2020 Census Operational Plan

A New Design for the 21st Century

Issued September 2017
Version 3.0

United States™ Census Bureau

U.S. Department of Commerce
Economics and Statistics Administration
U.S. CENSUS BUREAU
census.gov

Note to Reader:

Please note that the *2020 Census Operational Plan v3.0* reflects the operational design for the 2020 Census as of July 31, 2017, unless noted otherwise.

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1. Introduction

1.1 PURPOSE

The U.S. Census Bureau's 2020 Census Operational Plan documents the design for conducting the 2020 Census. It reflects and supports evidence-based decision-making by describing design concepts and their rationale, identifying decisions made and remaining decisions, and describing remaining risks related to the implementation of the 2020 Census Operational Plan.

1.2 DESIGN APPROACH

As shown in Figure 1, the operational design comprises a set of design decisions that drive how the 2020 Census will be conducted. These design decisions have been informed through research, testing, and analysis conducted from 2012 through 2017. The operational design also drives the requirements for Information Technology (IT) capabilities and acquisitions.

The 2020 Census has been designed and developed in an iterative fashion, incorporating results from various tests conducted over the decade. Most design decisions have been made and are reflected in this document. Adjustments to the design may be required based on analysis and final tests conducted in 2018, in particular the 2018 End-to-End Census Test.

An important aspect of the design approach for the 2020 Census is an increased reliance on enterprise standards and solutions. Specifically, the design of all IT capabilities adheres to the Enterprise Systems Development Life Cycle (eSDLC) and IT Guiding Principles. Furthermore, the 2020 Census Program's budget, schedule, and work activities align with the eSDLC/Mission Enabling and Support Work Breakdown Structure. The 2020 Census design also leverages enterprise-shared services, including the Census Enterprise Data Collection and Processing

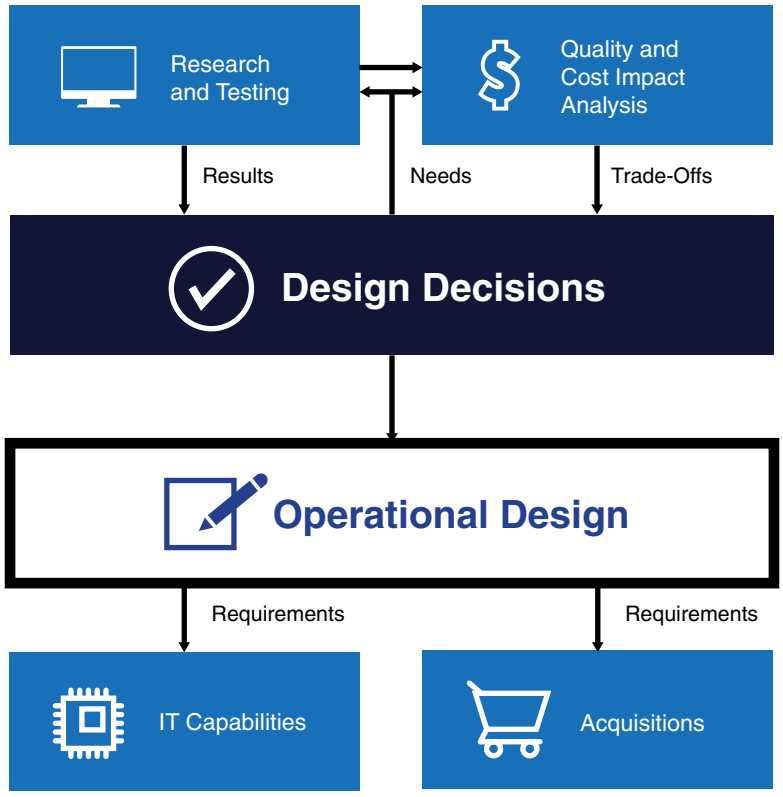

Figure 1: Approach to the Operational Design

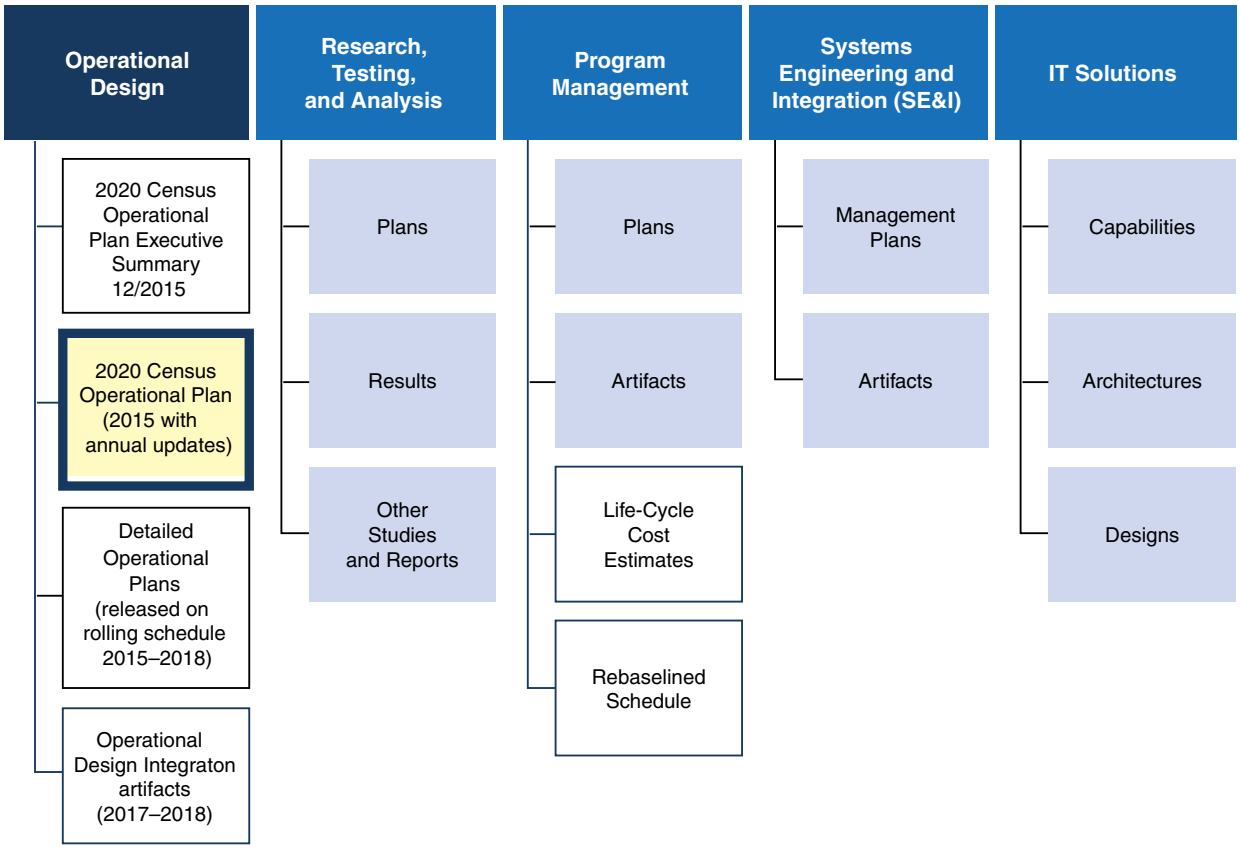

Figure 2: 2020 Census Program Documentation Structure

(CEDCaP) solution and the Center for Enterprise Dissemination Services and Consumer Innovation solution.[1] These two initiatives provide the technology solutions required to support significant portions of the innovations for the 2020 Census.

1.3 DOCUMENT SCOPE

This document is version 3.0 of the 2020 Census operational design and covers all operations required to execute the 2020 Census, starting with precensus address and geographic feature updates, and ending once census data products are disseminated and coverage and quality are measured. It describes what will be done during the 2020 Census and, at a high level, how the work will be conducted. Additional specifics of how each operation will be performed are documented in individual 2020 Census Detailed Operational Plans, which are being created on a rolling schedule. These detailed plans include the business process models that have been developed for each operation. They also identify the set of activities that comprise the operation and the interactions among related operations.

As shown in Figure 2, this 2020 Census Operational Plan, shaded in yellow, is part of a broader set of documentation for the 2020 Census Program.

1.4 DOCUMENT DEVELOPMENT PROCESS

Many organizations across the Decennial Census Programs Directorate and the Census Bureau have worked together to develop the 2020 Census operational design. Figure 3 illustrates these organizations. The development of the 2020 Census Operational Plan is led by the Decennial Census Management Division (DCMD), in particular a set of

[1] Throughout this document, references are made to specific CEDCaP systems (i.e., MOJO, PRIMUS, and COMPASS Census operations) that were only used to support the early 2020 Census tests.

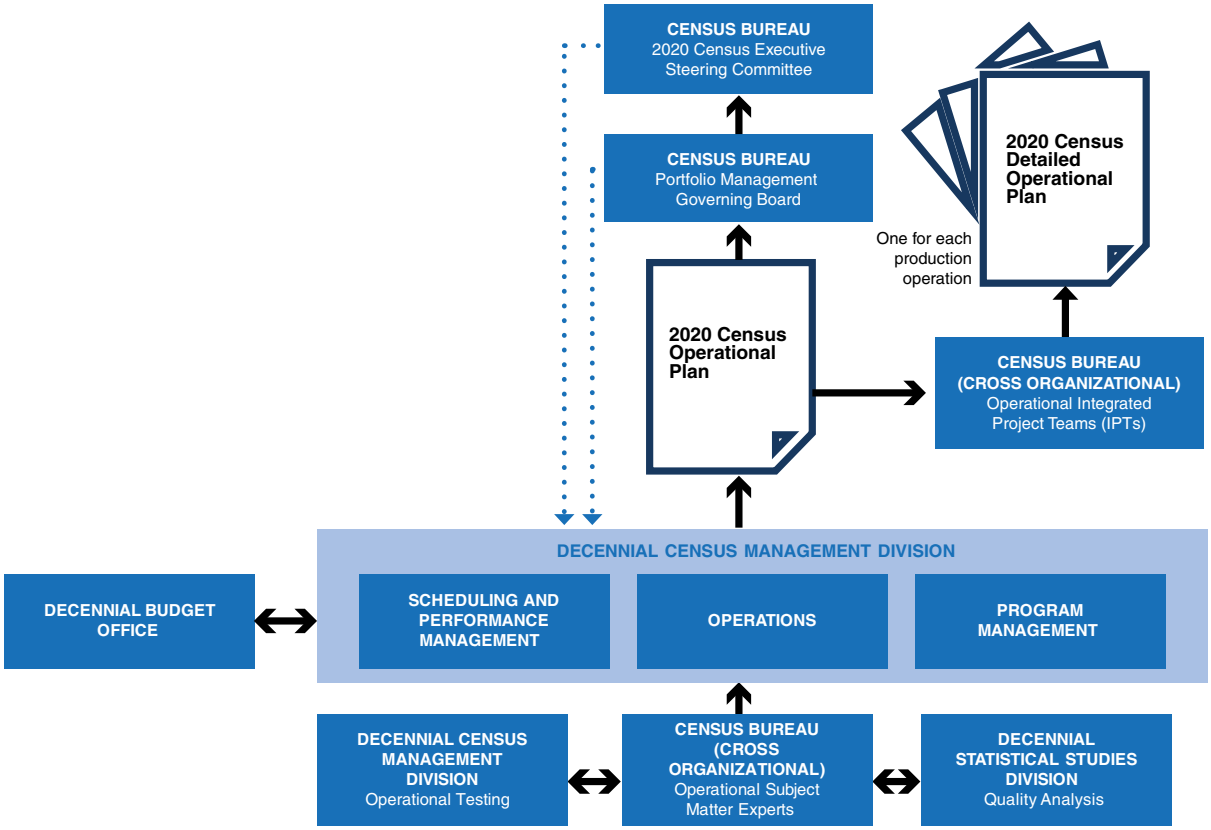

Figure 3: Organizations and Governance Boards for the 2020 Census Operational Plan

Assistant Division Chiefs responsible for the 2020 Census operations. These Assistant Division Chiefs are supported by several DCMD functional areas, including program management and scheduling and performance management. The DCMD operational design work also relies on operational subject matter experts from throughout the Census Bureau and the quality analysis staff within the Decennial Statistical Studies Division. The Decennial Budget Office analyzes the cost impacts of alternative operational designs and provides the life-cycle cost estimate. DCMD also has a team responsible for overseeing operational testing and reporting on test results, which inform operational design decisions.

The 2020 Census Operational Plan has been reviewed and approved by the 2020 Census Portfolio Management Governing Board and the 2020 Census Executive Steering Committee. Operational Integrated Project Teams develop the detailed operational plans. These teams are composed of subject matter experts from across the Census Bureau, including the IT and Field Directorates.

1.5 DOCUMENT ORGANIZATION

This document is organized into seven sections:

1. Introduction
2. The 2020 Census Overview
3. The Four Key Innovation Areas
4. Key Tests, Milestones, and Production Dates
5. The 2020 Census Operations
6. Key Program-Level Risks
7. Quality Analysis

Section 5 describes each of the 35 census operations and constitutes the bulk of this 2020 Census Operational Plan. All decisions in this section are current as of July 31, 2017.

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2. The 2020 Census Overview

2.1 PURPOSE AND GOAL

The purpose of the 2020 Census is to conduct a census of population and housing and disseminate the results to the President, the states, and the American people. The goal of the 2020 Census is to count everyone once, only once, and in the right place.

2.2 USES OF DECENNIAL DATA

As the 2020 Census draws near, it is important to keep in mind the purpose of the census and how the data will be used.

The primary requirement served by the decennial census is the apportionment of seats allocated to the states for the House of Representatives. This requirement is mandated in the U.S. Constitution:

> Article I, Section 2;
> *The actual Enumeration shall be made within three Years after the first Meeting of the Congress of the United States, and within every subsequent Term of ten Years*
>
> Fourteenth Amendment, Section 2;
> *Representatives shall be apportioned among the several States according to their respective numbers, counting the whole number of persons in each State*

Decennial data at the census block level are used by governmental entities for redistricting, i.e., defining the representative boundaries for congressional districts, state legislative districts, school districts, and voting precincts. Additionally, decennial data are used to enforce voting rights and civil rights legislation.

The Census Bureau also uses the decennial census results to determine the statistical sampling frames for the American Community Survey (ACS), which replaced the long form in the decennial census and is part of the Decennial Program, and the dozens of current surveys conducted by the Census Bureau. The results of these surveys are used to support important government functions, such as appropriating federal funds to local communities (an estimated $675 billion annually)[1]; calculating monthly unemployment, crime, and poverty rates; and publishing health and education data.

Finally, decennial data play an increasingly important role in U.S. commerce and the economy. As people expand their use of data to make decisions at the local and national levels, they increasingly depend on data from the Census Bureau to make these decisions. Today, local businesses look at data provided by the Census Bureau on topics like population growth and income levels to make decisions about whether or where to locate their restaurants or stores. Similarly, a real estate investor who is considering investing significant funds to develop a piece of land in the community relies on Census Bureau data to measure the demand for housing, predict future need, and review aggregate trends. Big businesses also rely heavily on Census Bureau data to make critical decisions that impact their success and shape the economy at the national level. As noted above, the decennial census is the foundation for the Census Bureau's demographic survey data.

The decennial data must meet high quality standards to ensure good decision-making and to continue building confidence in the government, society, and the economy. Studying the balance between cost and quality is an important focus of the census design.

[1] "Uses of Census Bureau Data in Federal Funds Distribution," prepared by Marisa Hotchkiss and Jessica Phelan, U.S. Census Bureau, Washington, DC, September 2017, <www.census.gov/library/working-papers/2017/decennial/census-data-federal-funds.html>.

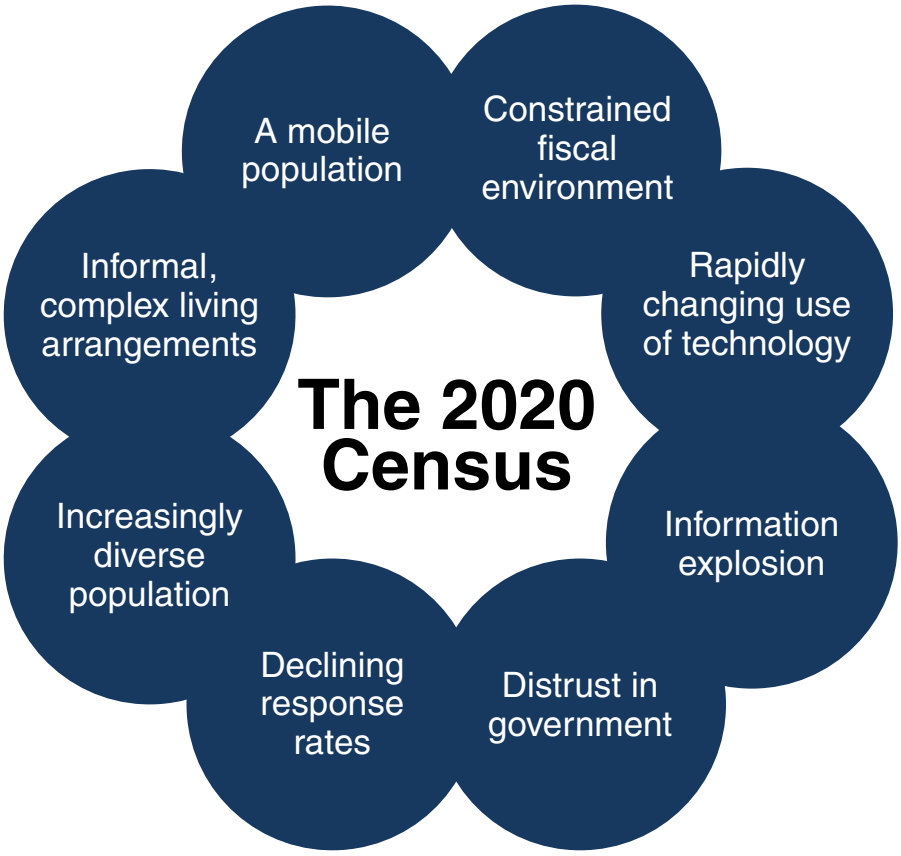

Figure 4: 2020 Census Environment

2.3 THE CHANGING ENVIRONMENT AND ESCALATING COSTS

The 2020 Census challenge is exacerbated by multiple environmental factors that have the potential to impact its success. The Census Bureau is committed to proactively addressing the challenges that follow (see Figure 4):

- **Constrained fiscal environment:** Budget deficits place significant pressure on funding available for the research, testing, design, and development work required for successful innovation.
- **Rapidly changing use of technology:** Stakeholders expect the decennial census to use technology innovation, yet the rapid pace of change makes it challenging to plan for and adequately test the use of these technologies before they become obsolete.
- **Information explosion:** Rapid changes in information technology (IT) create stakeholder expectations for how the Census Bureau interacts with the public to obtain and disseminate data products.
- **Distrust in government:** Concerns continue to grow about information security and privacy, the confidentiality of information given to the government, and how government programs will use the information they collect. This makes it more difficult to collect important demographic survey information.
- **Declining response rates:** Response rates for Census Bureau surveys, and for surveys and censuses in general, have declined as citizens are overloaded with requests for information and become increasingly concerned about sharing information.
- **Increasingly diverse population:** The demographic and cultural make-up of the United States continues to increase in complexity, including a growing number of households and individuals of Limited English Proficiency, who

may experience language barriers to enumeration and who may have varying levels of comfort with government involvement.

- **Informal, complex living arrangements:** Households are becoming more diverse and dynamic, making it a challenge to associate an identified person with a single location. For example, blended families may include children who have two primary residences. Additionally, some households include multiple relationships and generations.
- **A mobile population:** The United States continues to be a highly mobile nation as about 15 percent of the population moves in a given year, based on results from the ACS conducted in 2015. Continued growth in the use of cellular telephone technology and an associated reduction in landline telephones tied to physical locations may also complicate enumeration.

