

EXHIBIT A

**IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF CALIFORNIA
SAN FRANCISCO DIVISION**

STATE OF CALIFORNIA, *et al.*,

Plaintiffs,

v.

WILBUR L. ROSS, JR., *et al.*,

Defendants.

Civil Action No. 3:18-cv-01865-RS

CITY OF SAN JOSE, *et al.*,

Plaintiffs,

v.

WILBUR L. ROSS, JR., *et al.*,

Defendants.

Civil Action No. 5:18-cv-02279-RS

Declaration of John M. Abowd, Ph.D.

November 1, 2018

I. Introduction

Qualifications

1. I am the Chief Scientist and Associate Director for Research and Methodology at the United States Census Bureau. I have served in that capacity since June 2016. My position is covered by an Intergovernmental Personnel Act (IPA) agreement between Cornell University and the Census Bureau. At Cornell, I am the Edmund Ezra Day professor of economics, professor of statistics and information science, and director of the Labor Dynamics Institute.
2. In 1977, I received my Ph.D. in economics from the University of Chicago with specializations in econometrics and labor economics. My B.A. in economics is from the University of Notre Dame.
3. I have been a university professor since 1976. My first appointment was assistant professor of economics at Princeton University. I was also assistant and associate professor of econometrics and industrial relations at the University of Chicago Graduate School of Business. In 1987, I was appointed associate professor of industrial and labor relations with indefinite tenure at Cornell University, where I am still employed.
4. I am a member and fellow of the American Statistical Association, Econometric Society, and Society of Labor Economists (president 2014). I am an elected member of the International Statistical Institute. I am also a member of the American Economic Association, International Association for Official Statistics, National Association for Business Economists, American Association for Public Opinion Research, and American Association of Wine Economists. I regularly attend and present papers at the meetings of all of these organizations.
5. I currently serve on the American Economic Association Committee on Economic Statistics. I have also served on the National Academy of Sciences Committee on National Statistics, the Conference on Research in Income and Wealth Executive Committee, and the Bureau of Labor Statistics Technical Advisory Board for the National Longitudinal Surveys (chair: 1999-2001).

Relevant professional experience

6. In 1998, the Census Bureau and Cornell University entered into the first of a sequence of IPAs and other contracts under which I served continuously as Distinguished Senior Research Fellow at the Census Bureau until I assumed my current position in 2016, under a new IPA contract. While I was a senior research fellow, I worked with numerous senior executives. This includes Directors (Martha Riche, Kenneth Prewitt, C. Louis Kincannon, Stephen Murdoch, Robert Groves, and John Thompson), Deputy Directors (Hermann Habermann, Thomas Mesenbourg, and Nancy Potok), Chief Scientists (Roderick Little and Thomas Louis), and numerous other associate directors, assistant directors, and division chiefs. I also worked with Chief Economists John Haltiwanger, J. Bradford Jensen, Daniel Weinberg, and Lucia Foster, and researchers in all program areas.
7. I was one of three senior researchers who founded the Longitudinal Employer-Household Dynamics (LEHD) program at the Census Bureau. This program produces detailed public-use statistical data on the characteristics of workers and employers in local labor markets using large-scale linked administrative, census and survey data from many different sources. The program is acknowledged as the Census Bureau's first 21st Century data product: built to the specifications of local labor market specialists without additional survey burden, and published using state-of-the-art confidentiality protection. In addition to very substantial financial support from the Census Bureau, this project was

supported by a \$4.1 million grant from the National Science Foundation (NSF) on which I was the lead Principal Investigator.

8. From 2004 through 2009, I was the lead Principal Investigator on the \$3.3 million NSF-supported collaborative project with the Census Bureau to modernize secure access to confidential social science data. This project led to the first production implementation worldwide of differential privacy¹ for OnTheMap—a product of the LEHD program. It also produced prototype confidential data access systems with public-use synthetic micro-data supported by direct analysis of the confidential data on validation servers. These projects were the precursors to the Census Bureau's current program to implement central differential privacy for all publications from the 2020 Census of Population and Housing, which will be the first large-scale production implementation worldwide.
9. From 2011 until I assumed my position as Chief Scientist at the Census Bureau in 2016, I was the Principal Investigator of the Cornell University node of the NSF-Census Research Network (NCRN), one of eight such nodes that worked collaboratively with the Census Bureau and other federal statistical agencies to identify important theoretical and applied research projects of direct programmatic importance to the agencies. The Cornell node produced the fundamental science explaining the distinct roles of statistical policymakers and computer scientists in the design and implementation of differential privacy systems at statistical agencies.
10. I have published more than 100 scholarly books, monographs, and articles in the disciplines of economics, econometrics, statistics, computer science, and information science. I have been the principal investigator or co-principal investigator on 35 sponsored research projects. My full Curriculum Vitae is attached to this report.

What I was asked to analyze

11. I was asked to provide expert analysis in three areas:
 - a. Is there credible quantitative evidence that the addition of a citizenship question on the 2020 Census would affect the cost and quality of that census?
 - b. Are the activities of the Census Bureau appropriate and adequate to address any cost and quality consequences that might arise during the conduct of the 2020 Census?
 - c. Did the Census Bureau follow appropriate statistical quality standards when it placed the citizenship question from the American Community Survey onto the proposed questionnaire in the 2020 Census without further testing?

Key conclusions

12. The Census Bureau produced credible quantitative evidence that the addition of a citizenship question to the 2020 Census could be expected to lower the self-response rate in an identifiable and large sub-population—households that may contain non-citizens. The lower self-response rate can be expected to increase Nonresponse Followup (NRFU) costs and lower the quality of census data other than the count itself. Therefore, the Census Bureau can and will make appropriate adjustments to various components of the 2020 Census, including NRFU and the Integrated Partnership and Communications Program to mitigate these effects.

¹ Differential privacy is the leading privacy-enhancing data publication method in computer science.

13. Neither the Census Bureau nor any external expert has produced credible quantitative evidence that the addition of a citizenship question to the 2020 Census would increase the net undercount or increase differential net undercounts for identifiable sub-populations. Therefore, there is no credible quantitative evidence that the addition of the citizenship question would affect the accuracy of the count.
14. The citizenship question on the American Community Survey was thoroughly tested, most recently in 2006. Neither the Census Bureau's Quality Standards nor the Office of Management and Budget Statistical Policy Directives require further testing of this question before it can be used on the 2020 Census. If the OMB believes that further testing is necessary, it may request and provide clearance for such testing before issuing the clearance for the 2020 Census.

II. *Quantitative evidence on the effects of the citizenship question*

15. The purpose of the Decennial Census of Population and Housing is to conduct an actual enumeration of the population and disseminate the results to the President, the states, and the American people. The Census Bureau conducts the census in the 50 states, the District of Columbia, Puerto Rico, American Samoa, Guam, the Northern Mariana Islands, and the U.S. Virgin Islands. When conducting a decennial census, our goal is to count everyone once, only once, and in the right place.
16. The 2020 Census has been in testing, development and implementation for almost a full decade. On December 12, 2017, the Department of Justice requested the addition of a question on citizenship for the purpose of producing block-level statistics on the citizen voting-age population in support of enforcement of the Voting Rights Act. On March 26, 2018, the Secretary of Commerce instructed the Census Bureau to add a question on citizenship to the 2020 Census.
17. In the course of the deliberations and research that occurred at the Census Bureau between December 15, 2017, when we were notified of the Department of Justice (DoJ) request, and the present, I supervised the preparation of a sequence of technical responses to the DoJ request (AR 1277-1285, 1308-1312) and the work of a team of researchers who subsequently released a technical working paper in August 2018 (COM_DIS00009833-989). I will only summarize them here.
18. First, at the time those memos and research papers were written, I was not aware of any randomized controlled trial (RCT) that provided credible quantitative information about the effects of the addition of a citizenship question on the net undercount in the decennial census. That is still the case. Randomized controlled trials are the gold standard for internal validity, and none exist that can address the potential consequences for net undercount (the coverage measure of choice for assessing the accuracy of a decennial census). Even if such an RCT had existed, there would remain the question of generalizability of its results. However, disagreement about the generalizability of an internally valid RCT estimate of an effect of the citizenship question on the net undercount should be a discussion based on specific evidence rather than an expert opinion based on accumulated experience.
19. Second, the internal Census Bureau research relies on an alternative to RCTs, called a *natural experiment* or *difference-in-difference* estimator, to quantify the potential effect of a citizenship question on the *unit self-response rate*—the rate at which households voluntarily complete the census questionnaire and return it to the Census Bureau. The research statistically isolates a particular sub-population—households that contain at least one non-citizen or at least one person with unknown citizenship status—and compares it to a different sub-population—households that contain only citizens. The details of the way those sub-populations were isolated can be found in the technical

paper. The salient result is that households containing at least one noncitizen or person of unknown citizenship status may be less likely to self-respond to the 2020 Census if it contains a question on citizenship. Putting the question on the census is therefore likely to depress self-response on average if the control group—households that contain all citizens—do not change their self-response rates. Because we must rely on a natural experiment, however, we have no evidence on control group behavior. That is because we cannot design the estimator to produce the quantity we seek to address (overall effect on self-response) and must work with the quantity we can estimate (the differential effect on self-response in the households with non-citizens compared to households with citizens). These estimates of the effect of the presence of a citizenship question on self-response rates are used in the next section to estimate the increased NRFU costs (discussed below).

