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Dear Ms. Jones and Ms. Stempowski:

This JASON letter report, **JSR-20-2N (WS'21) Assessment of 2020 Census Data Quality Processes"** is in response to your interest in engaging external organizations in your efforts to assess your data quality processes, procedures, and plans and to provide insights and recommendations on areas for improvement and areas of strength.

This has been a quick-turnaround study aimed at providing timely recommendations. JASON is grateful for the responsiveness of Census leadership and their staffs to our questions during the January 4th – 8th briefing period and in the two weeks following.

INTRODUCTION

Every ten years the Census Bureau brings together more than a decade of planning, including extensive experimentation and tests, to conduct a complete and accurate enumeration of each person in the U.S. This planning includes lessons learned from the previous census and preparation for inevitable errors and unforeseen circumstances. As in other decades, the Census Bureau developed a detailed plan for the enumeration and subsequent data processing, one that included flexibility for contingencies like disruptions caused by natural disasters. This census included innovations such as internet self-response and paperless operations-management, providing the opportunity for the enumeration to be more resilient and responsive if enumeration lagged. Among the perturbations that might have occurred in any decennial census

were tropical storms, wildfires, and civil unrest. The twelve years of planning for the census could have surmounted these problems in the normal course of business. However, the unprecedented disruptions associated with the COVID-19 pandemic raise special concerns over the possible erosion of data quality of the 2020 Census. The COVID-19 pandemic caused an almost complete, albeit temporary, shutdown of field operations. In response, the Census Bureau at first planned to delay the normal schedule by four months but was subsequently required to replan and compress the schedule. These issues gave rise to the Census Bureau's engagement with JASON to help assess their data quality processes and procedures, and to elicit recommendations on areas for improved communication. JASON was asked to comment upon actions Census Bureau might take to strengthen the production and release of metrics to evaluate 2020 Census data quality. The focus of this report is the data quality of this census, compared with what would have been achieved in better circumstances, with a specific focus on the fitness of the data for the constitutional and statutory uses of the census.

Several other events compounded the complications associated with COVID-19 that, although not the focus of this letter, are worthy of mention. Controversy around counting non-citizens added unscheduled tasks, including conducting a 2019 Census Test to evaluate how a citizenship question would impact response rates. The U.S. also experienced twelve landfalls by named storms and prodigious wildfires in the Western United States. These environmental disruptions caused displacement of individuals, hampered in-person enumeration interviews, and may have altered response rates.

The Census Bureau asked JASON to
- provide recommendations, suggestions, and insights supporting 2020 Census efforts to ensure and provide quality data and metrics;
- identify strengths in the Census Bureau plans for data quality assessments and metrics;
- identify weaknesses and opportunities to strengthen Census Bureau plans for data quality assessments and metrics; and to
- provide recommendations on communicating important aspects of data quality that could accompany release of 2020 Census data products.

During January 4th through the 8th of 2021 JASON was briefed on census operations in the field, and the post-data collection processing that is currently underway for the delivery of resident population counts to support Congressional Apportionment and Redistricting Data Products. Our comments are informed by those discussions along with an extensive set of internal documents provided to understand the operational details of data collection and subsequent processing.

No Decennial Census Is, or Can Be, Perfect

The Constitution requires the decennial census to be an "actual enumeration" of "the whole number of persons in each State…." Congress is mandated by law to direct the "manner" in which the census is conducted and does so in Title 13 of the United States Code. The law requires the Secretary of Commerce (who supervises the Census Bureau) to "take a decennial census of population." The law (and governing regulations and court decisions) thus requires that a process be performed diligently, in accordance with the oath taken by public officials.

A hypothetical requirement to "take an *exactly accurate* decennial census" would be unreasonable, and unlikely to survive scrutiny by the courts, not just because impossibility is a recognized legal defense. The question of "how accurate is accurate enough?" is complicated and answered largely in the context of precedent. Congressional oversight on the adequacy (including accuracy) of the census occurs directly through Title 13 and by Senate confirmation of the Director of the Census Bureau; and indirectly by annually appropriating funds that maintain a level of competency and professionalism within the Census Bureau, a level that has been widely admired for more than a century.

