data points, then either made direct edits to the data or requested interviewers to re-visit the household and redo the questionnaire

— Imputation tool used post-census to edit and impute missing data points or anomalies to improve overall quality of census output

— Dashboard and reporting tool was a desktop and tablet application that visually displayed indicators received by various tools (e.g., address canvassing tool, data collection tool, error detection tool, data quality interviewer tool, aggregated data from other tools and functions) and extracted reports for operational leaders, project managements, and executives

— Dissemination tools. See Dissemination section on page 44

To manage the integration of these tools, the infrastructure for Census 2022 was hosted on a secured cloud environment provided by SITE on servers in Saudi Arabia. The infrastructure was built to achieve three goals:

1. Scalability to allow seamless connection for self-enumeration and data collection tools. SITE lead an intensive load performance testing on the cloud environment using real-time tools and testing multiple scenarios. Additionally, the infrastructure was continuously monitored throughout the census via a dedicated portal. This included an early warning system based on pre-defined thresholds on CPU and memory usage, which provided the IT team with the opportunity to provision additional resources (i.e., memory and CPU capacities)
2. Sufficient back-up levels on all core systems. GASTAT put in place disaster plans to ensure all critical information was backed up on local servers. Meanwhile, SITE set up an additional layer of backup on the cloud infrastructure to be activated if the primary back-up became unavailable. This ensured that captured data were readily available in the event of a system failure
3. Cybersecurity: Carried out penetration testing on the infrastructure using applications to identify security vulnerabilities. The data was communicated throughout the data process flow between databases, and devices were encrypted. Devices holding census data were tracked and managed via MDM System, a remote management system

Acknowledging the significance of data security and the sensitivity of the information at stake, GASTAT and SITE covered two main components in terms of cybersecurity: compromise assessment (CA) and Architecture and Configuration Review (ACR).

The Compromise Assessment (CA) service allowed GASTAT to capture any advanced threats and attacking groups. This was done through: (1) an evaluation of GASTAT's environment using SITE's expertise in advanced attackers' tactics, techniques, and practices; (2) a search for indications of compromise or penetration; and (3) an identification of malicious activities. The search for threats or compromises was conducted through network endpoints and traffic, and thorough logs analysis.

The Architecture and Configuration Review (ACR) service measured and assessed the security position of GASTAT's infrastructure and its diverse systems, focused on the architecture design and configuration. Once assessed, proper recommendations for improvements were detailed and provided, based on the industry's security standards and best practices.

5.3. DOCUMENTATION OF QUALITY ASSURANCE SAUDI CENSUS 2022

5.3.1. INTRODUCTION

The Saudi Census 2022, as a fundamental process for national data gathering, stands as a cornerstone in shaping the nation's socioeconomic strategies. It is the primary source of demographic, social, and economic data used by policymakers, researchers, and various other stakeholders. Given its significance, maintaining data integrity, accuracy, and overall quality is paramount. To ensure the quality of Census 2022 data, the Census Quality Assurance (CQA) framework has been developed and implemented. This report summarizes all measures taken to ensure high quality outcomes.

With a 95% accuracy rate, the Census 2022 conducted by GASTAT (General Authority for Statistics) in Saudi Arabia is regarded as the highest quality Census to date. The Census incorporated key learnings from global best practices and ensured high-quality outcomes through full coverage and data accuracy. To ensure comprehensive data collection, the Census 2022 employed high-quality fieldwork and the best scientific methodology for data validation. Interactive training models and a pilot study was conducted to prepare for the fieldwork. A Census Quality Assurance (CQA) team consisting of over 800 upskilled workers was established to conduct data quality checks during and after data collection

5.3.2. PRE-DATA COLLECTION:

5.3.2.1 IN-DEPTH ANALYSIS OF CENSUS OPERATIONS AND QUALITY ASSURANCE

The Census Quality Assurance (CQA) had three main objectives: enabling iterative operational planning, improving data quality, and providing leadership progress updates. To plan and execute the CQA, a five-component framework was defined, covering quality, people, operating model, technology, and implementation.

A holistic quality framework was developed to assess the Census's institutional, design, process, and output quality. Key quality indicators were defined, including relevance, accuracy, timeliness, accessibility, consistency, and interpretability.

To fulfill the objectives of the framework, the Census operations are structured into four interconnected stages: planning and development, data collection, data processing, and reporting results and releasing information. Each of these phases involves specialized steps and procedures aimed at ensuring the accuracy and reliability of the Census data

5.3.2.1 PLANNING AND DEVELOPMENT PHASE

This phase is the foundation of the entire operation. Rigorous preparatory tasks are conducted, including designing and testing data collection tools, questionnaires, and the development of a database system for data storage and processing. This stage also involves demarcating enumeration areas, recruiting, and training enumerators and other field staff. The success of this phase significantly affects the overall quality of the data collected as it ensures that all necessary groundwork is ready for a smooth data collection process.

5.3.3 DURING DATA COLLECTION:

5.3.3.1. DATA COLLECTION PHASE

Data collection forms the core of Census 2022 operations. During this stage, data is meticulously collected from every household through multiple nodes (fields, kiosks, and self-numeration), making it a large-scale task requiring enormous resources and planning. This phase's accuracy significantly impacts the quality of the data collected, making quality assurance crucial at this stage.

