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2. Lessons learned from censuses of the 2020 round

Lessons learned from the National Population, Households and Housing Census 2022 of Argentina

Note by the National Institute of Statistics and Censuses of Argentina (INDEC)[1]

Abstract

This article analyzes the main lessons learned from the National Population, Households and Housing Census 2022 of the Republic of Argentina. The Census included technical and methodological innovations. On the one hand, it was, for the first time in the country, a "*de jure*" census, in which people are counted in their place of usual residence. On the other hand, the collection instrument was a single questionnaire applied in two ways: i) an online survey (Digital Census), which was available for two months, and ii) face-to-face interviews on 18 May 2022 (Census Day). Additionally, technological innovations were introduced to the remaining Census preparatory stages, such as automated geographical segmentation, virtual training, and a mass communication strategy, segmented for digital media. In this sense, the Census 2022 is a transition census that lays the foundations for a new statistical infrastructure that will enable the development of a statistical population register, relating and integrating census information, geospatial data and administrative records, and an experimental test for a population census based on records. Regarding these innovations, the present article explains the key census processes, lessons learned, and perspectives that open up for the development of future population censuses.

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I. Introduction

1. As in many other countries, the National Population, Households and Housing Census of the Republic of Argentina (hereafter, Census 2022) was originally planned to take place in 2020. However, due to the COVID-19 pandemic, the National Institute of Statistics and Censuses (INDEC) it was postponed until 2022. Despite these difficulties, the delay created a series of opportunities to introduce innovations in the Census.

2. The Census 2022 was defined in methodological terms as a *de jure* census, implemented by means of two collection modes: i) the Digital Census, available throughout the Argentine territory during the two months preceding Census Day for private dwellings, and ii) a field survey with face-to-face interviews in urban and rural areas, collective dwellings, and to homeless people. A single census questionnaire was applied in both modes for private dwellings, and a shorter questionnaire was applied for collective dwellings.

3. The interviews in urban private dwellings took place in one day (Census Day), which required the deployment of 650,000 census-takers. On Census Day, declared a national holiday to avoid the mobilization of the resident populations, census-takers covered the whole national territory to request the Digital Census completion codes from the households who had chosen to fill out the Census online, or perform face-to-face interviews to households who preferred this option. The remaining surveys —in rural areas, collective dwellings, and to homeless people— were carried out during the days preceding Census Day.

4. Further specific innovations were included in the census processes, as a result of i) two pilot tests (2017 and 2019); ii) a series of tests focused on the questionnaire and the navigability of the web application; and iii) the Experimental Census (EC) in 2021. The following sections analyze the various processes applied to the implementation of the Census 2022.

II. Developing the Census 2022

A. Evolution of the methodological and conceptual design of the Census 2022

5. Including the Census 2010, the past ten censuses in the country were *de facto* censuses: the population was enumerated where they had spent the night before census day. However, the recent global trend has been the *de jure* method, in which the population is counted according to place of usual residence. This makes it possible to pinpoint where services are used, and where they are in demand.

6. The first pilot test evaluated the implementation of a *de jure* census, during a 23-day field survey which included a system for monitoring census coverage and tested the question about usual place of residence. The main conclusion of this test was that it was possible to enumerate the population according to place of usual residence, although it also found that there were difficulties, when extending the number of field survey days, in finding people at their homes, as well as an increase in census-taker exhaustion. Thus, it was concluded that the field survey should be performed during a special national holiday, to prevent mobilization and help census-takers locate the population in their place of usual residence.

7. During the second pilot test, in 2019, the traditional *de facto* method was applied: the national mid-week holiday, coupled with an oversight plan and a computer system for monitoring and management. The collection instrument was a basic questionnaire, and an extended questionnaire for a sample of private dwellings in localities with

populations over 50,000. Both questionnaires included items on property ownership and national identification number (DNI). The remaining processes maintained the general features of past censuses which, with positive results, set the methodological design for the definitive round 2020 census.