Because of social and technological change, every decennial census is different. It is neither possible nor desirable to repeat the prior process. A reasonable standard is whether the *plan* for the decennial census would produce results that *improve* on the standards set in previous decades given legally mandated constraints, including budget, and the information available at the time. Then, given the on-the-ground circumstances under which the census is conducted, the results are expected to meet or surpass the quality of accepted decennials of recent decades. Under the difficult circumstances of Census 2020, it is obvious that the standard for execution might be lower than the standard prepared for in the original plan. But being judged as having executed the 2020 Census and achieving a process quality, *within the range* of previously accepted decennials is still an important test.

It is important to understand—and for the Census Bureau to communicate to the public—that the accepted range over previous decades allows for considerable imperfections, as long as these do not knowingly embody *a priori* biases against individual states or statutorily defined classes of individuals. Constitutionally, the Decennial Census must favor timely good-faith closure (e.g., the certification of state populations for the purpose of apportionment) over unachievable perfection. After the fact, the Census Bureau puts significant effort into measuring its own imperfections in a Post-Enumeration Survey (PES) that has been conducted after every census since 1980. Because the PES utilizes statistical sampling techniques, it is not itself an "actual enumeration" and could not be used to "correct" decennial census results, even if

Congress wished to do so (*Utah v. Evans*, 536 U.S. 452, 2002, *Department of Commerce v. House of Representatives*, 525 U.S. 316, 1999). But, as demonstrated through illustrations of "what-if" apportionment scenarios, using imperfections comparable in magnitude as implied by the 2010 PES for the actual Decennial, the seat distributions could shift (Seeskin and Spencer, 2018). This does not make the 2010 Census "wrong" or "unacceptable." There is no "perfect" answer for an enumeration, necessarily with imperfections, that can be carried out exactly once—especially under conditions that cannot always be foreseen.

The approach taken in this letter report is to review existing metrics, and to suggest additional metrics that could be used to elucidate the overall quality of the present implementation of the 2020 Census. These include metrics of the enumeration and of the post-processing of the data, as well as metrics associated with the counts themselves. The ultimate measure of census quality will be the sample-based Post Enumeration Survey (PES), which becomes available only long after census results are submitted for reapportionment and redistricting. In the meantime, and for purposes of reaching closure on the 2020 apportionment and redistricting results, we can only rely on judgements of the quality of the process, albeit informed by the experience of past censuses.

THE OPERATIONS TIMELINE AND ITS IMPACT ON DATA QUALITY

Over 12 years leading up to the 2020 Census, the Census Bureau developed and tested a comprehensive plan for enumerating the U.S. population. This plan required significant revision as a result of issues associated with the COVID-19 pandemic and devasting weather events. Both complicated the execution of the original plans.

The Census Bureau's response to the COVID-19 pandemic was to suspend all activities involving direct contact with the public in order to follow federal, state, and local authorities' guidance for protecting the health and safety of the American public and Census Bureau employees. This suspension led to a proposal to shift the overall schedule of operations and post-data processing by four months. Failing to obtain Congressional approval for the proposed delayed delivery of the apportionment counts and subsequent delayed delivery of the Redistricting Data Products, the Census Bureau had to again alter its timeline, compressing its time in the field and the time allotted for post-processing of the data.

Prior to releasing the apportionment counts Census must produce several intermediate internal data products. These are

- Decennial Response File 1 (DRF1) – a large number of processes are executed here to determine the universe of housing units and group quarters, identification of unique

persons, standardization of responses and, importantly, a quality assessment of the non-response follow-up (NRFU) cases by incorporation of field re-interview results.

- Decennial Response File 2 (DRF2) – several processes are executed here, the most important of which is deduplication of multiple responses which requires processing the entire nation at once rather than state-by-state as in DRF1.

- Census Unedited File (CUF) – in this phase administrative records are integrated, and the final population count for each address is determined. It is at this stage that address status is imputed if necessary.

- Counts – in this phase the state level population counts are created. This includes merging in the count of the Federally Affiliated Overseas population for each state, ensuring accuracy in the apportionment numbers using multiple independent methods, and comparing and reconciling final results.