5.3.3.2. MODELING, RESEARCH, & DATA INTERVIEWERS

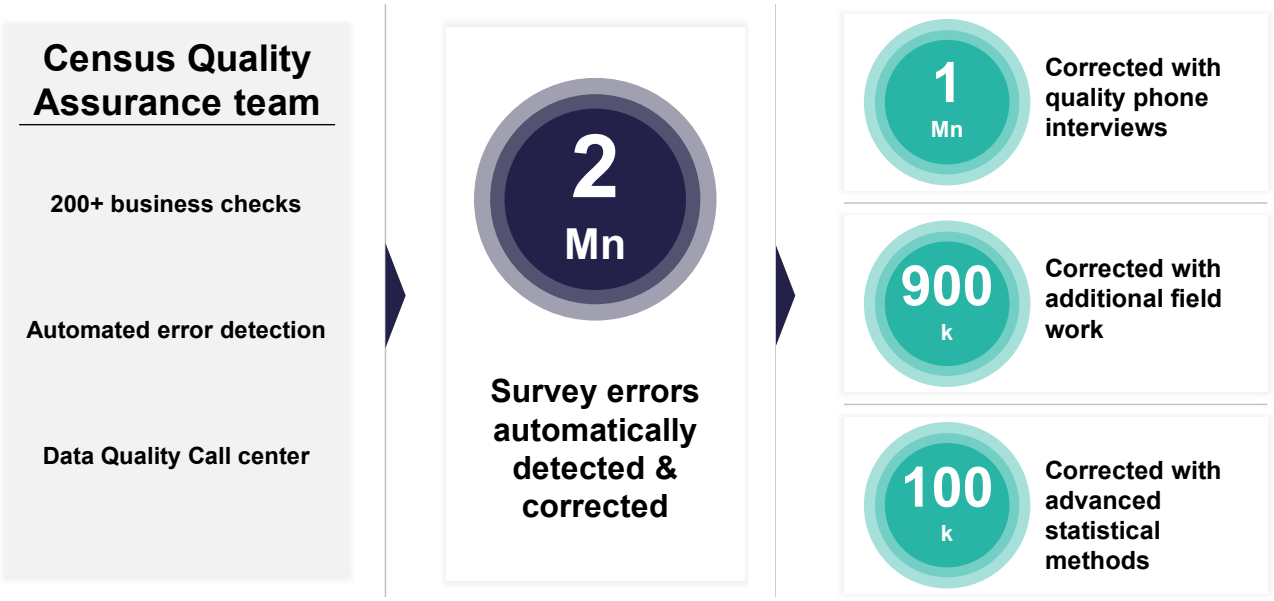
The Modelling & Research team and the Data Quality Interviewers played a pivotal role in making sure collected data complies with the quality measures and standards, and this was proven with a 95% accuracy rate facilitated through +1Mn quality phone interviews. The Modelling & Research team used advanced tools to identify anomalies and outliers in the collected data. During data collection, three specific journeys took place for data validation, including error detection, investigating lopsided ratios, and re-interviewing a sample of enumerator tool responses. Any inconsistencies or discrepancies are flagged and passed on to supervisors and, if unresolved, are dealt with by the Data Quality Interviewers. These interviewers conducted follow-up interviews to validate and correct the data. Their work helped to ensure the collected data's integrity and accuracy, leading to a more reliable Census results.

The Modelling & Research team used advanced error detection tools to identify anomalies or outliers in the collected data, flagging +2Mn implausible values for further investigation. Concurrently, they defined a sample of responses for quality checks, which are passed on to supervisors if any issues are identified. Whereas the Data Quality Interviewers follow up on flagged responses, conducting re-interviews as necessary to validate the data and correct any identified errors. By employing a robust system of checks and validations, these teams ensured the integrity and accuracy of the collected data.

5.3.3.3. OPERATIONS ANALYTICS

The Operations Analytics team also played a vital role during this phase. They worked with operations experts to identify helpful analyses for iterative planning and perform these analyses, generating insights and recommendations. Their work helped optimize the data collection process, enhancing the Census data's overall quality. They conducted these analyses, generating insights and recommendations that helped shape the data collection process. Their work is instrumental in ensuring the effectiveness and efficiency of the Census operations, thereby contributing to the quality of the Census data.

EXHIBIT 31:
DATA ACCURACY WAS ACHIEVED THROUGH CENSUS QUALITY ASSURANCE



5.3.4. POST DATA COLLECTION:

5.3.4.1. DATA PROCESSING PHASE

After data collection, the next step is the data processing phase. Here, the data collected is compiled, cleaned, and verified for accuracy and completeness. This phase's quality significantly impacts the overall Census data quality, as inaccuracies not identified and corrected during this phase may lead to flawed data.

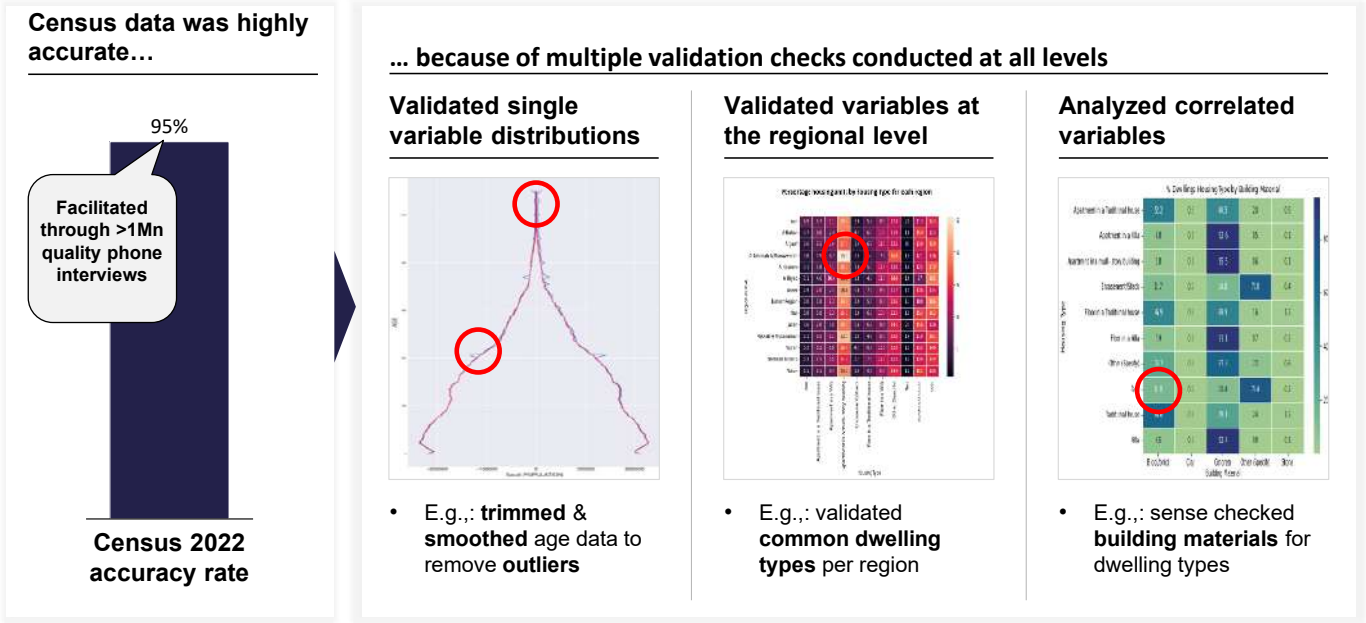
The Edit & Imputation (E&I) team and the Modelling & Research team played central roles during data processing. The E&I team identified errors in the data and undertook item or whole person imputation. This process ensured the correction of errors and completion of missing or inconsistent data, thereby enhancing data quality. The Modelling & Research team, on the other hand, used comparator sources to model patterns and data outcomes. This data is used as an input by the E&I team for the imputation process, thereby improving the quality of the final data.