20. It is important to stress that the estimated decrease in self-response rates does not translate into an increase in net undercount, and the use of our estimates as if they did is wholly inappropriate. Controlling net undercount depends critically on the Census Bureau's ability to fully enumerate the housing stock in the country, and then to determine which housing units are occupied, vacant, or nonexistent. Once a housing unit is known to be occupied, the quality of the data recorded for the occupants of that housing unit depends critically on self-response. Voluntary self-response produces much more accurate measures of the age, sex and other variables measured by the questionnaire. This is distinct from the process by which the Census Bureau ensures that it gets an accurate count in the NRFU operation (as measured by the net undercount statistics in the coverage evaluation program).
21. Third, our research clearly showed that there is a serious issue regarding the accuracy of self-reported citizenship status. We did this by using record linkage methods to compare the answers on surveys to the citizenship status recorded in high quality administrative data. For individuals identified as citizens in the administrative data and who answer the citizenship question in the ACS, over 99 percent self-report that they are citizens. For individuals identified as noncitizens in the administrative data, a substantial minority (30 to 35 percent, depending on the year) report that they are citizens.
22. Given the cost and data-quality concerns, the Census Bureau consistently recommended using administrative records rather than a citizenship question. However, this recommendation does not imply that asking the citizenship question will result in a less accurate count. We have no credible quantitative evidence to support that conclusion.

III. Nonresponse followup consequences of the citizenship question

23. Nonresponse followup (NRFU) is the largest of the decennial census field data collection operations. The primary purpose of NRFU is to conduct in-person contact attempts at each and every housing unit address that did not provide a response to the decennial census questionnaire using an online questionnaire, by returning a completed paper questionnaire, or by providing response information to a Census customer service representative over the telephone. We estimate, after providing approximately six weeks for individuals to respond, that the self-response rate will be 60.5 percent of all housing units.² This self-response rate estimate means that we also estimate that 39.5 percent of the housing unit addresses in the universe will not initially respond.³ In NRFU,

² U.S. Census Bureau (2017d) page 15.

³ Calculated value – 100 percent minus 60.5 percent.

field representatives (known as enumerators) attempt to locate each nonresponding housing unit address, determine its status (occupied, vacant, non-existent), and for occupied housing unit addresses conduct an interview with a knowledgeable person who can provide responses to the decennial census questionnaire.

24. The Census Bureau is prepared to conduct the 2020 Census NRFU operation and believes that those efforts will result in a complete enumeration. The Census Bureau has demonstrated the ability to successfully conduct a NRFU operation in previous censuses and in the 2018 End-to-End Census Test, the last field test prior to the 2020 Census. It has tested the operational design in evaluations over the course of the decade. The evaluations, along with historical data from past censuses and the American Community Survey, have informed the Census Bureau's operational design and the assumptions supporting that design. These evaluations have identified factors that could impact the operational implementation of NRFU. They have also provided evidence on the effects of an operational outcome such as a lower than estimated self-response rates.⁴ Contingency funding to handle deviations from the planned operations are built in to the Life Cycle Cost Estimate (LCCE). The decision to include a question on citizenship has not impacted the NRFU operational design, but it will modify the execution of that design, if the self-response rate at the start of NRFU is below the estimate built into the LCCE. As documented in Section II, there is no evidence, to date, that the addition of the citizenship question will result in a less accurate enumeration. We are, however, prepared to react, adjust, and complete NRFU to ensure an accurate count and deliver the highest quality census data.

Background

25. To understand how the NRFU efforts work, one must first understand the basic methodology used for counting individuals for purposes of the decennial census. To conduct the census, the Census Bureau must consider all places where someone lives or could live as of April 1, 2020 (Census Day). We classify these places as one of two types of *living quarters*: housing units and group quarters. Living quarters are usually found in structures intended for residential use, but also may be found in structures intended for nonresidential use as well as in places such as tents, vans, hotels/motels, and emergency and transitional shelters.
26. A *housing unit* is a structure such as a house, an apartment, a mobile home, a group of rooms, or a single room that is occupied (or, if vacant, intended for occupancy) as *separate living quarters*. Separate living quarters are those in which the occupants live separately from any other individuals in the building and that have direct access from outside the building or through a common hall. For the 2020 Census, there are approximately 144.3 million⁵ housing unit addresses. *Group quarters* comprise a diverse range of group living arrangements, and include, for example: college or university student housing, residential treatment centers, skilled nursing facilities, group homes, correctional facilities, maritime vessels, workers' dormitories, domestic violence shelters, emergency shelters, and soup kitchens. Resident services are provided at group quarters and may

⁴ For example, preliminary analysis of the 2018 End-to-End Census Test suggests that shortfalls in recruiting NRFU enumerators can be partially or fully offset by efficiency gains from the Field Operational Control System.

⁵ Internal Document: August 14, 2018 2020 Census Type of Enumeration Areas (TEA) – Final TEA Delineations for Approval, page 3 “Total” row rounded to the nearest 100,000.

include custodial or medical care as well as other types of assistance. Residency is commonly restricted to those receiving these services. For the 2020 Census, there are approximately 300,000 group quarter addresses.⁶

Methods of Enumeration

27. In the 2020 Census, there are six ways in which occupants of a housing unit can be enumerated. Respondents can complete the census⁷ by: using the online questionnaire, using the paper questionnaire, providing their information to a Census customer service representative over the telephone, or providing their information in-person when a Census field representative visits their address. Occupants of a housing unit can also be counted through the use of high-quality administrative data or proxy interviews. As discussed in detail below, if an individual does not provide an initial self-response to the census, NRFU efforts are used to ensure that an actual enumeration takes place, and in the small percent of housing units for which we are unable to obtain an enumeration, we impute⁸ the information for these housing units. I discuss below the various steps the Census Bureau takes to ensure that a complete enumeration occurs.

Initial Contact

Mail Delivery Areas

28. In geographic areas where the United States Postal Service (USPS) delivers mail to the majority of the addresses, and the majority of the housing units have a house number and street name, commonly called a *city-style address*, the Census Bureau mails information to occupants instructing them as to how to respond to the census. These areas are more likely to be urban and suburban parts of the country. Approximately 137.5 million⁹ housing unit addresses of the 144.3 million housing unit addresses, or 95.3 percent¹⁰, will be enumerated using a contact strategy consisting of five mailings. The mailing activities, known as mailout, occur between mid-March and the end of April 2020.
29. There are two approaches to the first mailing. Approximately 80 percent of the addresses will receive a letter inviting the occupants to complete the 2020 Census questionnaire online.¹¹ For the remaining 20 percent of the housing unit addresses, the first mailing contains a paper questionnaire along with

⁶ Internal Document: September 29, 2017 version of the 2020 Census Lifecycle Cost Estimate Assumptions Table 12, sum of Rows “Group Quarters Enumeration”, “Service-based Enumeration - Shelters”, “Service-based Enumeration - Soup Kitchens” and “Service-based Enumeration - Targeted Non-Shelter” in the “Workload” column rounded to the nearest 100,000.

⁷ Data collected in the 2020 Census include name, relationship, sex, age, date of birth, Hispanic origin, race, citizenship, and tenure.

⁸ Imputation is a well-established statistical methodology for filling in responses when they are missing, either for individual items or for all the items at the address including the population count.

⁹ Internal Document: August 14, 2018 2020 Census Type of Enumeration Areas (TEA) – Final TEA Delineations for Approval, page 3 “TEA 1 – Self Response” row rounded to the nearest 100,000.

¹⁰ Calculated value – 137.5 divided by 144.3 then multiplied by 100 rounded to one decimal place.

¹¹ Calculated value – 100 percent minus 20 percent, see next reference.

the invitation to complete the questionnaire online.¹² Areas that receive the paper questionnaire in the first mailing are tracts¹³ where the Census Bureau observed low self-response rates in the American Community Survey¹⁴ and where respondents are more likely to send back a paper form. In addition, in deciding to mail a paper questionnaire, the Census Bureau also added tracts with high concentrations of people aged 65 or over or with relatively low internet access.¹⁵

30. The remaining four mailings (mailings two through five) are reminders to encourage households to respond. The second mailing is a letter; the third mailing is a postcard; the fourth mailing is a letter, but also contains a paper questionnaire; and the fifth mailing is a postcard. The first two mailings are delivered four days apart and are sent to all housing unit addresses, regardless of whether they have may have already responded to the census using the online questionnaire, using the paper questionnaire, or provided their information to a Census customer service representative over the telephone. The remaining three mailings are sent only to nonresponding housing unit addresses. All the mailings include information on how to complete the questionnaire online, along with toll-free telephone numbers to obtain assistance in completing the questionnaire. When speaking with the Census customer service representative, a respondent may be provided the opportunity to complete a questionnaire over the phone. If an eligible occupant of the housing unit does not complete the online questionnaire, the paper questionnaire, or provide their information over the telephone, a Census field representative will visit the address to determine the housing unit status (occupied, vacant, or non-existent) and, if occupied, conduct the interview in person. These in-person interviews are conducted during the NRFU operation. For some nonresponding cases, the Census Bureau will use administrative data if we are unable to conduct the in-person interview.

¹² Internal Document: September 29, 2017 version of the 2020 Census Lifecycle Cost Estimate Assumptions Table 6, 2020 Printing Information Sub-Table in the “Initial Questionnaire” column heading.

¹³ A Census tract is generally a contiguous set of blocks with a population size between 1,200 and 8,000 people, with a target size of 4,000 people. Census blocks are statistical areas bounded by visible features, such as streets, roads, streams, and railroad tracks, and by nonvisible boundaries, such as selected property lines and city, township, school district, and county limits and short line-of-sight extensions of streets and roads. Generally, census blocks are small in area; for example, a block in a city bounded on all sides by streets. Census blocks in suburban and rural areas may be large, irregular, and bounded by a variety of features, such as roads, streams, and transmission lines. In remote areas, census blocks may encompass hundreds of square miles. Census blocks cover the entire territory of the United States, Puerto Rico, and the Island Areas. Census blocks nest within all other tabulated census geographic entities and are the basis for all tabulated data. (https://www.census.gov/geo/reference/gtc/gtc_block.html)

¹⁴ The American Community Survey is a nationwide survey designed to provide communities with reliable and timely social, economic, housing, and demographic data every year. The Census Bureau uses data collected in the American Community Survey to provide estimates on a broad range of population, housing unit, and household characteristics for all geographic areas in the United States, including states, counties, cities, American Indian and Alaska Native areas, tribal sub-division areas, school districts, Congressional Districts, census tracts, and block groups.

¹⁵ Federal Communications Commission (FCC) data were used in determining areas with low internet access.