Several of the societal, demographic, and technological trends listed above can result in a population that is harder and more expensive to enumerate. As it becomes more challenging to locate individuals and solicit their participation through traditional methods, the Census Bureau must decade after decade spend more money simply to maintain the same level of accuracy as in previous censuses. With the innovations described in the 2020 Census Operational Plan, the Census Bureau estimates that billions of dollars can be saved relative to replicating a design similar to that of the 2010 Census.

2.4 FOUR KEY INNOVATION AREAS

The 2020 Census team focused on four key innovation areas in redesigning the Census:

Field costs associated with Address Canvassing (ADC) and Nonresponse Followup (NRFU) operations comprise the most expensive parts of the 2020 Census. All four innovation areas are aimed at reducing the costs of fieldwork. A reengineered ADC Operation is expected to reduce the field workload for address updating by 70 percent. Self-response innovations, which are aimed at generating the largest possible self-response rate, coupled with the use of administrative records and third-party data, are intended to reduce the field workload associated with NRFU. Finally, the reengineered field operations are intended to increase the efficiency of those operations, allowing managers and fieldworkers to be more productive and effective.

Each innovation area is described further in Section 3.

2.5 A NEW DESIGN FOR THE 21ST CENTURY

Figure 5 describes at a high-level how the 2020 Census will be conducted. This design reflects a flexible approach that takes advantage of new technologies and data sources while minimizing risk.

The first step in conducting the 2020 Census is to identify all of the addresses where people could live, or **Establish Where to Count**. An accurate address list helps ensure that everyone is counted. For the 2020 Census, the Census Bureau began an in-office review of 100 percent of the nation's addresses in September 2015 and continually updates the address list based on data from multiple sources, including the U.S. Postal Service, tribal, state, and local governments, satellite imagery, and third-party data providers. This office work will also determine which parts of the country require fieldwork to verify address information. In-Field ADC will begin in 2019 and is anticipated to cover approximately 30 percent of all addresses, a significant reduction from the nearly 100 percent that were reviewed in the field during the 2010 Census.

As noted on page 6, response rates to surveys and censuses have been declining. To **Motivate People to Respond**, the 2020 Census will include a nationwide communications and partnership campaign. This campaign is focused on getting people to respond on their own (self-respond). It costs significantly less to process a response provided via the Internet or through a paper form than it does to send a fieldworker to someone's home to collect their response. Advertising will make heavy use of digital media, tailoring the message to the audience.

The Census Bureau **Counts the Population** by collecting information from all households, including those residing in group or unique living arrangements. The Census Bureau wants to make it easy for people to respond anytime and anywhere. To this end, the 2020 Census will offer the opportunity and encourage people to respond via the Internet and will encourage, but not require, people to enter a unique Census identification with their response. Online responses will be accurate, secure, and convenient.

For those who do not respond, the Census Bureau will use the most cost-effective strategy for contacting and counting people. The goal for the 2020 Census is to reduce the average number of visits to nonresponding households by using available data from government administrative records and third-party sources. These data will be used to identify vacant households, to determine the best time of day to visit a particular household, and to count the people and fill in the responses with existing high-quality data from trusted sources. A reduced number of visits will lead to significant

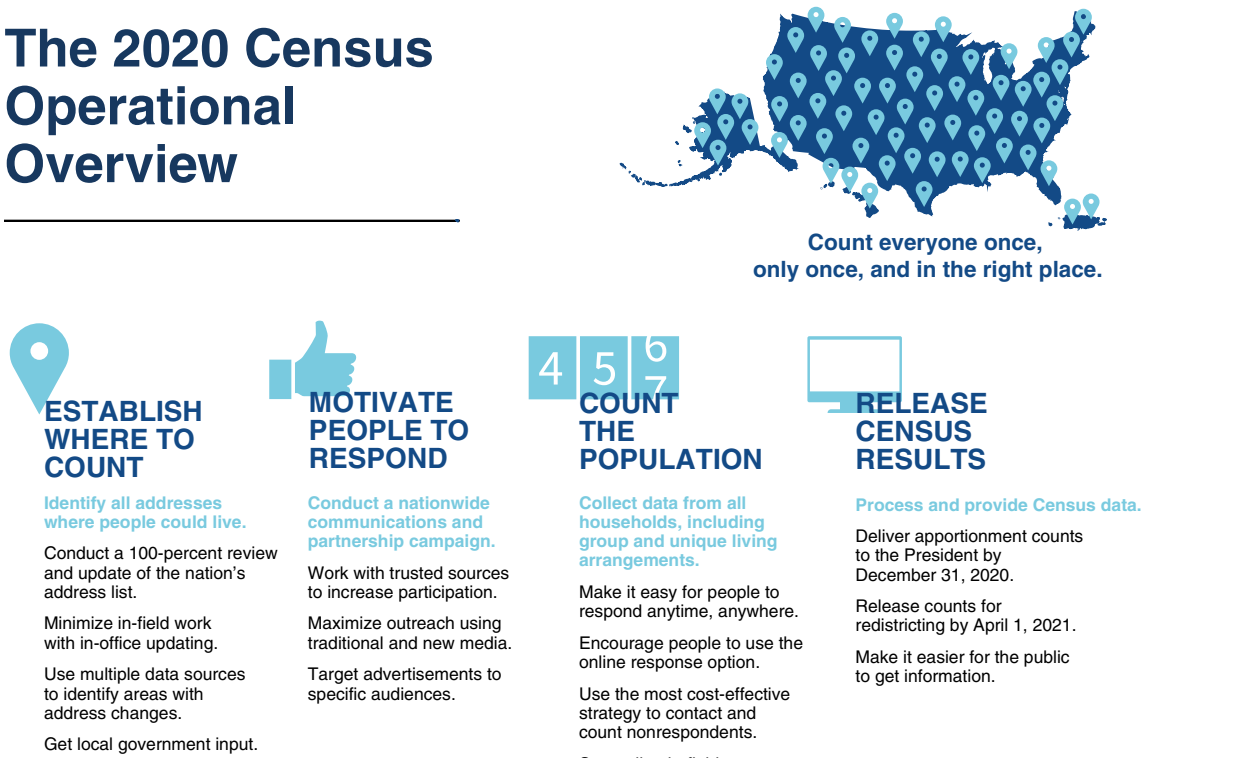

Figure 5: The 2020 Census—A New Design for the 21st Century

cost savings. It can also allow the Census Bureau to focus its field resources to achieve consistent response rates across geographic areas and demographic groups.

In addition, the majority of fieldworkers will use mobile devices for collecting the data. Operations such as recruiting, training, and payroll will be automated, reducing the time required for these activities. New operational control centers will rely on automation to manage most of the fieldwork, enabling more efficient case assignment, automatic determination of optimal travel routes, and reduction of the number of physical offices. In general, a streamlined operation and management structure is expected to increase productivity and save costs.

The last step in the 2020 Census is to **Release the 2020 Census Results**. The 2020 Census data will be processed and sent to the President (for apportionment) by December 31, 2020, to the states (for redistricting) by April 1, 2021, and to the public beginning in December 2021.

2.6 THE 2020 CENSUS OPERATIONS

The 2020 Census includes 35 operations that are organized into eight major areas that correspond with the Census Bureau standard Work Breakdown Structure. The term operation refers to both support and business functions. For example, Program Management is considered a support function, and ADC is considered a business function. Table 1 provides a high-level purpose statement for each operation.

Table 1: Operations and Purpose

Operations	Purpose
Program Management	
Program Management (PM)	Define and implement program management policies, processes, and the control functions for planning and implementing the 2020 Census in order to ensure an efficient and well-managed program.
Census/Survey Engineering	
Systems Engineering and Integration (SEI)	Manage the delivery of a System of Systems that meets the 2020 Census Program business and capability requirements.
Security, Privacy, and Confidentiality (SPC)	Ensure that all operations and systems used in the 2020 Census adhere to laws, policies, and regulations that ensure appropriate systems and data security, and protect respondent and employee privacy and confidentiality.
Content and Forms Design (CFD)	Identify and finalize content and design of questionnaires and other associated nonquestionnaire materials, ensure consistency across data collection modes and operations, and provide the optimal design and content of the questionnaires to encourage high response rates.
Language Services (LNG)	Assess and support language needs of non-English speaking populations, determine the number of non-English languages and level of support for the 2020 Census, optimize the non-English content of questionnaires and associated nonquestionnaire materials across data collection modes and operations, and ensure cultural relevancy and meaningful translation of 2020 Census questionnaires and associated nonquestionnaire materials.
Frame	
Geographic Programs (GEOP)	Provide the geographic foundation in support of the 2020 Census data collection and tabulation activities, within the Master Address File (MAF)/Topologically Integrated Geographic Encoding and Referencing (TIGER) System. The MAF/TIGER System (software applications and databases) serves as the national repository for all of the spatial, geographic, and residential address data needed for census and survey data collection, data tabulation, data dissemination, geocoding services, and map production. Components of this operation include Geographic Delineations, Geographic Partnership Programs and Geographic Data Processing.
Local Update of Census Addresses (LUCA)	Provide an opportunity for tribal, federal, state, and local governments to review and improve the address lists and maps used to conduct the 2020 Census as required by Public Law (P.L.) 103-430.
Address Canvassing (ADC)	Deliver a complete and accurate address list and spatial database for enumeration and determining the type and address characteristics for each living quarter.
Response Data	
Forms Printing and Distribution (FPD)	Print and distribute Internet invitation letters, reminder cards or letters or both, questionnaire mailing packages, and materials for other special operations, as required. Other materials required to support field operations are handled in the Decennial Logistics Management.
Paper Data Capture (PDC)	Capture and convert data from the 2020 Census paper questionnaires, including mail receipt, document preparation, scanning, Optical Character Recognition, Optical Mark Recognition, Key From Image, data delivery, checkout, and form destruction.
Integrated Partnership and Communications (IPC)	Communicate the importance of participating in the 2020 Census to the entire population of the 50 states, the District of Columbia, and Puerto Rico to support field recruitment efforts, engage and motivate people to self-respond (preferably via the Internet), raise and keep awareness high throughout the entire 2020 Census to encourage response, and effectively support dissemination of Census data to stakeholders and the public.
Internet Self-Response (ISR)	Maximize online response to the 2020 Census via contact strategies and improved access for respondents and collect response data via the Internet to reduce paper and Nonresponse Followup.

Operations	Purpose
Non-ID Processing (NID)	Make it easy for people to respond anytime, anywhere to increase self-response rates by providing response options that do not require a unique Census ID, maximizing real-time matching of non-ID respondent addresses to the census living quarters address inventory, assigning nonmatching addresses to census blocks.
Update Enumerate (UE)	Update the address and feature data and enumerate respondents in person. UE is designated to occur in areas where the initial visit requires enumerating while updating the address frame, in particular in remote geographic areas that have unique challenges associated with accessibility.
Update Leave (UL)	Update the address and feature data and leave a choice questionnaire package at every housing unit identified to allow the household to self-respond. UL is designed to occur in areas where the majority of housing units do not have a city-style address to receive mail.
Group Quarters (GQ)	Enumerate people living or staying in group quarters and provide an opportunity for people experiencing homelessness and receiving service at service-based locations, such as soup kitchens, to be counted in the census.
Enumeration at Transitory Locations (ETL)	Enumerate individuals in occupied units at transitory locations who do not have a usual home elsewhere, such as recreational vehicle parks, campgrounds, racetracks, circuses, carnivals, marinas, hotels, and motels.
Census Questionnaire Assistance (CQA)	Provide questionnaire assistance for respondents by answering questions about specific items on the census form or other frequently asked questions about the 2020 Census and provide an option for respondents to complete a census interview over the telephone. Also provide outbound calling support of NRFU Reinterview and Coverage Improvement.
Nonresponse Followup (NRFU)	Determine housing unit status for nonresponding addresses that do not self-respond to the 2020 Census and enumerate households that are determined to have a housing unit status of occupied.
Response Processing (RPO)	Create and distribute the initial 2020 Census enumeration universe, assign the specific enumeration strategy for each living quarter based on case status and associated paradata, create and distribute workload files required for enumeration operations, track case enumeration status, run postdata collection processing actions in preparation for producing the final 2020 Census results, and check for fraudulent returns.
Federally Affiliated Count Overseas (FACO)	Obtain counts by home state of U.S. military and federal civilian employees stationed or deployed overseas and their dependents living with them.
Publish Data	
Data Products and Dissemination (DPD)	Prepare and deliver the 2020 Census population counts to the President of the United States for Congressional apportionment, tabulate and disseminate 2020 Census data products for use by the states for redistricting, and tabulate and disseminate 2020 Census data for use by the public.
Redistricting Data (RDP)	Provide to each state the legally required P.L. 94-171 redistricting data tabulations by the mandated deadline of 1 year from Census Day: April 1, 2021.
Count Review (CRO)	Enhance the accuracy of the 2020 Census through remediating potential gaps in coverage by implementing an efficient and equitable process to identify and correct missing or geographically misallocated large group quarters and their population and positioning remaining count issues for a smooth transition to the Count Question Resolution Operation.
Count Question Resolution (CQR)	Provide a mechanism for governmental units to challenge their official 2020 Census results.
Archiving (ARC)	Coordinate storage of the materials and data and provide 2020 Census records deemed permanent, including files containing individual responses, to the National Archives and Records Administration and to the National Processing Center to use as source materials to conduct the Age Search Service. Also store data to cover in-house needs.

Operations	Purpose
Other Censuses	
Island Areas Censuses (IAC)	Enumerate all residents of American Samoa, the Commonwealth of the Northern Mariana Islands, Guam, and the U.S. Virgin Islands; process and tabulate the collected data; and disseminate data products to the public.
Test and Evaluation	
Coverage Measurement Design and Estimation (CMDE)	Develop the survey design and sample for the Post-Enumeration Survey of the 2020 Census and produce estimates of census coverage based on the Post-Enumeration Survey.
Coverage Measurement Matching (CMM)	Identify matches, nonmatches, and discrepancies between the 2020 Census and the Post-Enumeration Survey for both housing units and people in the same areas. Both computer and clerical components of matching are conducted.
Coverage Measurement Field Operations (CMFO)	Collect person and housing unit information (independent from the 2020 Census operations) for the sample of housing units in the Post-Enumeration Survey to help understand census coverage and to detect erroneous enumerations.
Evaluations and Experiments (EAE)	Document how well the 2020 Census was conducted, and analyze, interpret, and synthesize the effectiveness of census components and their impact on data quality or coverage or both. Measure the success of critical 2020 Census operations. Formulate and execute an experimentation program to support early planning and inform the transition and design of the 2030 Census and produce an independent assessment of population and housing unit coverage.
Infrastructure	
Decennial Service Center (DSC)	Support 2020 Census Field operations for decennial staff (i.e., Headquarters, PDC, Regional Census Center, Area Census Office, Island Areas Censuses, remote workers, and listers/enumerators.
Field Infrastructure (FLDI)	Provide the administrative infrastructure for data collection operations covering the 50 states, the District of Columbia, and Puerto Rico.
Decennial Logistics Management (DLM)	Coordinate space acquisition and lease management for the regional census centers, area census offices, and the Puerto Rico area office; and provide logistics management support services (e.g., kit assembly, supplies to field staff).
IT Infrastructure (ITIN)	Provide the IT-related Infrastructure support to the 2020 Census, including enterprise systems and applications, 2020 Census-specific applications, Field IT infrastructure, mobile computing, and cloud computing.

Figure 6 presents a graphic representation of the 35 operations organized into the eight areas described above. A separate area, Other Censuses, was added to account for the Island Areas Censuses Operation, which is a unique component of the Decennial Census Programs. See Section 5 for details about the design and decisions for each of these operations.

SUPPORT

Program Management

1. Program Management (PM)

Census/Survey Engineering

2. Systems Engineering and Integration (SEI)
3. Security, Privacy, and Confidentiality (SPC)
4. Content and Forms Design (CFD)
5. Language Services (LNG)

Infrastructure

31. Decennial Service Center (DSC)
32. Field Infrastructure (FLDI)
33. Decennial Logistics Management (DLM)
34. IT Infrastructure (ITIN)

FRAME

6. Geographic Programs (GEOP)
7. Local Update of Census Addresses (LUCA)
8. Address Canvassing (ADC)

RESPONSE DATA

9. Forms Printing and Distribution (FPD)
10. Paper Data Capture (PDC)
11. Integrated Partnership and Communications (IPC)
12. Internet Self-Response (ISR)
13. Non-ID Processing (NID)
14. Update Enumerate (UE)
15. Group Quarters (GQ)
16. Enumeration at Transitory Locations (ETL)
17. Census Questionnaire Assistance (CQA)
18. Nonresponse Followup (NRFU)
19. Response Processing (RPO)
20. Federally Affiliated Count Overseas (FACO)
35. Update Leave (UL)

PUBLISH DATA

21. Data Products and Dissemination (DPD)
22. Redistricting Data Program (RDP)
23. Count Review (CRO)
24. Count Question Resolution (CQR)
25. Archiving (ARC)

OTHER CENSUSES

26. Island Areas Censuses (IAC)

TEST AND EVALUATION

27. Coverage Measurement Design and Estimation (CMDE)
28. Coverage Measurement Matching (CMM)
29. Coverage Measurement Field Operations (CMFO)
30. Evaluations and Experiments (EAE)

Figure 6: Operations by Work Breakdown Structure

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3. The Four Key Innovation Areas

The Census Bureau plans to conduct the most automated, modern, and dynamic decennial census in history. The 2020 Census includes design changes in four key areas, including new methodologies to conduct Address Canvassing, innovative ways of optimizing self-response, the use of administrative records and third-party data to reduce the Nonresponse Followup (NRFU) workload, and the use of technology to reduce the manual effort and improve the productivity of field operations. The primary goal is to achieve efficiency by:

- Adding new addresses to the Census Bureau's address frame using geographic information systems and aerial imagery instead of sending Census Bureau employees to walk and physically check 11 million census blocks.
- Encouraging the population to respond to the 2020 Census using the Internet, reducing the need for more expensive paper data capture.
- Using data the public has already provided to the government and data available from commercial sources, allowing realized savings to focus additional visits in areas that have traditionally been hard to enumerate.
- Using sophisticated operational control systems to send Census Bureau employees to follow up with nonresponding housing units and to track daily progress.

3.1 REENGINEERING ADDRESS CANVASSING

The goal of Reengineering Address Canvassing is to eliminate the need to canvass every census block. Instead, the Census Bureau has developed innovative methodologies for updating the Master Address File/Topologically Integrated Geographic Encoding and Referencing (MAF/TIGER) System throughout the decade. Figure 7 highlights the key concepts in the Reengineering Address Canvassing approach.