While the E&I team identified errors and undertakes item or whole person imputation, the Modelling & Research team modeled patterns and data outcomes using comparator sources. This data is used as an input by the E&I team, providing a solid foundation for the imputation process. In effect, these teams performed rigorous scrutiny of the data, eliminating errors, filling gaps, and ensuring the data's completeness and consistency.

5.3.4.2. DATA VALIDATION AND TREATMENT

Data validation and treatment are integral to maintaining the quality of Census 2022 data. These processes work in tandem with data collection and data processing stages. As data is collected, it undergoes continuous validation using cutting-edge error detection tools. Flagged outliers or missing data fields are investigated promptly, with unresolved data issues handed over to Data Quality Interviewers for further inquiry and validation through re-interviews.

During the data processing stage, all collected data is subjected to intensive scrutiny. Any missing or inconsistent data fields are treated with a meticulous application of several imputation techniques. GASTAT have conducted +20 variable distributions which were validated through various advanced analytical methods. These methods ensure that the final data is devoid of any inaccuracies and provides a true reflection of the population



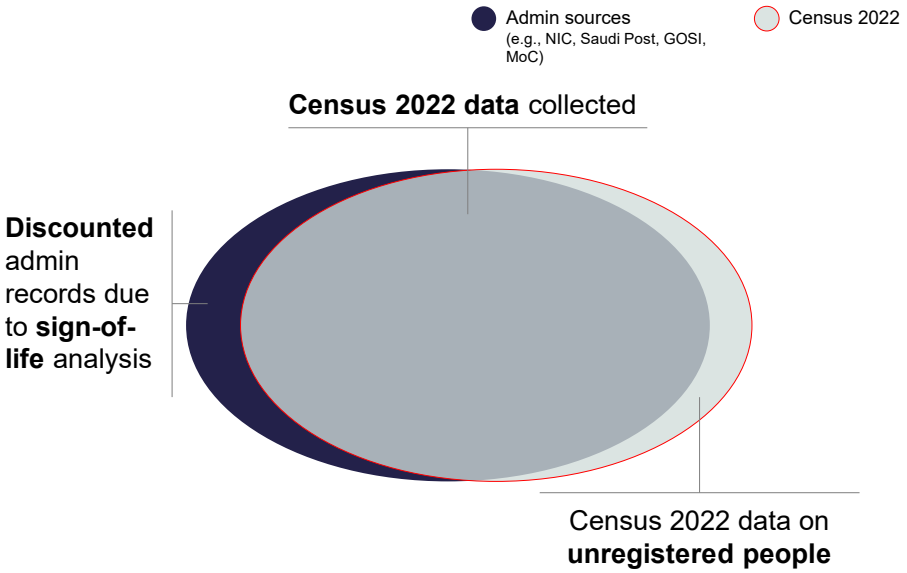
5.3.4.3. SIGN OF LIFE CHECKS

As part of data validation & treatment and as the final step before imputation GASTAT have augmented its Census 2022 results with admin data making sure that maximum population coverage is achieved. This exercise was conducted by gathering relevant admin records for missed individuals after cross checking with the national register for all residents in Saudi. After identifying the pool of individuals that were missed during data collection, GASTAT conducted a sign of life exercise. The purpose of this exercise was to identify the population that can be part of the Active population for the Saudi Census 2022.

The active population part of Saudi Census 2022 is sourced from:

- Survey records, data directly collected during the collection phase of the Saudi Census 2022.
- SDAIA records, data received from SDAIA post census collection.

According to Saudi Census 2022 definitions, the active population is comprised from all persons living at within country borders at the census reference date. To produce high quality data for the Census, for all the persons that are counted as part of active population, checks were required to reasonably ensure that the conditions (living within country borders at the census reference date) are met. The Sign of life checks verified 100% of the population through life signal checks, boarder crossing checks, call center information, studying abroad checks, & death information. In total GASTAT have conducted more than 100 checks with +5 admin data sources to ensure maximum accuracy and coverage.



5.3.4.4. IMPUTATION TECHNIQUES

The imputation methods used during data treatment included Rule-based Imputation, Deductive Imputation, Model-based Imputation, Donor-based Imputation, and Interactive Treatment.

In Rule-based Imputation, predetermined rules based on other data fields are employed. This method is particularly effective when the nature of the error is well understood, allowing the recovery of the original, accurate value.

Deductive Imputation is employed when a unique set of values, given specific values of other fields, can logically complete the data. Although its application is limited, it is a reliable method due to its deterministic nature.

Model-based Imputation uses explicit models to predict missing values based on some auxiliary variables. Although model specification can be time-consuming, this method provides good predictions if the model is carefully specified and tested.

Donor-based Imputation replaces missing or inconsistent values with observed values from another record, known as the 'donor'. This method is highly reliant on the size and quality of the donor pool, making its application dependent on the data set's nature.

Interactive Treatment is a manual process where a human editor adjusts the data. The editor may re-contact the respondent, replace values from another variable/data source, or create a value based on subject matter expertise

5.3.4.5. REPORTING & DOCUMENTATION

This last stage involved the consolidation of data, distribution to regional governments for review, and comprehensive internal coherence checks. This phase ensured that the Census 2022 results align with set standards of accuracy and reliability, impacting the data's overall quality.

The Reporting & Documentation team plays an essential role in this phase. The Reporting team compiled key performance indicators into report/dashboard formats, providing

data to relevant stakeholders in an easily digestible manner. The Documentation team ensured that all methodologies used for data validation and data treatment are thoroughly documented, promoting transparency and reproducibility of the Census 2022 process

5.3.5 CONCLUSION

The Census Quality Assurance program's implementation was instrumental in securing the accuracy and reliability of the 2022 KSA Census data. The CQA's meticulous planning, robust data collection, rigorous data validation and treatment, and comprehensive reporting and documentation processes played a pivotal role in the Census's successful execution. As a result, the Census 2022 data serves as a dependable resource, reliably shaping the Kingdom's future strategic planning and decision-making processes.