Hand Delivery Areas

31. In geographic areas where the Census Bureau has concerns about accurate mail delivery by the USPS, Census field representatives hand deliver information to occupants on how to respond to the census. These areas are more likely to be rural parts of the country with a combination of city-style and non-city-style addresses.¹⁶ Approximately 6.5 million housing unit addresses¹⁷ of the 144.3 million housing unit addresses, or 4.5 percent¹⁸, will be enumerated using the approach where Census field representatives deliver a paper questionnaire along with the invitation to complete the 2020 Census online. The delivery activities, known as *Update Leave*, for this approach occur between mid-March and mid-April 2020. In addition, the USPS delivers to all mailable addresses a reminder letter on April 1, 2020, followed by a reminder postcard on April 20, 2020. The materials include the toll-free telephone numbers to obtain assistance in completing the questionnaire. When speaking with the Census customer service representative, the respondent may be provided the opportunity to complete a questionnaire over the phone. If the occupant of the housing unit does not complete the online questionnaire, the paper questionnaire, or provide their information over the telephone, a Census field representative will visit the address in NRFU to determine the housing unit status (occupied, vacant, or non-existent) and, if occupied, conduct the interview in person. For some nonresponding cases, the Census Bureau will use administrative data if we are unable to conduct the in-person interview.

Remote Areas

32. In geographically remote areas with low housing unit density that are sparsely populated or have challenges with accessibility, a Census field representative will visit addresses to conduct an in-person interview in lieu of a mailing. These areas are very rural parts of the country and include remote areas of Alaska. These geographic areas contain approximately 35,000¹⁹ housing unit addresses of the 144.3 million housing unit addresses, less than 0.02 percent²⁰ of the addresses in the country.

¹⁶ Non-city-style addresses are not house number and street name formatted, for example: Rural Route 4 Box 12.

¹⁷ Internal Document: August 14, 2018 2020 Census Type of Enumeration Areas (TEA) – Final TEA Delineations for Approval, page 3 “TEA 6 – Update Leave” row rounded to the nearest 100,000.

¹⁸ Calculated value – 6.5 divided by 144.3 then multiplied by 100 rounded to one decimal place.

¹⁹ Internal Document: August 14, 2018 2020 Census Type of Enumeration Areas (TEA) – Final TEA Delineations for Approval, page 3 sum of “TEA 2 – Update Enumerate” and “TEA 4 – Remote Alaska” rows rounded to the nearest 1,000.

²⁰ Calculated value – 0.242 divided by 144.3 then multiplied by 100 rounded to two decimal places.

U.S. Military Bases

33. Finally, housing units owned by the U.S. Military on bases will be enumerated through administrative records provided by Defense Manpower Data Center.²¹ There are approximately 242,000²² housing unit addresses of the 144.3 million housing unit addresses on military bases, about 0.2 percent²³ of the addresses in the country.

Self-Response Rates

34. For the planning purposes in the 2020 Census, we are projecting a national self-response rate in areas where the USPS or Census field representatives deliver materials in the range of 55.5 percent to 65.5 percent.²⁴ After allowing approximately six weeks for self-response, NRFU will begin.²⁵ At the start of the NRFU operation, the Census Bureau estimates a national self-response rate of 60.5 percent, the midpoint of the range noted above. This means we estimate that 39.5 percent of the housing unit addresses will not self-respond by the start of NRFU operations. The estimated self-response rate of 60.5 percent for the 2020 Census compares to projected national self-response rates of 70 percent, 61 percent, and 64 percent in the 1990, 2000, and 2010 Censuses, respectively, at equivalent dates in their planning cycles.²⁶ The breakdown of the estimated self-response rate from the three data collection modes that support self-response is 45.0 percent through the Internet, 11.2 percent by paper, and 4.3 percent by telephone.²⁷

Missing Data

35. It is important to draw a distinction between *item nonresponse* and *total/unit nonresponse*, particularly as it relates to those cases that are included in the 2020 Census NRFU workload. *Item nonresponse* refers to the absence of an answer to one or more questions on the census questionnaire. Item nonresponse can occur for self-responses (Internet, telephone, or paper) and can also occur with in-person collected responses. For example, item nonresponse occurs when the occupant of a

²¹ Defense Manpower Data Center serves under the Secretary of Defense to collate personnel, manpower, training, financial, and other data for the Department of Defense; and provides information on military personnel and their families living on Military bases.

²² Internal Document: August 14, 2018 2020 Census Type of Enumeration Areas (TEA) – Final TEA Delineations for Approval, page 3 “TEA 5 – Military” row rounded to the nearest 1,000.

²³ Calculated value – 6.5 divided by 144.3 then multiplied by 100 rounded to one decimal place.

²⁴ U.S. Census Bureau (2017d) page 15.

²⁵ In some geographic areas around college and university campuses where the spring semester ends prior to the start of NRFU in mid-May, we will conduct what we refer to as early NRFU. Early NRFU will begin in early April. This is done in an attempt to reach students and faculty who might otherwise have returned home or moved elsewhere by the time the Census Bureau begins NRFU in earnest. For the bulk of the country, we determine the initial NRFU universe in early May and begin the field work to reach nonresponding housing unit addresses around mid-May.

²⁶ Bates (2017) page 876 Figure 1.

²⁷ Internal Document: September 29, 2017 version of the 2020 Census Lifecycle Cost Estimate Assumptions Table 2, row “After 6 weeks – Cut NRFU Workload”, “Mid” columns for “Internet %”, “Mail %” and “Phone %”.

housing unit address answers the online questionnaire but does not provide a response to the race question or does not provide a response to the age and date of birth questions for one or more occupants in the housing unit.

36. Self-responses with item nonresponse are not included in the NRFU workload.²⁸ For example, if the Census Bureau receives a self-response where the respondent answered all the questions except the citizenship question, the housing unit address associated with that self-response would not be included in the NRFU workload. Item nonresponse does not impact the accuracy of the count. After the total person counts have been established, missing item data are then imputed to ensure that all persons have characteristic values for the purpose of tabulating other census information products such as the PL94-171 redistricting data.
37. In contrast, *total/unit nonresponse* refers to cases for which the Census Bureau has received no self-response data for a housing unit address. This means that the Census Bureau has no information about how many people may live at the housing unit address and has no information about any person(s) who may be living at the housing unit address including names, relationship, sex, age, dates of birth, Hispanic origin, race, citizenship, and tenure.
38. Housing unit addresses with total/unit nonresponse are included in the NRFU workload. Without the additional efforts undertaken in the NRFU operation to determine the status (occupied, vacant, non-existent) and, when occupied, to collect response data, the Census Bureau's goal of counting everyone once, only once, and in the right place is not achievable. However, at the conclusion of NRFU, total/unit nonresponse cases that remain unresolved are subject to imputation to assign status and household size. And, as stated above, once the total person counts have been established, missing item data are imputed to ensure all persons have characteristic values. In the 2010 Census, 0.38 percent or approximately 522,000 housing unit addresses had an imputed population count.

The 2020 Census Nonresponse Followup Operation

39. The Census Bureau implements robust field data collection operations, known as Nonresponse Followup, to ensure a complete enumeration of nonresponding housing unit addresses. NRFU is conducted in areas where the USPS or Census field representatives (known as enumerators) deliver materials notifying the occupants to respond to the 2020 Census. Of the 144.3 million housing unit addresses nationwide, approximately 144.0 million²⁹ housing unit addresses or 99.8 percent³⁰ are in these areas.³¹ While the options to self-respond using the online questionnaire, a paper questionnaire, or over the telephone are readily available, there are many housing unit addresses that require the Census Bureau to send an enumerator to conduct an interview in person because an initial response to the questionnaire was not received by the time the Census Bureau begins NRFU. The 2020 Census

²⁸ Some self-responses with item nonresponse do go to NRFU. The Census Bureau maintains a set of sufficiency criteria that determine whether enough information has been supplied on a self-response to keep the occupied housing unit out of NRFU. These criteria vary by collection mode. The specifications for the sufficiency criteria are still in flux for the 2020 Census.

²⁹ Calculated value – 137.5 million plus 6.5 million.

³⁰ Calculated value – 144.0 divided by 144.3 then multiplied by 100 rounded to one decimal place.

³¹ The remaining 0.2 percent of the housing unit addresses are in Remote Areas or on U.S. Military bases. Calculated value – 100 percent minus 99.8 percent.

NRFU operation is designed to enumerate these households and will occur between early April and the end of July 2020. The primary purposes of NRFU are:

- a. To determine or resolve the housing unit status (occupied, vacant, or non-existent) for addresses for which the Census Bureau has not received an initial self-response via the online questionnaire, a paper questionnaire, or by telephone.
 - b. To collect census response data for housing units determined to be occupied.
40. NRFU was one of the 24 operations³² successfully implemented in the 2018 End-to-End Census Test conducted in Providence County, Rhode Island.³³ This demonstrated our ability to conduct the NRFU.
 41. The 2020 Census has a multi-tiered approach to managing the field operations, starting with the Census Bureau Headquarters in Suitland, Maryland; through six Regional Census Centers in New York, Philadelphia, Atlanta, Chicago, Dallas, and Los Angeles; to 248 Area Census Offices³⁴ that are located across the country.³⁵
 42. At the Area Census Offices, there is also a multi-tiered approach to managing the field operations, starting with the Area Census Office Manager (ACOM); to the Census Field Managers (CFM); to the Census Field Supervisors (CFS); to the enumerators that actually visit addresses that did not respond online, by paper, or over the telephone. At the national level, to support NRFU, the Census Bureau plans to hire 248 ACOMs, about 1,400 CFMs, about 15,000 CFSs, and about 295,000 enumerators.³⁶ On average, at the national level, each ACOM supervises 5.5 CFMs, who each supervise 10.8 CFSs, who each supervise 20 enumerators.³⁷
 43. The Census Bureau determined the number of Area Census Offices through a data-driven process based on the number of Census field staff needed for the NRFU operation. The Census Bureau used several data sources to estimate the number of field staff needed, such as historical response rates from the 2010 Census, the estimated NRFU workload, and the locations of group quarters. The Census Bureau then used the following criteria to delineate the Area Census Office boundaries:
 - At least one Area Census Office per state
 - Must not split Indian Reservations (regardless of county, state, or regional boundaries)
 - Must not split Military bases
 - Must not cross state or regional boundaries (with noted exceptions above)
 - Will align with county boundaries (except for counties with multiple Area Census Offices)

³² Internal Document: 2018 End-to-End Census Test Plan, page 4.

