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Lessons learned from censuses of the 2020 round

A mixed-mode approach to Census data collection in Malta

Note by National Statistics Office, Malta*

Summary

The 2021 Census round in Malta was marked by important innovations in terms of field operations, ranging from more use of register data to a mixed-mode data collection process.

For the first time, people had the option to fill in the census questionnaire through an online form. Enumerators visiting households recorded the information directly on tablet computers through personal or telephone interviews, rather than traditional paper questionnaires, which were only used as a backup. Geocoding was also used at various stages of the process, namely for the setting up of enumeration areas to facilitate field operations and to allow the studying of census results on a 1 km² grid. This contributed to a net overall response rate of 83.4 per cent prior to the initiation of the follow-up exercise which was launched in August 2022. Of these, 55.8 per cent were collected over the web.

These changes brought more efficiency, as well as enhanced information security and a reduction in the reliance on and use of paper. This is well in line with the Maltese National Statistics Office's objective to move towards a fully register-based census in the years to come.

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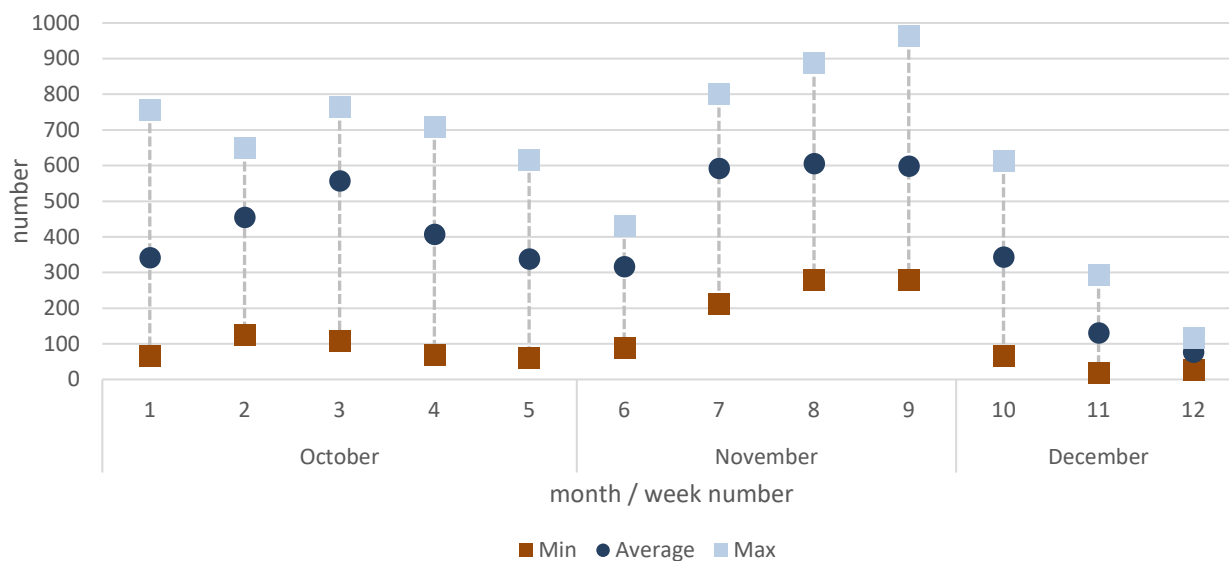
I. Introduction

1. The last Census of Population and Housing (hereafter referred to as the Census, for short) in Malta, taken on 21 November 2021, recorded an estimated total population count of more than 519 thousand persons, a sharp increase of over 100 thousand people compared to the previous census held in 2011. Of these, around 10 thousand persons were found to reside in institutional dwellings or live in other forms of alternative care.
2. The data collection started in October 2021. From a variety of perspectives, the 2021 Census had many innovations. In line with both Government and National Statistics Office (NSO) policies for adopting environmentally-friendly measures as well as in order to automate the collection of data, people were for the first time given the possibility to fill in the questionnaire through an online form. To encourage public participation, the Census questionnaire was considerably shorter than those used in previous Censuses. Another novelty was that the interviewers recorded the information on tablet computers rather than through the traditional paper questionnaire, either by visiting the dwellings or by contacting them by telephone.
3. These changes resulted in enhanced information security, given that all collected data was encrypted and limited to authorized Census personnel. Other advantages were reduced paper use and more efficiency. Paper forms were still printed to cover all possible exigencies of the households responding to the questionnaire. Training of all census staff was also improved, covering technical and operational aspects, although the Information Technology (IT) tools developed for field work were very user-friendly and the vast majority of enumerators fared very well.