Figure 1 depicts the shifting timelines and highlights both the field operations and the data post-processing. These timelines have continued to shift. Figure 1 is based on correspondence with the Census Bureau as of February 2, 2021. The Census Bureau is currently working through its post-processing of the data and has not finalized the delivery dates for the constitutional and statutory data releases. As was briefed to JASON, there are several consequences of the pandemic and other events that increase the importance of completing and checking all aspects of the processing milestones. For example, the pandemic may have exacerbated the duplication of responses as a result of relocation of college students back to their primary residences.
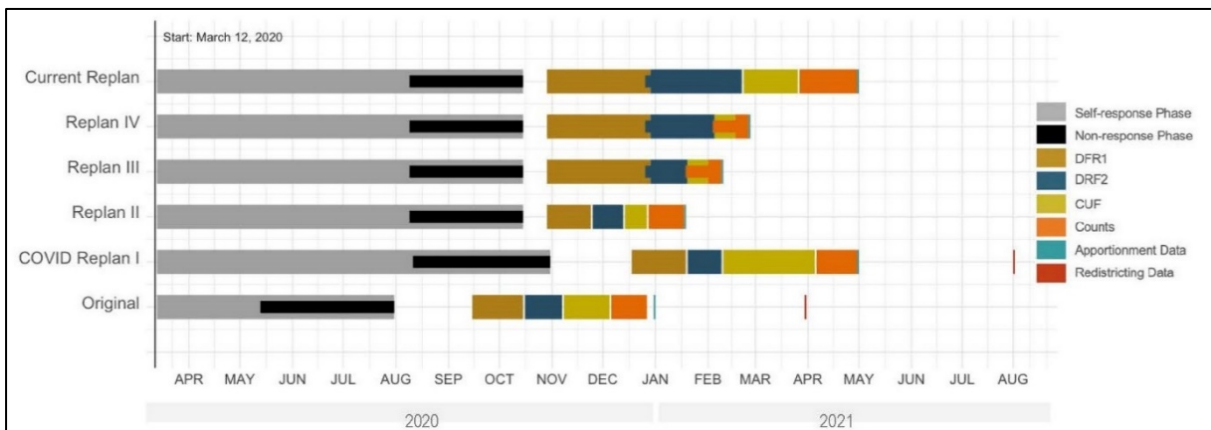

Figure 1. Timelines for field operations and data post-processing. Six timelines are shown here based on correspondence with the Census Bureau as of February 2, 2021. Reading up from the bottom, the first is the original schedule with the apportionment counts delivered by Dec. 31, 2020. The second is a timeline adjusted for the delays incurred due to the pandemic and other factors. The third is a second replanning attempting to compress the timeline. The fourth corresponds to a readjustment of the dates due to the detection of various data processing issues. The fifth is a further readjustment again due to detection of data processing issues. The sixth and latest timeline returns the date for delivery of the apportionment counts to April 30, 2021. During the time between Non-response Phase and DRF processing, geographic processing takes place to account for any new addresses found during field operations and to ensure the final address frame is correct and in the proper data format for final Census processing.

The potential consequences of these schedule changes lie at the heart of questions arising around data quality. The first shift of the timeline was a response by the Census Bureau to provide adequate time to complete processing of the data in accord with longstanding experience and included an anticipated lengthening of the time to complete the CUF so that additional data quality checks could be performed. The allocation of appropriate time to complete Census Bureau post-processing tasks can be viewed as a quality measure. The second shift compressed the timeline. As can be seen in Figure 1, some of the timelines have the various phases of data post-processing overlapping. In JASON's view, compression of the allotted times for post processing of the intermediate and final Census products such as the DRF1, DRF2 and CUF risks compromising data quality. For example, as data issues (discussed further below) are detected, additional processing is required. The time taken to address these issues affects future tasks in the processing. As in any well-run project, contingency was added in the original project plan to accommodate possible unexpected data issues. The compression of the timeline reduced the amount of time allotted to fully address such issues.

Recommendation

- In accordance with Sec. 4 of President Biden's Executive Order ("Ensuring a Lawful and Accurate Enumeration and Apportionment Pursuant to the Decennial Census", January 20, 2021), the Secretary of Commerce should order a return to a timeline that allows adequate time for complete, accurate, and transparent processing of the data (e.g., "COVID Replan I" in Figure 1).