³³ The 2020 Census operational design involves 35 distinct but integrated operations and 52 integrated systems.

³⁴ U.S. Census (2017c) page 1. There are an additional five offices, one each in American Samoa, Guam, and the Northern Mariana Islands, and two offices in the U.S. Virgin Islands.

³⁵ This includes the 50 states, the District of Columbia, and Puerto Rico.

³⁶ Internal email: August 10, 2018.

³⁷ Internal email: August 10, 2018.

- Will contain at least one major city
 - Must consider compactness, transportation networks, and impassable features/water bodies
44. Given these criteria, it was not possible to delineate Area Census Offices with similar NRFU workloads. The estimated Area Census Office workloads range from about 64,000 to 494,000³⁸ with an average workload of approximately 228,000³⁹ cases. Given the variation in the estimated workloads, the number of CFMs, CFSs, and enumerators allocated to each Area Census Office will vary to account for the differences in the NRFU workloads. Therefore, offices with smaller workloads will be allocated fewer field managers, supervisors, and enumerators; and offices with larger workloads will be allocated more staff.
45. For the first time in a decennial census, the Census Bureau will provide enumerators with iPhone 8 smart phones for their work on the 2020 Census NRFU operation. Their devices will be pre-loaded with several applications for use in their day-to-day activities:
- Field Data Collection Application – Used by enumerators to enter work availability, view their daily case load, conduct the interview, and complete payroll activities. The data collection application is available in English and Spanish.
 - Field Data Collection Training Application – Used to train enumerators on how to complete activities in the Field Data Collection Application.
 - E-Quest Training Application – Used to teach enumerators about the Census, the NRFU operation, and day-to-day activities they will perform in their position.
 - MOJO Mapping – Displays an enumerator’s daily caseload on a map.
 - Apple Maps – Used by enumerators to get turn-by-turn directions to their assigned cases.
46. The NRFU operation workload is primarily managed via the Field Operational Control System,⁴⁰ which is an automated system that tracks information on both enumerators and NRFU cases. One feature of Field Operational Control System is an optimizer that determines the most efficient set of cases to assign the enumerators and determines the most efficient routing of their field work. For example, the optimizer will assign cases to enumerators whose home addresses are closest to the addresses that require an in-person interview. The optimizer will also route enumerators to their assigned cases in an order that takes into consideration the best time to contact a particular household.
47. Each evening, enumerators will enter their work availability into the field data collection application to indicate the hours they are able to work for the following five days. The optimizer will, in overnight processing, analyze the enumerators’ availability and the other critical information regarding the case, enumerators’ home locations, their hours of availability, and best times to contact

³⁸ Internal Document: NRFU Workload Estimates by ACO, minimum and maximum rounded to the nearest 1,000.

³⁹ Internal Document: NRFU Workload Estimates by ACO, sum of the estimated ACO NRFU workloads divided by 248 rounded to the nearest 1,000.

⁴⁰ In every decennial census, we develop and utilize capabilities to manage the field operational data collection processes. In the 2010 Census, the capabilities existed within a system referred to as the Paper-based Operational Control System (PBOCS). For the 2020 Census, the capabilities exist within the Field Operational Control System. The capabilities can and do differ from census to census; however, the capabilities are at their core fundamentally similar. The Field Operational Control System is new development and not simply a re-use of the 2010 Census PBOCS code.

the case. Based on the optimizer's analysis, the enumerators are assigned nonresponding cases to work. When enumerators log into their iPhones in the morning, their assignments will be loaded onto their devices to enable their work for the day. The cases will be sorted in the optimal order to ensure the enumerators travel to their cases and conduct interview attempts in the most efficient manner possible. This system was among the systems successfully tested in the 2018 End-to-End Census Test.

48. Enumerators will use the field data collection application and mapping applications (MOJO mapping and Apple maps) that are loaded onto the iPhones to conduct their interviews. The data collection application will guide the enumerators through their activities for completing interviews. It provides them with scripting for the introduction and the specific census questions and it also provides extensive help screens for answering any questions the respondents may ask during the interview. Enumerators conduct interviews with household respondents when they successfully make contact. The field data collection application was among the systems successfully tested in the 2018 End-to-End Census Test.
49. The Census Bureau recognizes that some housing unit addresses in the NRFU workload can be more difficult to locate or interview. This could be due to a lack of awareness about the Census, language barriers, concerns about providing sensitive information, or other reasons. With regard to language barriers, the Census Bureau's recruiting strategy considers the demographic characteristics of each unique geographic area. The Census Bureau attempts to recruit and hire enumerators from the communities where they live and where they will work. In so doing, we also consider the language skills enumerators may need to communicate with the residents of nonresponding addresses.
50. If an enumerator encounters a language barrier and there is no one available at the address who speaks English, the enumerator shows the respondent a Language Identification Card that displays a message in 59 non-English languages. The respondent uses the card to identify the language s/he speaks. The enumerator captures information on the language spoken. If the respondent identifies one of the 12 non-English languages supported by our Internet Self-Response application or the Census Bureau's Census Questionnaire Assistance centers, the enumerator will provide the respondent information regarding how to provide their responses online or over the telephone. In addition, the NRFU enumeration application is available in both English and Spanish. Should subsequent contact attempts at nonresponding housing unit addresses with language barriers be necessary, the Census Bureau will assign the case to an enumerator who possesses the necessary language skills and/or engage an interpreter who can accompany an enumerator to assist in the collection of the census response data.
51. If the enumerators are unable to make contact with a knowledgeable respondent, they leave a Notice of Visit form at the address. The Notice of Visit provides the household with their census identification number and instructions as to how they can self-respond to the 2020 Census. It also informs the household that someone will return at a future time to attempt to collect their census responses.
52. With regard to providing sensitive information, the Census Bureau recognizes that some nonrespondents may be concerned about providing their information to the enumerator during an in-person interview. The design of the NRFU operation provides these nonresponding households with the capability to participate in the census without having to provide their information to the enumerator. As stated earlier, the Notice of Visit form provides the household with its census identification number and instructions as to how they can self-respond to the 2020 Census. Once the

Census Bureau receives a household's information it will remove the household from the NRFU workload. These Notice of Visit forms have proven to be an effective tool to remind households that they can still self-respond to the census and did increase the overall self-response rate. In the 2018 End-to-End Census Test, about 9 percent of the NRFU households were resolved when a self-response was received during the NRFU operation. In addition, if during the in-person interview the respondent refuses to answer a question, for any reason, the question will be left blank.

53. The Field Operational Control System maintains information on the number of contact attempts for each case. How an enumerator handles a case depends on the number of previous attempts to conduct the interview. For example, once an enumerator has attempted to contact and interview a household a particular number of times, s/he is able to contact a proxy⁴¹ respondent to collect information about the persons living in the nonresponding housing unit. The Census Bureau is not aware of any credible quantitative evidence suggesting that proxies in the census provide a greater net undercount or differential net undercount in comparison to self-response or in-person interviews. Similarly, once a NRFU case has received a maximum threshold for attempts, final attempt procedures may be used to ensure that sufficient data are recorded for that household. If the Census Bureau has high quality information on the household from reliable administrative records sources,⁴² those data will be used for households that cannot be successfully contacted and interviewed in the first NRFU visit. For other cases that reach the maximum attempt threshold,⁴³ but for which there are not reliable data from administrative records sources, additional attempts will be made by the most experienced and effective enumerators to contact the household or proxy respondents to gather the necessary information.
54. At the end of each day, enumerators will enter the hours worked, mileage traveled, and any other expenses incurred while conducting interviews that day into the field data collection application. The information they provided is validated and approved by the CFSs and informs payroll activities.
55. At the conclusion of NRFU every case in the initial NRFU workload will receive a final outcome:
 - Removed from the workload because a self-response was obtained during NRFU;
 - Completed interview with a household respondent;
 - Completed interview with a proxy respondent;
 - Partial interview with a household respondent;
 - Partial interview with a proxy respondent;
 - Enumerated using administrative records;
 - Vacant or nonexistent status;
 - Unresolved.
56. For cases that remain unresolved after all attempts have been made to contact and interview the household, the housing unit will be enumerated through imputation. The Census Bureau is not aware

⁴¹ Examples of a proxy respondent are a neighbor or building manager.

⁴² Examples of administrative records are information from the Internal Revenue Service or the Social Security Administration.

⁴³ The maximum number of attempts is six.

of any credible quantitative data suggesting that imputation in the census leads to a greater net undercount or differential net undercount in comparison to self-response or in-person interviews.

57. The NRFU operation is expected to be the source of census data for approximately 37.5 percent⁴⁴ of housing unit addresses for the 2020 Census, so the quality of the data collected during the operation is critical to the quality of the census overall. Therefore, a rigorous quality control program is implemented as part of the NRFU operation. A sample of NRFU cases is reinterviewed to verify that the enumerators conducted the interview and, if not, to obtain the data. Data from these reinterviews are compared to the original interviews to detect discrepancies that could be indicative of errors, procedural violations, or data falsification. If any errors are detected, rework is implemented as necessary to ensure accurate data are secured for all followup households. In the 2010 Census, nearly 2 million cases were selected to be reinterviewed and about 100,000 of those were determined to be in error and required recontact and enumeration.⁴⁵

The Nonresponse Followup Operation Budget

58. The NRFU operation is the most expensive of the decennial census field data collection operations. The 2020 Census Life Cycle Cost Estimate (LCCE) includes an estimated fiscal year 2020 cost for NRFU of approximately \$1.5 billion.⁴⁶ The variables that inform this estimate are factors impacting the NRFU workload such as the self-response rate at the start of the operation, self-responses received after the start of the operation, occupied, vacant and non-existent cases in the workload that are removed using administrative information, late adds, reinterview, re-works, and Field Verification⁴⁷ workloads. There are additional factors that inform the cost estimate such as the number of days the enumerators work, the average hours the enumerators worked per day, the number of contact attempts to conduct the interview, training hours for the CFSs and enumerators, mileage, and miscellaneous expenses.
59. All of these variables contribute to the 2020 Census NRFU cost estimate and each has some degree of uncertainty associated with it. Quantifying the effects of the uncertainty associated with each variable impacting the NRFU costs is part of a programmatic assessment and calculation of contingency. Although the Census Bureau does not attribute specific contingency dollars to each operational component, contingency funds are available in the event it needs to react to any number of unexpected events, including, but not limited to a lower than expected self-response rate. The

⁴⁴ The 37.5 percent is based on an estimated 60.5 percent self-response rate at the start of NRFU and an estimated additional 2 percent self-response during NRFU that will be removed from the workload.