8. In early 2020, once the World Health Organization had declared the pandemic, the Argentine State ordered, as of 18 March, a "precautionary, mandatory, social lockdown". Even though the lockdown restrictions were later applied according to the epidemic situation in each geographical area, the measures remained in effect until 31 March 2022. Early on during this mobility restriction period of social distancing and uncertainty caused by the pandemic, INDEC began an internal discussion process. By that point, it was evident that the census could not be carried out under the technical definitions and traditional methods of the latest pilot test. Additionally, because of a series of changes in the behaviour of the population, it was both necessary and possible to introduce methodological innovations and include new technology in census processes.

9. The first main methodological decision was to carry out a *de jure* census. As mentioned before, because it would be the first *de jure* census, its design — two-month Digital Census and one-day field survey, as in past censuses— considered the possible risks deriving from the behaviour and awareness of the population of this new methodology. While the Digital Census would be filled out by the population with access to technology and digital capacity, the field sweep would confirm the geographical location (GL) of these online responses and ensure that the population that preferred the face-to-face interview was counted. Both the INDEC Director-General's office and the technical team considered that a *de jure* census would not only modernize some aspects of the census but would also enable a new sociodemographic statistical infrastructure that could help link census information with administrative records. This would jumpstart the transition to record-based censuses.

10. With these preliminary definitions in place and observing what other countries in the international statistical community were doing in the new pandemic context, the Digital Census was born as an additional enumeration method in combination with face-to-face interviews. Back in 2020, some countries (Colombia and Mexico are some regional examples) had carried out digital enumerations, while others were preparing to launch this method in the pandemic context (Canada, the United States, and the United Kingdom, among others). INDEC's team consulted with the mentioned countries to address the various technical and planning aspects for the main census processes: methodological design, operational geographical information for the field survey, development of the web application, training of human resources, and communication strategy.

11. The development process for the Digital Census involved four pilot tests aimed at evaluating i) the design, function, and navigability of the application on different devices and browsers, ii) the system that would enable users to identify their dwellings; iii) the practicality of assistance tools in the questionnaire; iv) different wording alternatives for specific questions; and v) the automated and semi-automated coding process for some of the open questions (for example, economic activity).

12. The main methodological challenge of the Digital Census was to pinpoint the completed online questionnaires to specific, definite GLs. The consulted countries had overcome this challenge by using a database of dwellings or addresses, with coverage close to 100%, ensuring the link between dwelling and GL, and distributing visitation notices.

13. INDEC had a dwelling registry of Argentina that presented coverage heterogeneities in different provinces, ranging from 4% to 95%, with a national average of around 62%. The main issue was that the dwellings that were not in the registry would not be available in the application, and their census questionnaires would not be associated

with the GL. In the face of this challenge, the first possibility analyzed was that the Digital Census only be available in urban centres that had their own dwelling registries.

14. However, the aim was to reach the whole population with the Digital Census, and since the field survey would require comprehensively sweeping through the whole territory, the decision was made to create an alphanumeric completion code for the Digital Census that would be collected by census-takers at every dwelling in their working areas. In this way, the link between the online form and the GL would be confirmed on site. The next step was to design a comprehensive field test, to put into practice the adopted methodological design and definitions.

B. The Experimental Census

15. As a result of the aforementioned definitions, and taking into account the international recommendations, INDEC's team designed a strategy for the EC that included methodological and technological innovations in the census processes and was in line with the main findings of the pilot tests.

16. The highlights of the EC strategy were: i) a *de jure* census implemented in two modes with a single questionnaire; ii) an online survey, the Digital Census, available during the two weeks preceding the CE day; iii) special field surveys before the CE day, with face-to-face interviews in rural areas, collective dwellings and to homeless people; and iv) implementing a fully virtual training system. The EC was launched on 17 November 2021 in selected areas[2] and included a total of 18,910 dwellings. From that day and until 4 December, the experimental Digital Census was tested. On 5 December, the field survey took place. The workload averaged 36 dwellings, and the assumption was that 20% would complete the Digital Census (i.e., 1 in every 5 dwellings for each segment), which amounted to an estimated 2,000 census-takers necessary.

17. The EC produced the following overall results:3 i) 20,295 total dwellings, ii) 8,189 interviews, iii) 12,106 non-responses, and iv) 3,486 households completed the Digital Census. Participation in the Digital Census calculated over expected dwellings was 18.4%; and over surveyed dwellings, 17.2%.