MEASURING THE QUALITY OF THE PROCESS

The Census Bureau would like to know if the choices they made around schedule and the associated changes to its operations, both in the field and, for the post-data collection processing, have led to a biased or differential count of the population. Would some other well-informed group have made similar decisions? This is a counterfactual that cannot be tested. Nevertheless, various quality metrics can be developed to examine whether the enumeration process was reasonable and fair, under the circumstances, in terms of its effort to achieve uniform and high coverage. These include metrics that capture spatial or demographic differences, metrics that provide direct comparisons to various baselines, and metrics that capture change over time.

Intra-comparison of Data Quality Metrics

Intra-comparison of quality metrics relies on trying to identify spatial or demographic differences within the data set. A number of data quality metrics were suggested by Census

Bureau Chief Scientist John Abowd in his presentation on 7 January, "2020 Census Assessments of Quality: Proposed Data Quality Metrics." JASON agrees that these are useful quantities to evaluate data quality. Here we describe additional spatial analyses of these quantities that may afford more detailed quality checks to respond to concerns over the possibility of non-uniform coverage as regards enumerations.

For the purposes of this analysis, we will make a distinction between process measures (or paradata) that quantify the steps taken during data collection and outcome measures that quantify the collected data. Examples of the former include number of enumerators per area, average number of NRFU visits, and average time conducting interviews, while examples of the latter include percentage of completed enumerations, percentage of self-responses, percentage of enumerations by proxy. This distinction allows correlating process measures with outcomes as one way to assess data quality.

A straightforward augmentation to the planned data quality dissemination discussed by John Abowd would be to include some sort of outlier detection and to report on these results. The median population of a census tract is ~4000 and the median number of tracts with some population count within a state is ~1700. Thus, the total number of tracts in the country with some population count is ~73,000, which appears to be a sufficient number of Census tracts to allow for data-driven examination of outliers. An outlier can be defined as a data point that deviates from others to an extent that it arouses suspicion as having been generated by a different mechanism (Hawkins, 1980). Internal subject matter experts along with external experts sworn under Title 13 could examine the distributions and further inquire into points that might arouse suspicion. This discussion aligns with analyses and recommendations made by the American Statistical Association's (ASA) 2020 Census Quality Indicators Task Force (ASA, 2020). The tract level distributions can further be subdivided according to demographics (e.g., based on race) or geography (e.g., urban vs. rural). If distributions are offset from each other across these sub-divisions, that could imply a bias in the data, which can also be investigated.

Another useful extension would be to examine the joint distributions between quality metrics, especially those that correlate outcome metrics with process metrics. A geographical area may, for example, be an outlier in response rates yet still achieve fair coverage because of compensating variations in the number of visits per household. Techniques could include scatter plots, two-dimensional histograms, Loess regression, or others. It is important to note that an outlier does not necessarily imply low data quality but provides a method for identifying potential concerns. If examination of distributions shows outliers, then a discussion of the circumstances that led to the difference should be provided to include whether substantial differences in these outliers would affect apportionment counts.

Although there are many techniques available for outlier detection, JASON cautions against using automated outlier detection approaches. What constitutes an outlier depends upon the underlying distribution that is unknown and that will vary according to metric. Use of tests assuming normality are unlikely to be useful because distributions are unlikely to be normal, or to follow any other simple parametric distribution. Because of this, flexible data-driven definitions of outliers should be employed (e.g., data points that are disjoint from the main distribution or that lie on highly extended tails not supported by expectations) rather than pre-determined thresholds (e.g., 5% of data points).

To report data quality metrics at the state level, a 5-number summary or a boxplot for each state based on the percentages across all the Census Tracts in the state is useful. The standard 5-number summary is (min, Q1 (25th percentile), median, Q3 (75th percentile), max). In a box-and-whisker plot, the outliers are more explicitly identified by extending "whiskers" from the last data point within 1.5 IQR (Inter-quartile range defined as IQR = Q3-Q1) to the data points outside that range. The Census Bureau could look at such plots and summaries across states for differential patterns.

One important consideration for any public release of information about data quality is the risk of disclosing sensitive information. Disclosure review is required to determine if a result can be released or if it is necessary to add privacy noise and count the release against the overall privacy loss budget. The available privacy loss budget should be used to maximize the accuracy and value of the future data products released and not for releasing detailed statistics to increase the public's confidence in data quality. JASON believes granular analyses (e.g., geographic or demographic) will be useful internally, but that any public data released from these analyses should be aggregated to avoid disclosure risk.