⁴⁵ U.S. Census Bureau (March 21, 2013) page 12 Table 5 column 2 rows 3 and 7 rounded to nearest million and nearest 100,000, respectively.

⁴⁶ Internal Document: September 29, 2017 version of the 2020 Census Lifecycle Cost Estimate Assumptions Table 3, NRFU Operation Costs Sub-Table, "Total Cost" row "Total" column.

⁴⁷ Field Verification is a component of the NRFU workload where we have received a self-response that requires confirmation that the address exists.

2020 Census Program has an estimated \$2.6 billion⁴⁸ in contingency built into the Life Cycle Cost Estimate. In fiscal year 2020,⁴⁹ the program will have approximately \$1.7 billion⁵⁰ in contingency.

60. The 2020 Census Lifecycle Cost Estimate for the incremental cost or savings from a one percentage point decrease or increase in the self-response rate for the 2020 Census is \$55 million.⁵¹ The estimate is derived from the proportional costs of conducting the NRFU operation per percentage of nonresponding housing unit addresses. This includes the cost of additional or lowered field supervisors and enumerators, hours in the field, mileage, training costs, provisioning and usage of handheld devices, and impacts on printing, postage, and paper data capture operations. The estimate assumes that the increased or decreased percentage of housing unit addresses self-responding is not easier or harder to count than a representative percentage of those not responding to the census. It also assumes no change in the number of Area Census Offices or the levels of Area Census Office and Regional Census Center staff to support field operations.

Adjusting to Change

61. There is an inverse relation between the self-response rate and the NRFU workload. As the self-response rate increases, the NRFU workload decreases. There are several factors that could result in lower than expected self-response rates. For instance, a decrease in confidence by the public in the Census Bureau's ability to keep their information private. This could occur as the result of cyber incidents (perceived or actual) at the Census Bureau, another Federal agency, or the private sector. Additionally, negative stories about the 2020 Census in the press, in social media, or by *trusted voices*⁵² can also adversely impact self-response. If respondents are unaware of the census, they may not self-respond to the 2020 Census. Respondents also may simply be unwilling to self-respond. Finally, natural disasters can prevent the USPS and/or Census field staff from delivering materials to respondents.

⁴⁸ Internal email: September 11, 2018.

⁴⁹ NRFU is conducted in fiscal year 2020.

⁵⁰ Internal email: September 11, 2018. Of the \$1.7 billion in contingency, approximately \$1.1 billion is risk-based and the remaining \$0.6 billion is Secretarial-based. To use the risk-based contingency, the 2020 program needs approval from the Census Bureau's 2020 Census Executive Steering Committee and concurrence from the Under Secretary. To use the Secretarial-based contingency, the 2020 program needs approval from the Census Bureau's 2020 Census Executive Steering Committee, the Under Secretary and the Secretary of Commerce. For both contingencies, the program is required to notify the Office of Management and Budget and Congressional Committees if we plan to use the money.

⁵¹ Internal email: September 11, 2018.

⁵² Through our Integrated Partnership and Communications Program, the Census Bureau works closely with national, state, local, and tribal stakeholders that people trust to help communities understand the importance of responding to the Census. Census partners are major organizations, like the National Congress of American Indians, the National Association of Latino Elected Officials, and the National Urban League and community-based organizations like churches or other religions organizations, health clinics, and legal offices. Hundreds of thousands of Census partners join together during the Census to carry the message forward that participating in the census is safe and important. They are the *trusted voices* that help people understand that being included in the final count is critical for their communities.

62. To address these challenges, the Census Bureau takes steps to ensure that it meets its self-response rate goals at both the national and Area Census Office levels. The techniques are employed before and during NRFU. On the cybersecurity front, the Census Bureau has a robust multi-tiered cyber security plan that engages cyber security partnerships and external experts aimed at reducing the possibility of an incident. The Census Bureau also establishes partnerships with trusted voices to help in promoting the 2020 Census. The communication, advertising, and partnership efforts, known collectively as the Integrated Partnership and Communications Program, are implemented at the national and sub-national levels with the goals of maximizing self-response and encouraging cooperation during NRFU. In addition, before the start of NRFU, the Census Bureau can deploy Census field staff in the communities to assist with self-response, implement supplemental mailings in targeted areas, and blitz areas with paper questionnaires.
63. The Census Bureau employs a comprehensive process to prepare for the NRFU operation, including steps to estimate workload and the staffing required to support and complete the operation in the time allotted. The recruiting strategy is based on current environmental factors (such as the unemployment rate and local wage rates) and historical experience. The Census Bureau plans to recruit multiples of the estimated number of people needed to conduct the operation. For example, in the 2010 Census, to meet a target employment of approximately 857,000 people, it recruited approximately 3,900,000 applicants.⁵³ This recruiting target allows for applicants who may not ultimately be employed for any number of reasons while providing a suitable applicant pool of qualified candidates from which to select, train and deploy supervisors and enumerators to the field. Additionally, if the Census Bureau is challenged in meeting its recruiting and hiring targets it has the ability to increase local pay rates to meet its staffing needs.
64. The Census Bureau conducts real-time monitoring of the self-response rates at different geographic levels; i.e., at the national level and at local levels.⁵⁴ Daily monitoring is done leading up to the start of NRFU, as well as during the operation. Monitoring the self-response rates provides the information to take actions through the Integrated Partnership and Communications Program to increase self-response before the NRFU operation, encourage cooperation with our NRFU field staff, and ramp up efforts to encourage self-response during the operation. The Census Bureau can also increase hiring targets to account for increases in the NRFU workload.
65. As stated above, the Census Bureau's contact strategy in self-response areas⁵⁵ involves multiple contacts aimed at raising awareness and encouraging participation. It also provides respondents multiple ways of self-responding, with and without their census identification number. Respondents can provide their information online or over the telephone without having to provide the census identification number (NonID processing). Especially in areas where the Census Bureau is challenged in reaching households due to natural disasters, NonID processing can compensate for the failure to deliver a form or reach the household with an enumerator. Beginning before the peak self-response operations, and continuing through the end of NRFU, the Census Bureau will also employ a multi-faceted communication and advertising campaign focused on an extensive range of strategies aimed at also raising awareness and encouraging participation.

⁵³ U.S. Census Bureau (2011) page 23 Table 4.

⁵⁴ Local level represents areas at and below the Area Census Office level.

⁵⁵ This includes mail delivery and hand delivery areas.

66. In the event that it does not achieve its target 2020 Census self-response rate, contingency strategies are available to allow the Census Bureau to deploy enumerators to areas where the NRFU workload is higher than expected. As mentioned above, the Census Bureau's recruiting strategy is designed to provide an ample pool of resources from which it can pull, providing it the flexibility needed to expand beyond the number of CFMs, CFSs and enumerators it estimated it would need. In addition, although the Census Bureau's preference is to have enumerators work in the geographic areas where they live, it has the ability to assign work to enumerators in other areas. In some instances, this could mean assigning work in areas within the Area Census Office in which they were hired or even assign work in other Area Census Offices. The important flexibility is that the Census Bureau can "move" people to the areas at any point in time. Another contingency strategy, should it fall short of staffing needs in certain geographic areas, is the ability to authorize overtime for the enumerators. Providing the opportunity for enumerators to work overtime increases the number of hours available for completing the NRFU operation.
67. Finally, if needed, the Census Bureau has the ability to extend the period of time allocated for completing the NRFU operation. Extending the data collection period, either alone or in combination with the strategies above, allows enumerators to continue working to complete the necessary follow-up with all nonresponding addresses. As noted above, the 2020 Census Life Cycle Cost Estimate considers the uncertainty around each of the variables and allows an estimated \$2.6 billion in contingency, including approximately \$1.7 billion in contingency for fiscal year 2020. These contingency funds will be used to pay for increased NRFU should any of the events noted above occur.

Assessment of the Effects of Potential Outcomes

Possible Decrease in Self-Response Rates

68. As noted in the discussion of Brown et al. (2018) in Section II, they estimated the potential increase in the NRFU workload as a result of the citizenship question under several scenarios. Their method assumed that households⁵⁶ containing only citizens would have self-response rates that are unaffected by the inclusion of the citizenship question. Thus, the NRFU workload for these households would not be impacted. This assumption is known as a "counterfactual." It is a maintained assumption that permits the analysis of the effects of other changes. It is not a prediction about the behavior of these households. As noted in Section II, the Census Bureau has limited credible quantitative evidence about the overall effect of the inclusion of a citizenship question on the decennial census.
69. The households that are potentially impacted are those with at least one non-citizen or at least one person with unknown or missing citizenship status.⁵⁷ Brown et al. (2018) estimated that between 9.8 percent and 28.6 percent⁵⁸ of such households⁵⁹ could potentially contain at least one non-citizen. Of these households, they estimated the possible reduction in the self-response rate from the inclusion

⁵⁶ Households are occupied housing units.

⁵⁷ There is a large overlap between households potentially containing at least one non-citizen and households with at least one Hispanic. Households potentially including at least one non-citizen or at least one Hispanic are 33.6 percent of the households.