5.4. QUALITY PERSONNEL

During the census, the Census Quality Assurance (CQA) team worked at full capacity to ensure quality of census process and outputs, mainly in the data collection and data processing phases. The objective of the CQA team was threefold: iterative operational planning, data quality, and leadership progress updates.

5.4.1. CQA'S STRUCTURE

The CQA team's structure was built around four teams designed to help it meet its specific objectives. The CQA accomplished these goals across 3 key teams, each with varying responsibilities for the overall census effort:

- Data Quality Analytics: This grouping included both "Modelling and Research" and "Edit and Imputation" subteams
  - Modeling and Research Team used data from the census questionnaire's automated error detection tool to flag census respondents for re-interviewing. They also modeled aggregated incoming data to flag lopsided ratios (validation was conducted against historical datasets)
  - Data imputation team defined edit and imputation rules and worked closely with tool developers to fine-tune and test tool specifications
  - Data Quality Interviewers: This team ensured that the census's data collection maintained a high quality standard by conducting 3 main types of responsibilities: (1 conducted follow-up interviews with statistical outliers to validate their responses, (2 re-interviewed a sample of respondents from the numerator tool to ensure there were no systemic errors, and (3 logged responses and outcomes from interviews.
- Reporting and Documentation Team: This group had dual responsibilities for both reporting and documentation.
  - For reporting, they ensured that all required KPIs tracked for census were compiled in the required frequency and provided to relevant stakeholders
  - For documentation, they ensured all methodologies used for data validation and data

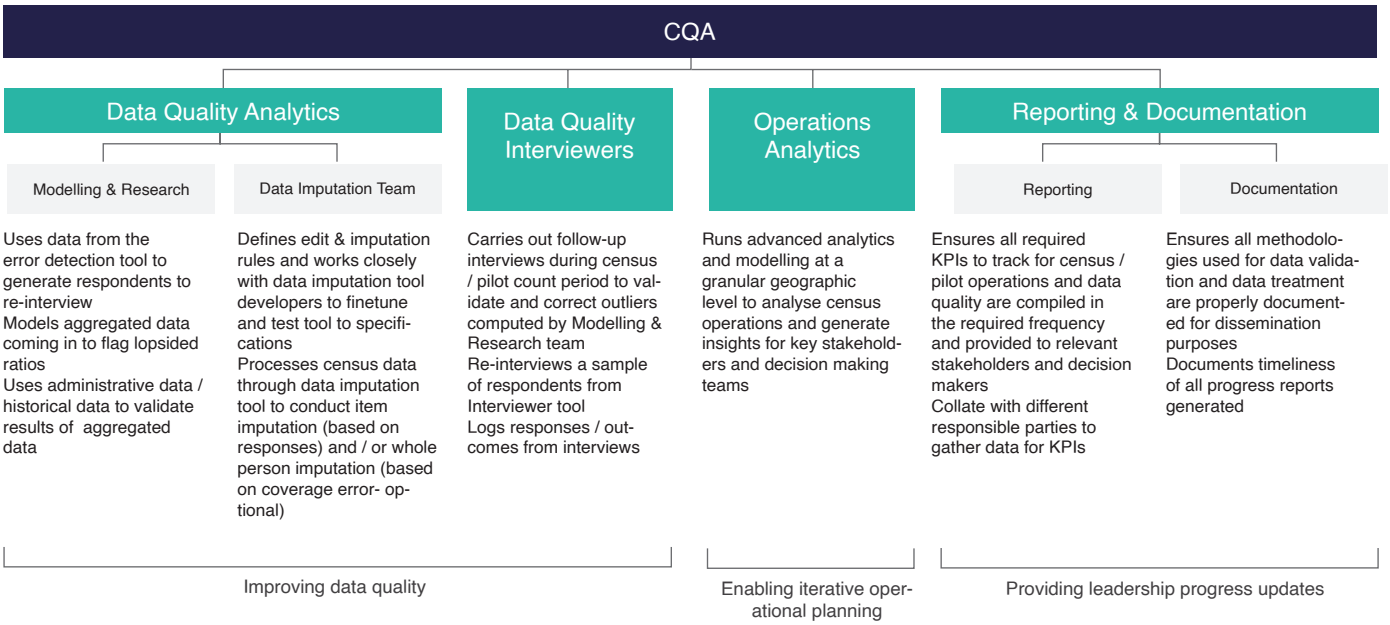
treatment were properly documented for dissemination purposes and recorded the punctuality of report publication

5.4.2. KEY TRAINING ELEMENTS FOR FIELD PERSONNEL

Census interviewers and other personnel were trained on three key systems for Census 2022:

- Data collection systems: The field data was collected during the counting phase and the enumeration phase. In the counting phase, buildings and residential units were identified and entered into forms, with updated addresses, using a digital tablet interface. This was also the phase where self-enumerating households were identified. Field work areas were then defined ahead of the enumeration phase. During enumeration, household and individual data was collected through both self-enumeration on the dedicated online portal or through field work conducted by researchers in public housing units. The self-enumeration process simplified reporting for households since they could complete the online questionnaire in their own time, with complete privacy, and in a fully digital format. The combination of these systems ensured high data accuracy, efficient data capture, and a streamlined administrative and logistical process.
- Inspector and researcher systems: Inspectors worked with a digital application during the counting phase that clearly mapped out national addresses within specific neighborhoods of that inspector's assigned work area. National addresses were color-coded and contained detailed options to fill in under their respective coordinates. Once these options were filled in by the inspector, the household units of that address

EXHIBIT 31:
CQA STRUCTURE WAS DEFINED TO MEET ITS OBJECTIVES



that had chosen self-enumeration were identified. The inspector then placed a QR sticker at the unit's entrance and scanned it to tie the gathered data to the QR code. This made for easier tracking and auditing as the census progressed. Researchers then proceeded with their own work, using a similar map of residential address coordinates and residential unit information form. For each household dwelling or unit, the researcher captured occupancy and other dwelling data, adding family members and individual data as needed. The procedure was considered complete once all respondent data had been captured on the form.

- Self-enumeration system: The self-enumeration process began with a URL received by SMS that allowed an individual to sign in through GASTAT or using their National Single Sign On. Their national ID number was then tied to their residential unit's QR code, and they could then fill in their household's data online. They needed to confirm the family members living at their address and to complete census forms for each individual in the household. They also needed to define their permanent residence along with those of every member of the household, should some had multiple places of residence. Individual data captured included place of birth, education, employment status, as well as any difficulties or chronic diseases the individual was facing. The dwelling form captured elements including housing characteristics, services available within the households, as well as the preference language of communication of the households. All these elements allowed the government to better analyze and project its population needs to better support them over time.