Recommendation

- To gain confidence around potential differential count of the population the Census Bureau should make use of its data science resources and summarize the assessments of data quality across various geographies and for relevant demographic groups. Any public release from these analyses should be limited to summary statistics that do not require consumption of privacy loss budget. The expenditure of privacy loss budget should be prioritized to optimize accuracy of future Census Bureau data product releases.

Inter-comparisons of Data Quality Metrics

Inter-comparison of data quality measures involves direct comparison of the data against some (at least partially) independent control set of data such as previous censuses or other

demographic surveys. The Census Bureau plans such assessments through the post-enumeration survey (PES) and the Population Estimates Program.

Another data source the Census Bureau could use for inter-comparisons is the 2019 Census Test data. The Census Bureau did a nationwide test in 2019 to evaluate the potential consequences to enumeration as a result of adding a question on citizenship. The 2019 Census Test offers further opportunity for a near-term assessment of the Census process. Although the 2019 Census Test was originally designed to study the potential impact on self-response of including a citizenship question on the 2020 Census questionnaire, the fact that it is a recent, nationwide experiment allows for comparison against the self-response rates attained in the 2020 Census.

The Census Bureau already has plans to compare self-response rates in the 2019 Test Census to those in the 2020 Decennial Census for purposes of evaluating the efficacy of advertising and its influence on rates of mail-in versus internet responses. Specifically, self-response rates of households included in the control condition, not subject to a citizenship question, would be compared between 2019 and 2020. The study was formulated in November of 2019 and a final report is to be issued in February 2022. The effects of the COVID-19 pandemic, however, may also have a substantial influence, both in terms of absolute self-response rates and preferences between mail-in and internet responses. A straight-forward assessment of these effects would involve conducting the originally-designed analyses. A reduction in overall self-response rates in 2020 relative to 2019, despite advertising in 2020, would be indicative of a lower bound on the effects of COVID-19.

In addition to changes in advertising and the effects of COVID-19, there are several other limiting factors in comparing 2019 and 2020 response rates:

- The results of this test apply only to self-response in areas able to receive mail through the postal service.
- Non-response follow ups were not conducted.
- An ID was required for the 2019 Census Test to respond by internet, but not for the 2020 Census.
- The 2019 Census Test was conducted on July 1st, when more people would typically be on vacation than on April 1st, colleges would not be in session, and regional agricultural work would differ.
- Less language support was available for the 2019 Test.
- There were more wildfires and tropical cyclones.

A more detailed analysis could attempt to isolate effects such as those associated with environmental disasters, advertising effort, and language preference in order to better identify the individual effect of COVID-19, possibly through use of a panel analysis.

Recommendation

- JASON recommends the Census Bureau evaluate the direct comparisons between the 2020 Census and the 2019 Census Test self-response rates during this current data quality assessment phase with a focus on effects of the response to COVID-19.

Time-series Analysis

JASON proposes the development of time series of various quality metrics as a way of understanding the impact of the dynamic conditions surrounding the 2020 Census enumeration processes. This can be applied to both inter– and intra–data quality checks. Examination of the temporal variability in quality metrics for the timespan over which the Census was conducted may help to elucidate the effects of COVID-19 as they became more widespread. Because the spread of COVID-19 and the establishment of various measures to stem its spread were heterogeneous across the states, it may also be possible to observe differential responses between states.

The Census Bureau nimbly redeployed assets, leveraging alternative methods for enumeration using mail-in and internet responses, and tailoring advertising campaigns to reflect the altered conditions. Summarizing these changes in enumeration methods in response to changes in on-the-ground conditions could offer a powerful illustration of how and why the Census Bureau altered certain enumeration strategies. If possible, it may be useful to also indicate the previously planned deployment. It is envisioned that such time series would highlight the ability of the Census Bureau, through its agility in adjusting enumeration processes, to minimize deficiencies in enumeration.