A. Reaching out to the public

4. To succeed in its mission, the NSO implemented a vast communication and promotional campaign to encourage public participation, especially through self-administered web forms. The Census was featured extensively by all media, including television, radio and newspapers. An official website was developed (<https://census2021.gov.mt/>), containing updated information on the Census and the latest developments for general public consumption, together with an online contact form through which the public could send their queries.
5. A freephone service was launched in September 2021, with the aim of addressing common public queries and serving as the main contact reference. This service was outsourced to a private local company that handled nearly 32 thousand calls between 1 October and 15 December 2021 (averaging 417 calls per day) with almost half of these being received during the month of November. Nearly 36 per cent of the serviced calls were about the Census questionnaire. In addition to this, support was also provided through a dedicated e-mail address.

Figure I
Number of calls serviced by month and week number



6. As part of this campaign, the NSO also held a competition among local schools in collaboration with the Ministry for Education. Students in participating schools were invited to submit artwork or literary compositions which depicted the essence of the Census and the theme ‘Everyone Matters’. This initiative aimed to promote the Census among the younger generation (and consequently, their parents and/or guardians), thus allowing them to better understand the social value of this important nationwide exercise.
7. Despite schools being closed for summer holidays during the promotional campaign and COVID-19 restrictions, among others, the Office still managed to garner considerable interest in this initiative. Around 500 students from 18 schools submitted entries for the competition. An exhibition was held in March 2022 to present a selected number of entries and acknowledge all the work that was put into the initiative by participating students. All participants received a certificate of participation along with a medal as a token of appreciation, while prizes were also given to the 12 winning students. A commemorative trophy was given to all the schools that participated in this competition.
8. In May 2020, the Office launched a public consultation whereby stakeholders were invited to send their proposals for additional themes and questions that could potentially be included in the Census questionnaire. This stage was essential to ensure that the needs of users were carefully considered. A total of 39 proposals were received from individuals, entities, authorities and other stakeholders. Following this, a number of new questions were amended while topics on religion, ethnicity, sexual orientation and attendance at schools were included in the census questionnaire, which, in addition to the traditional Maltese and English languages, was also prepared in Italian, French and Arabic.
9. Such proposals, however, had to be balanced against issues of response burden, cost-effectiveness, data quality and above all, the need to keep the questionnaire to a reasonable length. For this reason, each proposal was considered carefully and a reason was provided for any rejection. In most cases, an alternative source of information was already available, including but not limited to administrative data available in the country or existing surveys carried out by the NSO. Alternative solutions for collecting the additional indicators proposed were also communicated to the relevant stakeholders.

B. Project management

10. In October 2019, Mr Etienne Caruana, Director General of the NSO, was appointed Census Officer by the Honourable Prime Minister as the person in charge of the preparations for the Census and all related matters. He was assisted by two Deputy Census Officers who were responsible for the running of the Census Office that was set up to oversee field and data management issues. They were aided by a group of seven district managers and 50 supervisors who were in turn monitoring field operations and verifying the quality of data collected by enumerators. An internal committee was also set up to address issues of an administrative nature, such as the promotional campaign, dissemination and communication and procurement.
11. Compared to past censuses, the Census management team was strengthened to ensure that domain experts could focus on their respective areas and engage with external consultants on domain-specific technical issues. This was predominately the case for design and IT-related work.
12. Nearly 1,000 enumerators were recruited for canvassing and fieldwork activities within their designated area. Such areas, formally referred to as enumeration areas, consist of several streets or parts thereof in a locality, typically encompassing an average of 200 dwellings.
13. The delineation of enumeration areas was carried out by means of optimization algorithms developed internally by NSO staff and the use of Geographical Information Systems (GIS). This ensured a much more uniform allocation of enumeration areas with only minimal exceptions, thus leading to a significant enhancement over previous censuses.