5.5. COMMUNICATION

A communication campaign was launched to inform the public of the purpose of the census, the importance of participation, and the need for people to provide complete and accurate data. GASTAT launched the awareness campaign for Census 2022 in the months prior to launch on 10 May 2022. During this period, the public heard about the census through multiple channels, including mass media and targeted social media campaigns. The communication approach was tailored to serve different audience segments across the various phases of the census.

GASTAT launched the awareness campaign for the census across five phases:

1. Public opinion preparation
2. Awareness and conviction
3. Participation
4. Amplification and celebration
5. Report's promotion

5.5.1. COMMUNICATION APPROACHES

GASTAT identified the communication approach and developed the communication materials by benchmarking similar global practices and executing the following:

1. Current state understanding: Conducted workshops to map the various GASTAT stakeholders and interviewed regional teams to understand operational challenges Segmented the public based on their perception and behavior towards the census. The public was assessed based on differences in regions, age groups, nationalities, genders, income, and educational levels through qualitative (14 Focus Groups) and quantitative interviews (8,600 Computer Assisted Interviews)

   Identified lessons learned from global benchmarks including the following countries: USA, Canada, Australia, New Zealand, and South Korea

   Conducted a traditional and digital media scan in order to assess GASTAT's communication presence and performance and further understand public perceptions
2. Interim strategy: An interim strategy provided a preliminary communication direction until the completion of the field research work. The interim strategy determined which initial communication phases to focus on, identified preliminary target segments, and developed the general communication direction and work
3. Communication strategy: The communication strategy has already achieved the following:
   - Identified the target segments
   - Developed the overall communication narratives
   - Developed the communication architecture
   - Identified the communication objectives for each target segment
   - Developed a behavior change model for each target segment
   - Developed the key messages
   - Identified communication channels and tools
   - Identified KPIs and suitable monitoring methodologies
   - Determined critical success factors
   - Built a communication risk and crisis management strategy to:
     - Identify external communication risks
     - Classify communication risks based on probability vs. impact
     - Develop a communication crisis management guide outlining mechanisms for media crisis mitigation and management
4. Communication plan: A comprehensive plan was prepared to detail the timeline and budget for each communication campaign, along with an implementation plan created with all key activities for each campaign including outlining roles and responsibilities.

The planning phase also included designing a comprehensive customer journey map that identified critical customer interaction points along the entire census journey. As a result, communication channels, tools, and processes were developed and assigned to ensure the delivery of a simple and well-integrated customer experience from both a

communication and an operations point view. Examples of developed customer journeys included address canvassing, field and self-enumeration, inbound and outbound calls, and quality assurance journeys.

In addition, GASTAT commissioned third party agencies for public relations, social media, creative art, event management, and production to support in the execution of the communication plan.

5.6. PROGRAM MANAGEMENT

5.6.1. OVERVIEW OF CENSUS PROGRAM MANAGEMENT

GASTAT set up an internal and external operating model and governance structure, including roles and responsibilities, required committees, and meeting cadence. An integrated governance model was built to enable effective governance across program developments and operations.

GASTAT developed the processes that maintained the performance quality and built an operating system to ensure delivery. Different processes were created to ensure the delivery of the program.

5.6.2. PROGRAM MANAGEMENT PROCESSES

GASTAT developed five program management processes:

1. Project mode decision-making process: Decision-making process on content or progress related to projects and portfolios
2. Operations decision-making process: Decision-making process for issues and risks related to census operations and activities
3. Resources and staffing process: Process for designating resources and project management staff to portfolios
4. Performance verification process (reporting): Process for monitoring and tracking progress and ensuring project goals are being met
5. Delivering to operation process (handover): Process for the transition from portfolios to operations across all projects

5.6.3. RISKS

GASTAT put in place a program masterplan that included all important milestones of the process and identified potential risks. Within the masterplan, GASTAT identified two significant potential risks to the success of Census 2022 and developed a risk mitigation plan.

1. Potential COVID-19 disruptions including health and perception issues among field workers and the public. GASTAT worked closely with health authorities with the goal of vaccinating all field workers and it included COVID-19 guidelines in field work training. In addition, public sentiment was tested during the pilot and targeted media campaigns were conducted to reassure the public
2. Technology risks included crashes and malfunctions of interviewer, self-enumeration,

and quality tools. GASTAT thoroughly tested the tools through usage in a full-scale pilot and through a series of testing phases to make sure all technological tools were robust

3. Safety and Security risks were mitigated through constant contact with on ground field teams, high quality training for field workers on safety procedures, and close coordination with law enforcement where needed

4. Lack of sufficient coordination with government entities, e.g., data-sharing agreements. To mitigate this risk, GASTAT established a governance structure encompassing the full range of stakeholders. It engaged early and frequently with government entities with clear owners and points of contact from GASTAT

5.6.4. REPORTS

The program reporting process followed a clear approach to support implementation and decision making. Census reports provided transparency to stakeholders on overall program implementation and identified risks and facilitated decision making by providing insights.

Depending on the census governance structure, different reports ensured delivery of the program with high quality and efficiency. There were four types of reports: Weekly Executive Review Report, Executive Committee Progress Report, Quarterly Steering Committee Report, and Dashboard.

1. Weekly Executive Review Report

   This report provided an overview of the progress for each portfolio. It enabled owners to present current challenges, potential risks, completion of projects, late projects, and support needed. It was owned by portfolio leaders, with the support of program managers, and supported general supervisors and program managers.