As a point of comparison, the response rate to the monthly Current Population Survey (CPS) declined from a baseline of 82% in late 2019 to a nadir of 66% in June 2020, and then rebounded to near baseline values by October 2020 (see Figure 2). Similar patterns of response rates may be expected for the 2020 Census. However, the impact could be less severe for the 2020 Census because it was conducted over a longer time frame, had greater capacity for follow-up, and incorporated internet-based enumeration approaches. This conjecture could be explored through time series analyses of enumeration response patterns.
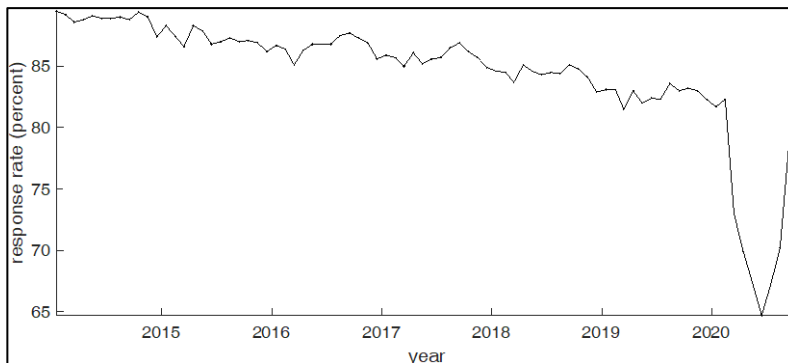
Figure 2. Current Population Survey response rates. The Current Population Survey has a sample size of 60,000 households, is conducted monthly, and uses phone and in-person visits. Data was downloaded from https://www.bls.gov/osmr/response-rates/home.htm on January 18th, 2021.

Recommendation

- The Bureau should develop time series that clearly summarize changes in enumeration conditions and response rates. Changes in enumeration conditions may be illustrated using response rates to in-person, online and mail solicitations, and by reporting the rate of different modalities of solicitation over time. It will be useful to also indicate the planned deployment prior to altered conditions. Such time series would highlight that, although enumeration conditions varied, by adjusting operational strategies, Census was able to avert deficiencies in enumeration that otherwise would have appeared.

2020 CENSUS INNOVATIONS FACILITATE THE DEVELOPMENT OF QUALITY METRICS

Several notable innovations for the 2020 Census help to mitigate some of the enumeration challenges presented by COVID-19 and the displacement of people due to environmental conditions (US Census Bureau, 2018). The Census Bureau increased its use of administrative records and third-party data in both address canvassing and NRFU interview scheduling and enumerations. An internet response mode was added for the 2020 Census. This was not simply a cost savings operational change; rather, it offers new opportunities for enumerating previously undercounted populations and thus for increasing the accuracy of the Census (JASON, 2015). In the context of the 2020 circumstances, it offered an efficient way to respond without endangering the health and safety of Census Bureau enumerators or their interviewees. The management of field operations was reengineered to allow for rapid assessment of activities and redistribution of resources. This section discusses how the application of these innovations could be tracked over the course of the front-end field enumeration process and the post-processing of the data thereby providing measures of data quality.

Time Series Reflecting Field Operations

In the years leading up to the 2020 Census the Census Bureau developed an impressive information technology infrastructure via development of software and hardware that made it possible not only to monitor the data collection process, but also to adapt deployment of resources in response to various issues. For example, a Survey Operational Control System (SOCS) and a Field Operational Control System (FOCS) were developed and used to distribute workloads to enumerators. Enumerators utilized a standard Field Data Collection App (FDCA) to upload their data. This app was also used to optimize labor assignments. The use of these tools allowed for a much more integrated approach to the NRFU process. For example, when a self-response occurred, the NRFU list was immediately updated, thus improving efficiency.

These tools provided unprecedented insight into, and adjustment of, the canvassing processes. The Census Bureau was able to use this real-time data to respond to potential coverage issues by adjusting enumerator placements, schedules, and incentives. The records resulting from the use of these tools as the canvassing proceeded can be collated to provide a time series of metrics on the coverage and also the completeness of the enumeration. The Census Bureau does typically provide updates on response rates as part of its external communication to stakeholders, but the availability of the audit trails of the productivity assessment tools creates a new opportunity to develop an even deeper understanding of the quality of the enumeration.

Recommendation

- Census should collect and analyze the data from its control system tools. This data should then be summarized to develop indicators of enumeration progress as a function of time that can be compared to progress measures in previous censuses. Depictions of these indicators that highlight responses by Census to the pandemic and other events should be developed for communication to relevant stakeholders.