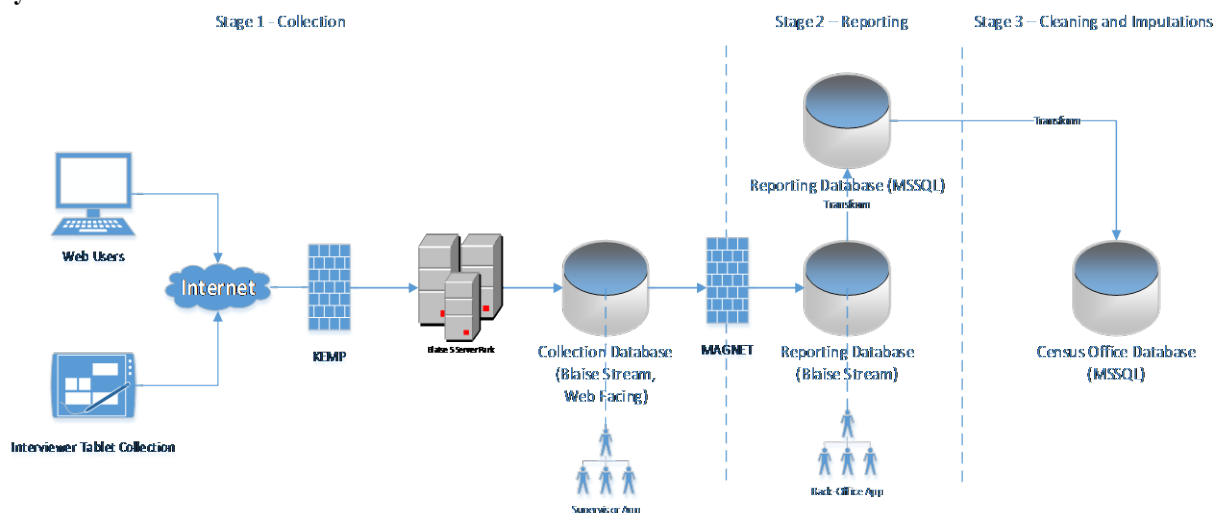
C. Training of staff

14. Nearly 30 training sessions for district managers, supervisors, enumerators and call centre personnel were held in Malta and Gozo between September and November 2021. These sessions focused on various aspects of the Census process, particularly field operations, the Census questionnaire, the data collection platforms as well as legal responsibilities connected with each role. Upon completion of the training, all staff were provided with the required hardware, a geographical map of their assigned enumeration area and all other material required for the completion of their duties.
15. Although the delivery of physical training sessions was a rather cumbersome task in view of COVID-19 restrictions, particularly due to the social distancing protocols which had to be observed at all times, each session covered all salient generic and technical aspects related to the Census and included a practical session with a detailed overview of the systems available to enumerators and other staff.

D. Information Technology infrastructure

16. The Census data collection tool was composed of four main system components: (a) the web questionnaire that was developed using Blaise 5 (b) the computer-assisted personal interviewing (CAPI) module that was built on Blaise for Android (c) an authentication portal that was developed using .Net, and (d) a Microsoft SQL Server database.
17. The system was built using the 'security by design' principle and incorporated a number of features to protect the confidentiality, integrity and availability of the system and data. It made use of Hypertext Transfer Protocol Secure (HTTPS) to ensure the encryption of the data being exchanged. Additionally, the system components exchanged tokens between them to verify that the data being sent from one component to another was coming from an authorized source. All tablet devices used throughout the data collection process were encrypted using Samsung Knox and hardened using government-certified Mobile Device Management (MDM) software to secure, monitor and manage the devices.