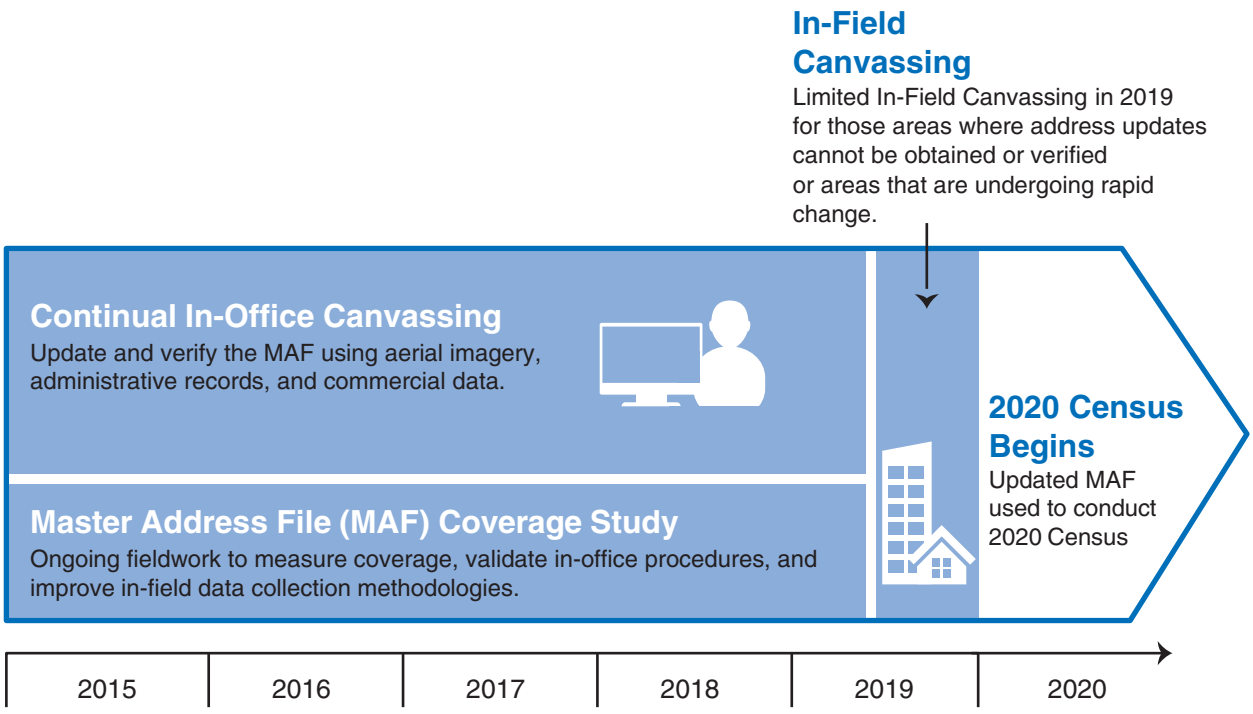

Figure 7: Summary of Reengineering Address Canvassing

Continual research and updating through In-Office Address Canvassing began in September 2015 and will continue through 2019 with the establishment of the frame for the 2020 Census. Every year clerks will start with the most recent Census Bureau address list and update it based on new information from the United States Postal Service (USPS) and data from tribal, state, and local governments and third parties (i.e., commercial vendors). Clerks will review satellite imagery to determine where changes in addresses are occurring, and based on these changes, the Census Bureau will develop a plan for capturing those changes. This plan will include In-Field Address Canvassing where address updates cannot be obtained or verified or in areas undergoing rapid change. The number of addresses requiring In-Field Canvassing is expected to be approximately 30 percent of the total number of addresses.

The operations shaded in darker blue in Figure 8 include innovations related to Reengineering Address Canvassing.

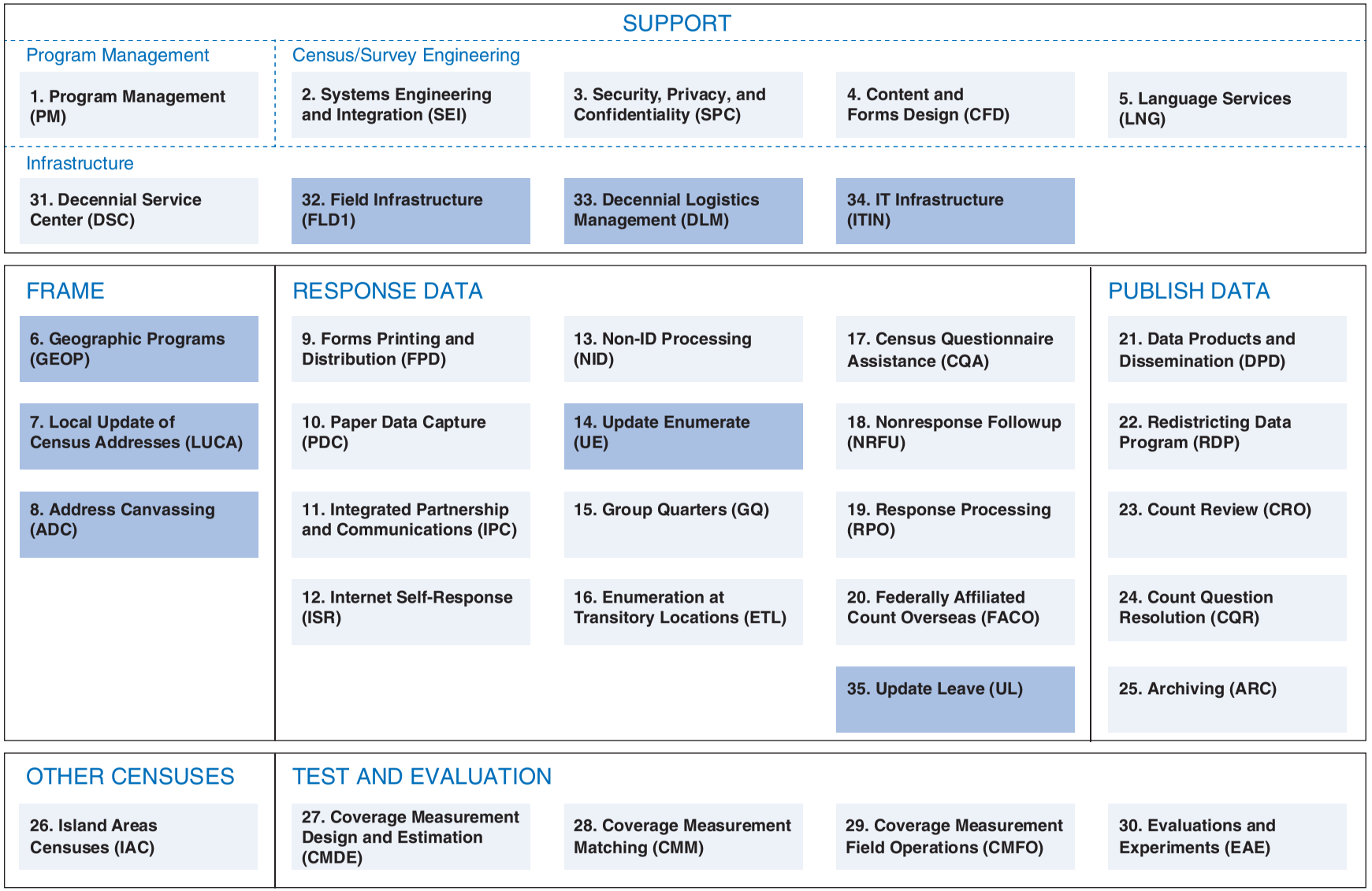

Figure 8: Operations That Contribute to Reengineering Address Canvassing

Documented below are brief descriptions of how each operation contributes to the Reengineering Address Canvassing innovation area:

Table 2: Description of Operations That Contribute to Reengineering Address Canvassing

Operation	Contributions
Geographic Programs (GEOP)	• Simplified collection geography. • Simplified Type of Enumeration Area delineation. • More data sources to validate and augment the frame. • More frequent engagement with partners to improve quality of the MAF/TIGER System.
Local Update of Census Addresses (LUCA)	Local Update of Census Addresses submissions validated as part of In-Office Address Canvassing.
Address Canvassing (ADC)	• 100 percent of addresses canvassed in In-Office Address Canvassing. • Target 30 percent of living quarters for In-Field Address Canvassing. • Ongoing in-office and in-field improvement process. • Classification of living quarter types during in-office review. • Increased productivity of field staff due to automated case assignment and route optimization.
Update Enumerate (UE)	Geography in the Update Enumerate areas not included in the in-field workloads.
Update Leave (UL)	Geography in the Update Leave areas not included in the in-field workloads.
Field Infrastructure (FLDI)	Automated administrative functions.
Decennial Logistics Management (DLM)	Reduced office infrastructure needed for In-Field Address Canvassing.
IT Infrastructure (ITIN)	• Listing applications for In-Field Address Canvassing supported by decennial Device as a Service (dDaaS). • Enterprise solutions with flexible architecture. • Additional IT infrastructure to support In-Office Address Canvassing.

3.2 OPTIMIZING SELF-RESPONSE

The goal of this innovation area is to communicate the importance of the 2020 Census to the U.S. population and generate the largest possible self-response, reducing the need to conduct expensive in-person follow-up with those households.

As shown in Figure 9, the Census Bureau will motivate people to respond by using technology and administrative records and third-party data to target advertisements and tailor contact strategies to different demographic groups and geographic areas. The Census Bureau also will use its partnership program, providing information to government agencies and hosting events at community, recreation, and faith-based organizations. Communication and contact strategies will encourage the use of the Internet as the primary response mode through a sequence of invitations and postcard mailings. In addition, Census Bureau enumerators will leave materials to encourage self-response.

Figure 9: Summary of Optimizing Self-Response

A second key aspect of Optimizing Self-Response is to make it easy for people to respond from any location at any time. This is done in several ways:

- By enabling people to respond via multiple modes (Internet, paper, or telephone if they call the Census Questionnaire Assistance [CQA] Center).
- By allowing respondents to submit a questionnaire without a unique identification code.
- By providing online forms in multiple languages.

For these innovations to be successful, respondents must know that their personal information is protected. Thus, a key element of this innovation area is to assure respondents that their data are secure and treated as confidential.

The operations shaded in darker blue in Figure 10 include innovations related to Optimizing Self-Response.

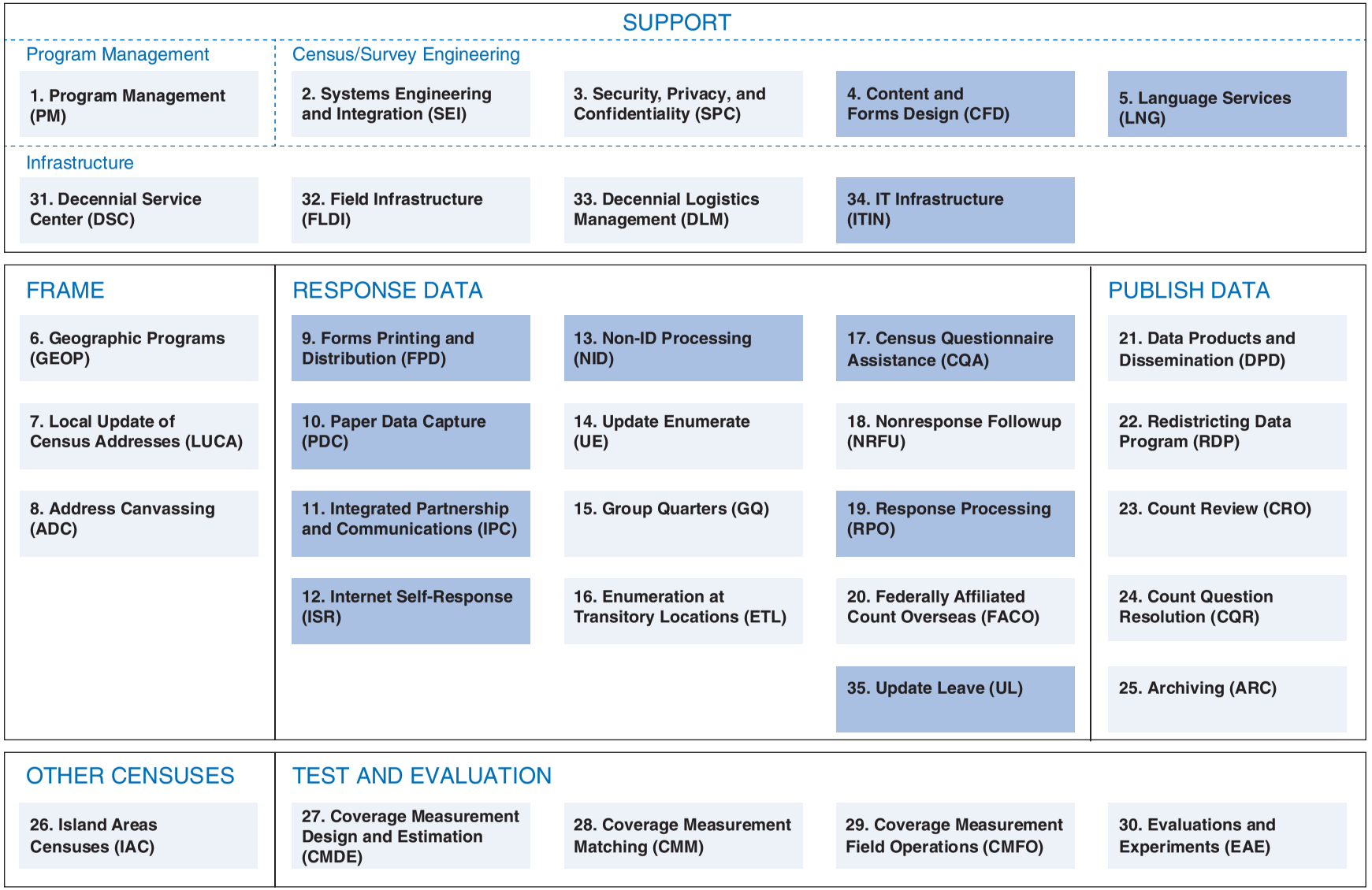

Figure 10: Operations That Contribute to Optimizing Self-Response

Documented below are brief descriptions of how each operation contributes to the Optimizing Self-Response innovation area:

Table 3: Description of Operations That Contribute to Optimizing Self-Response

Operation	Contributions
Content and Forms Design (CFD)	Questionnaire designed for multiple modes and devices.
Language Services (LNG)	• Non-English questionnaires available across modes. • Non-English content development of contact materials (e.g., invitation letters and postcards).
Forms Printing and Distribution (FPD)	Census mailing that encourages people to respond via the Internet.
Paper Data Capture (PDC)	Paper available as a response mode.
Integrated Partnership and Communications (IPC)	• Micro-targeted advertising. • Multichannel outreach. • Integrated Partnership and Communications Program adjusted based on customer response, behavior, and feedback. • National and local partnerships promoting self-response. • Educational awareness campaign through traditional and new media sources (e.g., social media).
Internet Self-Response (ISR)	• Internet instrument optimized for mobile devices. • Multiple languages available. • Contact approach tailored based on prior response rates, Internet access data, and demographics (up to five self-response mailings). • Real-time edit checks for Internet Self-Response to improve quality.
Non-ID Processing (NID)	• Public can respond anytime, anywhere without a unique Census ID. • Real-time geocoding of responses. • Real-time validation of responses without a unique Census ID. • Real-time soft edits and checks for addresses. • Administrative records and third-party data used to validate identity and validate and augment address data.
Census Questionnaire Assistance (CQA)	• Flexible and adaptive language support. • Respondent-initiated telephone response collection.
Response Processing (RPO)	Single operational control system that tracks case status across all modes.
IT Infrastructure (ITIN)	• Infrastructure built and sized to meet demand and ensure adequate performance for Internet Self-Response. • Secure Internet response capability.
Update Leave (UL)	• Paper forms left at housing units to encourage self-response.

3.3 UTILIZING ADMINISTRATIVE RECORDS AND THIRD-PARTY DATA

The goal of this innovation area is to use information people have already provided to improve the efficiency and effectiveness of the 2020 Census, and in particular, reduce expensive in-person follow-up activities. Administrative record data refers to information from federal and state governments. Third-party data refers to information from commercial sources. As shown in Figure 11, data from both sources help to improve the quality of the address list (frame), increase the effectiveness of advertising and contact strategies, validate respondent submissions, and reduce field workload for follow-up activities.

As has been done in prior decades, administrative data from the USPS and other government records are used to update the address frame and reflect changes to the housing stock that occur over time. Additional administrative records sources, as well as third-party data from commercial companies, will also be used for this purpose. In addition, these data sources will be used to validate incoming data from tribal, federal, state, and local governments.

To increase the effectiveness of advertising and contact strategies, the Census Bureau will use demographic and geographic information from various administrative record and third-party data sources to help target the advertising to specific populations.

Administrative records and third-party data will also be used to validate respondent addresses for all Internet responses. This will help prevent fraudulent and erroneous submissions.

Finally, a primary use of administrative records is to reduce field workload for follow-up activities. To this end, the Census Bureau will use data from internal and external sources, such as the 2010

Improve the quality of the address list.	Update the address list.	Validate incoming data from tribal, federal, state, and local governments.
Increase effectiveness of advertising and contact strategies.	Support the micro-targeted advertising campaign.	
Validate respondent submissions.	Validate respondent addresses and prevent fraudulent submissions.	
Reduce field workload for follow-up activities.	Remove vacant and nonresponding occupied housing units from the NRFU workload.	Optimize the number of contact attempts. Tailor work assignments with best time of day to contact.

Figure 11: Summary of Utilizing Administrative Records and Third-Party Data

Census, the USPS, the Internal Revenue Service, and the Centers for Medicare and Medicaid Services to identify vacant and nonresponding occupied housing units and remove them from the NRFU workload. Data from these sources and the American Community Survey will also be used to tailor work assignments related to the best time of day to contact a household.

The Census Bureau plans to continue acquiring and testing data from other sources, including the National Directory of New Hires, the Supplemental Nutrition and Assistance Program, and state-administered programs such as Temporary Assistance for Needy Families to better understand how these data sources can help reduce follow-up field workload.

The operations shaded in darker blue in Figure 12 include innovations related to Utilizing Administrative Records and Third-Party Data.

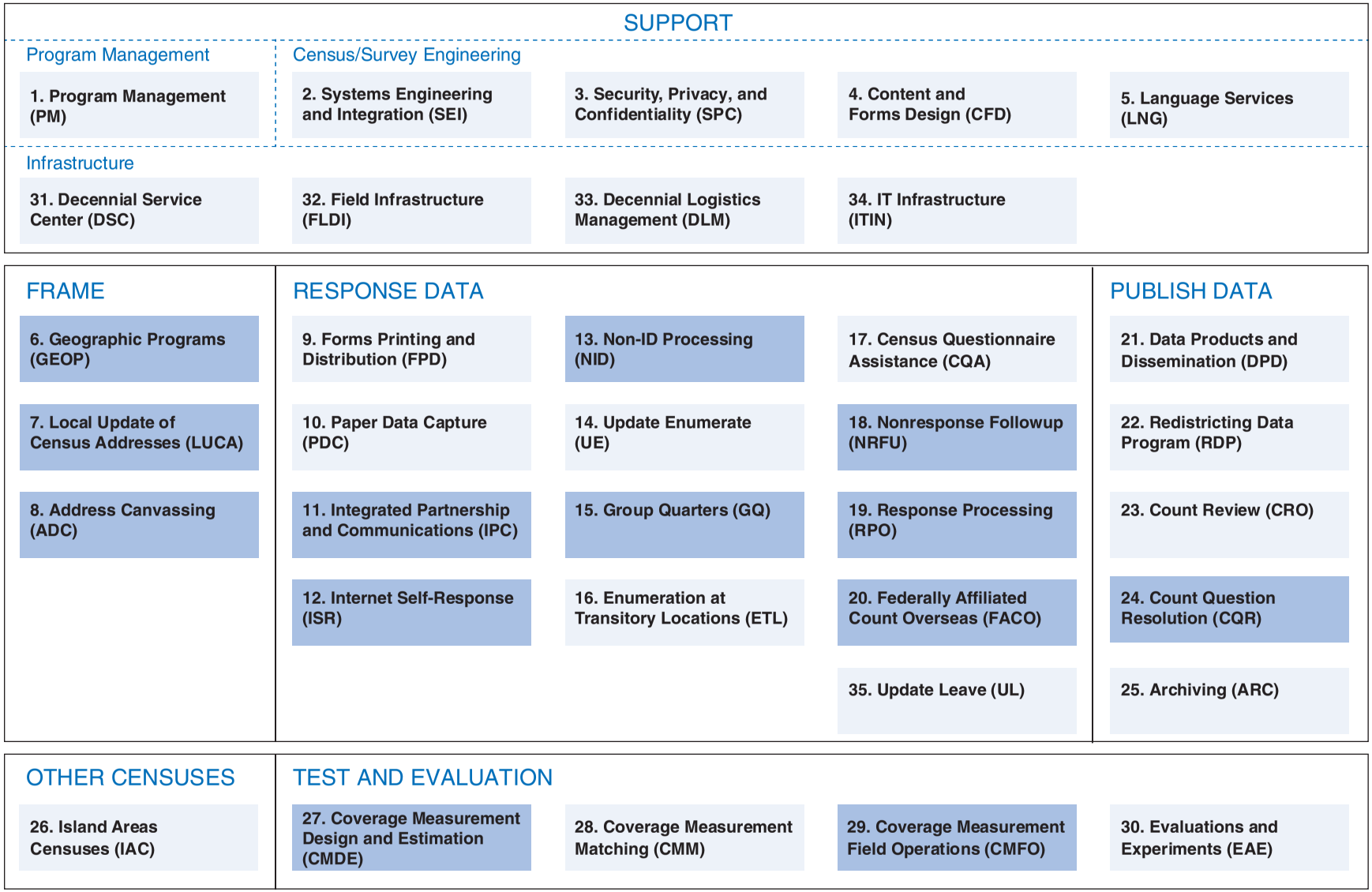

Figure 12: Operations That Contribute to Utilizing Administrative Records and Third-Party Data

Documented below are brief descriptions of how each operation contributes to the Utilizing Administrative Records and Third-Party Data innovation area:

Table 4: Description of Operations That Contribute to Utilizing Administrative Records and Third-Party Data

Operation	Contributions
Geographic Programs (GEOP)	Administrative records and third-party data used to determine types of enumeration areas, basic collection units, and geographic boundaries.
Local Update of Census Addresses (LUCA)	Administrative records and third-party data used to validate incoming data from tribal, federal, state, and local governments.
Address Canvassing (ADC)	Additional sources of administrative records and third-party data used to update the address frame in lieu of fieldwork.
Integrated Partnership and Communications (IPC)	Expanded use of administrative records and third-party data to support micro-targeted IPC Program.
Internet Self-Response (ISR)	Administrative records and third-party data used to tailor the contact strategy.
Non-ID Processing (NID)	Administrative records and third-party data used to validate and augment respondent-provided address data and validate identity for submissions without a unique Census ID.
Group Quarters (GQ)	Electronic transfer and expanded use of administrative records to enumerate group quarters where possible.
Nonresponse Followup (NRFU)	• Expanded use of administrative records and third-party data to remove vacant housing units and reduce the Nonresponse Followup workload. • Administrative records and third-party data used to reduce the number of contact attempts made. • Administrative records and third-party data used to tailor work assignments based on language and “best time of day” for contact.
Response Processing (RPO)	• Increased use of administrative records and third-party data to impute response data (in whole or in part). • Increased use of libraries from past surveys and censuses to support editing and coding. • Increased use of administrative records and third-party data to enhance libraries for Primary Selection Algorithm and Invalid Return Detection.
Federally Affiliated Count Overseas (FACO)	Administrative records used to complete this count of federally affiliated persons overseas.
Count Question Resolution (CQR)	Administrative records and third-party data used to resolve Count Question Resolution challenges.
Coverage Measurement Design and Estimation (CMDE)	• Administrative records and third-party data used for estimation. • Administrative records and third-party data used for sample design.
Coverage Measurement Field Operations (CMFO)	• Administrative records and third-party data used to reduce the number of contact attempts made. • Administrative records and third-party data used to tailor work assignments based on “best time of day” for contact.