18. The experience during the EC favoured the introduction of improvements in the fieldwork that helped strengthen the strategy for the Census 2022, including:

   i.   the introduction of mandatory on-site training sessions to reinforce the knowledge acquired during the virtual training stage;

   ii.   reducing the average workload to 32 dwellings per census-taker to ensure coverage in each work area;

   iii. adjustments to the collection instrument, and designing specific audio-visual material for the population to better understand specific concepts; and

   iv.   implementing a contingency plan for potential traffic peaks in the Digital Census website.

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[2] Selected tracts in boroughs 2 and 5 of the Autonomous City of Buenos Aires (CABA) and the Gálvez district in the province of Santa Fe.

[3] i) 20,295 total dwellings enumerated (8,484 Gálvez, 10,042 CABA, 1,769 CABA reconciliation), ii) 8,189 interviews performed (5,511 Gálvez, 2,350 CABA, 328 CABA reconciliation), iii) 12,106 failed interviews (2,973 Gálvez, 7,692 CABA, 1,441 CABA reconciliation), iv) 3,486 households completed the Digital Census (2,367 Gálvez, 1,119 CABA)

C. Innovative aspects of the Census 2022 processes

19. Based on the aforementioned strategy, other specific features were included in the census processes, responding to the numerous challenges arising from a context that still included a pandemic: i) implementing a stable, solid, and user-friendly application for everyone who wished to fill out the Digital Census; ii) having a single questionnaire, adapted to two enumeration modes, and that would avoid the usual bias; iii) using a Pre-census of Dwellings to guarantee coverage; iv) automated segmentation to define each census-taker's working area; v) virtual training for the census structure; and vi) introducing technology in questionnaire scanning.

20. In this way, from the methodological viewpoint, the Census 2022 presents as a transition to future censuses. A *de jure* census enables progress towards integration with administrative records and an experimental test for a record-based census. These efforts are aimed at laying out the foundations for a new demographic statistical infrastructure, based on the development of a statistical population register resulting from linking census information and records. Once this link is established, a statistical population register could be more frequently updated, at a lower cost, and could continuously be fed from information from other administrative records. Additionally, a statistical population registry would propitiate the development of a geo-located data system and the subsequent inclusion of information layers into representation maps.

D. Developing the Digital Census application

21. From a methodological viewpoint, introducing the Digital Census meant facing the new challenge of a self-administered census questionnaire for the direct use of the whole population. This meant leaving behind the census-taker's traditional facilitating role and not only rewording the questions to produce plain language, but also offering quick help tools that were only a click away.

22. With this goal in mind, 5 pilot tests were carried out between 2020 and 2021 for the online questionnaire, each one presenting a new and improved version of the web application. Various key aspects of these tests were evaluated: how the application performed on different devices (PCs, laptops, tablets, and smartphones), navigation through the app, completion times for different-sized households, design of help tools for each question, the concept of usual residence, and the inclusion of reference dates.

23. The Digital Census web application was fully designed in house and in parallel with definitions on methodology and potential scope in terms of population and territory, as explained above. Once the decision was made to make the Digital Census nation-wide, the main challenge was to estimate the required software and hardware resources, especially considering that there was no precedent on the number of households that would fill out the Digital Census, except for the experience of a set of countries with different census strategies and populations.

24. The common denominators in international experiences were census websites errors due to a large portion of the population trying to fill out the census simultaneously. The consulted countries stated that these surges occurred at two main points: close to launch, due to the novelty effect, and nearing the census deadline, to avoid other enumeration modes (mail or face-to-face interviews). To avoid the stress to their systems, the consulted countries used a variety of strategies, implemented either in tandem or separately: a self-scalable infrastructure for high simultaneous user concurrency, a contingency infrastructure, and developing a backup application that could be deployed whenever the main application failed.

25. In this context, and considering the behaviour observed during the pilot tests and, even more, during the experimental Digital Census that was available for 2 weeks, a computer

infrastructure scheme was developed with both horizontal and vertical scaling. Vertical to increase server processing capacity based on demand; and horizontal to increase the number of servers that could offer the application based on the increasing number of users demanding access.