⁵⁸ Brown et al. (2018) page 42.

⁵⁹ The estimated number of households is 126 million addresses from Brown et al. (2018) page 42.

of the citizenship question to be between 5.1 and 5.8 percentage points.⁶⁰ This resulted in a potential increase in the NRFU workload between 0.6 million and 2.1 million housing unit addresses.⁶¹ Thus, there is a potential decrease in the national self-response rate between 0.4 and 1.5 percentage points.⁶² The increased cost to NRFU for each percentage point decrease in the national self-response rate is approximately \$55 million. Therefore, the increase in the NRFU cost would range between \$22.0 million and \$82.5 million⁶³, which is well under the \$1.7 billion in fiscal year 2020 contingency.

70. I now consider some alternative cost estimates based upon varying parameters of the estimates in the previous paragraph. If one were to assume a reduction in self-response of only 2.0 percentage points among households with at least one noncitizen or person of unknown citizenship status and use the larger estimate of 28.6 percent of such households in the population, then the predicted increase in the NRFU workload would be approximately 0.7 million⁶⁴ addresses. The potential decrease in the overall self-response rate would be 0.5 percentage points⁶⁵, leading to a predicted increase of \$27.5 million⁶⁶ in NRFU costs. If one were to assume a reduction in self-response of 10.0 percentage points among affected households and using the upper bound of 28.6 percent of such households in the population, then the predicted increase in the NRFU workload would be approximately 3.6 million⁶⁷ addresses. The potential decrease in the overall self-response rate would be 2.5 percentage points⁶⁸, leading to a predicted increase of \$137.5 million⁶⁹ in NRFU costs. All of the estimates in this paragraph fall well below the \$1.7 billion in fiscal year 2020 contingency.

71. An example of a randomized controlled trial that directly addresses differences in self-response rates from the presence or absence of a single question occurred after the 1990 Census. As a result of declining mail self-response rates in that census compared to those from the 1980 Census, the Census Bureau investigated various approaches to increase mail back self-response. This RCT compared an abbreviated short form with and without a question asking for the respondent's Social Security Number. Collecting the Social Security Number would allow direct linkage to administrative records

⁶⁰ Brown et al. (2018) page 42.

⁶¹ Brown et al. (2018) page 42.

⁶² Calculated value – 0.6 divided by 144.0 then multiplied by 100 rounded to one decimal place and 2.1 divided by 144.0 then multiplied by 100 rounded to one decimal place.

⁶³ Calculated value – \$55 million times 0.4 rounded to one decimal place and \$55 million times 1.5 rounded to one decimal place. Also, Brown et al. (2018) reported cost estimates of \$27.5 million and \$91.2 million, respectively, for these two cases. The minor differences in their cost estimates compared to the ones reported here are due to differences in the base housing unit addresses to which the NRFU costs apply.

⁶⁴ Calculated value – 2.0 divided by 5.8 then multiplied by 2.1 then multiplied 100 rounded to one decimal place.

⁶⁵ Calculated value – 0.7 divided by 144.0 then multiplied by 100 rounded to one decimal place.

⁶⁶ Calculated value – \$55 million times 0.5 rounded to one decimal place.

⁶⁷ Calculated value – 10.0 divided by 5.8 then multiplied by 2.1 then multiplied 100 rounded to one decimal place.

⁶⁸ Calculated value – 3.6 divided by 144.0 then multiplied by 100 rounded to one decimal place.

⁶⁹ Calculated value – \$55 million times 2.5 rounded to one decimal place.

that could provide response data for the eliminated questions, thus reducing respondent burden, costs, and staffing requirements. However, the collection of Social Security Number turned out to be highly sensitive. The experiment was conducted as part of a Mail Response Evaluation for the Simplified Questionnaire Test. The experimental evaluation was a randomized controlled trial of the impact on the self-response rate of including a question to collect Social Security Number compared to an identical instrument without the Social Security Number question. (U.S. Census Bureau, 1992). The national results showed a 3.4 percentage point⁷⁰ decrease in the self-response rate when the Social Security Number question was asked compared to the rate for the comparable form that did not ask the Social Security Number question. The sensitivity around the collection of Social Security Number impacted the entire population. The 1992 randomized controlled trial was internally valid but may still not be generalizable to the current census climate. Using the results from this RCT, I estimate the effect on 2020 Census NRFU costs from the potential national decrease in the self-response rate of 3.4 percentage points to be \$187.0 million⁷¹. Again, the estimate falls well below the \$1.7 billion in fiscal year 2020 contingency.⁷²

72. These NRFU cost effects are summarized in the following table:

	2% Decrease in Non-Citizen Self- Response Rate (Affects 28.6% of Households)	5.8% Decrease in Non-Citizen Self- Response Rate (Affects 28.6% of Households)	10% Decrease in Non-Citizen Self- Response Rate (Affects 28.6% of Households)	1992 Simplified Questionnaire Test (Affects All Households)
Decrease in Overall Self-Response Rate (in percentage points)	0.5%	1.5%	2.5%	3.4%
Increase in NRFU workload (in housing units)	0.7 million	2.1 million	3.6 million	4.9 million ⁷³
Increase in Cost	\$27.5 million	\$82.5 million	\$137.5 million	\$187.0 million

73. Therefore, the possible increase in the NRFU cost could range between \$22.0 million and \$187.0 million, all of which are well below the \$1.7 billion in fiscal year 2020 contingency.

Example Scenario for an Area Census Office

74. It is important to consider an example for an Area Census Office that illustrates the NRFU. For this discussion, I will focus on the El Paso, TX Area Census Office. There are approximately 521,000 housing unit addresses for the El Paso office where the USPS or Census field representatives will

⁷⁰ U.S. Census Bureau (1992) page 4 Table 3.

⁷¹ Calculated value – \$55 million times 3.4 rounded to one decimal place.

⁷² The Census Bureau has no credible data for comparing the general sensitivity of a question about Social Security Numbers to a question about citizenship.

⁷³ Calculated value – 3.4 multiplied by 144.0 million then divided by 100 rounded to one decimal place.

deliver materials notifying the occupants to respond to the 2020 Census.⁷⁴ The current working estimate of self-response rate for the El Paso Area Census Office is 64.3 percent.⁷⁵ Given this rate, the estimated NRFU workload is about 186,000 housing unit addresses.⁷⁶ Based on these estimates we will set recruiting and hiring goals for the CFMs, CFSs and enumerators to ensure the completion of the operation within the time allotted. Examples of factors that help determine the number of enumerators is the average number of hours worked each week and the productivity rate. We estimate the average number of hours an enumerator will work each week at 22.85 hours with a productivity rate of 1.146 cases per hour.⁷⁷

75. Before and during the self-response phase of the 2020 Census the communication, advertising, and partnership efforts are focused on raising awareness about the census with the goal of maximizing the self-response. These efforts will be conducted at the national level and sub-national level. Households in the El Paso Area Census Office will be exposed to national messaging, targeted messaging for population sub-groups, local messaging and engagements through the community-based partnership efforts, and targeted advertising efforts at the local level. At the same time, the Census Bureau will be monitoring the self-response rates for the El Paso Area Census Office and geographic areas below the office level down to the tract level. If we determine that the 64.3 percent target self-response rate may not be achieved, we might, for example, schedule additional partnership events and increase the messaging activities. For example, we could increase local advertising efforts or place stories in the El Paso media market or in social media. These outreach activities, part of the Integrated Partnership and Communications Program, will be geared to raise awareness and encourage households to self-respond.
76. Immediately before the start of NRFU, the Census Bureau conducts enumerator training. If it is concerned that the NRFU workload will be larger than expected, the Census Bureau still has the ability to hire and train additional enumerators from the recruiting pool at this stage. Given the recruitment pool targets, which are set much earlier but which are several multiples of the expected enumerator hiring, we are still able to onboard and train additional enumerators above the original target even immediately before the onset of NRFU. For example, if the self-response rate for the El Paso Area Census Office was projecting to be lower than the plan, we would select additional recruits, send them to training, and deploy them to the field. The projected reduction in the self-response rate would be used in combination with the average number of hours an enumerator works each week and the productivity rate in determining the number of additional enumerators needed to conduct NRFU.
77. During NRFU, the Census Bureau monitors the operation. This monitoring occurs at the national level, the Regional Census Center level, the Area Census Office level, the CFM level, and the CFS level. For the El Paso Area Census Office, the ACOM, the CFMs and the CFSs are monitoring and managing the operation to ensure that it is on track with respect to quality and completeness. In

⁷⁴ Internal Document: NRFU Workload Estimates by ACO for El Paso Area Census Office rounded up to the nearest 1,000.

⁷⁵ Calculated value – 521,000 minus 186,000 then divided by 521,000 then multiplied by 100 rounded to the nearest decimal. This estimate might be refined as we get closer to the 2020 Census.

⁷⁶ Internal Document: NRFU Workload Estimates by ACO for El Paso Area Census Office rounded to the nearest 1,000.

⁷⁷ Internal email: September 11, 2018.

addition, staff at Headquarters and in the Regional Census Centers are also monitoring all of the Area Census Offices, including the El Paso office. If there are concerns that El Paso might not complete the operation on schedule the Census Bureau could consider asking enumerators to work more than the 22.85 hours each week. We also could authorize overtime or assign enumerators cases that are further from their residence. In addition, the communication, advertising, and partnership efforts transition to raising awareness that enumerators will be contacting nonresponding housing unit addresses, promoting cooperation with these enumerators, and engaging people to respond. Finally, if these efforts prove to be unsuccessful we can extend the operation up to a month without impacting the downstream data processing activities too severely. Extending the operation provides the Area Census Office additional time to complete the enumeration activities.