Tools for Assessment of Data Reasonableness

The Census Bureau has always performed in-depth reviews of the quality of the data, particularly as the raw enumeration data undergoes back-end processing to inform the various data products such as DRF1, DRF2, and ultimately, the CUF. These reviews identify processing errors, assess data quality, and, of most relevance for this discussion, evaluate the reasonableness of the data as regards expected demographic trends. There are several data sources that are used as benchmarks to identify inconsistencies at the macro level. These include results from the Population Estimates Program, the American Community Survey and comparisons to the results of the 2010 Census.

A tool to assess the quality of the data at various stages of post-collection back-end processing has been developed to support a team of internal subject matter experts in the end-to-end review of the data. The Census Review Analysis and Visualization Application (CRAVA) provides detailed assessments of data quality at the county level for the responses to all questions asked in the 2020 Census and, for some responses, down to the census block level. The tool is used in multiple ways and offers capability in assessing data quality in a variety of settings. For example, in the development of DRF1 it is used to compare results with the benchmarks noted above with the objective of finding and eliminating duplicates. The aggregate results of all such data quality investigations can be used to measure the quality of the current census relative to previous surveys and can also be used to assess the impact of exogenous events such as the pandemic, hurricanes, fires and civil unrest. There is value in communicating, again via a time series, how well the data eventually compared to the various benchmarks. This can be done on a county-by-county basis to provide a nationwide quality picture. It also can be used to provide evidence that the numbers going into the CUF are indeed of the requisite quality.

Recommendation

- Census should make use of the reports generated by the CRAVA tool to show how data quality issues were identified and addressed over time as the various Census Bureau data products (DRF1, DRF2, CUF, etc.) were produced. These issues and their resolution could be summarized graphically, using a set of time-dependent quality metrics obtained from retrospective analysis of the enumeration data and processes.

Checking and Reporting Data Consistency

As part of the back-end processing of data, the Census Bureau performs a number of checks for data completeness and consistency and detects potential inconsistencies that the Census Bureau terms anomalies. Such inconsistencies are not surprising or indicative of serious problems but are an expected and normal part of the data quality-control processes. Changes in the design since the 2010 Census led to certain types of data issues being detected earlier in the process than they had been in previous censuses. However, the shifts in some of the timelines for completion of the 2020 Census, as described above, left no room in the schedule for handling issues when they were detected later in the process. Even though the issues detected later in the process were expected and not unusual, addressing them required a delay in the targeted release dates.

JASON reviewed the identified issues in DRF1 (from the list of remaining issues on 22 November 2020). There were 15 issues listed, and although it is important that they be addressed, the issues do not suggest any serious risks to data quality. Indeed, their detection confirms the effectiveness of the measures used to detect potential inconsistencies. Six of the

issues involved Group Quarters. In these cases, complex coding situations may result in counting errors, such as multiple sources attributing different data to the same address. Two issues were programming errors that would lead to erroneous results such as miscalculated ages for people with missing birthdays. Two issues involved resolving duplicate addresses in different forms, and the remaining five concern confusions in coded entities. From the materials provided to JASON on the 2010 issues, the rate of such issues appears to have declined in the 2020 enumerations independent of the development of improvements in the processes used to detect inconsistencies.

The treatment of what are termed "anomalies" is an area where transparency and careful communication would be highly beneficial. When they are discussed in abstract terms or disclosed through a FOIA request or legal process, absent the appropriate context, there is a tendency to view them as critical problems or, even worse, as evidence that something is being covered up. Instead, the types of issues that are found reveal the complexity of the task and the thoroughness of the quality-control measures in use.

Recommendation

- The Census Bureau should change the terminology around detected issues from specialized terms that can be misconstrued as negative judgments when they are actually useful quality measures. The Census Bureau should consider avoiding using the term "anomaly", which may raise inappropriate alarm to non-experts, and communicate openly about the measures used to check for data consistency, the specific issues uncovered, and steps taken to address them. If possible, comparison should be made with the number and type of issues identified during the 2010 Census.

Administrative Records Use

The Census Bureau uses administrative records, such as data from IRS tax returns and Medicaid enrollments, US Postal service undeliverable-as-addressed results for census mailings, as well as data collected from state and local agencies, and third-party data collected from companies, to expedite the NRFU process.