3.4 REENGINEERING FIELD OPERATIONS

The goal of this innovation area is to use technology to efficiently and effectively manage the 2020 Census fieldwork, and as a result, reduce the staffing, infrastructure, and brick and mortar footprint required for the 2020 Census. Figure 13 shows the three main components of the reengineered field operations: streamlined office and staffing structure, increased use of technology, and increased management and staff productivity.

The 2020 Census field operations will rely heavily on automation. For example, the Census Bureau plans to provide most listers and enumerators with the capability to work completely remotely and perform all administrative and data collection tasks directly from a mobile device. Supervisors will also be able to work remotely from the field and communicate with their staff via these devices. These enhanced capabilities significantly reduce the number of offices required to support 2020 Census fieldwork. In the 2010 Census, the Census Bureau established 12 Regional Census Centers (RCCs) and nearly 500 Area Census Offices (ACOs). The agency hired more than 516,000 enumerators to conduct NRFU activities. The new design for the 2020 Census field operations includes six RCCs with 248 ACOs.

In addition, automation enables significant changes to how cases are assigned and the supervision of field staff. By making it easier for supervisors to monitor and manage their workers, the ratio of workers to supervisor can be increased, reducing the number of supervisors required. This streamlines the staffing structure. Other design changes include optimized case assignment and routing.

All administrative functions associated with most field staff will be automated, including recruiting, hiring, training, time and attendance, and payroll. Finally, the new capabilities allow for quality to be infused into the process through alerts to supervisors when there is an anomaly in an enumerator's performance (e.g., the Global Positioning Satellite indicator on an enumerator's handheld device indicates that she or he is not near the assigned location) and real-time edits on data collection. Accordingly, the quality assurance process used in the 2010 Census is being reengineered to account for changes in technology.

Streamlined Office and Staffing Structure	Increased Use of Technology	Increased Management and Staff Productivity
Area Census Office Manager Census Field Managers Census Field Supervisors Listers and Enumerators	• Automated and optimized work assignments • Automated recruiting, training, payroll, and expense reporting • Automated applications for address canvassing and enumeration on mobile devices	• Increased visibility into case status for improved workforce management • Redesigned quality assurance operations • Improved communications

Figure 13: Summary of Reengineering Field Operations

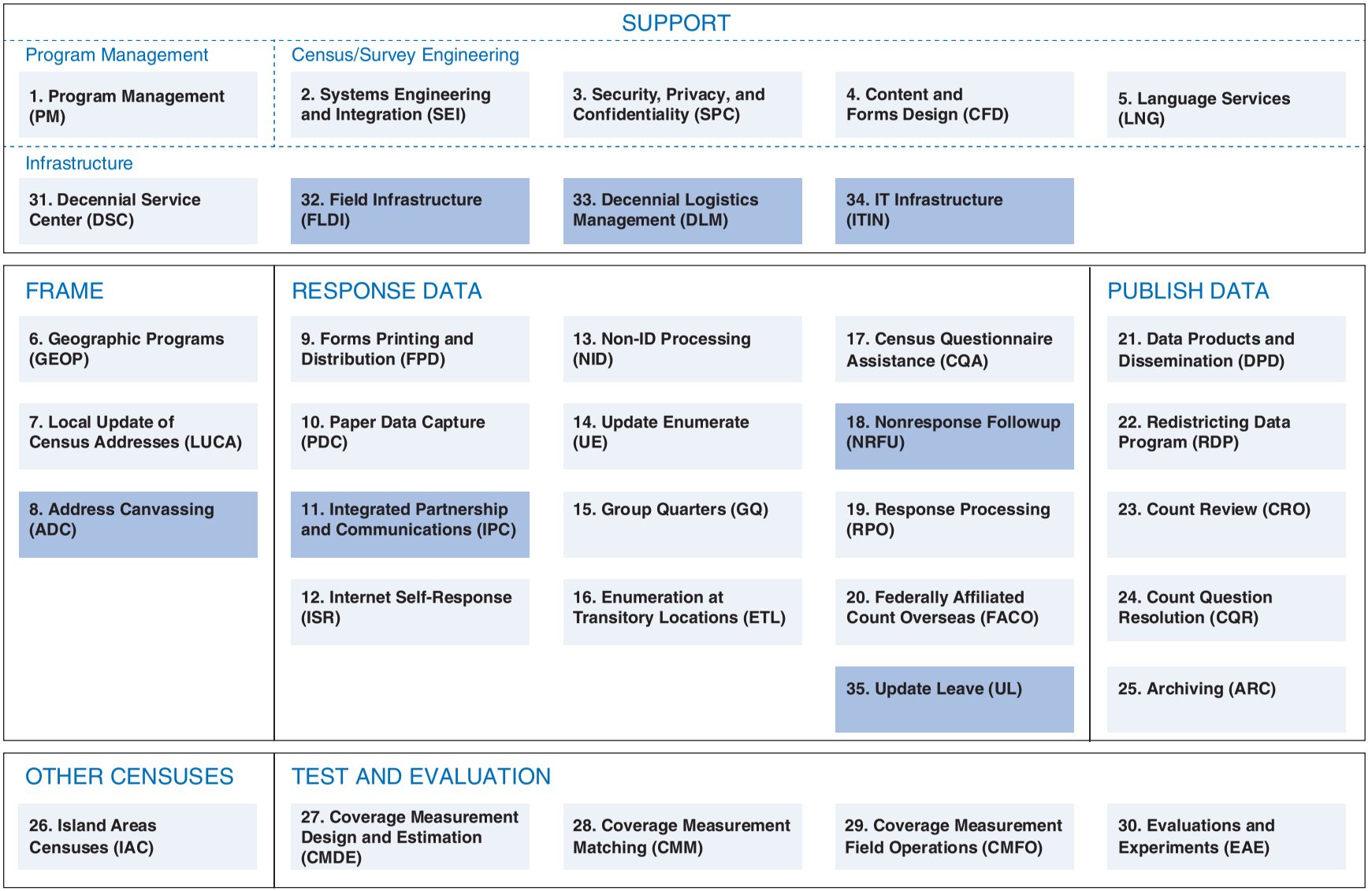

Figure 14: Operations That Contribute to Reengineering Field Operations

Documented below are brief descriptions of how each operation contributes to the Reengineering Field operations innovation area. The field data collection operations are grouped together as they all contribute similarly.

Table 5: Description of Operations That Contribute to Reengineering Field Operations

Operation	Contributions
Field Infrastructure (FLDI)	• Streamlined staffing structure. • Automated use of real-time data by the field operations control system to enable better management of the field workforce. • Automated training for field staff. • Automated administrative functions, including recruiting and payroll. • Supervisory support for listers and enumerators available during all hours worked.
Decennial Logistics Management (DLM)	Reduced office infrastructure.
IT Infrastructure (ITIN)	• Enterprise solutions with flexible architecture. • Listing and enumeration applications using decennial Device as a Service.
Integrated Partnership and Communications (IPC)	Enhanced communications to support field recruitment.
Field Data Collection Operations: • Address Canvassing • Update Leave • Nonresponse Followup	• Reduced paper through automated online training, field data collection, time and expense, etc. • Reduced field workload as measured by cases and attempts. • Near real-time case status updates. • Automated and optimized assignment of work. • Fieldwork assigned based on field staff members' declaration of work availability and geographic location along with existing case assignments. • Flexibility built into work assignment process based on in-field feedback or observations. • Data on household language and "best time of day to contact" standardized and available at central location for work assignments. • Redesigned quality assurance process. • Automated applications for address canvassing and enumeration on mobile devices.

3.5 SUMMARY OF INNOVATIONS

This section summarizes the key innovations being implemented for the 2020 Census. Innovations are considered significant changes to the operational design as compared with the 2010 Census.

The operations shaded in darker blue in Figure 15 are those that have the most significant innovations.

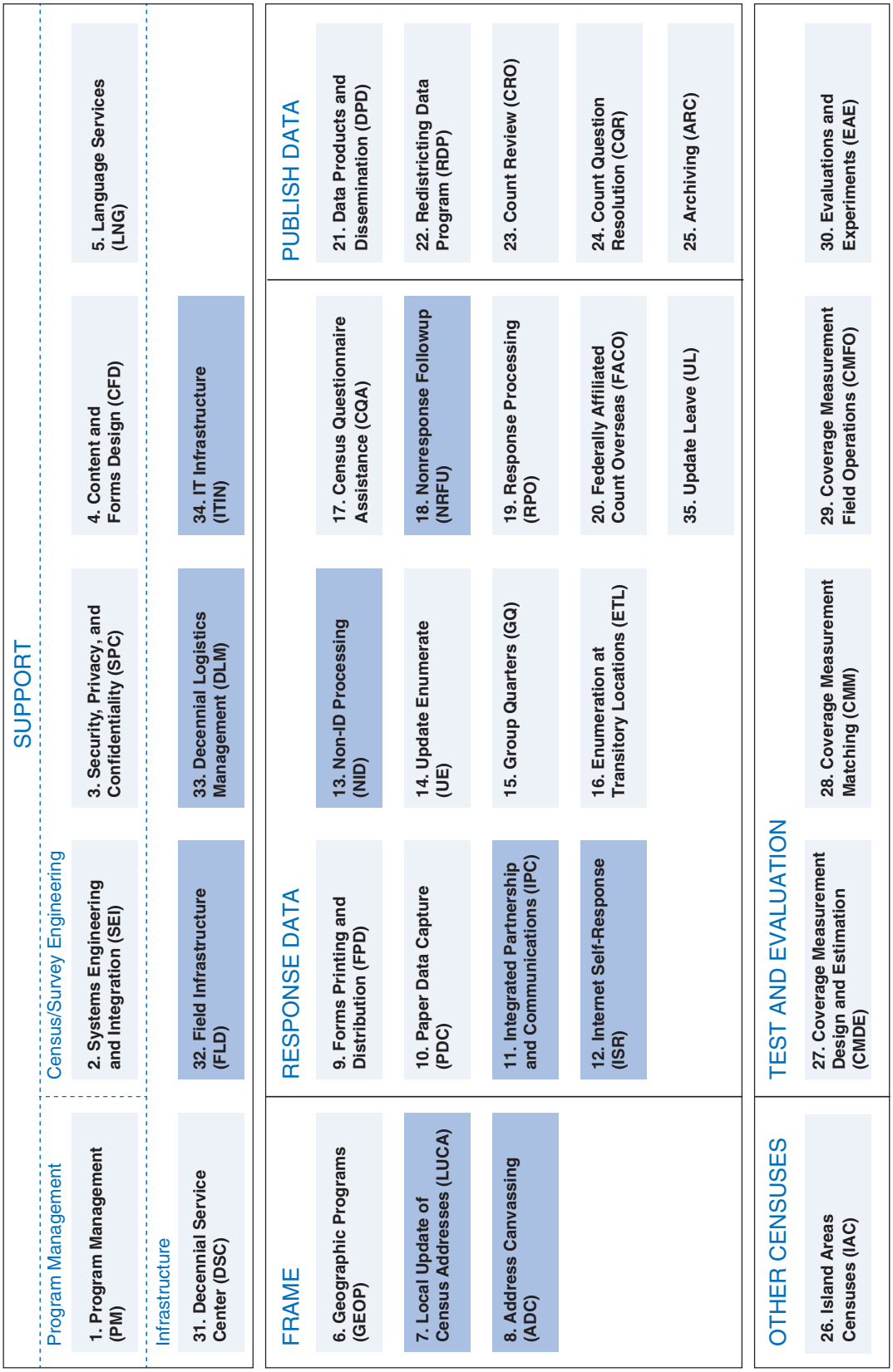

Figure 15: Operations With Significant Innovations Since the 2010 Census

Documented below are brief descriptions of how each operation contributes to the specific innovations for each of these operations. Note that these innovations are dependent upon funding.

Table 6: Summary of Key Innovations by Operation

Operation	Contributions
Local Update of Census Addresses (LUCA)	• Reduced complexity for participants. • Elimination of the full address list submission options to improve quality and reduce burden and cost.
Address Canvassing (ADC)	• Use of a combination of in-office and in-field methods with 100 percent In-Office Address Canvassing and an estimated 30 percent of addresses going to the field. • Use of automation and data (imagery, administrative records, and third-party data) for In-Office Address Canvassing. • Ongoing fieldwork (Master Address File Coverage Study) to validate in-office procedures, measure coverage, and improve in-field data collection methodologies. • Use of reengineered field management structure and approach to managing fieldwork, including new field office structure and new staff positions.
Integrated Partnership and Communications (IPC)	• Microtargeted messages and placement for digital advertising, especially for hard-to-count populations. • Advertising and partnership campaign adjusted based on respondent actions. • Expanded predictive modeling to determine propensity to respond by geographic areas. • Expanded use of social media.
Internet Self-Response (ISR)	• Internet data capture, providing real-time edits, ability to capture unlimited household size entries, and multiaccess methods across different technologies (e.g., computers, phones, tablets). • Online questionnaires available in multiple languages. • Contact approach tailored based on prior response rates, Internet access data, and demographics (up to five self-response mailings). • Validation of Internet responses.
Non-ID Processing (NID)	• Ability for public to respond anytime, anywhere. • Real-time matching and geocoding of responses. • Use of administrative records and third-party data to validate identity and validate and augment address data for non-ID submissions.
Nonresponse Followup (NRFU)	• Use of administrative records and third-party data to remove vacant housing units from the Nonresponse Followup workload. • Use of administrative records and third-party data to remove nonresponding occupied housing units from the Nonresponse Followup workload. • Use of reengineered field management structure and approach to managing fieldwork. • Use of a variable contact strategy and stopping rules to control the number of attempts made for each address. • Assignment and route optimization. • Automated training for field staff. • Automation of the field data collection. • Automation of administrative functions such as recruiting, onboarding, and payroll. • Reengineered quality assurance approach.
Field Infrastructure (FLDI)	• Automated job application and recruiting processes, payroll submission and approval process, and other administrative processes resulting in reduced staffing requirements. • Automated training. • Reduced number of listers, enumerators, and supervisors due to reengineered design for field operations.

Documented below are brief descriptions of how each operation contributes to the specific innovations for each of these operations. Note that these innovations are dependent upon funding.

Table 6: Summary of Key Innovations by Operation—Con.

Operation	Contributions
Decennial Logistics Management (DLM)	• Reduced number of RCCs managing a reduced number of ACOs tasked with managing field operations and support activities. • Implementation of an online, real-time Enterprise Resource Planning system with extended access for the Regional Census Centers and field offices. • Implementation of a wireless network and bar code technology that will automate inventory transactions.
IT Infrastructure (ITIN)	• Early development of solutions architecture. • Use of enterprise solutions as appropriate. • Iterative deployment of infrastructure aligned with and based on testing. • Implementation of decennial Device as a Service. • Use of demand models to help predict Internet response volume, Census Questionnaire Assistance center staffing, etc. • Scalable design. • Agile development of applications.

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4. Key Tests, Milestones, and Production Dates

The 2020 Census has multiple decision points, milestones, and production dates that must be met to deliver the final apportionment and redistricting data. Informing the decision points are a series of tests. More detailed information about each test is captured in formal research and test plan documents. An integrated master schedule facilitates the integration and coordination of activities across tests and operations. Refer to Figure 2 in Section 1.3 for how this documentation fits into the broader set of documentation for the 2020 Census Program. Test reports on specific research topics are available at the Census Bureau Web site <www.census.gov>.

The first part of this section describes the tests used to inform the operational design and prepare for conducting the 2020 Census. The second part highlights key decision points and milestones beginning with the research and testing phase in late 2011 through the completion of the 2020 Census in 2023. The third part provides the planned production timeline for primary 2020 Census operations, and the final section shows an integrated schedule of the tests, milestones, and production operations.

4.1 TESTS TO INFORM THE OPERATIONAL DESIGN AND PREPARE FOR CONDUCTING THE CENSUS

As shown in Figure 16, the tests conducted early in the decade (2012–2015) are aimed at answering specific research questions (objectives) needed to make decisions on important aspects of the operational design for the four key innovation areas. In 2016, the focus shifted to validating and refining the design by testing the interactions across operations and determining the proposed methodology for the operations. Testing of production systems began in 2017 and continues through 2018, with final performance testing to ensure scalability occurring in 2019. The End-to-End Census Test in 2018 will test the integration of major operations and systems.

In May 2016 the Census Bureau announced that the 2020 Census Program will use a commercial off-the-shelf platform for the data collection component of the 2020 Census.[1] Prototype systems (e.g., in-field operational control system [MOJO], Census Operations Mobile Platform for Adaptive Services and Solutions [COMPASS], and PRIMUS) were used

[1] Blumerman, L., *2020 Census Business Solution Architecture*, 2020 Census Program Memorandum Series: 2016.06.