Figure II
System structure



18. The web portal also made use of a Captcha to stop Denial of Service (DoS) attacks and had inbuilt controls to prevent SQL injection attacks. Moreover, the system sat behind a Web Application Firewall (WAF) to block unwanted network traffic.
19. The system was implemented on Microsoft Azure so as to leverage cloud capabilities. A server farm of seven virtual machines was used to host the application, thus ensuring its responsiveness. The capacity requirements were established based on the expected maximum number of concurrent users. It also included a load balancer to distribute network traffic across the servers to meet the demand at peak hours. By being implemented on the cloud the system was scalable and permitted the deployment of further servers on-the-fly if required. After the official data collection period, the system was scaled down to two servers.
20. The application available to the enumerators on the tablet devices allowed them to identify any dwellings which did not submit the questionnaire online, so that they could assist them in the process or fill out the form on their behalf. Enumerators were encouraged to synchronize their tablets frequently so that any data (including incomplete questionnaires) stored on the tablets was transferred to the server and hence backed up through the Microsoft Azure facility. In turn, the live database was backed up twice daily.
21. A separate application was also developed for supervisors to validate the work of the enumerators answerable to them. This included a back-office management and reporting tool and back-end processes to transform and synchronize the data which were not exposed over internet but accessible only through the Office's Local Area Network (LAN) or Virtual Private Network (VPN).

E. Level of response

22. The first phase of data collection, which was launched in October 2021, welcomed the general public to participate in the Census by means of the online portal. This was possible following the distribution of over 230 thousand letters among all dwellings in Malta and Gozo that took place a month earlier, and which included the required credentials to log onto the Census online portal.
23. In order to distribute the online responses as evenly as possible and hence reduce server load, Census letters were allocated in three batches.

24. Almost a third of the dwellings completed the Census form online prior to the engagement of field officers on 8 November 2021. Data collection from the field or by telephone was carried out between 8 and 28 November 2021 and was further extended until 15 December 2021 in certain areas. This contributed an additional 36.9 percentage points to the overall response. Another 14.5 per cent participated online from 8 November 2021 onwards, amounting to a total online participation rate of 46.5 per cent (or 55.8 per cent of the collected responses). Enumeration was highest on Mondays and Tuesdays (with nearly 2,000 responses per day).