As planned, the 2020 Census expected to make more use of administrative records than in the 2010 decennial. The quality tests and models for using administrative records were developed based on an analysis of the 2010 Census. Administrative records were used to predict addresses likely to be vacant, deleted or occupied. Addresses predicted to be occupied would be matched with available administrative records to enumerate household units at the person level. After a first unsuccessful NRFU attempt, if high quality administrative records were available, no

further NRFU attempts were made and the data for the address were enumerated based on the administrative records.

The planned uses of administrative records were modified for the COVID-19 disruptions. Under the original plans, the Census would have received information from the IRS in early May to support the start of NRFU on May 14. This would have been coordinated with a follow-up Census mailing and a subsequent data release from the IRS, to identify addresses as one-visit occupied or model-determined Vacant/Delete. With the tax filing and NRFU delays, this schedule was no longer feasible, although Census did continue to receive monthly data releases from IRS. The Census Bureau performed tests to analyze the quality of administrative records and decisions they would make based on them and found agreement with self-responses and other data sources. Addresses that would have been classified as Vacant or Delete based on administrative records were reclassified based on the new modeling and received full NRFU contact. As of October 16, the enumeration of 5.3% of addresses was completed using administrative records, amounting to 13.9% of the NRFU workload (lower than the original expectation of 22.5%). From this we see that the Census Bureau quickly adapted to changes resulting from the COVID-19 timeline(s) in its use of administrative records in a careful way.

Recommendation

- Looking forward to the 2030 Census JASON recommends that the Census Bureau explore more opportunities to use administrative records and third-party data, while maintaining transparency and careful quality controls on any use of such data.

COMMUNICATING QUALITY METRICS

The Census Bureau has significant capacity for communication with many stakeholders, ranging from primary school students to expert data users. It offers regular blogs on several topics, produces regular press releases, posts regularly on social media (Twitter, Facebook, Instagram) and has an active YouTube channel.

JASON notes that these communication efforts focus on the importance of being counted, advertising of and training with Census Bureau data products, and the results of Census Bureau research. These efforts are laudable. We also applaud the partnerships established with numerous organizations during the 2020 Census, including efforts in communicating with businesses and with local and state governments. However, JASON finds a shortfall in the communication efforts of the Census Bureau regarding its enumeration processes and changes made to these processes for a range of reasons, including those resulting in improvements.

Refining the information found in the briefings to JASON and summarized in existing blog posts, such as from Deputy Director Jarmin on November 5, 2020, will help the Census Bureau with its goal of "communicating important aspects of data quality that could accompany release of 2020 Census data products". A select list of particularly impressive points includes the following and would be worth communicating:

- The existence of multiple avenues for response, including the internet for the first time in 2020;
- Repeated attempts, up to 6 times, for in-person follow-up for households who did not responded to the survey;
- Real-time adjustments to the tasking of field-workers, relying on cell-phone based software, to increase coverage in all areas, to improve homogeneity in enumeration and to respond to disruptive events;
- Comparison with population estimates that are cultivated throughout the decade to identify any problems and ensure quality;
- End-to-end field tests prior to the census year to make sure the whole operation functions smoothly;
- Development and deployment of sophisticated analysis tools such as CRAVA to assess data quality.

The Census Bureau's current communication efforts include little content that explains the process of the 2020 Census in a manner that builds appropriate confidence that the work of the Census Bureau will achieve an accurate count. This information should be presented in a way that renders it clear and useful to a variety of audiences, including the general public as well as Congressional staffers, journalists, small business owners, and state and local government.

Recommendation

- JASON recommends the Census Bureau develop tiered messaging ranging from videos of a few minutes to a longer presentation (~1 hour) that provides increasing levels of quantification of the myriad efforts undertaken to ensure an accurate count in the 2020 Census.

CONCLUSIONS

This letter report is the outcome of a quick-turnaround study by JASON with the aim of providing timely recommendations to the Census Bureau. Currently, the Census Bureau is in the middle of the post-processing of 2020 Census data, as shown in Figure 1. JASON believes the recommendations provided here could be implemented in a timeframe to support the

Census Bureau's communications as regards the quality of both its enumeration processes and the resulting development of data to support apportionment and redistricting.

Sincerely,

JASONs

SK/DM/abh

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