Overall Assessment

78. The Census Bureau is prepared to conduct the 2020 Census NRFU operation and believes that those efforts will result in a complete enumeration. The Census Bureau has demonstrated the ability to successfully conduct a NRFU operation in previous censuses and in the 2018 End-to-End Census Test. It has tested the operational design in various tests over the course of the decade. The tests, along with historical data from past censuses and the American Community Survey, have informed the Census Bureau's operational design and the assumptions supporting that design; it has identified factors that could impact the operational implementation of NRFU; it has identified how it will react should an event such as a lower than estimated self-response rate be realized. Contingency funding to handle deviations from the assumed design parameters are built in to the Life Cycle Cost Estimate. The decision to include a question on citizenship has not impacted the NRFU operational design. In addition, there is no evidence, to date, that the addition of the citizenship question or any other factor will result in a less accurate count. We are, however, prepared to react, adjust, and complete NRFU to ensure an accurate enumeration.
79. The Census Bureau is projecting a national self-response rate in the range of 55.5 percent to 65.5 percent with an estimated self-response rate of 60.5 percent at the time the NRFU workload is determined. Real-time monitoring of the self-response rate at national and local levels in the time frame leading up to the start of NRFU, as well as during the NRFU data collection timeframe, will inform actions that the Census Bureau takes to increase self-response and encourage cooperation with its NRFU enumerators.
80. The 2020 Census Life Cycle Cost Estimate assumptions supporting the completion of the NRFU workload are as follows:

	Counts of Addresses in Millions⁷⁸	Percent of NRFU Workload⁷⁹
Initial NRFU Workload⁸⁰	61.3	100.0%
Late Self-Response: Pre-Attempt 1⁸¹	1.5	2.4%
Administrative Records Vacant/Delete	4.7	7.7%
Attempt 1 Completions	15.0	24.5%
Late Self-Response: Post-Attempt 1⁸²	1.5	2.4%
Administrative Records Enumeration	6.6	10.8%
Attempt 2 Completions	8.7	14.2%
Attempt 3 Completions	10.8	17.6%
Attempt 4 Completions	5.8	9.4%
Attempt 5 Completions	3.1	5.0%
Attempt 6 Completions	3.7	6.0%

81. In the event that we do not achieve our target 2020 Census self-response rate, contingency strategies have been identified and funding is available. The deployment of those strategies will be determined in response and reaction to the timing and magnitude of the situation.

82. The 2020 Census NRFU Operation, as designed and planned, is sufficiently budgeted to support a full and accurate count and, when combined with the Integrated Partnership and Communications Program, to maximize self-response.

IV. Testing of the citizenship question

83. The Census Bureau's statistical work is guided by, and complies with, the U. S. Census Bureau Statistical Quality Standards. In 2005, after conducting a benchmarking study of the standards of

⁷⁸ Internal Document: September 29, 2017 version of the 2020 Census Lifecycle Cost Estimate Assumptions Table 3, Total Workload column rounded to the nearest 100,000.

⁷⁹ Calculated values using previous column data.

⁸⁰ At the start of the NRFU operation the workload is calculated based on 144.3 million housing unit addresses and a 60.5 percent self-response rate; this results in a workload of approximately 57 million addresses. To the 57 million addresses we add approximately 4 million addresses from other census operations. The additional addresses are either identified after the determination of the enumeration workload (e.g., new addresses from the USPS) or are addresses that require additional field follow-up for final resolution (e.g., paper questionnaires received with insufficient information).

⁸¹ The Life Cycle Cost Estimate assumes an additional one percent of the 144.3 million housing unit addresses will self-respond after the NRFU workload has been determined, but before any contacts have been made in the NRFU operation. The Life Cycle Cost Estimate also assumes another one percent of the 144.3 million housing unit addresses will self-respond after the first NRFU contacts are made. Each of those one-percent assumptions translates into about 2.4 percent of the initial NRFU workload.

⁸² The same qualification applies to this category as in the footnote above.

other statistical organizations, the Census Bureau's Methodology and Standards (M&S) Council⁸³ initiated a more coordinated approach for developing a comprehensive set of statistical quality standards. Beginning with existing written standards, the Council aimed to improve consistency and cohesion among the standards, as well as to reflect all the requirements of the OMB's Standards and Guidelines for Statistical Surveys, contained primarily in Statistical Policy Directive 2, in the context of the Census Bureau's programs, products, and processes. The Census Bureau began developing these comprehensive standards in May 2006. The process was completed in May 2010, when the Census Bureau issued its standards. These standards were officially revised in July 2013.

84. The Census Bureau's statistical quality standards apply to all information products released by the Census Bureau and all activities that generate those products, including products released to the public, sponsors, joint partners, or other customers. All Census Bureau employees and Special Sworn Status individuals must comply with these standards, including contractors and other individuals who receive Census Bureau funding to develop and release Census Bureau information products. The standards describe what is required without mandating specific procedures for how to satisfy the requirements.
85. Census Bureau management is charged with insuring compliance with the standards when producing and releasing information products to the public. The separate directorates are charged with ensuring compliance with the standards. When questions arise on whether a certain procedure or methodology is compliant, the Quality Program Staff (QPS) is asked for guidance on how to proceed. If the QPS staff is unsure, the matter is referred to the M&S Council for guidance. The M&S Council is empowered to issue waivers to all standards except those pertaining to confidentiality protection.

Decennial Census Questionnaire

86. From the 1940 Census through the 2000 Census, the decennial questionnaire consisted of long and short forms. Most of the population answered the short form, and a controlled percentage of randomly selected households answered the long form. When an agency requested the addition of a new decennial question, it was proposed for the long form. There was a defined process to add a question to the long form to ensure that the new question would collect the required information without causing undue respondent burden. In 2005, after more than a decade of planning and tests, the American Community Survey (ACS) replaced the long form.
87. The ACS is an annual survey that collects the information formerly collected on the long form, which was removed from the decennial census in the 2010 Census. There is now a well-defined process for adding questions to the ACS, as well as a regular content review program that is empowered to remove questions. No content had been added to the decennial census short form since the creation of the long form in the 1940 Census, although the questionnaire changed considerably as the Census Bureau moved from enumerators to self-response as the primary collection mode.
88. The Department of Justice's request to add a question to the 2020 Census was, therefore, the first request for new content on the decennial census short form since the creation of the long form. When the request arrived, the Census Bureau did not have a written policy that defined the process for adding a question to the short form because all known requests from agencies of the Executive Branch prior to the December 2017 DoJ request had been for the addition of questions on the long

⁸³ The M&S Council is chaired by the Chief Scientist and Associate Director for Research and Methodology and is composed of the senior mathematical statisticians and survey methodologists from all directorates of the Census Bureau. It is considered convened with a quorum when the Chair and at least three directorates are present.

form or ACS. There is at least one documented Congressional mandate to change a question on the 1990 Census, which I will discuss later in this section.

Adding Survey Questions

89. Standard A2-3 requires that data collection instruments and supporting materials be developed and tested in a manner that balances (within the constraints of budget, resources, and time) data quality and respondent burden. Testing in reference to compliance standards involves two aspects. The individual questions must be cognitively tested to ensure that the respondent will understand and answer the question in the manner desired. In addition, subject to certain exceptions, the questionnaire instrument must be tested for contextual effects to ensure that an individual question does not bias how another question on the form is answered.
90. More specifically and subject to the same exceptions, A2-3.3 requires that a data collection instrument be pretested with respondents to identify any problems with cognitive understanding of the questions. Pretesting of a specific question previously used on another survey however is not required (see the note to Standard Sub-Requirement A2-3.3.1). This note to Standard Sub-Requirement A2-3.3.1 was added to the standards because it is an accepted practice within the survey field and allows the Census Bureau and client agencies to save resources. The Census Bureau could borrow from other surveys that we conducted or from other agencies such as the National Center for Health Statistics (NCHS), which, like the Census Bureau, has resources devoted to testing questionnaires and questions. This exception for previously tested questions thus allows the Census Bureau to use questions that were already extensively tested for use in OMB-authorized surveys to be re-used without repeating the cost of testing.

Compliance and the Citizenship Question

91. The ACS questionnaire went through extensive testing in decade before it officially replaced the decennial census long form in 2005. This testing included the citizenship question as implemented on the 2000 Census long form. The question was found to gather the information intended, and has been used continuously since ACS's inception in 2005.
92. Tests conducted in 2006 determined that the citizenship question could be improved by including a write-in box for the year of naturalization. The 2006 testing indicated no issues with contextual effects. The write-in box for year of naturalization was implemented in 2008. This question in its current form has been used in ACS production for more than 10 years. As a consequence of the 2006 testing and 10 years of production success, the ACS citizenship question was deemed "adequately tested" and in compliance with the Census Bureau's 2014 Quality Standards for use on the 2020 Census by virtue of the exception for previously tested questions in Standard A2 3.3.1 (note).
93. The historical origins of that standard make it clear that it also waives any requirement for full-form testing because the use of the tested question on a previous Census Bureau or other OMB-approved survey necessarily involved contextual differences in the full survey form. These contextual differences do not imply contextual difficulties in the proposed new survey.
94. Senior Census Bureau experts determined that compliance with our standards required using the existing question exactly as it had been tested and implemented on the ACS. By using a question that fulfilled the requirements of the note to Standard A2-3.3.1, pretesting of the citizenship question was not required. To address the concern about potential contextual effects from adding the citizenship question to the 2020 Census forms, experienced Census Bureau statisticians determined that the current ACS citizenship question was used in the most similar manner and presentation to the proposed 2020 Census questionnaire. This determination was made by a group of senior statisticians at the Census Bureau who have worked on questionnaire design since the 1980's. Thus after this expert review, the ACS citizenship question was proposed, specifically with no changes to minimize

the possibility of contextual effects and maintain compliance with the standards. No new content, contextual or full-form tests were conducted.⁸⁴