Figure III.
Daily response by date and type

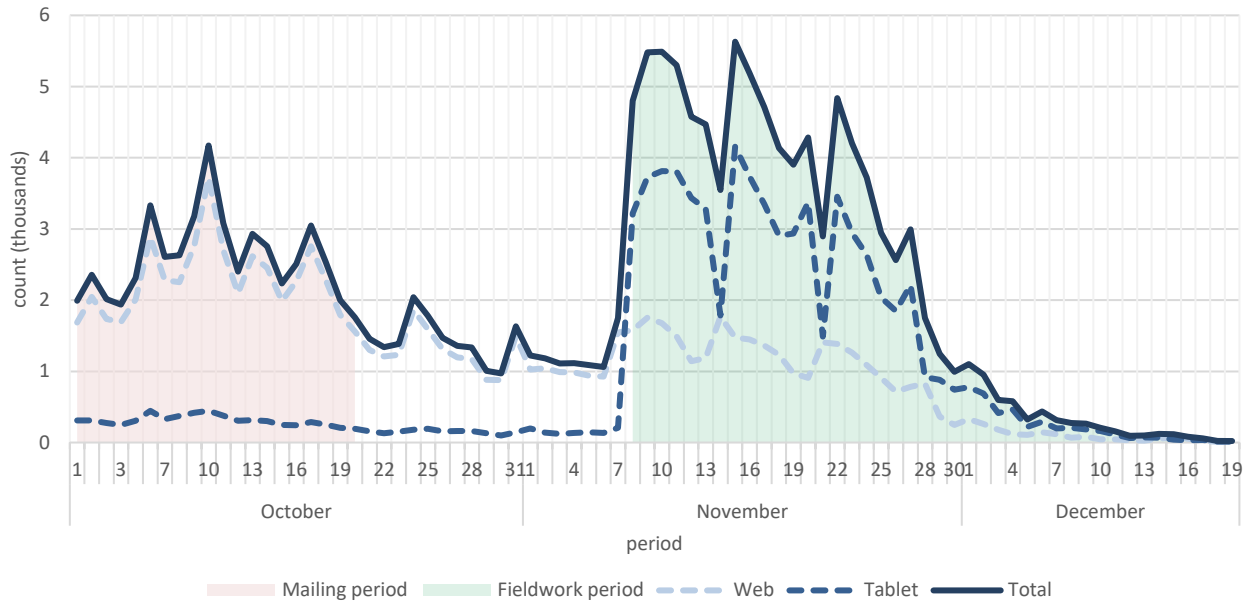
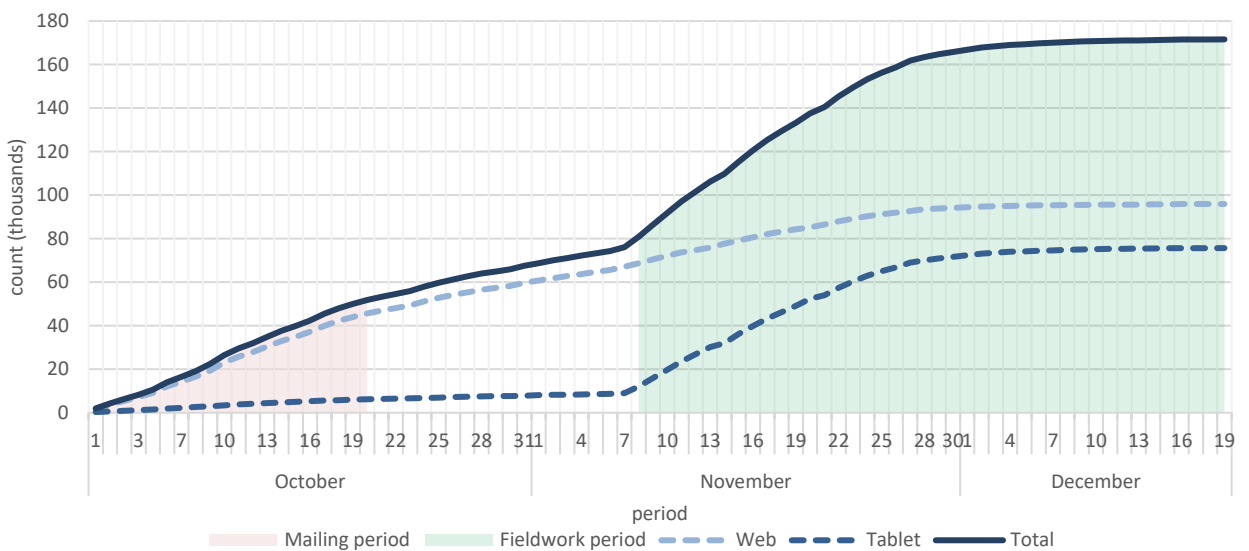


Figure IV.
Total response by date and type



25. An overall net response rate of 83.4 per cent was achieved during official fieldwork and prior to the initiation of the follow-up exercise which was launched in August 2022. Participation was highest among dwellings which were predominantly of Maltese nationality.
26. The peak times for accessing and submitting the Census form online were 8-9 a.m. and 4-6 p.m. respectively. Nearly half of the daily quotas were submitted after 3 p.m.. The average number of daily Census forms submitted online before 8 November 2021 stood at 1,767, with the majority being recorded on Sundays and Mondays (an average of 2,186 and 1,858 respectively), reflecting data collected during the weekend and transmitted shortly afterwards.