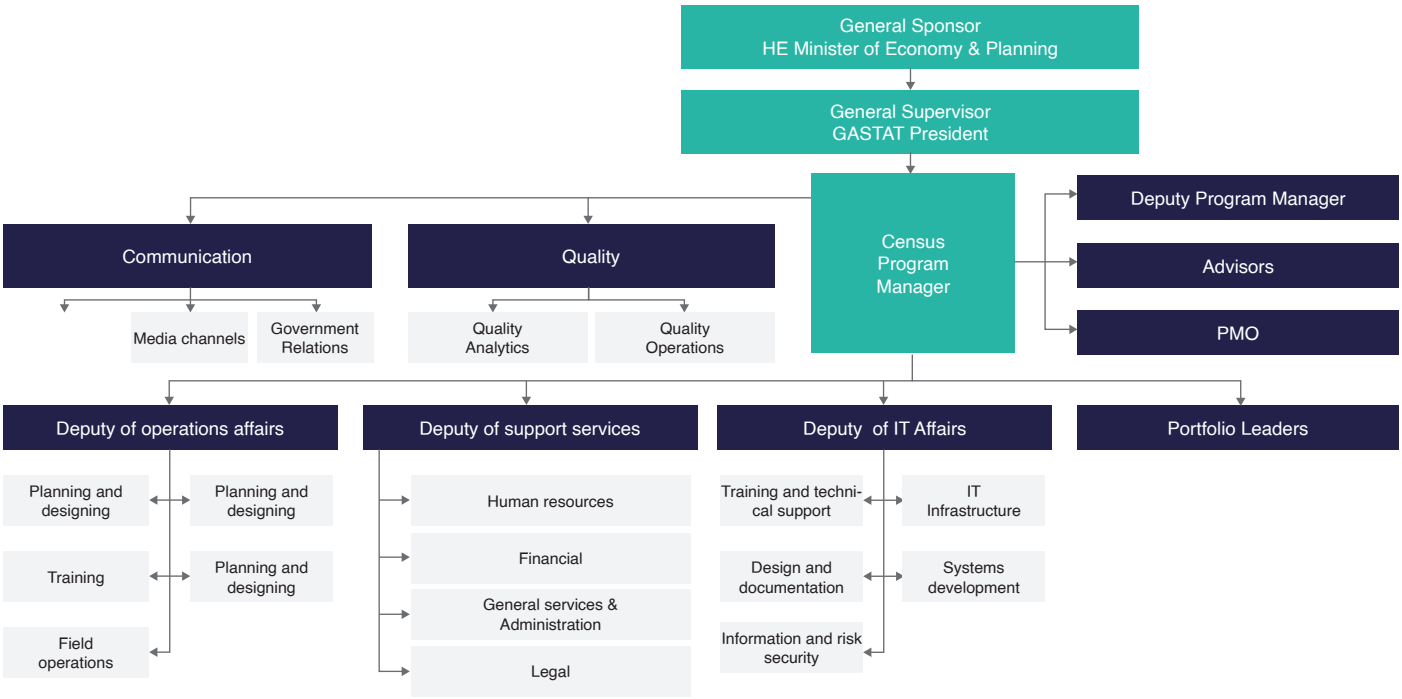
2. Executive Committee Progress Report

- The census executive report was presented during the Executive Committee's regular meetings. It provided an overview of the planning and implementation of the 2022 Census program to support it by:
- Reviewing the implementation plans and mechanisms for the census program;
- Going over issues and discussion points raised to the committee;
- Overcoming challenges and risks related to the program;
- Discussing specific topics that required the committee's advice. The report, was released every four weeks, was owned by the Secretary General of the Executive Committee, and supported by the PMO for the benefit for the Executive Committee members.

3. Quarterly Steering Committee Report

   This report shared a high-level program progress with Steering Committee members. It communicated the overall progress of the census program and supported progress by sharing the program's achievements and success stories, aligning on key next steps and major activities, and providing the necessary support to avoid risks and overcame challenges. The quarterly report was owned by the Secretary General of the Steering Committee and supported by the PMO for the benefit of Steering Committee members.

EXHIBIT 32:
THE CENSUS'S ORGANIZATIONAL STRUCTURE WAS BUILT TO PROMOTE EFFECTIVE GOVERNANCE



4. Dashboard

   The dashboard showed project-level progress for daily tracking and quick decision making. It provided a detailed view on the daily progress of each portfolio and the overall program to show current challenges, potential risks, completion of projects, late projects, and support needed. It was owned by the central team with the support of program managers. It benefited program managers, portfolio leaders and several other stakeholder groups.

5.6.5. GOVERNANCE

GASTAT built an integrated governance model based on four components: organizational structure, roles and responsibilities, interaction model, meeting cadence, and escalation mechanism

Organizational structure

GASTAT developed the organizational structure of the census program and its main units according to PMO mandate. The census program's organizational structure enabled effective governance of all processes and decisions across program development and operations.