26. Additionally, since this scalable scheme was implemented on a main cloud from an internet service provider, it was deemed necessary to have a similar scheme, or mirror, on a separate cloud (contingency cloud) that would be activated if the main cloud failed during peak concurrency, or even in the event of a cyber-attack.

27. The Digital Census web application was stressed twice due to concurrency peaks: the first time was shortly after launch, and the second during the days nearing the deadline. According to the dashboard, during the highest peak, 8-11 p.m. on 16 March 2022 (launch day), 61,310 dwellings successfully filled out their Census questionnaires, while during the last day the application was available, on 17 May, the number totalled 440,000. It must be noted that the contingency scheme was implemented during the last 3 days of the Digital Census (15-17 May), and that it remained active alongside the main scheme, using an algorithm that constantly monitored user traffic and directed users to one cloud or the other.

E. Design of the single census questionnaire

28. In parallel with the digital tests and the development of the web application, adjustments were made to the wording of some questions, both the new questions introduced in the Census 2022 and the questions modified from previous censuses.

29. The single census questionnaire used in the digital tests and the EC was divided into the three statistical blocks of the Census 2022: housing, households, and population. The following questions may be noted as innovations:

    i) In the housing section, a question on availability of internet connections and, in the household section, possession of computers, smartphones and tablets.

    ii) In the household section, the question on disability was formulated based on the United Nations international recommendations[4].

    iii) Lastly, in the population section, the questions included items about indigenous peoples, afro-descendants, and a new question on gender identity.

30. With the aim of linking census information with administrative records, both in the pilot tests and in the EC, the census questionnaire included a question on identification document possession and DNI[5]. According to the assessments performed, the DNI question displayed a high response rate in all tests, had a high acceptance rate and there was agreement across the State and the National Statistical System (NSS) about the advantages to statistical production.

31. However, during the consultation stage, civil society organizations[6] commented on the need for additional time to create awareness among people who might feel compromised by providing this information. Given this context and the sensitivity of the issue, INDEC decided to exclude the DNI question from the single questionnaire for the Census 2022.

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[4] The Washington Group on Disability Statistics. https://www.washingtongroup-disability.com/

[5] Argentine residents must have a DNI, used for all interaction between the individual and the national, provincial, and local State bodies, public utility enterprises, and other daily life activities.

[6] Human rights, immigrant protection, and population group representative organizations.

F. Pre-census of Dwellings

32. The Pre-census of Dwellings is a comprehensive list of addresses by block side in localities with populations over 2,000. As well as becoming a web tool for geo-referenced visualization of the country's dwellings, the Pre-census was the fundamental input to determine census-taker workload based on segmentation for territory sweeping and to validate addresses for the self-administered digital census.

33. The enumeration was carried out in all urban areas across the country, under agreements with the Provincial Statistics Offices (PSOs) in the 24 jurisdictions, using mobile devices (phones, tablets, and drones) and covering 100% of the country's urban census block groups.

34. Additionally, this web application constitutes the initial stage in the development of a geo-portal, which can be added to with information layers from various sources (statistical records of public and private utilities, bodies of the NSS and other INDEC surveys).

G. Automated segmentation

35. Since 2019, INDEC and the PSOs had been updating the national geographical database and the list of dwellings of the whole national territory. As a result, two main inputs were developed for the Census 2022: i) the list of geolocated addresses, and ii) the dwellings linked to the national geographical database. The list of geolocated addresses was used to help the population locate their dwellings in the Digital Census web application. The total enumerated dwellings associated to the national geographical database determined the number of dwellings that each census-taker would have to visit in their work area (i.e., segment).

36. When the census survey is performed in only one day, it is necessary to determine the number of dwellings that a census-taker must visit, i.e., the workload, both to improve process efficiency and to define how many census-takers will be needed. Assuming that a workday is 8-hours long, the workload is determined by using information from the previous census (2010) on average household size by province and the expected participation in the Digital Census.7

37. Once the workload was estimated in urban areas for each of the 24 provinces, the segmentation process lasted around 4 months. This process was performed with an in-house computer system that, based on a set of inputs and an algorithm, was able to segment and create a work area map for the census-takers.