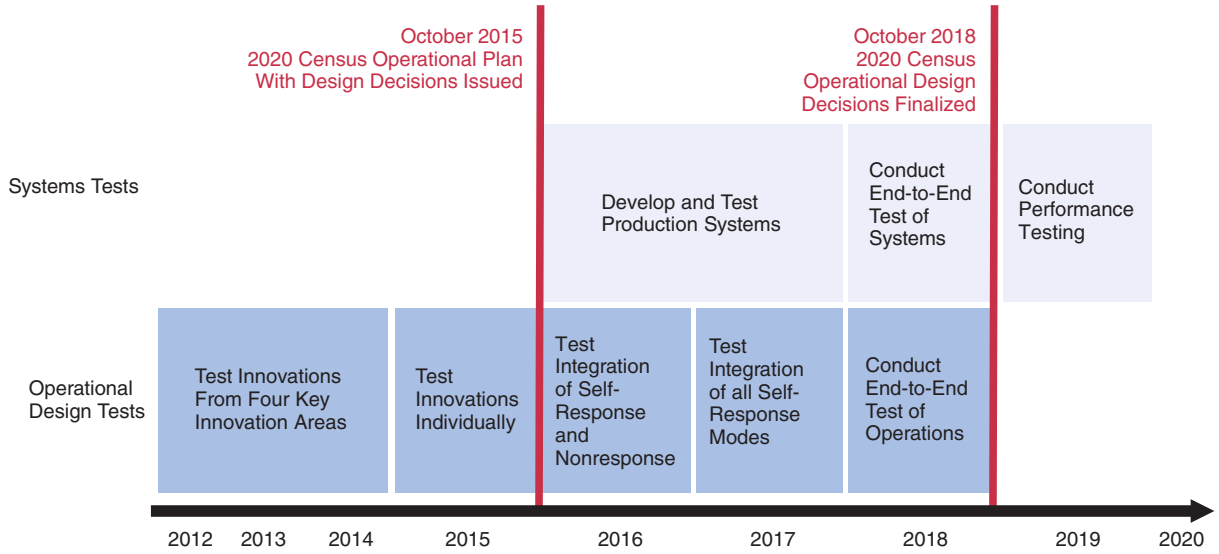

Figure 16: High-Level View of Tests

for the 2020 Census tests in 2014–2016. Beginning in 2017, 2020 Census tests included systems per the revised Business Solution Architecture.

Table 7 lists the operational tests executed or planned for the 2020 Census.

Table 7: Operational Tests

Calendar Year	Test
2012	• Public-Opinion Polling (ongoing as needed throughout the decade). • 2012 National Census Test.
2013	• 2013 National Census Contact Test. • 2013 Census Test.
2014	• 2014 Census Test. • Continuous Small-Scale testing (ongoing as needed throughout the decade). • Local Update of Census Addresses Focus Groups. • 2014 Human-in-the-Loop Test.
2015	• Address Validation Test (started in late 2014). • 2015 Optimizing Self-Response Test. • 2015 Census Test. • 2015 National Content Test. • 2015 Group Quarters Electronic Capability Test Survey.
2016	• 2016 Census Test. • Address Canvassing Test. • 2016 eResponse Data Transfer Test. • 2016 Service-Based Enumeration Census Test.
2017	• 2017 Census Test. • 2017 eResponse Data Transfer Test.
2018	2018 End-to-End Census Test.
2019	Post End-to-End Testing.

The following sections describe the tests listed above. Tests for calendar years 2012 through 2014 (the Research and Testing Phase) are combined into one section. For the past and current tests, a short description of the purpose, scope, and timing is presented, followed by a table with objectives of the tests, findings, and where applicable, design implications based on these findings. For future tests, only the purpose, scope, timing, and objective are provided.

4.1.1 Tests in 2012–2014

As shown in Figure 17, eight tests were conducted between 2012 and 2014.

4.1.1.1 Public Opinion Polling

The Public Opinion Polling Test is a public opinion survey of attitudes toward statistics produced by the federal government that focuses on trust in the federal statistical system, the credibility of federal statistics, and attitudes toward and knowledge of the statistical uses of administrative records and third-party data. The Census Bureau is using the Nightly Gallup Polling for this survey and collects data by telephone from 100 nationally representative housing units daily. Data collection started in February 2012 and will continue through 2017. Findings from this survey are being used to inform approaches to communication about administrative records, privacy, and confidentiality.

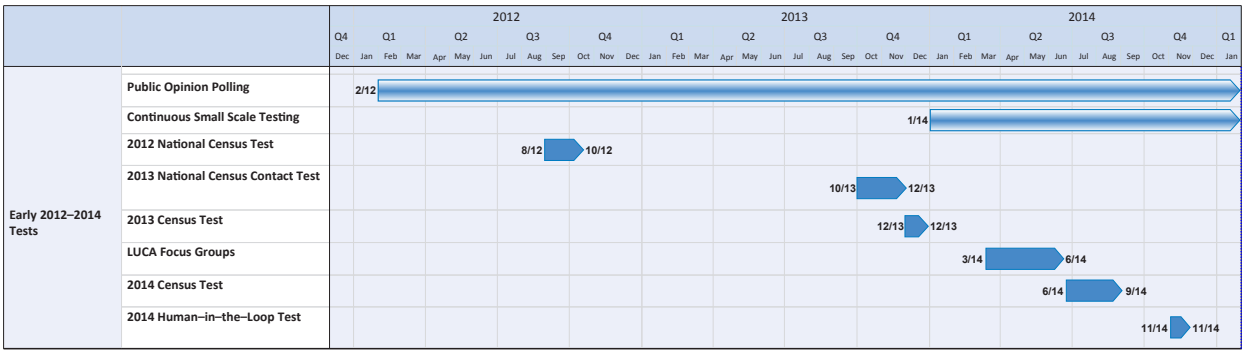

Figure 17: Tests in 2012–2014

Public-Opinion Polling Test	
Objectives	• Determine if the public's perception of the Census Bureau's commitment and ability to protect privacy and confidentiality are impacted if administrative records are used in the 2020 Census design. • Determine what the public is most concerned about with regard to privacy and confidentiality, in general and as related to government data collection. • Determine if attitudes towards the federal statistical system have changed over time or in relation to specific events. • Collect data on hiring practices for the decennial census and on awareness of the Office of Personnel Management (OPM) data breach.
Findings	• Reported belief in the credibility of statistics predicts reported trust in federal statistics. • Respondents are more likely to favor using administrative records and third-party data when questions regarding administrative records and third-party data are framed to indicate that the use of records can save the government money or provide a social good. • Respondents are more likely to favor combining government data sets when questions regarding combining data sources are framed to indicate that combined data would make better use of funds and improve government services. • Respondents who report being concerned with responding to the census online cite concerns with security or hacking and access to the Internet or a computer. • Respondents who report knowledge of the statistical system, using data, or believing that data are relevant, that data are kept confidential, and that agencies respect privacy also report increased trust in statistical products. • Continue to see declines in reported trust of federal statistics and in the belief that federal statistical agencies keep data confidential. • Awareness of the OPM data breach negatively influences respondents' trust in federal statistics. • Hiring people with criminal backgrounds for 2020 Census jobs has the potential to erode trust for many and would hardly ever earn trust.

Public-Opinion Polling Test	
Design Implications	• Continue to pursue research and testing related to the use of administrative records and third-party data. • Continue efforts to use partnership and communications activities to increase trust. • Suggest efforts to increase knowledge about the statistical system and increase data users, which could help by increasing confidence in the federal statistical system. • Continue plans for a rapid response team to use communications to mitigate negative impacts on trust from any data breaches or similar events. • Do not hire people with criminal backgrounds for the 2020 Census.

4.1.1.2 2012 National Census Test

The 2012 National Census Test studied overall self-response rates and Internet self-response rates. The test was conducted from August 2012 to October 2012 and included 80,000 nationally representative housing units.

2012 National Census Test	
Objectives	• Assess relative self-response rates and Internet self-response rates. • Evaluate the performance of combined race and origin questions on the Internet. • Assess the Telephone Questionnaire Assistance Operation.

Findings	• Total self-response rate was 56.9 percent, and the Internet self-response rate was 36.5 percent. • An advance letter resulted in no significant difference in overall response rate as compared with no advance letter. • Providing a telephone number in the initial mailing resulted in no significant difference in overall response, but did result in an increase of telephone interviews. • A second reminder to answer the 2012 National Census Test performed well. • Tailoring the content of the reminder materials resulted in no significant difference in overall response. • Response distributions of the combined race and origin questions were similar across the two question versions. • Results did not indicate expected benefit of enhanced reporting of detailed race and origin groups. • Of the calls to the Telephone Questionnaire Assistance Operation, 69 percent were because the respondent did not have a computer or Internet access.
Design Implications	• Continue tests to determine response rates and optimal contact strategies. • Further study of the collection of detailed race and origin groups in a national mail-out test. • The 2020 Census Questionnaire Assistance Operation must account for increased call volumes.

4.1.1.3 2013 National Census Contact Test

The 2013 National Census Contact Test studied two key areas related to strategies for contacting respondents: the quality of the Contact Frame (a list of supplemental contact information such as email addresses and phone numbers, built from third-party data sources) and automated processing of census responses lacking a preassigned Census identification number (Non-ID Processing). The study included 39,999 nationally representative addresses.

2013 National Census Contact Test	
Objectives	• Evaluate the quality of phone and email contact information acquired from third-party data sources. • Test proposed enhancements to automated processing of responses lacking a preassigned Census identification number.
Findings	• Respondents were not able to validate contact information for other household members. • The use of administrative records and third-party data was effective in enhancing non-ID addresses to allow for a match to the MAF.
Design Implications	• Continue testing the quality of the Contact Frame. • Continue enhancing the functionality associated with Non-ID Processing.

4.1.1.4 2013 Census Test

The 2013 Census Test was an operational study of Nonresponse Followup (NRFU) procedures. This test was conducted in late 2013 and involved 2,077 housing units in Philadelphia, PA.

2013 Census Test	
Objectives	• Evaluate the use of administrative records and third-party data to identify vacant housing units and remove them from the NRFU workload. • Evaluate the use of administrative records and third-party data to enumerate nonresponding occupied housing units to reduce the NRFU workload. • Test an adaptive design approach for cases not enumerated with administrative records and third-party data. • Test methods for reducing the number of enumeration contact attempts as compared with the 2010 Census. • Test the use of the telephone to make initial enumeration contact attempts.
Findings	• Successfully used administrative records and third-party data to identify vacant and occupied housing units and removed cases from the NRFU workload. • Successfully used administrative records and third-party data as part of an adaptive design approach to designate cases for one to three contact attempts. • Adaptive design strategies as implemented did not work. • Design added complexity to training of enumerators.
Design Implications	• Continue refinement of adaptive design methods and administrative records and third-party data usage. • Continue refinement of training methods.

4.1.1.5 2014 Census Test

The 2014 Census Test was an operational study of self-response and NRFU procedures. For this test, Census Day was July 1, 2014. The test involved 192,500 housing units in portions of Montgomery County, MD, and Washington, DC.

2014 Census Test	
Objectives	• Test various self-response modes, including the Internet, Census Questionnaire Assistance, and paper, and response without a preassigned Census identifier. • Evaluate the value of a preregistration option using "Notify Me" (a Web site that allows respondents to indicate a preferred mode of contact for the 2020 Census). • Test the use of mobile devices for NRFU enumeration in the field. • Test the use of Bring Your Own Device (BYOD) to conduct enumeration in the field. • Continue evaluating the use of administrative records and third-party data to remove cases (vacant and nonresponding occupied housing units) from the NRFU workload. • Test the effectiveness of applying adaptive design methodologies in managing the way field enumerators are assigned their work. • Examine reactions to the alternate contacts, response options, administrative record use, and privacy or confidentiality concerns (including how the Census Bureau might address these concerns through micro- or macro-messaging) through focus groups.
Findings	• Total self-response rate was 65.9 percent, and the Internet self-response rate was 50.6 percent. • Email contact attempts did not work due to large number of incorrect email addresses (bounce-backs). • The address collection interface in the Internet instrument yielded a much greater proportion of higher quality address data from respondents without a unique Census ID than in 2010. • Use of administrative records and third-party data matching improved the overall address matching rate. • "Notify Me" had low participation, with only about 3 percent of the sample choosing to preregister. • Higher than projected in-bound phone workloads due to respondent questions and issues primarily related to Internet access. • Problems with coordinating contact with gated communities resulting in inefficient enumeration. • Need to strengthen training and procedures on contacting nonresponding housing units, specifically as related to proxy interviews. • Need improved business rules and improved rule-based models for administrative records and third-party data.
Design Implications	• Conduct another test of "Notify Me" to determine if more people use this capability when advertising is used to inform the public about the 2020 Census, and specifically about the "Notify Me" option. • Determine optimal use of adaptive design and administrative records and third-party data. • Further explore the use of BYOD.

4.1.1.6 Continuous Small-Scale Testing

The Continuous Small-Scale Testing is a study of respondent and nonrespondent reactions to new modes of decennial census contact and response. The study focuses on reactions related to privacy and confidentiality of these modes. This study started in January 2014 and is ongoing as needed. It included emails to 1,000–2,200 housing units sampled from an opt-in frame.

Continuous Small-Scale Testing	
Objectives	• Determine how new contact and response modes will impact the public's perception of the Census Bureau's commitment and ability to protect privacy and confidentiality. • Determine how the public feels about each new mode being tested, specifically with regard to privacy and confidentiality.
Findings	• A text-based email out performed graphical emails. • Longer email content with "Dear Resident" and signature of the Director outperformed a shorter email invitation without the greeting and signature. • Respondents report preferring reporting online to a decennial census with a mailed invitation with the link over all other options. • Experimenting with an idea for publicity for the 2020 Census, very few respondents (less than 4 percent) forwarded a survey request to friend and family. • In an experiment with Non-ID Processing, asking an explicit question about collecting location data in addition to the smartphone's own question appeared to increase the percentage of people who allowed their mobile phones location to be accessed compared to when only the phone's own location message appeared. • The source of the administrative data has more impact on a favorable opinion towards its use than any other attribute, including the amount of time saved by the respondent if administrative data are used instead of a survey response. • Data use statements are more important to respondents than other messages contained in the survey invitation.
Design Implications	Continue to monitor respondent and nonrespondent reactions to various contact and response modes.

4.1.1.7 LUCA Focus Groups

The Local Update of Census Addresses (LUCA) Focus Groups collected input on potential LUCA models for the 2020 Census. Focus groups consisted of eligible LUCA participants representing various sizes and types of governments across the nation. Forty-six governmental entities participated. The focus groups were conducted from March 2014 through June 2014.

LUCA Focus Groups	
Objectives	Obtain feedback on potential LUCA models for the 2020 Census through a series of focus groups with 2010 Census LUCA participants.
Findings	• Continue the 2010 Census LUCA Operation improvements that were successful: ◦ 120-day review time for participants. ◦ 6-month advance notice about the LUCA Operation registration. ◦ Comprehensive communication program with participants. ◦ Provide a variety of LUCA media types. ◦ Improve the partnership software application. ◦ State participation in the LUCA Operation. • Eliminate the full address list submission options that were available in 2010 LUCA (Options 2 and 3). This will: ◦ Reduce the number of deleted LUCA addresses in field verification activities. ◦ Reduce the burden and cost of processing addresses and LUCA address validation. ◦ Reduce the complexity of the LUCA Operation. • Include census housing unit location coordinates in the census address list and allow partners to return their housing unit location coordinates as part of their submission. • Provide any ungeocoded United States Postal Service Delivery Sequence File address to state and county partners. • Provide the address list in more standard formats. • Conduct an in-office validation of LUCA-submitted addresses. • Utilize Geographic Support System data and tools to validate LUCA submissions. • Encourage governments at the lowest level to work with higher level governments to consolidate their submission. • Eliminate the Block Count Challenge. • Eliminate the use of the asterisk (*) designation for multiunits submitted without unit designations. • Encourage LUCA participants to identify addresses used for mailing, location, or both.
Design Implications	• Develop in-office validation processes, procedures, and tools. • Define relationship between Address Canvassing and LUCA, taking into consideration the timing of LUCA feedback and the appeals operation. • Determine the feasibility of technical recommendations for the 2020 Census LUCA Operation: ◦ Use of background imagery on paper maps. ◦ Ability to provide structure locations within LUCA materials. ◦ Feasibility of Web-based registration. • Determine feasibility of using areas where the Census Bureau has planned field activities to validate LUCA addresses.

4.1.1.8 2014 Human-in-the-Loop Test

The 2014 Human-in-the-Loop Test consisted of a simulation of reengineered field operations using an Operational Control Center and the enhanced operational control system. The purpose was to test proposed devices, systems, and the field structure for staff and management processes. The Simulation Experiment occurred in November 2014. In this test, real-time field operations and field management structure were tested by 87 field and office staff members.

2014 Human-in-the-Loop Test	
Objectives	• Exercise field reengineering methods (staffing ratios and enhanced operational control system) in a simulated environment. • Refine methods and get input from field staff to improve business processes prior to the 2015 Census Test.
Findings	• The new design for managing field operations was successful, including the use of an Operational Control Center and operational control system to manage the NRFU workload. • The ratio of enumerators to supervisors can be increased from the 2010 Census. • Instant notification to enumerators and supervisors is feasible and serves as a successful means of communication.
Design Implications	• Employ the new design for reengineered field operations during the 2015 Census Test. • Increase the ratio of enumerators to supervisors—further testing required.

4.1.2 Tests in 2015

A key milestone in October 2015 was the release of the preliminary operational design for the 2020 Census as documented in version 1.1 of this plan and supporting materials. This original design was informed by tests conducted from 2012 through 2015.

Figure 18 shows the schedule for the four tests in 2015 and the 2020 Census Operational Plan milestone. Each test is described below.

4.1.2.1 Address Validation Test

The Address Validation Test was conducted to assess the performance of methods and models that will help develop the 2020 Census address list, and to estimate the In-Field Address Canvassing workloads for the 2020 Census. The test contained two components, the Master Address File (MAF) Model Validation Test (MMVT) and the Partial-Block Canvassing (PBC) Test.

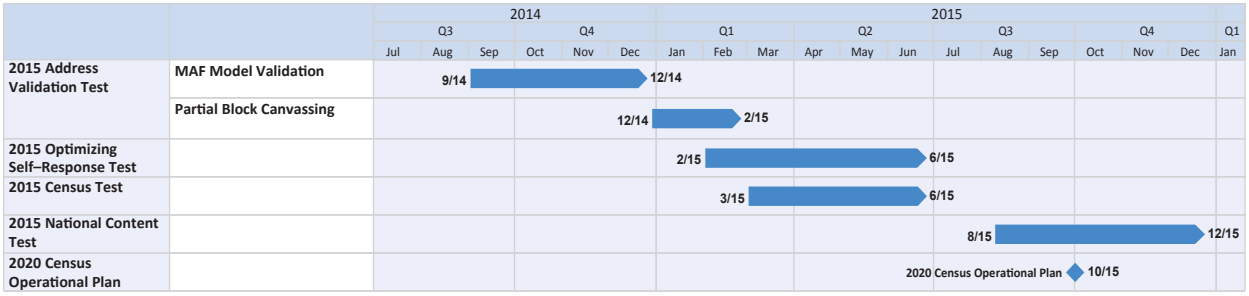

Figure 18: Tests and Key Decisions in 2015

MAF Model Validation Test

The MMVT evaluated methods that are part of the reengineered Address Canvassing innovation area. The test was conducted from September 2014 to December 2014 and included 10,100 nationally representative blocks (100 blocks with no addresses), which included approximately 1.04 million addresses in the sample blocks.

MAF Model Validation Test	
Objectives	• Test In-Office and In-Field Address Canvassing procedures. • Determine the ability to ensure an accurate MAF. • Assess the ability of two sets of statistical models to predict blocks that have experienced address changes.
Findings	• In-Office Address Canvassing was effective. • Statistical models were not effective at identifying blocks with changes. • Statistical models were not effective at predicting national coverage errors.
Design Implications	• Statistical models are not being pursued for determining blocks with changes or MAF coverage. • Continue with In-Office and In-Field Address Canvassing approaches.

Partial-Block Canvassing

The PBC Test evaluated the feasibility of canvassing portions of blocks, rather than entire blocks, using both in-office and in-field methods. This test was conducted from December 2014 to February 2015. The staff conducted an interactive review of aerial imagery over time and geographic quality indicators. Six hundred fifteen blocks with national distribution were listed by 35 professional staff.

Partial-Block Canvassing	
Objectives	• Measure unrecorded changes in blocks and identify portions of blocks where change is likely. • Determine ability to accurately canvass partial blocks. • Evaluate an interactive review of various materials—primarily aerial imagery over time and geographic quality indicators.
Findings	• Operationally feasible to canvass portions of blocks. • In-office imagery review of blocks has utility.
Design Implications	Continue to evaluate risks vs. benefits of PBC approach. (Note: subsequent to this test, a decision was made to do only full-block address canvassing. See the Address Canvassing Operation section for more information.)