Figure V.
Census website traffic by time

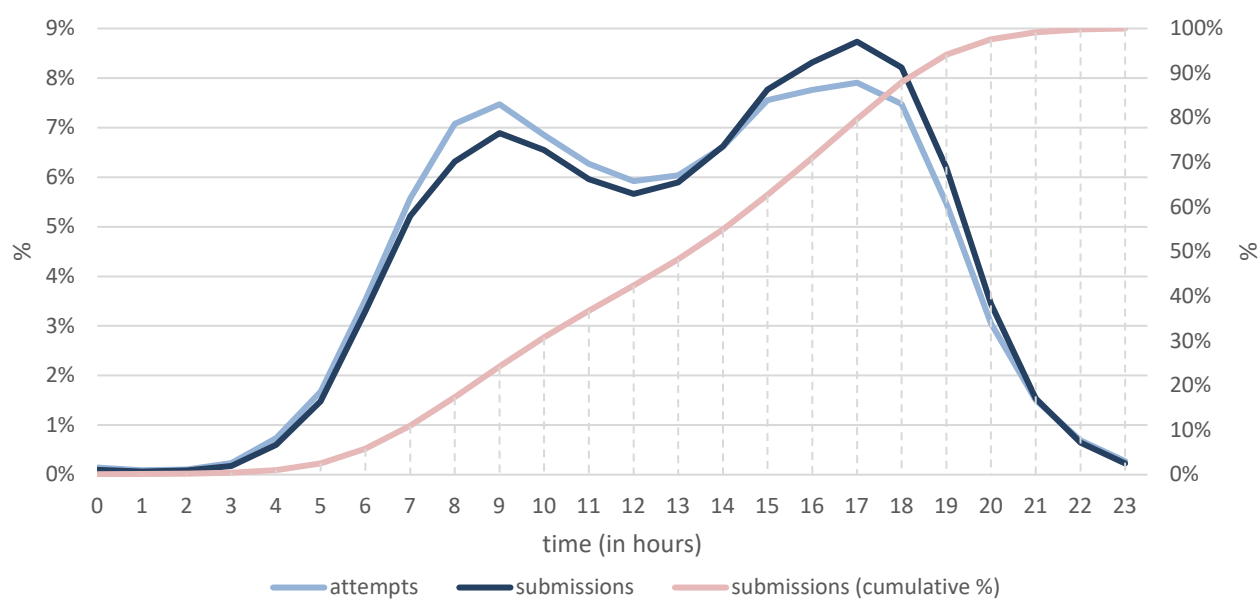


Table 1.
Overall response by type and month

Period	Total			% Response			Daily average		
	Web	Tablet/ Telephone	Total	Web	Tablet/ Telephone	Total	Web	Tablet/ Telephone	Total
2021									
October	60,184	7,920	68,104	28.7	3.8	32.4	1,941	255	2,197
November	34,700	64,268	98,968	16.5	30.6	47.1	1,157	2,142	3,299
December	1,973	4,148	6,121	0.9	2.0	2.9	64	134	197
2022									
January	497	478	975	0.2	0.2	0.5	16	15	31
February	324	649	973	0.2	0.3	0.5	12	23	35
Total	97,678	77,463	175,141	46.5	36.9	83.4	647	513	1,160

F. Importance of alternative data sources

27. Unlike previous censuses, use of register data for the 2021 Census was not limited to benchmarking or imputation purposes. Indeed, multiple administrative registers and Big Data sources were used before, during and after data collection to define the mailing register, monitor the enumeration progress and address any unit/item non-response.
28. In addition to traditional administrative data sources (e.g. identity card registers and residence permit data) which are used extensively in the production of demographic statistics by the NSO, the use of additional data sources sought to strengthen the application of the 'sign-of-life' principle. This included extensive use of tax records and COVID-19 vaccine data to identify permanent residents, complemented by the use of data on water and electricity use to determine usual residence and dwelling statuses.
29. The progress made in this field highlights the improvements made over the years in terms of data availability, coverage and quality of a wide spectrum of administrative registers available in the country.
30. Secondary data sources will be also used extensively in the follow-up exercise, during which the NSO will try to collect information from dwellings where it was not possible to establish any form of contact during the official fieldwork period. These consist mainly of household members who were living temporarily in other residences in Malta or abroad.
31. The Census enumeration process is split into a number of phases, with the full enumeration expected to be terminated by October 2022. Upon the termination of the follow-up exercise, indicators about the final population will be released in a series of thematic publications starting from the last quarter of 2022.

G. Conclusion

32. The Census of Population and Housing is a rich and sought-after source of information about many aspects of the population of Malta and Maltese society. Information on the count, characteristics, composition and condition of the population of Malta feeds into many spheres, making possible informed decisions about public policy, business strategies and the life choices of families and individuals.
 33. For the coming decade and beyond, Census 2021 information will serve as a basis for all demographic updates for Malta and Gozo. This prospect is what motivates a major task such as a population and housing census. Hence all the hard work is directed towards this objective and to the formation of the foundations for a fully-fledged register-based census in the years to come.
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