95. Changes to the census questionnaire are not unprecedented. In the lead-up to the 1990 Census, the Census Bureau proposed a race question that included seven pre-specified categories. Separate write-in spaces were provided for three of the categories—Asian or Pacific Islander, American Indian, and Other race. This format for the question appeared on the March 1988 proposed-question submission to Congress. The format for the proposed race question had been thoroughly tested during the 1980s.
96. In September and October 1988 considerable Congressional opposition to the proposed question emerged. No law was actually passed mandating a different form for the race question, but the “report language associated with [the Census Bureau’s] fiscal year 1989 appropriate bill ... directed the Bureau to use prelisted categories for Asian and Pacific Islander groups.” (App. A; U.S. Census Bureau 1988 at 1.)
97. The prelisted category format for the race question was untested. Internal Census Bureau records, delivered with this expert report, show that the senior management raised many of the same objections to using the untested question as have been raised regarding the current citizenship question. On a single day, December 5, 1988, Director John Keane instructed the 1990 Census to use the tested write-in format for Asian or Pacific Islander at 7:30am—in spite of the language in the appropriation act—then reversed himself at 4:30pm by issuing the instruction to use the untested prelisted category format for Asian or Pacific Islander.
98. The Department of Commerce weighed in the next day indicating that it would not be the Census Bureau’s decision. The Census Bureau responded by saying that unless a decision was made by December 9, 1988, it would use the OMB-approved write-in format for Asian or Pacific Islander, effectively reversing itself again. On January 12, 1989, OMB approved the prelisted category version of the question, without requiring additional testing. On January 13, 1989, the Census Bureau notified Congress that it would use the prelisted category version of the race question for Asian or Pacific Islander. The prelisted category version of the race question for Asian or Pacific Islander was used on the 1990 Census short and long forms. In the final analysis, OMB had approved both the tested and untested versions of the question, and the Census Bureau used the untested version in deference to the wishes of Congress. Post-census evaluations indicated that the untested question did not cause measurement problems with the Asian or Pacific Islander category.⁸⁵
99. Importing a question from a previously tested survey has also happened before. In the lead-up to the 1970 Census, the Current Population Survey tested and implemented a new question on Hispanic origin by self-identification, as an alternative to the prevailing practice of using Spanish surnames

⁸⁴ While the Census Bureau was in compliance with its own Quality Standards, the issue is not settled. The final determination of whether the addition of a citizenship question to the 2020 Census is permissible rests with the OMB. The Census Bureau must first prepare the clearance package, then submit it to OMB for approval. Before completing the clearance package the Census Bureau must compile and reply to the more than 140,000 comments received by the August 7, 2018 deadline on *Federal Register* notice 83 FR 26643. If those comments suggest that further testing should be required, and if the OMB agrees, then the Census Bureau can be compelled to do further testing in order to receive the OMB clearance. If the OMB agrees that the question has been adequately tested, then it can issue the clearance without further testing. The OMB has not yet issued the Census Bureau a clearance number to conduct the 2020 Census.

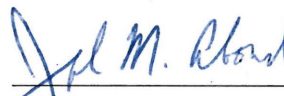
⁸⁵ In the 1990 Census Content Reinterview Survey, 449 persons responded “Asian or Pacific Islander” and 80 responded “Other Asian or Pacific Islander.” For both of these categories, the Census Bureau concluded that the relevant net error rate was not statistically significant different from zero. (U.S. Census Bureau 1993, page 21)

and country of birth (or parental country of birth) to determine Hispanic ethnicity. The question was also used on the 1970 Census long form, based the Current Population Survey testing and implementation. In the final analysis, the Census Bureau determined that it could use the testing program from what was, at the time, the flagship household survey to prepare content for the decennial census.

100. The 1970 and 1990 Census examples illustrate that neither using a question on the decennial census that has not undergone decade-long testing nor importing a tested question from a well-designed household survey onto the decennial census is unprecedented. Neither of these situations are “best practice,” and the standards enforced by the Census Bureau’s own quality reviews and the OMB clearance process are certainly intended to control the potential for unintended consequences caused by inadequate testing. My opinion is that the Census Bureau properly balanced cost, quality and risk concerns by using the tested ACS citizenship question in response to the Secretary’s March 26, 2018 instruction to add such a question to the 2020 Census.

I declare under penalty of perjury that the foregoing is true and correct.

November 1, 2018



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V. References

- Bates, Nancy. (2017) The Morris Hansen Lecture, Hard-to-Survey Populations and the U.S. Census: Making Use of Social Marketing Campaigns, *Journal of Official Statistics*, Vol. 33, No. 4, 2017, pp. 873–885, <http://dx.doi.org/10.1515/JOS-2017-0040>.
- Brown, J. David, Misty L. Heggeness, Suzanne M. Dorinski, Lawrence Warren, and Moises Yi (2018) “Understanding the Quality of Alternative Citizenship Data Sources for the 2020 Census,” U.S. Census Bureau, Center for Economic Studies, Working Paper 18-38 (August) <https://www2.census.gov/ces/wp/2018/CES-WP-18-38.pdf>.
- Siegel, Jacob S. and Jeffrey S. Passel (1979) Coverage of the Hispanic Population of the United States in the 1970 Census: A Methodological Analysis, Current Population Reports: Special Studies P-23, No. 82 U.S. Census Bureau <https://babel.hathitrust.org/cgi/pt?id=txu.059173017849708;view=1up;seq=1>
- U.S. Census Bureau (1988) Issue Paper on the 1990 Census Race Question, November 10, 1988; includes associated documents from the Census Bureau archives. (Placed in the public domain by attachment to this report.)
- U.S. Census Bureau (1992) DSSD 2000 Census Memorandum Series #E-18, *Final Results of the Mail Response Evaluation for the Simplified Questionnaire Test (SQT)*, dated August 3, 1992. Internal document
- U.S. Census Bureau (1993) 1990 Census of Population and Housing Evaluation and Research Reports, *Content Reinterview Survey: Accuracy of Data for Selected Population and Housing Characteristics as Measured by Reinterview*, September 1993, Report 1990 CPH-E-1.
- U.S. Census Bureau (2013), 2010 Census Planning Memorandum Series, Number 182, *2010 Census Nonresponse Followup Quality Profile*, dated March 21, 2013, https://www.census.gov/content/dam/Census/library/publications/2012/dec/2010_cpex_182.pdf
- U.S. Census Bureau (2013) Statistical Quality Standards (July) <https://www.census.gov/about/policies/quality/standards.html>
- U.S. Census Bureau (2014) Research Report Series, #2013-05, *A Visual Proof, a Test, and an Extension of a Simple Tool for Comparing Competing Estimates*, dated February 24, 2014, <https://www.census.gov/srd/papers/pdf/rrs2013-05.pdf>
- U.S. Census Bureau (2017a) *2020 Census Operation Plan*, September 2017, Version 3.0, <https://www2.census.gov/programs-surveys/decennial/2020/program-management/planning-docs/2020-oper-plan3.pdf>
- U.S. Census Bureau (2017b) *2020 Census Detailed Operation Plan for: 15. Group Quarters Operation (GQ)*, September 29, 2017, Version: 1.0, https://www2.census.gov/programs-surveys/decennial/2020/program-management/planning-docs/GQ_detailed_operational_plan.pdf
- U.S. Census Bureau (2017c) 2020 Census Program Memorandum Series: 2017.21, *Area Census Offices for the 2020 Census*, Memorandum for the Record, From Albert E. Fontenot Jr., Associate Director, Decennial Census Programs, November 6, 2017, https://www2.census.gov/programs-surveys/decennial/2020/program-management/memo-series/2020-memo-2017_21.pdf
- U.S. Census Bureau (2017d), 2020 Census Life-Cycle Cost Estimate Executive Summary, dated December 21, 2017, Version 1.0, <https://www2.census.gov/programs-surveys/decennial/2020/program-management/planning-docs/2020-cost-estimate1.pdf>

- U.S. Census Bureau (2018a), 2020 Census Detailed Operational Plan for: 32. Field Infrastructure Operation (FLDI) and 33. Decennial Logistics Management Operation (DLM), January 24, 2018, Version 1.0, https://www2.census.gov/programs-surveys/decennial/2020/program-management/final-analysis-reports/FLDI-DLM_detailed_operational_plan.pdf
- U.S. Census Bureau (2018b) 2020 Census Operational Plan Executive Summary, dated February 2018, Version 2.0, <https://www2.census.gov/programs-surveys/decennial/2020/program-management/planning-docs/2020-oper-plan-exec-sum-2.pdf>
- U.S. Census Bureau (2018c) 2020 Census Detailed Operational Plan for: 17. Census Questionnaire Assistance Operation (CQA), dated February 2018, Version: 2.0, https://www2.census.gov/programs-surveys/decennial/2020/program-management/planning-docs/CQA_detailed_operational_plan_2.0.pdf
- U.S. Census Bureau (2018d) 2020 Census Detailed Operational Plan for: 18. Nonresponse Followup (NRFU), dated April 16, 2018, Version: 1.0, <https://www2.census.gov/programs-surveys/decennial/2020/program-management/planning-docs/NRFU-detailed-operational-plan.pdf>
- U.S. Census Bureau (2018e) 2020 Census Detailed Operational Plan for: 35. Update Leave Operation (UL), June 25, 2018, Version: 1.0, https://www2.census.gov/programs-surveys/decennial/2020/program-management/planning-docs/UL_detailed_operational_plan.pdf
- U.S. Census Bureau (2018f) 2020 Census Detailed Operational Plan for: 12. Internet Self-Response (ISR) Operation, August 22, 2018, Version 1.0, https://www2.census.gov/programs-surveys/decennial/2020/program-management/planning-docs/ISR_detailed_operational_plan.pdf
- U.S. Census Bureau (2011) 2010 Census Recruiting and Hiring Assessment Report, November 2, 2011, <https://www2.census.gov/programs-surveys/decennial/2010/program-management/5-review/cpex/2010-memo-155.pdf>
- Internal Document, 2020 Census Lifecycle Cost Estimate Internal Document, Assumption Tables 2, 3, 6, and 12, September 29, 2017.
- Internal Email from Benjamin Taylor, August 10, 2018.
- Internal Email from Benjamin Taylor, September 11, 2018.
- Internal Document, 2020 Type of Enumeration Areas (TEAs) Final TEA Delineations for Approval, August 14, 2018.
- Internal Document, 2018 End-to-End Census Test Plan, November 1, 2017.
- Internal Document, NRFU Workload Estimates by ACO.