4.1.2.2 2015 Optimizing Self-Response Test

The 2015 Optimizing Self-Response Test was an operational study of self-response procedures. For this test, Census Day was April 1, 2015. In the Savannah, GA, media market, 407,000 housing units were included in this test, with 120,000 sampled self-responding housing units.

2015 Optimizing Self-Response Test	
Objectives	• Determine use of digital and targeted advertising, promotion, and outreach to engage and motivate respondents. • Test value of "Notify Me" when partnerships and traditional and targeted advertising are used to promote early engagement of respondents. • Offer opportunity to respond without a Census ID (Non-ID Processing) and determine operational feasibility and potential workloads around real-time Non-ID Processing. • Determine self-response and Internet response rates.
Findings	• The total response rate was 47.5 percent, and the Internet response rate was 33.4 percent. • An additional 35,249 Internet responses came from housing units not selected in mail panels as a result of advertising and promotional efforts. • Continued low participation in "Notify Me." • Successful implementation of real-time Non-ID Processing, matching 98.5 percent of cases. • A new postcard panel, designed to test how housing units not originally included in the sample would respond to an invitation after being exposed to advertising, generated a response of approximately 8 percent.
Design Implications	• Discontinue "Notify Me." • Continue testing related to partnerships, advertising, and promotional efforts. • Continue use of offering the non-ID option to respondents.

4.1.2.3 2015 Census Test

The 2015 Census Test was an operational study of NRFU procedures. Census Day was April 1, 2015. This test included 165,000 sampled housing units in Maricopa County, AZ.

2015 Census Test	
Objectives	• Continue testing of fully utilized field operations management system that leverages planned automation and available real-time data, as well as data households have already provided to the government, to transform the efficiency and effectiveness of data collection operations. • Begin examining how regional offices can remotely manage local office operations in an automated environment, the extent to which enumerator and manager interactions can occur without daily face-to-face meetings, and revised field staffing ratios. • Reduce NRFU workload and increase productivity with the use of administrative records and third-party data, field reengineering, and adaptive design. • Test operational implementation of BYOD. • Explore reactions to the NRFU contact methods, administrative records and third-party data use, and privacy or confidentiality concerns.
Findings	• The total self-response rate was 54.9 percent and the Internet self-response rate was 39.7 percent. ◦ Coverage questions increased respondent burden. • Field Staff Training ◦ Combination of online and classroom training provided standardization of the information, provided tracking capabilities, and offered various learning methods. ◦ Reduced training hours compared with the 2010 Census NRFU enumerator training from 32 hours to 18 hours. ◦ Deployment of YouTube videos efficiently provided supplemental training to enumerators. ◦ Topics requiring additional training in future tests were identified. • Field Reengineering ◦ Area Operations Support Center and staffing of the Area Operations Support Center were successful. ◦ Electronic payroll was successful. ◦ Enumerator entry of availability for work and office operational system workload optimization were effective. ◦ Operational Control System alerts were effective in bringing attention to situations that required follow-up and possible corrective action. ◦ Optimized routing was successful overall, but uncovered need for modifications to the routing algorithm. • COMPASS was effectively used as the application for enumerating nonresponding housing units. ◦ COMPASS application was easy to use. ◦ COMPASS application experienced crashes and freezes; further investigation into root causes is needed. • Field Test Procedures ◦ Work needed to define a coordinated approach to enumeration within multiunits and gated communities. ◦ Refinement to data collection application “pathing” needed to better assist enumerators in cases on proxy responses and noninterviews. • BYOD ◦ Training was fairly labor-intensive. ◦ Based on observations, no adverse respondent reactions to the device being used for data collection. ◦ A variety of logistical and security risks related to implementation of BYOD were identified.
Design Implications	• Employ the use of automated training. • Continue to test the use of administrative records and third-party data in reducing the NRFU workload. • Optimize the number of visits and phone contacts for nonresponding housing units. • Make at least one contact for nonresponding housing units. • Continue to test field procedures for contacting nonresponding housing units. • The decision to stop testing BYOD and move forward with Decennial Device as a Service (dDaaS) was made in January 2016 because of the risks related to BYOD. The decision discussion and risks are documented in the “2020 Census Program Memorandum Series: 2016.01.”

4.1.2.4 2015 National Content Test

The 2015 National Content Test evaluated and compared different census questionnaire content. It assumed a Census Day of September 1, 2015. The test included 1.2 million nationally representative households, including 20,000 households in Puerto Rico and 100,000 reinterviews. Two major reports of results from this test have been released publicly at <www.census.gov>. These are the 2015 National Content Test Relationship Question Experiment Analysis at 2020 Census Program Memorandum Series 2017.07 and the 2015 National Content Test Race Ethnicity Analysis Report at 2020 Census Program Memorandum Series 2017.08.

2015 National Content Test	
Objectives	• Evaluate and compare different census questionnaire content, including questions on Race and Hispanic origin (e.g., combining Race and Hispanic origin into a single question versus using separate questions, and introducing a Middle Eastern North African category), relationship (introducing same-sex relationship categories), and within-household coverage (streamlined approach for ensuring accurate within-household coverage). • Refine estimates of national self-response and Internet response rates. • Continue to test self-response modes and contact strategies (see 2014 Census Test objectives). • Reinterview a subsample of respondents to further assess the accuracy and reliability of the question alternatives for race, Hispanic origin, and within-household coverage.
Findings	• The total self-response rate was 51.9 percent, and the Internet self-response rate was 35.6 percent. • Adding a final mailing, a reminder sent after the paper questionnaire, significantly increased response rates. • Sending the final reminder sooner by a few days prompted quicker responses, thus reducing the size of the third mailing. • In low response areas, the "choice" strategy of sending a paper questionnaire in the final mailing, is effective. • Providing the letters in English and Spanish, rather than just English with a Spanish sentence, elicits more Spanish language responses. • The new relationship question (with same-sex and opposite-sex categories) showed the same distributions as the old relationship question. • Analysis of the race and ethnicity questions appears in an external report.
Design Implications	• Send a fifth mailing to nonrespondents. • Send the final reminder mailing a few days sooner. • Provide more language support in the mail materials. • Continue research on identifying which areas should receive the paper questionnaire in the final mailing. • Use the new relationship categories.

4.1.3 Tests in 2016

In 2016, the Census Bureau moved from small-scale individual tests using proof of concept and prototype systems to more refined tests and the building and integration of systems that will support the 2020 Census. As shown in Figure 19, two major tests were completed in 2016. The 2016 Census Test focused on the integration of self-response and NRFU. The Address Canvassing Test expanded early address canvassing tests to refine the in-office and in-field methods. Each test is described below.

The following operations and systems were tested in 2016 through these two tests:

Key Innovation Area	Operations	Systems
Reengineering Address Canvassing	Address listing.	Enterprise Listing and Mapping System/ Listing and Mapping Instrument.
Optimizing Self-Response	• Internet Response. • Telephone Response. • Paper Response. • Non-ID Processing. • Language Service.	• PRIMUS Prototype. • Census Bureau Call Centers. • Integrated Capture and Data Entry. • Real-time Non-ID Processing.
Utilizing Administrative Records and Third-Party Data	• Identification of vacant and occupied units. • Removal of cases with high-quality data from other sources from the NRFU workload.	• Headquarters' servers. • Control and Response Processing Data System.
Reengineering Field Operations	• Workload Control • Enumeration • Quality Assurance	• MOJO (in-field operational control system) prototype begins interfacing with Multimode Operational Control System • COMPASS Prototype

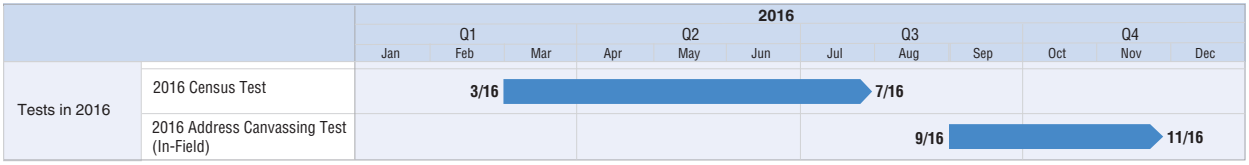

Figure 19: Tests Planned in 2016

4.1.3.1 2016 Census Test

The 2016 Census Test was an operational study of both self-response and NRFU procedures. It had a Census Day of April 1, 2016, and included a planned 250,000 housing units per site in Los Angeles County, CA, and Harris County, TX.

2016 Census Test	
Objectives	• Self-Response ◦ Test provision of language support to Limited English Proficient populations through partnerships and bilingual questionnaires. ◦ Test ability to reach demographically diverse populations. ◦ Test deployment of non-English data collection instruments and contact strategies. ◦ Refine Real-Time Non-ID Processing methods, including respondent validation. • NRFU ◦ Refine the reengineered field operations. ◦ Refine the field management staffing structure. ◦ Test enhancements to the Operational Control System and COMPASS. ◦ Refine the path in COMPASS to conduct proxy interviews. ◦ Test improved procedures for multiunit accessibility and contact. • Reengineered quality assurance ◦ Evaluate the use of paradata and Global Positioning Satellite points collected during interview. ◦ Test reinterview functionality. • Measure the systems' abilities to manage a significant number of concurrent users during self-response. • Test a combination of government-furnished equipment and dDaaS strategies for supplying enumerators with hardware devices. • Test scalability of Internet and Non-ID Processing during self-response using enterprise solutions.
Findings and Design Implications	Findings: • Sending a letter instead of a postcard as the first reminder has a positive impact on improving response rates. • Sending a paper questionnaire in the first mailing (Internet choice) to areas expected to have lower Internet usage is beneficial. Design implications: • In the 2020 Census, about 20 percent of the country will receive the Internet-choice methodology, with all areas receiving a paper questionnaire if they have not yet responded in the fourth mailing.

4.1.3.2 Address Canvassing Test

The primary objective of the Address Canvassing Test was to examine the effectiveness of the In-Office Address Canvassing through the results of the In-Field Address Canvassing. In addition, the test provided the opportunity to measure the effectiveness of integrated systems, field staff training, and the use of new collection geography in the field. The Address Canvassing Test occurred in Buncombe County, NC, and city of St. Louis, MO. Both Address Canvassing components, In-Office and In-Field, were conducted for all areas of the test sites. All data collection activities for the test occurred from August through December of 2016, with In-Office Address Canvassing data collection from August through October of 2016, In-Field Address Canvassing data collection from October through mid-November of 2016, and In-Field Relisting from mid-November through mid-December of 2016.

Address Canvassing Test	
Objectives	• Implement all In-Office Address Canvassing processes, including Interactive Review, Active Block Resolution, MAF Updating and Identification of the In-Field Address Canvassing workload. • Evaluate the effectiveness of online training for Field Supervisors and Field Representatives. • Measure the effectiveness of In-Office Address Canvassing through In-Field Address Canvassing. • Integrate multiple information technology applications to create one seamless operational data collection, control and management system.

Address Canvassing Test	
Findings and Design Implications	• The Census Bureau should continue pursuing the use of In-Office Address Canvassing processes for identification of the In-Field Address Canvassing workload. • In-Office Address Canvassing methods are generally effective in detecting where the MAF has remained accurate, where it is keeping pace with changes on the ground, and where fieldwork is needed to acquire address updates. • Assumptions about situations that pose challenges to detect change through imagery analysis are generally correct.

4.1.3.3 Group Quarters Tests

Group Quarters were not included in any of the testing that occurred early in the decade. However, there were three small-scale tests in 2015 and 2016 that were primarily efforts to test automation in collection of response data through electronic means. These tests were the 2015 Group Quarters Electronic Capability Test Survey, the 2016 eResponse Data Transfer Test, and the 2016 Service-Based Enumeration Census Test.

Group Quarters Electronic Capability Test Survey

Purpose: Explore GQ administrators' ability and willingness to send resident-level data electronically to the Census Bureau.

Preliminary Results: Of 260 GQ umbrella organizations and agencies contacted, 40 percent responded. Of those that responded, the majority reported: the availability of eResponse data records, the ability to transmit eResponse data records to the Census Bureau, the ability to provide an electronic file in an Excel format, and willingness to participate in the Group Quarters Electronic Response Data Transfer Test (or eResponse Test).

eResponse Data Transfer Test

Purpose: Explore the capabilities for enumeration using electronic response data; evaluate the ability of GQ administrators to link residents/clients to the correct GQ address.

Preliminary Results: All data files were successfully uploaded; all administrators were able to use the Excel spreadsheet provided by the Census Bureau; files linked residents/clients to the correct GQ address, as specified; some data parsing was required for formatting submitted data into usable enumeration data.

Lesson Learned: Test with a standardized template and test across multiple GQ types.

Service-Based Enumeration Census Test

Purpose: Explore the feasibility of enumerating the service-based population using an automated instrument; explore the availability of administrative records for enumerating at service-based locations; determine the staffing needs when using a mix of enumeration instruments at these locations.

Preliminary Results: Almost 100 percent of participants were enumerated using the automated instrument and provided the required data items; the automation and administrative record enumeration effort was strongly supported by GQ administrators.

Lessons Learned:

Only shelters have the capability to provide listings containing client-level information.

A different staffing ratio is required depending on type of service-based location and whether automation is used for enumeration.

4.1.4 Tests in 2017

One major test was completed in 2017: the 2017 Census Test. This test is described below.

4.1.4.1 2017 Census Test

The 2017 Census Test was a nationwide self-response test of 80,000 households, testing the integration of operations and systems for self-response. In particular, Internet Self-Response was tested in the cloud and Census Questionnaire Assistance was tested at two call centers. It allowed the Census Bureau to test the feasibility of collecting tribal enrollment information. The test oversampled areas with relatively high populations of American Indians and Alaska Natives as a mechanism for testing potential tribal enrollment questions nationwide. This test had a Census Day of April 1, 2017.

2017 Census Test	
Objectives	• Test the integration of operations and systems for Self-Response. • Test the feasibility of collecting tribal enrollment information.
Findings and Design Implications	In progress.

4.1.5 Tests in 2018

One test is planned for 2018, the 2018 End-to-End Census Test. The goal is to have the entire operational design for the major operations ready for production—from a systems, operational, and architectural perspective. The 2018 End-to-End Census Test includes significant field data collection components, and the timing of the field operations will mimic the 2020 Census (see Figure 21).

Findings and lessons from prior tests have been used to develop the test plans to the extent possible. Other efforts in preparation of this test include introducing enterprise systems that were not in place for earlier tests, expanding and enhancing systems already in use, and expanding and enhancing the systems using cloud technologies.

Any problems found during the 2018 End-to-End Census Test will be addressed using careful regression testing and change control procedures in 2019.

4.1.5.1 2018 End-to-End Census Test

The 2018 End-to-End Census Test is planned to test and validate 2020 Census operations, procedures, systems, and infrastructure together. This test will

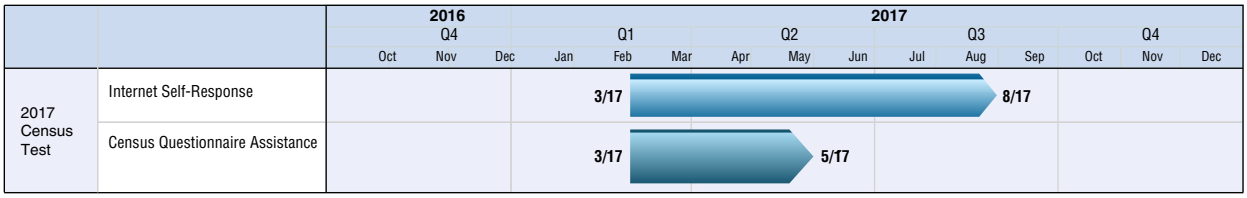

Figure 20: Schedule for the 2017 Census Test

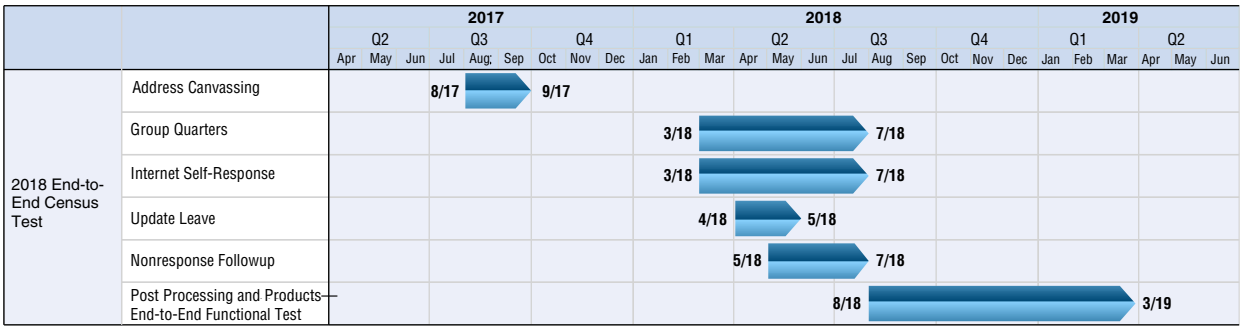

Figure 21: Schedule for the 2018 End-to-End Census Test

have a Census Day of April 1, 2018, and will be conducted in Providence County, RI. The Address Canvassing Operation will be conducted in the prior calendar year because this operation is responsible for producing the census frame, which has to be done before the data collection. Address canvassing will be performed in three areas: Pierce County, WA; Providence County, RI; and Bluefield-Beckley-Oak Hill, WV.

2018 Census End-to-End Test	
Objectives	• Test and validate 2020 Census operations, procedures, systems, and field infrastructure together to ensure proper integration and conformance with functional and nonfunctional requirements. • Produce a prototype of geographic and data products.
Findings and Design Implications	To be completed once the test is conducted.

4.1.6 Tests in 2019

As shown in Figure 22, two types of tests are planned for 2019, Defect Resolution Testing and Post End-to-End Census Test Performance Testing. These tests and their scope are dependent on funding. The Defect Resolution Testing will ensure that any changes made to fix defects in the systems tested in the 2018 End-to-End Census Test are correctly resolved. This final performance testing in 2019 minimizes the risk of system crashes and delays in processing respondent Internet submissions and phone calls. Components of performance testing will be done according to best practices.

4.2 KEY DECISION POINTS AND MILESTONES

Figure 23 shows the key decision points and milestones for the full life cycle of the 2020 Census. Milestones include public facing milestones, such as launching the 2020 Census Web site, delivery of topics and questions to Congress, as well as delivery of 2020 Census products to the President, states, and the public.

4.3 2020 CENSUS PRODUCTION OPERATIONAL SCHEDULE

Figure 24 describes the planned timing for the major production field operations for the 2020 Census. This schedule represents the current baseline and may change based on available funding and final design decisions.

Figure 25 provides an integrated schedule for the tests, key milestones, and production operations in one chart. Different types of tests (research, readiness, performance, end-to-end, and post end-to-end) are shown in different colors as noted in the legend. Key milestones, including the baseline of the 2020 Census Operational Plan, Census Day, and the delivery of apportionment counts and redistricting data are also shown.