EXHIBIT 33:
THE CENSUS'S INTERACTION MODEL DEFINED HOW THE STAKEHOLDERS WILL INTERACTED

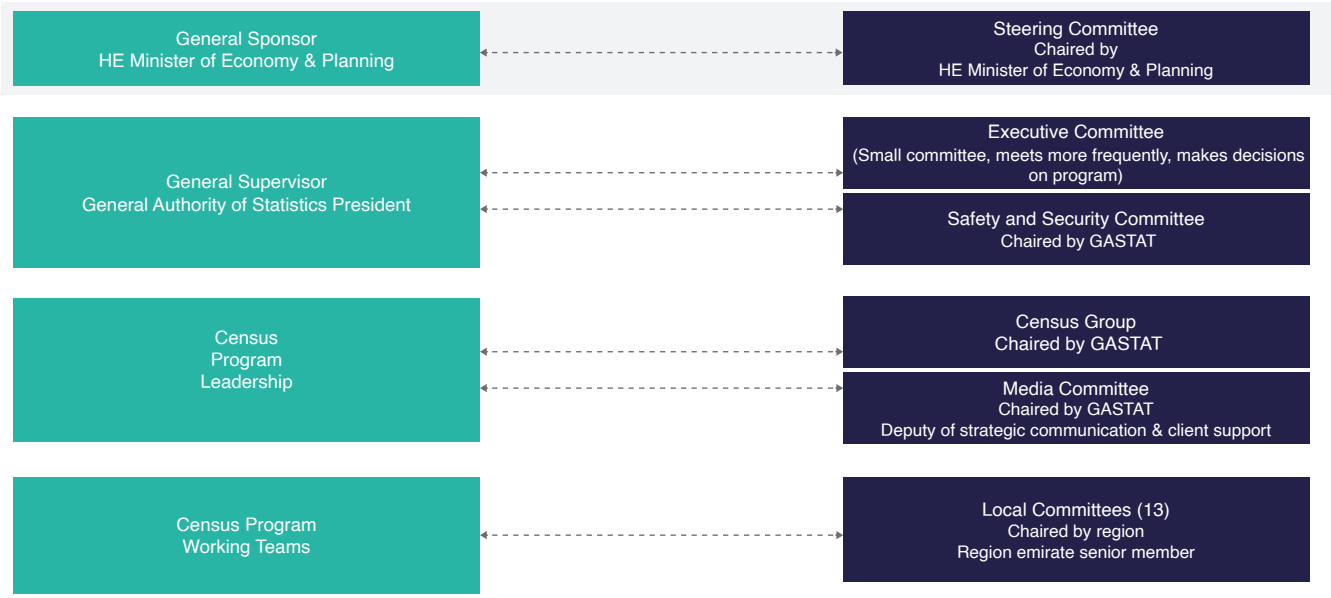
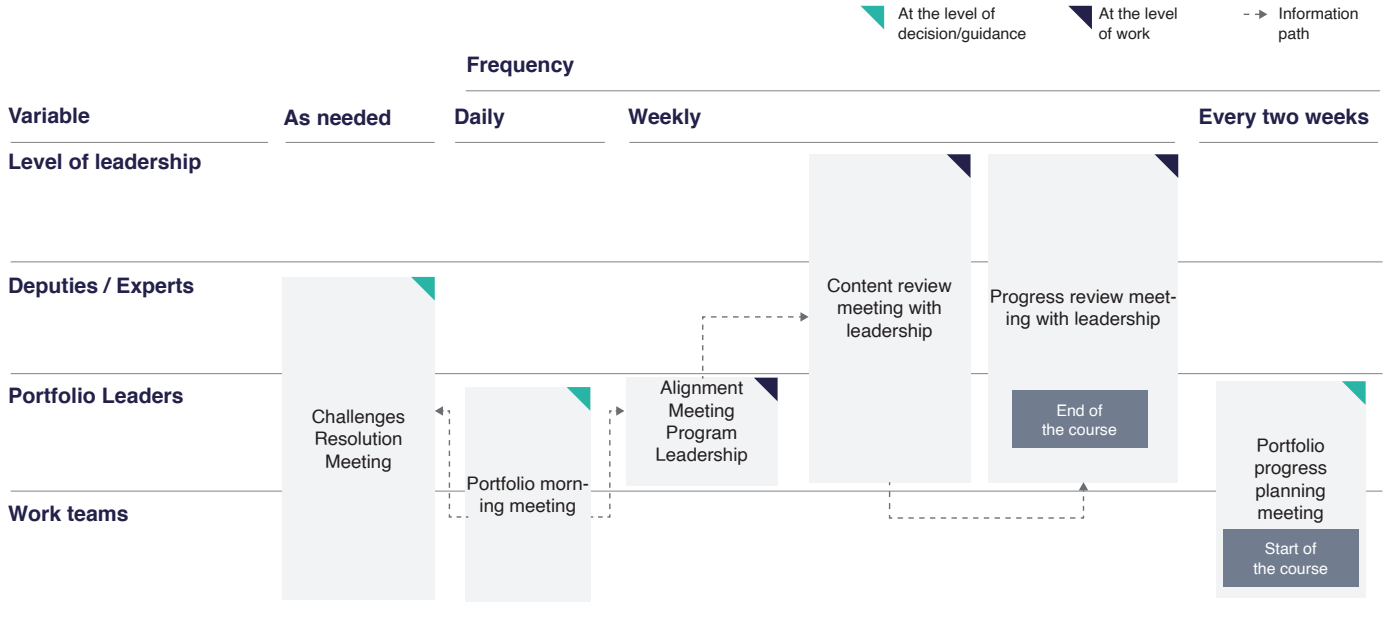
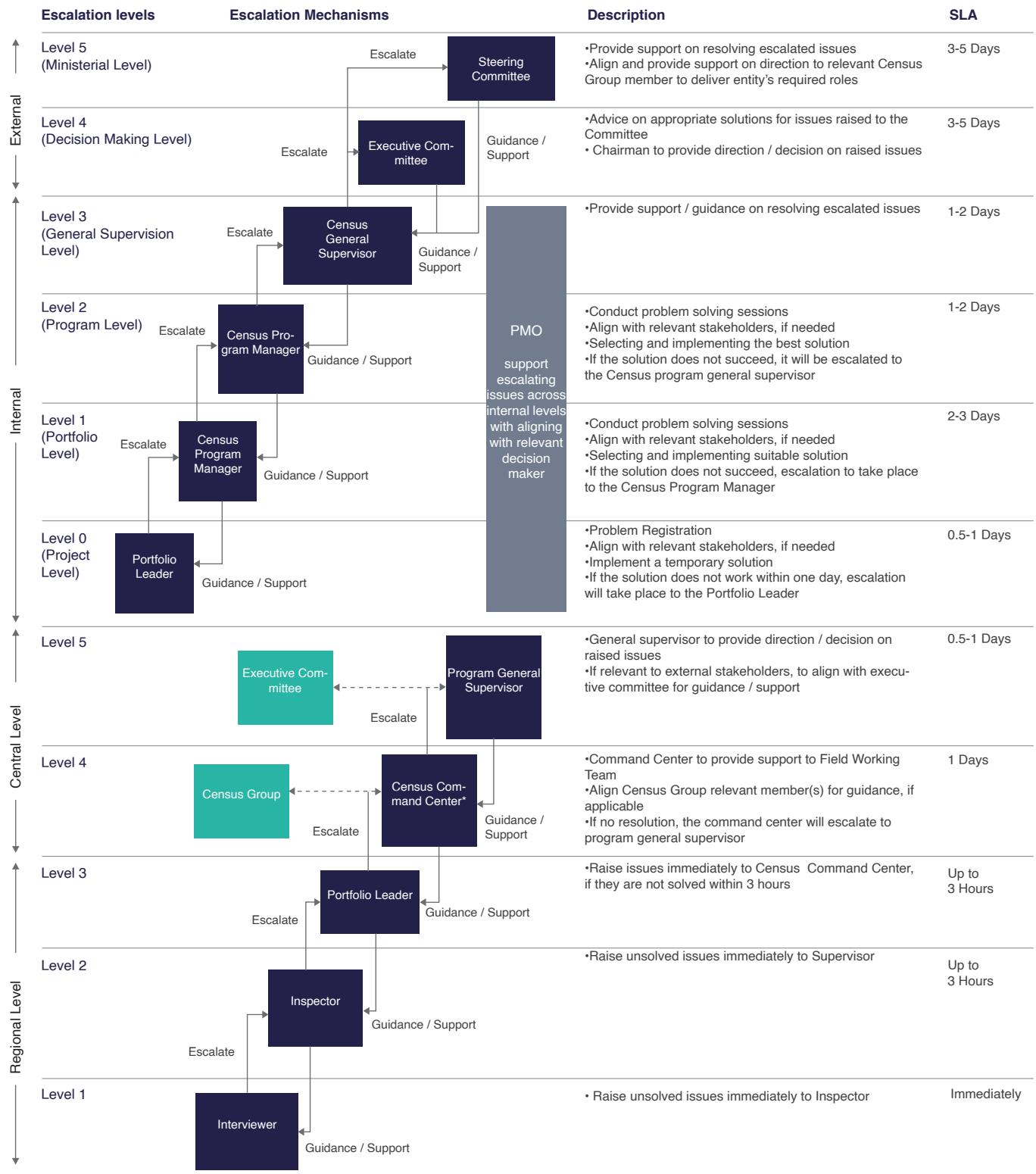