H. Training the Census 2022 human resources

38. Regarding training the census structure, previous censuses had performed on-site training, with around 45,000 trainers and 800,000 printed manuals. Some of the disadvantages of this strategy were a higher cost, difficulty to evaluate the results of activities, a degradation of contents due to the cascade effect, no indicators to monitor progress, and a negative impact on the environment due to the large quantity of printed material.

39. After the diagnosis detailed above, the context of the COVID-19 pandemic and, mainly, the decision to strategically make progress along a technological modernization path, INDEC decided to accelerate the digital transformation process related to training for

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7 For example, for a 4-person household, the average face-to-face interview time was estimated in 11 minutes. If that same household had filled out the Digital Census, the estimated interview time was 3 minutes.

the Census 2022. The fundamental pillar was having a comprehensive modular management system that would allow the concatenation of various activities and tasks related to training the census structure. Consequently, INDEC took several steps to guarantee the success of this cultural, functional, and technological change, such as:

- Designing a virtual training strategy for the Census 2022.

- Developing and implementing the Virtual Campus.

- Developing digital and multimedia content on the Census 2022.

40. As a result, a fully virtual training strategy was implemented for the EC. This strategy included the implementation of a Virtual Campus with courses tailored for each level of the census structure (provincial coordinator, managing assistant coordinator, department chief, tract chief, block group chief, and census-taker).

41. The courses were organized by thematic module (5-9 modules per level). Tab-based navigation helped easily access contents and activities. Each module included reading material and multimedia resources to enhance participant experience. After each module there was a self-assessment activity.

42. The result of virtual training for the EC was broadly positive, even though some opportunities for improvement were identified to reinforce the understanding of fundamental concepts and build engagement at all levels. Among the aspects identified as opportunities for improvement, we may mention the time limit established for census-takers to take the course (it was available only a few days before the field survey), offline access to contents, and direct contact with an immediate superior to discuss key issues before Census Day (since training was fully virtual, this was not possible).

43. Based on the EC experience, the training strategy for the Census 2022 was strengthened: i) short, downloadable content was developed for each level, ii) on-site training stages were established (content-reinforcing workshops) for each level, iii) quick, induction training was performed, and iv) a training progress dashboard was developed.

44. The training strategy was conceived for each level of the structure to be able to validate the knowledge about their own position, and to validate the route of the levels under their position. The new Virtual Campus offered training statistics on the number of people enrolled, with ongoing/completed courses, and who had passed the tests.

45. The total number of registered users on the training platform reached 796,491, out of which 648,223 either finished or progressed through the learning courses (over 81%). Based on collaborative work with the jurisdictions, it was decided that the virtual strategy would be supplemented by actions to achieve the full training defined as an objective. Among the actions developed to this end, we may mention:

- including a census questionnaire simulator for all participants to self-evaluate;

- developing over 25 interactive learning resources and over 50 audio-visual fictional and animated resources;

- implementing over 500,000 satisfaction surveys to keep improving the activities after the Census, providing feedback for the learning process related to the implemented cultural, technological, and functional change.

I. Communication strategy

46. Since one of the main goals of a census is to achieve a high coverage rate, getting the population to participate is essential. To this end, the comprehensive communication campaign designed by INDEC was aimed at providing detailed information about the

Census, its goals, and its statistical importance, to achieve the active engagement of the population, i.e., to make them "take ownership" of the Census.

47. To achieve a high level of participation, it was necessary to have the collaboration and commitment of the government and civil society organizations directly and indirectly involved. The communication campaign also sought to provide authorities with a continuous stream of information on the reactions of the population during the whole Census stage. An active listening strategy was implemented to i) monitor digital conversation topics around the Census; ii) analyze the evolution of discussions on certain topics that originated in specific audiences; and iii) identify fake news. During the communication campaign, there were two marked peaks in conversation: on the day the Digital Census was launched, with an estimated audience of over 36.5 million; and on Census Day, with an estimated audience of 211 million.

48. A comprehensive awareness strategy was planned to deliver a univocal message to the population through all the communication channels available. The objectives of the campaign were:

- To reach every person living in the national territory and deliver the news that the Census would be carried out.