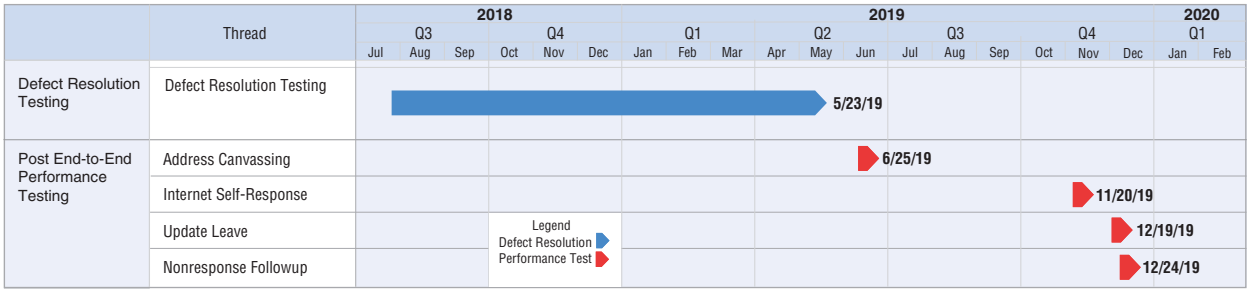

Figure 22: Defect Resolution and Performance Tests in 2019

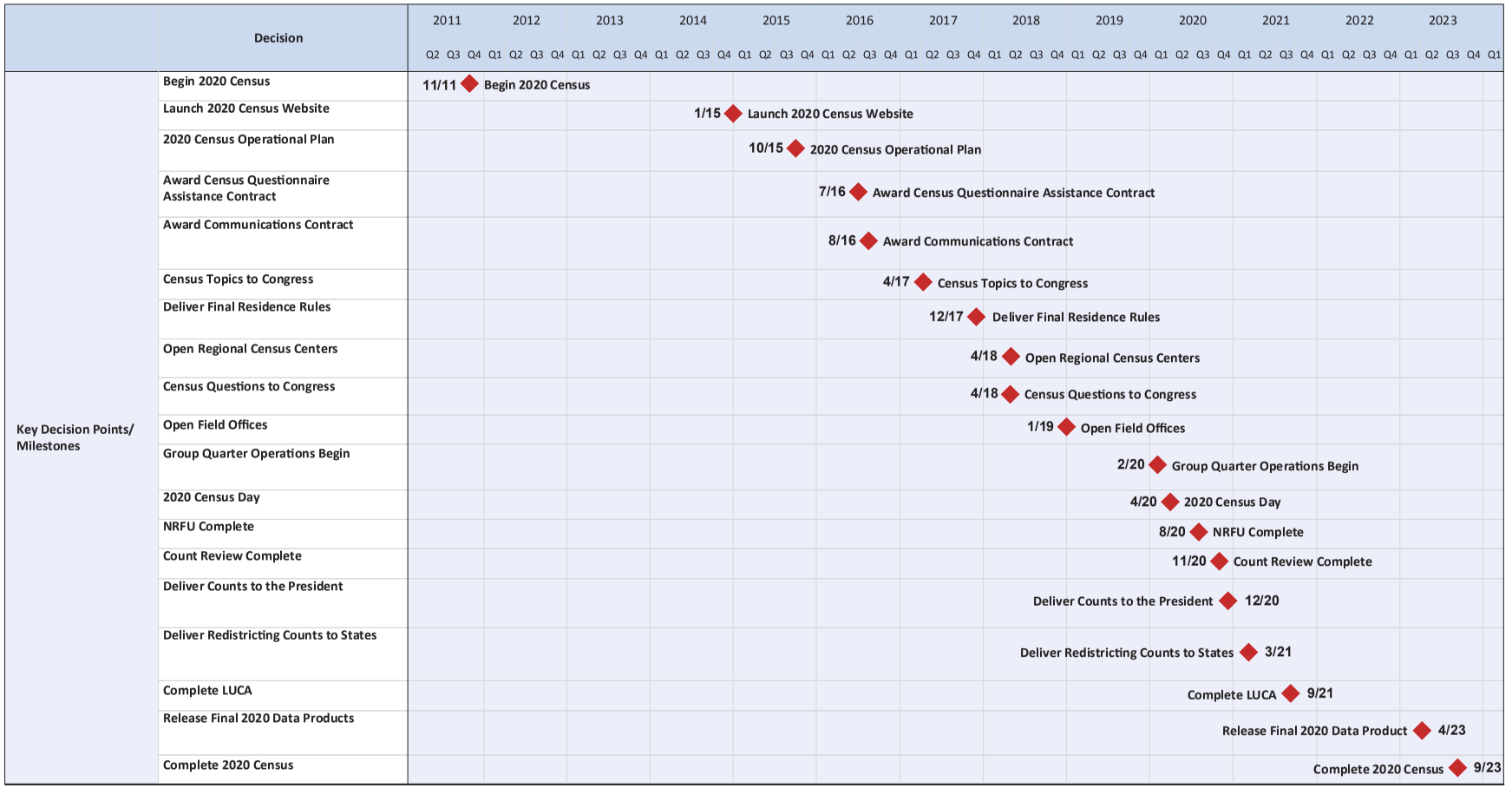

Figure 23: Key Decision Points and Milestones

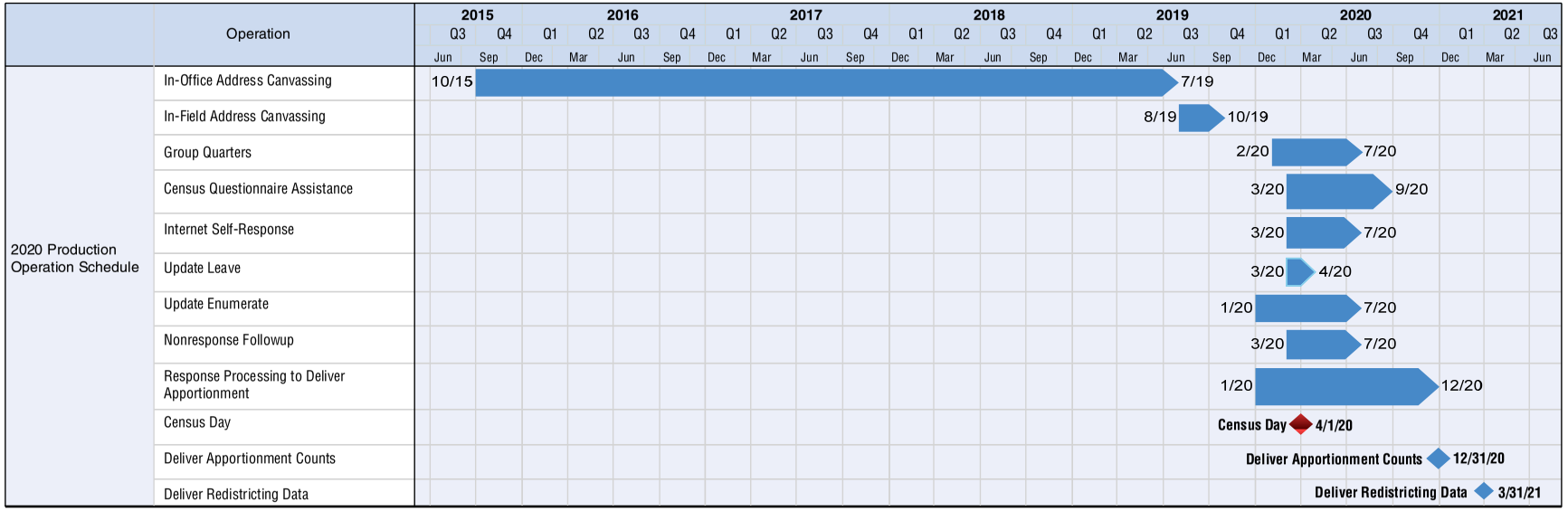

Figure 24: 2020 Census Operations—Production Timeline

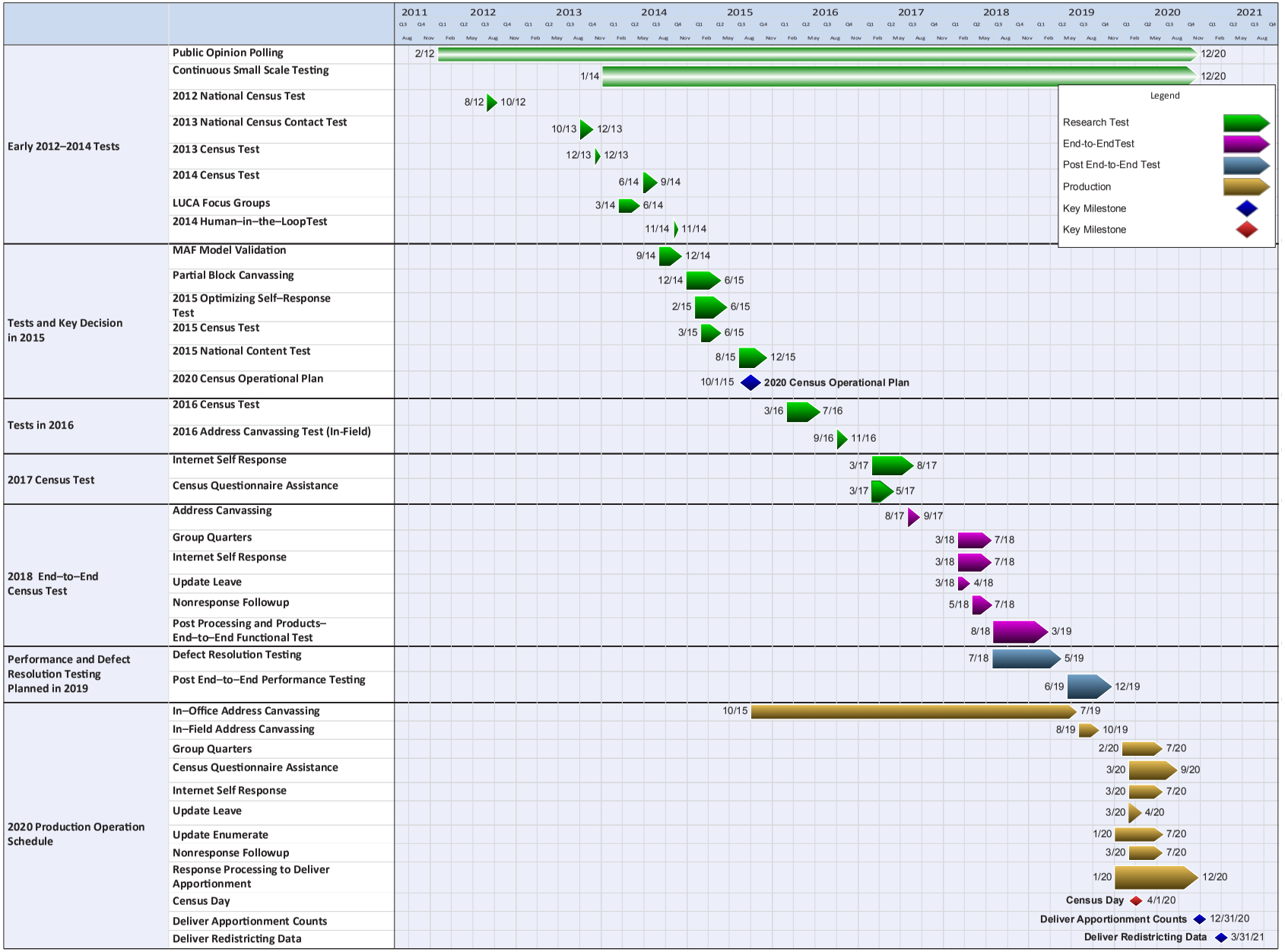

Figure 25: High-Level Integrated Schedule

5. The 2020 Census Operations

This section of the document provides the current state of the operational design. An overview of the 35 operations is presented, followed by more detailed descriptions of each operation that include the following:

- **Purpose:** A concise description of the operation.
- **Changes Made Since Version 2.0 Operational Plan Release:** A brief summary of significant changes made for this operation.
- **Lessons Learned:** Selected lessons learned from the 2010 Census or tests or studies that have occurred since the 2010 Census.[2]
- **Operational Innovations:** Major innovations expected to be implemented for this operation.
- **Description of Operation:** A basic description of the operation.
- **Research Completed:** Research completed and the major findings from this research.
- **Decisions Made:** A list of the design decisions made based on research completed.
- **Design Issues to Be Resolved:** A list of the outstanding design decisions and the date by which they are expected to be made.
- **Cost and Quality:** The expected cost and quality impacts of the design for this operation on the overall 2020 Census.
- **Risks:**[3] The top risks associated with this operation.
- **Milestones:** Important dates associated with this operation, to include decision points and production dates.

For support and similar operations that do not require a research-based design, the research and decision section focuses on work completed.

Throughout this section, some references are made to specific Census Enterprise Data Collection and Processing (CEDCaP) systems that were used to support the early 2020 Census tests.

5.1 OPERATIONS OVERVIEW

Figure 26 illustrates all 35 operations organized by the 2020 Census Work Breakdown Structure (WBS) elements. As noted by the shading on the diagram, the degree to which detailed planning has been conducted for each operation varies.

Detailed Operational Plans (DOPs) are being produced for most of the 35 operations. The development of the DOPs is not only further refining the design for those individual operations, but also helping clarify scope, boundaries, and interaction points among operations.

Integrated Operations Diagrams (IODs) have been developed to describe how a group of related operations work together to perform key functions of the 2020 Census (e.g., frame development, response data collection, and data products and dissemination). The IODs are included in the relevant DOPs. Additional operational integration artifacts are being developed, as time and funding allow, to ensure a full understanding of the integrated operational design.

The operations must work together to achieve a successful census. Information flows among the operations as the census proceeds from frame development through collection of response data to the publishing and release of the data. Key information flows among the primary business operations are highlighted in Figure 27. Major interactions and flows are shown with the arrows in the diagram, and the key external interfaces are depicted in blue text.

The integration of these business operations requires integration of the IT systems that support them. This significant effort is underway. The Systems Engineering and Integration (SEI) Operation will complete the 2020 Census Solution Architecture based upon Capability Requirements (CAP).

[2] The Knowledge Management Database contains the lessons learned from the 2010 Census and is available for review upon request.

[3] Each operation has its own project-level risk register, which includes the full list of project risks.

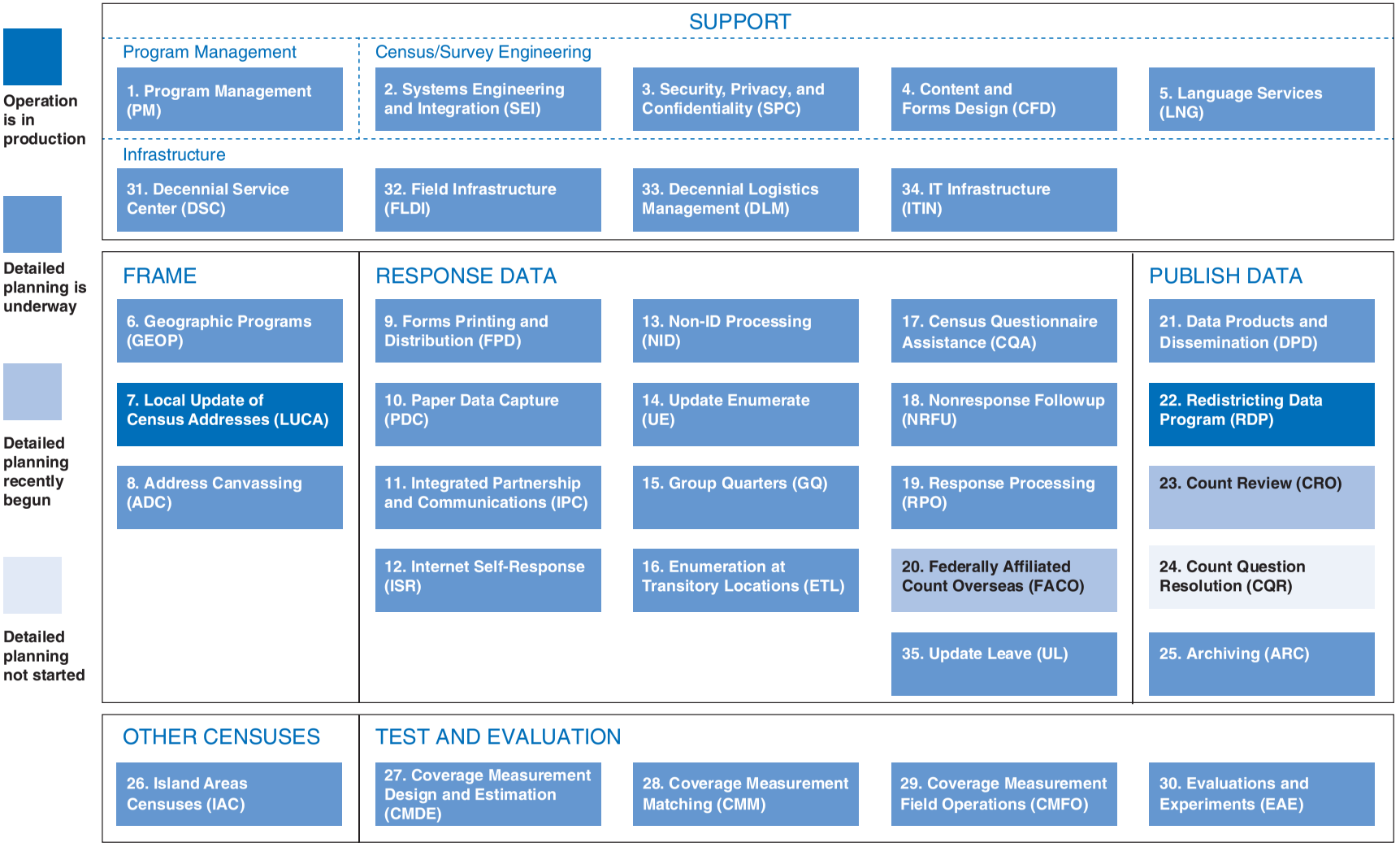

Figure 26: Operational Overview by Work Breakdown Schedule

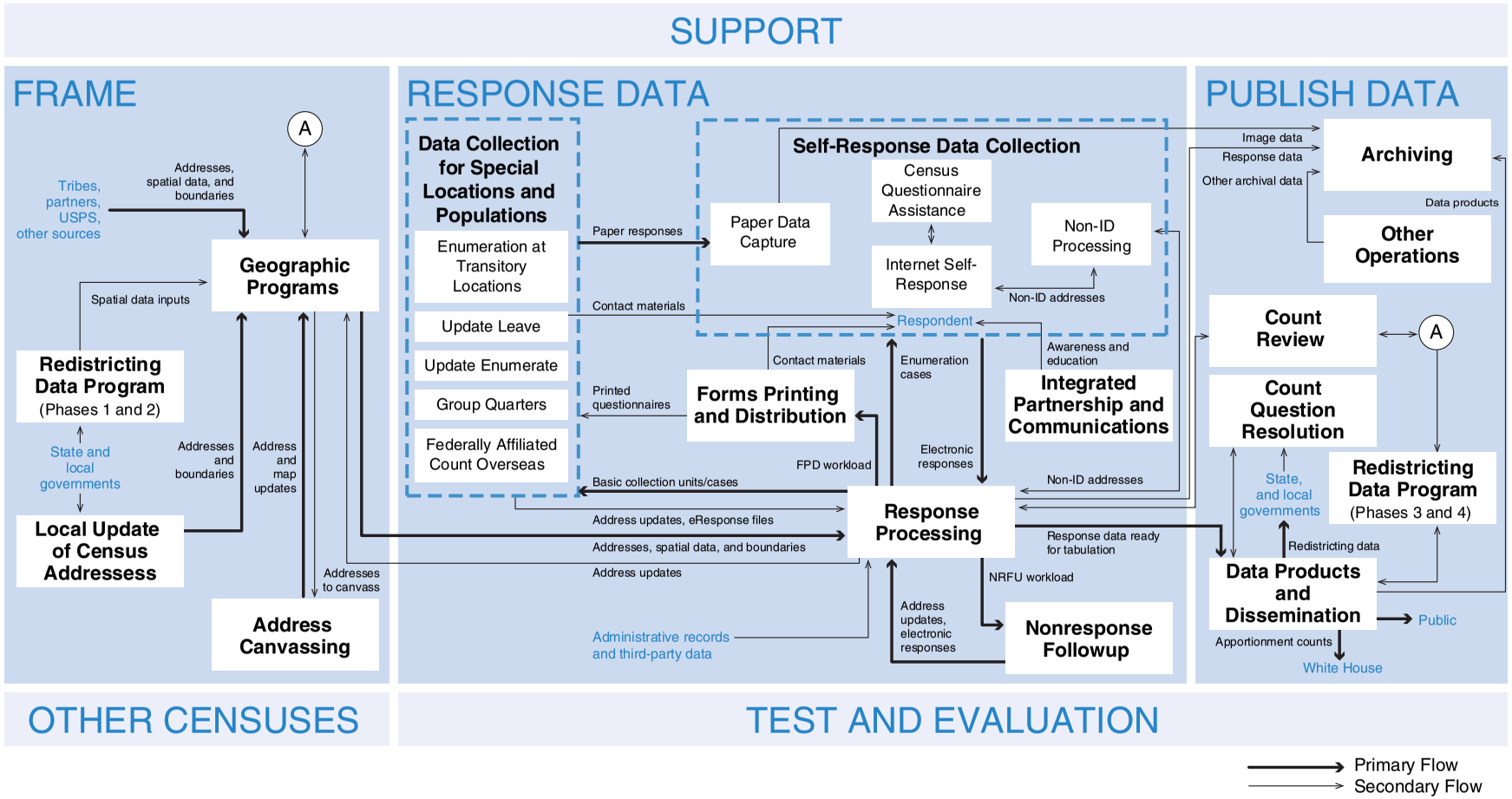

Figure 27: High-Level Integration of Operations

5.1.1 Frame

As shown in Figure 27 from the previous page, the basic flow of information begins in the frame area with the **Geographic Programs (GEOP)** Operation which maintains the Master Address File (MAF) and spatial and boundary data used to create the frame for the 2020 Census. Data from the United States Postal Service (USPS) and other administrative records and third-party data are used to maintain the MAF and spatial data. State and local governments provide address updates to GEOP during the **Local Update of Census Addresses (LUCA)** program. These governments also provide updates to GEOP on block boundaries and voting districts during the first two phases of the **Redistricting Data Program (RDP)**. GEOP provides the most current address list to the **Address Canvassing (ADC)** Operation, where staff make updates to the list via in-office and in-field procedures. These updates are processed by GEOP on an ongoing basis throughout the decade. Once the frame updates are complete, GEOP provides the address and spatial data to the Response Processing (RPO) Operation, which creates the initial universe of Basic Collection Units (BCUs) for listing operations and cases for self-response and enumeration operations.