EXHIBIT 34:
CENSUS MEETING CADENCE ENSURED TRANSPARENCY AND RESPONSIVENESS



The master plan and portfolio plan is the basis for all planning sessions, and the portfolio will lead their plans and meetings accordingly

EXHIBIT 35:
ESCALATION MECHANISM FOR PROJECT



* To follow decision making process for operations when escalating to central level

Roles and responsibilities

GASTAT defined the roles and responsibilities of the program deputies, portfolio leaders, managers and working teams. These were split across development, implementation, and support.

Interaction model

Beyond GASTAT, Census 2022 required support from a broad range of success partners. An interaction model for the program's external success partners and their governances was designed to enable effective governance and participation. A comprehensive approach was followed to come up with this model, which was the basis of establishing the different committees, detailed in the Stakeholder Involvement Section of this document.

Meeting cadence and escalation mechanism

GASTAT set a meeting cadence with different objectives and stakeholders and designed the escalation process.

There were six different types of meetings covered under leadership meetings and portfolio meetings.

1. Leadership meetings
    - Executive review: Progress review meeting with leadership (weekly)
    - Content review: Content review meeting with leadership (weekly)
    - Program leader's alignment (weekly)
2. Portfolio meetings
    - Planning session: Portfolio progress planning meeting (every two weeks)
    - Portfolio check-in: Portfolio morning meeting (daily)
    - Problem solving sessions: Discussion sessions and problem solving challenges (as needed)

The frequency of meetings ensured transparency and allowed GASTAT to respond quickly to new challenges and obstacles.

Census 2022 incorporated an escalation mechanism to ensure the proper response to any issues that arose. There were separate mechanisms for 'project mode' and 'execution mode'.

For project mode, the mechanism started at the project level and allowed for escalation to the portfolio level, program level, general supervision, and potentially executive level, if necessary. The PMO supported escalating issues across internal levels by aligning with the relevant decision maker, up to the level of general supervision.

For execution mode, escalation started at the interviewer level. Unsolved issues were immediately escalated to the inspector, then would move up to the supervisor—all at a regional level. If the issue still remained unsolved it would be escalated to the central Census 2022 Command Center and then potentially the Program General Supervisor.

5.7. DOCUMENT LOGS

5.7.1. REFERENCES

The three main documents that most benchmarks were extracted from are:

3. Principles and Recommendations for Population and Housing Censuses (UN)
4. The Conference of European Statisticians: Recommendations of the 2020 Census of Population and Housing, published by the UNECE (United Nations Economic Commission for Europe)
5. The Commission Implementing Regulation (EU) 2017/543, published in the Official Journal of the European Union

All documents were heavily sourced during the planning phase of the KSA Census 2022.



6
Population Back-Casting

تعداد السعودية
SAUDI CENSUS
التعداد العام للسكان والمساكن 2022

6. POPULATION BACK-CASTING

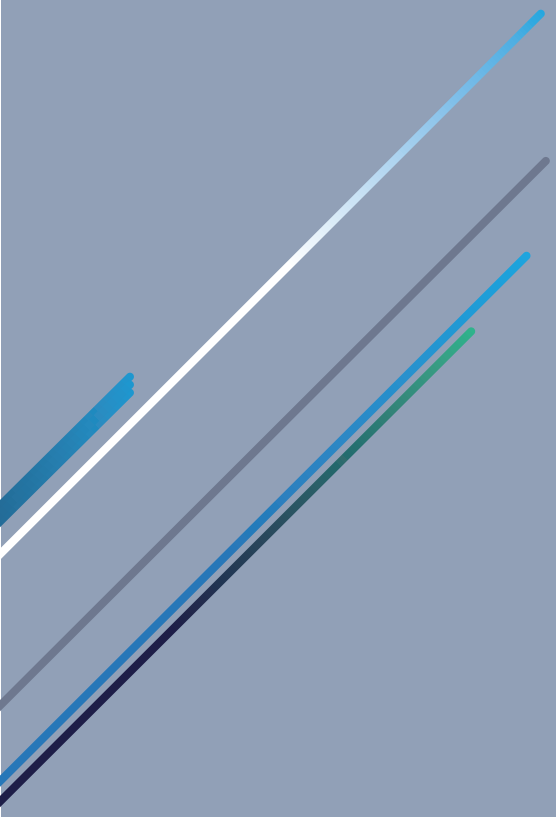
The Saudi Arabian Census of 2022 is the most meticulously carried out in the country's history. Census 2022 used administrative data to validate and cross check its accuracy and coverage. The Saudi Arabian population structure and demographic characteristics are best represented by Census 2022.

Comparing the results and the demographic structures of Census 2022 with the population projections generated based on the Census 2010, there were significant gaps that it is believed are combination of 2010 Census carried overestimated errors and the use of assumptions in the past that did not take into account demographic changes that happened during the period between 2011 and 2021. This meant 2010 Census population numbers and all population estimates based on it (years 2011-2021) had to be revised. The way forward for GASTAT was to conduct a population back-casting exercise.

Population back-casting is a widely used technique globally whereby statistics offices correct the annual population estimates issued in the years between Census exercises in conjunction with the historical administrative data for deaths, births, and migrations while ensuring major socio-economic developments are correctly reflected in the data.

Population back-casting is the process of revising previous population estimates by applying statistical methods that takes into account the available administrative data to estimate related demographic indicators. The process was applied for each year from 2010 – 2021 at both national and regional, level, and also at the level of different cohorts by age, sex, region and nationality (Saudi or non-Saudi).

The back casting results can be found on the Census portal portal.saudiCensus.sa




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