- To create awareness among the population and the sectoral organizations about the benefits of the Census, both for themselves and for the country.

- To remind people of their legal duty and their right to participate.

- To explain to the population in advance what would be asked, why, and for what purpose, besides providing guidance on what to do and when.

- To inform about privacy protection and confidentiality of individual data.

- To clarify the objectives and questions of the Census whenever erroneous interpretations should arise.

- To thank the population and institutions for their participation.

49. The campaign was aimed at three types of audiences: population residing in the national territory, segmented into target audiences; people and institutions who use census data; and individual and legal persons participating before and during the Census. The implementation of the communication campaign had the additional challenge of actively incorporating digital and social media for the first time in Argentina's census history. To this end, for the digital universe, stakeholder groups were identified and grouped into 8 categories (or clusters): work and production; communities; gender and diversity; public policies; Census methodology; people with disabilities; entertainment and art; and social life.

50. The recommendation of the United Nations (2017) for population and housing census reflects a global paradigm shift: we do not only have to answer the question "how many?", but also "who are we?". In this way, each person and household's singularities acquire a new value. Based on this, the positive qualities of the Argentine Census 2022 were related to diversity, self-perception, and self-identification: the Census slogan was Reconocernos, which, in Spanish, refers to the collective —and individual— task of finding ourselves. The Census 2022 recorded individual and particular features to contribute to a more inclusive, representative collective identity, safeguarding the confidentiality of individual data.

51. During the communication campaign, multiple communication resources and tools were used:

- Visual identity system: based on the creation of the Census brand, a graphic synthesis for exclusive use at the different stages of the Census.

- Website (www.censo.gob.ar): the indispensable centralizing tool for creating awareness. It was the entry point for the Digital Census and the platform that presented historical demographic information, planning for the ongoing round, and the conceptual content and working materials for the census personnel. It also included the necessary content to inform and assist the population during the weeks preceding the Digital Census and Census Day. During this period, the website received 25,770,835 users, an average of 525,935 per day.

- Social media: for the first time, social media were used as a tool to disseminate the awareness campaign. Besides Facebook, Twitter, Instagram, YouTube and LinkedIn, there was consideration of content generated by users through other platforms, such as WhatsApp, Spotify, and TikTok.

- Printed material and promotional products: for participation in fairs, festivals, and sports events, there were printed dissemination materials on the first bimodal Census of Argentina, institutional binders, plotted vehicles, and digital banners for strategic partners. In addition, there was a series of materials designed for census-takers to wear on Census Day: tote bags, vests, badges, and stickers to place on enumerated dwellings.

- Census literacy: the Metadata INDEC programme, an initiative to promote accessibility and understanding of statistical outputs within and outside the education community, was expanded to include the Census 2022. Online and presence-based events were held with schools across the country, and materials, such as magazines for students and teachers including educational and entertaining content, were distributed.

52. The communication campaign was divided into three stages:

- Emotional (January-February 2022): the aim during this stage was to create awareness and inform the population that the Census 2022 would take place soon and of its value. It appealed to the excitement of a new census, to finding out how many people are in our country, how we are, and how we live. It installed the Census brand and gave meaning to the slogan Reconocernos using communication pieces focused on diversity.

- Digital format (March-April 2022): the Digital Census was communicated, and the population was encouraged to self-enumerate with the digital questionnaire, including the benefits of this methodological innovation (time, security, simplicity, and active participation of the population).

- Today is the day (May 2022): the population was informed of the characteristics of the face-to-face field survey, and the fact that every person residing in each dwelling in the country had to wait for a census-taker to interview them or request the Digital Census code.

53. Nine TV ads were broadcasted on TV: "Reconocernos" and "My house is my country" during stage 1; "Self-census" and 4 jingles during stage 2; and "Numbers" and "Be there". In all cases, at least three scripts for each ad were drafted.

54. In the digital sphere, 2,242 unique audio-visual pieces were disseminated through national advertising (862 in stage 1; 991 in stage 2; and 389 in stage 3) in different formats: fixed, animated, and display.

55. There were joint actions with social media influencers on Instagram, Tik Tok, and YouTube. The promoted actions reached 3 million people, had 3.2 million views and 218,400 interactions.

56. Regarding press relations, the Director-General gave interviews and conferences during his trips to the 24 jurisdictions, and the remaining spokespeople gave an average of three

interviews a day on radio, television, and print media between 25 January and 18 May 2022.

J.   Scanning census questionnaires

57. For the first time, the census questionnaires were scanned using software that combines various digitalization and intelligent interpretation techniques. As well a highly efficient and reliable character conversion with OCR, it applies an ICR technique that detects and converts the data handwritten by census-takers. Additionally, and as a technological innovation in this process, there is the use of specialized algorithms to automatically correct words or characters that could not be correctly or full recognized, which helps disregard false positives or erroneous interpretations. These algorithms work with the aid of external dictionaries of words and characters, as well as data.

58. To guarantee data quality throughout the automated recognition process of questionnaires, an operator performs a specialized data evaluation. This manual operator correction is performed to all data that cannot be automatically adjusted. The software allows for specialized manual correction; there is a group of operators working exclusively with numbers, another group with marks, and a third group with text. This separation of data into operator groups is used to optimize performance and correction quality.

59. Each corrected piece of data is traceable by operator name, to monitor each operator's precision in data editing, since it is fundamental to analyze, detect, and minimize any type of human error. Traceability of changes also allows the detection of possible inconsistencies, validity errors, or incoherence, to rapidly make the necessary adjustments.

K. The operational Census

60. The Census 2022 was launched on 16 March 2022 across the Argentine territory, for an estimated total of 17 million households. From that day and until 8 a.m. on 18 May, the Digital Census remained active. The field survey was performed from 9 a.m. to 6 p.m. on 18 May. The workload averaged 32 dwellings,[8] and the assumption was that 25% of the population would fill out the Digital Census (based on the EC), which amounted to an estimated 650,000 census-takers necessary on the field. On Census Day, census-takers covered the whole national territory to request the Digital Census completion codes from the households who had chosen to fill out the Census online or perform face-to-face interviews to households who preferred this option. The remaining surveys —in rural areas, collective dwellings, and to homeless people— were carried out during the weeks preceding Census Day.

61. The population's participation in the Digital Census was 51% of dwellings, twice as much as for the EC. From the total number of dwellings that chose the Digital Census, 65% filled out the questionnaire using smartphones; 35%, computers; and the remaining 1%, tablets. This level of participation is strongly linked to the population's behaviour in the pandemic context, but it is also due to the awareness generated by the communication campaign, which informed people about the advantages in filling out the online census, and the support of local governments who promoted the Digital Census by setting up points where devices and internet connection were available.

62. The field survey developed as expected between 9 a.m. and 6 p.m. throughout the country, although it must be mentioned that, due to the high participation rate in the Digital Census, and especially in large urban areas, some census-takers were able to

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[8] Workload calculations were done for each province, based on the average household structures.

complete their tasks with time to spare. A noteworthy element was the fluency of the field survey, due to a noticeable reduction in interview times for households who had completed the Digital Census.

63. On 19 May and considering the results of both on-site and digital enumerations, the total population estimate was released. Regarding the Digital Census, first assessments show that the collected data are in line with the demographic parameters and projections in terms of distribution, population by sex, and household size by jurisdiction, among other indicators.

III. Conclusions

64. The pandemic postponed the Census, but it also generated a change in the behaviour of people, which opened up the possibility of accelerating innovations.

65. For the first time, a *de jure* census was defined, with advantages in terms of methodology, modernizing the statistical infrastructure, and using and exploiting administrative records.

66. This census included the opportunity to fill out the questionnaire online, keeping the field survey reduced to one day, as in past censuses. Even though this was the first Digital Census, the response rate well exceeded expectations, and early exploratory studies found no bias from demographic parameters.

67. Additionally, this was the first time a list of dwellings was used, allowing both automated segmentation and an updated geographical database, which will enable the inclusion of information layers from administrative records and other statistical studies.

68. The Census 2022 is a transition census that laid the foundations for a new statistical infrastructure. With the obtained results, the next objectives will be to develop a statistical population register combining census information and administrative records, and an experimental test for a population census based on records.

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