5.1.2 Response Data

Enumeration at Transitory Locations (ETL) Operation: Enumerates individuals in occupied units at transitory locations (TL) who do not have a Usual Home Elsewhere (UHE). TLs include recreational vehicle parks, campgrounds, racetracks, circuses, carnivals, marinas, hotels, and motels.

Update Enumerate (UE) Operation: Updates the address and feature data and enumerates housing units (HU) in areas where the initial visit requires enumerating while updating the address frame (primarily remote geographic areas that have unique challenges associated with accessibility).

Update Leave (UL) Operation: Updates the address and feature data for the area assigned and leaves a choice questionnaire package (contact materials) at every HU identified to allow the household to self-respond. UL occurs in areas where the majority of HU do not have a city-style address to receive mail.

Group Quarters (GQ) Operation: Enumerates people living or staying in GQ, people experiencing homelessness, and people receiving service at service-based locations, people living on maritime vessels, and people living on military bases.

Federally Affiliated Count Overseas (FACO) Operation: Obtains counts by home state of U.S. military and federal civilian employees stationed or deployed overseas and their dependents living with them.

Most responses from these operations are collected on paper questionnaires, provided by the **Forms Printing and Distribution (FPD**) Operation. Responses for the military and some GQ and the count of federally affiliated persons overseas are provided in electronic files. Paper questionnaires are sent to the **Paper Data Capture (PDC)** Operation, where they are scanned and imaged before being sent electronically to the **Response Processing (RPO)** Operation.

Address updates collected during these operations are sent to RPO, which sends the data back to GEOP.

A key goal for the 2020 Census is to optimize self-response. The **Integrated Partnership and Communications (IPC)** Operation helps do this by creating awareness and educating the public about the importance of the 2020 Census. FPD serves as the primary mechanism for contacting households and mailing the materials (letters, postcards, and in some cases, paper questionnaires) needed for self-response. The **Internet Self-Response (ISR)** Operation collects respondent information through an online questionnaire. For those Internet respondents who do not provide a Census ID, the Census Bureau conducts real-time (during the interview) processing to identify the correct block for the respondent's address using methods in the **Non-ID Processing (NID)** Operation. Households that do not respond on the Internet are given the opportunity to respond with paper questionnaires, which are mailed to and processed by PDC. Some people will call with questions. The **Census Questionnaire Assistance (CQA)** Operation responds to these questions and, if appropriate, offers to collect the responses through a telephone interview. All Internet and electronically captured paper questionnaire responses are sent to the RPO, which manages the status of cases across

the universe. HU addresses for which the Census Bureau did not receive a self-response are sent to the **Nonresponse Followup (NRFU)** Operation, which determines the most cost-effective way of enumerating those households (personal visit, use of administrative records and third-party data, or proxy responses). Any new addresses identified during NRFU are sent to RPO, which in turn sends them back to GEOP.

5.1.3 Publish Data

Preliminary counts created near the end of data collection are sent from RPO to the **Count Review (CRO)** Operation, which provides **Federal-State Cooperative Population Estimates (FSCPE)** members the opportunity to review the counts to ensure the accuracy of the 2020 Census. Any geographic updates resulting from CRO are sent to GEOP (as shown by the circled A connector in Figure 27). Once all of the data processing is complete, RPO delivers the processed data to the **Data Products and Dissemination (DPD)** Operation to prepare the final 2020 Census data products. This operation creates and delivers:

- Apportionment counts to the President and statistical data to the public.
- Redistricting data to the state legislatures (in coordination with the RDP) so state governments can define the geographic boundaries for Congressional and legislative districts.
- Final counts to the **Count Question Resolution (CQR)** so challenges to 2020 Census counts can be resolved.
- Data products to the **Archiving (ARC)** Operation.

ARC also receives responses from RPO and image data from PDC, as well as other archival data from other operations, including time and expense data and paradata. By law, decennial census results are archived and released to the public 72 years after the census.

This integrated view only depicts high-level data flows and interactions. The IODs mentioned above provide more detail related to operational integration.

5.2 PROGRAM MANAGEMENT

5.2.1 Program Management

Detailed Planning Status:	**Underway**

Purpose

The Program Management (PM) Operation defines and implements program management policies, processes, and the control functions for planning and implementing the 2020 Census in order to ensure an efficient and well-managed program.

Changes Made Since Version 2.0 Operational Plan Release: There have been no major changes to this operation.

Lessons Learned

Based on lessons learned from the 2010 Census and other reviews, the following recommendations were made:

- Develop a life cycle schedule for the 2020 Census, and complete it earlier in the decade.
- Place more emphasis and resources on updating cost and schedule estimates throughout the life cycle.
- Obtain independent cost estimates and use them to validate cost estimates (that include contingency reserves) developed by stakeholder organizations.
- Improve strategic planning and early implementation of the 2020 Census Risk Management process.
- Align system development schedules with operational deadlines to allow adequate time to test systems before their deployment.
- Reevaluate the practice of frontloading and develop a better process for developing workload and cost assumptions.
- Rethink and rework stakeholder engagement, education, and management. The Census Bureau needs to better define, and then clearly articulate, its expectations with regard to roles and responsibilities between the Census Bureau, contractors, and stakeholder groups.

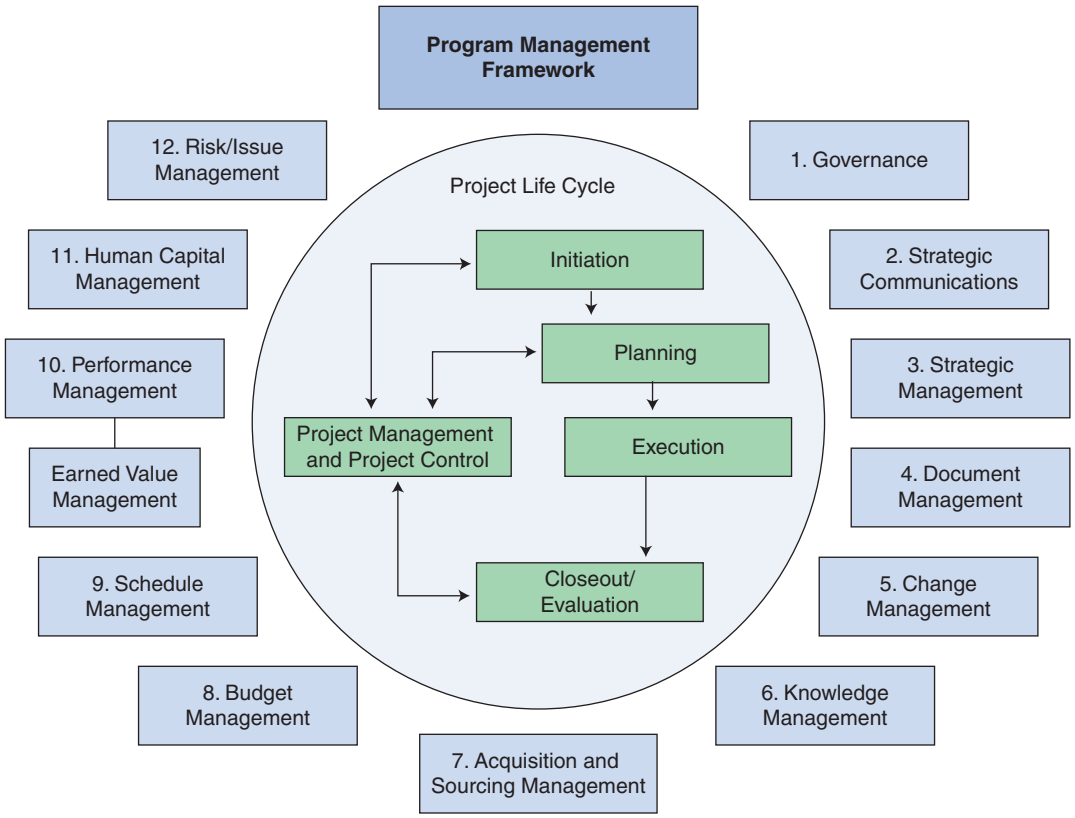

Figure 28: Program Management Framework

- Set a clear and publicly announced goal to reduce the inflation-adjusted per-housing-unit cost relative to 2010 Census totals.

Operational Innovations

Following an analysis and review of the 2010 Census program management practices, the 2020 Census improved its program management capabilities and defined program management processes earlier in the decade to support 2020 Census Research and Testing activities. New and improved program management practices integrated into the 2020 Census that were not part of the 2010 Census include the following:

- Iterative operational planning to allow for periodic design refinements based on findings from research and testing, as well as external changes in legislation and technology.
- Evidence-based decision-making to ensure that operational designs are based on solid evidence from research, testing, analysis, and previous survey and census experience.
- Integration of schedule, scope, and budget using a common WBS.
- An integrated life cycle master schedule that uses best practices based on the Government Accountability Office (GAO) schedule assessment guide.
- Cost and schedule estimates updated throughout the 2020 Census life cycle based on GAO best practices:
  - Publication GAO-09-3SP Cost Estimating and Assessment Guide: Best Practices for Developing and Managing Capital Program Costs.
  - Publication GAO-12-120G Schedule Assessment Guide: Best Practices for Project Schedules.
- A Knowledge Management process and database for lessons learned from the 2010 Census, 2020

Census Research and Testing Program, advisory committees, and audit and oversight reports.

- Alignment with the Census Bureau's approach to implement activity-based management and earned-value management techniques.
- Formal risk management kicked off earlier in decade (2012) and occurs at both the program level and project level.
- Increased transparency and collaboration with internal and external stakeholders about the 2020 Census.
- Increased international stakeholder communications to leverage learnings of other countries' census efforts and to share the Census Bureau's best practices and challenges.
- Governance that bridges organizational silos.
- Performance Management includes a focus on key cost drivers.
- Workforce that is appropriately skilled and trained.

Description of Operation

The PM Operation is responsible for the planning and implementation of the 2020 Census. Specifically, this operation defines the overall 2020 Census program and project management policies, framework, and control processes used across the entire 2020 Census and all projects established within the program.

The established PM framework is shown in Figure 28.

General activities are required to manage multiple, ongoing, interdependent projects to fulfill the 2020 Census mission and objectives. The PM Operation defines and manages the following 12 program management processes:

1. **Governance:** The overall management structure, decision-making authority, priority setting, resource utilization, and performance verification at each level of the program.
2. **Strategic Communications:** The engagement with internal and external stakeholders, including Congress and the general public, in the planning, research and analysis, progress, and decisions related to the 2020 Census. This activity also includes collaboration with international organizations, particularly the International Census Forum and the United Nations Statistics Division (for the global view of censuses) and the United Nations Economic Commission for Europe (for the regional view).
3. **Strategic Management:** The process for determining and documenting the 2020 Census strategic direction regarding strategies, goals, objectives, performance, and investments.
4. **Document Management:** Activities for consistent and centralized management of program documentation produced in support of the 2020 Census program.
5. **Change Management:** Activities for managing and controlling the 2020 Census strategic baseline, including control of charters, process plans, design documents, operational plans, project plans, requirements, and schedules.
6. **Knowledge Management:** Practices used to identify, create, represent, distribute, and enable adoption of insights and experiences.
7. **Acquisition and Sourcing Management:** Activities to provide and support acquisition principles and guidelines.
8. **Budget Management:** Activities used to establish and manage future-year budget formulations, current-year budget execution, and cost estimating and cost modeling.
9. **Schedule Management:** Activities used to identify and schedule activities required to produce program deliverables, identify interdependencies among activities, and determine activity resource requirements and duration.
10. **Performance Management:** Practices used to monitor the progress of the 2020 Census to identify variances, assign corrective actions, and make timely changes.
11. **Human Capital Management:** Activities to ensure that human competencies and skills are present and available to the organization.
12. **Risk and Issue Management:** Activities to facilitate the identification, analysis, mitigation, and contingency planning for risks and issues related to achieving the program's objectives.

Each component of the framework is documented in detail in a separate process plan. The PM process plans are revised based primarily on lessons learned, other feedback received from process owners and users, and as the program evolves.

Work Completed

The following work has been completed for this operation:

The program management processes listed above were approved in 2011, funded, established, and utilized during the 2020 Census Research and Testing Phase. They continue to be used for the planning and implementation phases of the 2020 Census.

Decisions Made

The following decisions have been made for this operation:

- ✓ Strategies for each program management element were defined and approved in 2011 and formed the basis for the management of the 2020 Census Program.
- ✓ The 2020 Census will be managed by using a fully integrated master schedule designed and built using best practices based on the GAO schedule assessment guide (GAO-12-12G, May 2012).
- ✓ The 2020 Census will follow the Enterprise Systems Development Life Cycle (eSDLC) process for all decennial IT projects. The Census Bureau Project Life Cycle will be followed for all projects (IT and non-IT projects).
- ✓ The 2020 Census will manage program-level risks via assigned risk owners and risk monitors, who will report to a risk review board. The 2020 Census will brief the Portfolio Management Governing Board regularly on the top program risks and escalate risks and issues as necessary for guidance. The 2020 Census project-level risks will be managed by the Integrated Project Teams that were formed for each operation supporting the 2020 Census.
- ✓ The program will have a finalized and integrated governance and performance measurement reporting mechanism.
- ✓ The risk management plan includes both the program and project-level processes.
- ✓ A formal memorandum series will be used to document significant program decisions.
- ✓ The program will actively engage with stakeholders and advisors on major aspects of the 2020 Census.
- ✓ Quarterly 2020 Census Program Management Reviews will be conducted by live Webcast, so stakeholders can watch live or on demand later.
- ✓ The 2020 Census Monthly Status Reports will be delivered to key oversight entities.
- ✓ A Decennial Policy Team will be developed and managed to ensure interdisciplinary, interdirectorate communication in regard to legal, policy, and IT security sensitivities.
- ✓ The 2020 Census Web site will be developed and supported.
- ✓ Frequently Asked Questions about the test program will be developed along with other supporting materials.
- ✓ Talking Points for customer assistance for internal phone and correspondence support centers will be developed.
- ✓ A directorate representative to Census Bureau's International Collaboration Steering Committee will be appointed to communicate and coordinate international collaboration across the agency.
- ✓ The Census Bureau will actively participate with international and national statistical and geographic organizations for key learnings and to share the Census Bureau's experiences.
- ✓ The Census Bureau will ensure the full utilization of performance management to better facilitate early identification and correction of problems.
- ✓ The Census Bureau will use change management processes to better ensure impact assessment.
- ✓ The Census Bureau will use human capital management outlined in the 2020 Census Human Capital Management Plan to better plan, facilitate, and monitor a workforce that has the required competencies and skills.
- ✓ The Census Bureau will mature the use of the Primavera scheduling tool for the program and MS Project interaction for the enterprise.
- ✓ The Census Bureau will ensure the integration of 2020 Census schedules with enterprise efforts

and enterprise schedules as outlined in the 2020 Census Schedule Management Plan.

✓ The Performance Measurement Branch will manage a SharePoint site that holds all performance report requirement documents, as well as links to all cost and progress reports.

Design Issues to Be Resolved

Additional work is required to make decisions on the following questions:

Question	Expected Date
Defining the detailed earned-value management methodology.	December 2017
Defining methods to link risk mitigation actions to the master integrated schedule.	December 2018

Cost and Quality

Investment in PM helps ensure an efficient 2020 Census, which is projected to influence (reduce ↓ or increase ↑) the 2020 Census overall costs. Specific examples are noted below.

↓ Investment in establishing a robust and formal program management office that develops and manages processes that minimize potential negative cost, schedule, and scope impacts.

↓ Ongoing stakeholder engagement reduces the likelihood of unplanned design changes late in the decade, which can prevent additional costs.

The PM does not directly impact the quality of the 2020 Census results.

Risks

The PM Operation identifies and manages all program-level risks. The risks listed below are specific to this operation.

Commitment by the 2020 Census senior managers to mature the program management process used for the 2010 Census Program requires dedicated resources, including staff with certain skill sets. **IF** the dedicated resources are not available and funded to implement program management processes, **THEN** critical functions such as schedule, budget, scope, and risk management will be jeopardized.

As part of the 2020 Census PM Operation, a framework of various program management processes have been developed for ensuring the implementation of consistent and thorough program management controls. **IF** staff working on the 2020 Census operations do not follow the program management processes, **THEN** the 2020 Census operations may not be able to properly meet the objectives and goals of the program.

Performance measurement is a critical function needed by managers to track the status of planning, development, and implementation of the 2020 Census Program and operations. **IF** performance measures are inadequately defined or monitored or both, **THEN** managers will have difficulty assessing and reporting accurate cost and progress status.

Milestones

Date	Activity
September 2010	Baseline the initial 2020 Census Strategic Plan.
June 2011	Baseline the initial 2020 Census Life Cycle Rough Order of Magnitude Cost Estimation (or Estimate).
September 2011	Develop and gain approval for 2020 Census Program Management Process Strategies for each component described in this operation.
September 2012	Baseline the initial 2020 Census Program-Project Management Plans for each component described in this section.
December 2012	Begin the quarterly 2020 Census Program Management Reviews.
May 2013	Baseline the initial 2020 Census Mission-level Requirements.
April 2014	Baseline the initial 2020 Census Life Cycle Integrated Schedule.
October 2015	Issue the Baseline of the 2020 Census Operational Plan.
October 2015–September 2018*	Baseline the 2020 Census DOPs (one for each operation).
Annually	Refresh and reissue strategic program documentation and the 2020 Census Operational Plan based on lessons learned, test results, and other feedback.
Annually	Conduct project management process training to process users.

* The dates for each of the DOPs vary depending on the timing of the operation. For example, the DOP for the ADC Operation was produced in December 2015 and the DOP for the Evaluations and Experiments Operation is due in 2018.

5.3 CENSUS/SURVEY ENGINEERING

The support operations in this area provide the foundation for conducting the 2020 Census. This area consists of four operations: Systems Engineering and Integration (SEI); Security, Privacy, and Confidentiality (SPC); Content and Forms Design (CFD); and Language Services (LNG). Each is described below.

5.3.1 Systems Engineering and Integration

Detailed Planning Status:	**Underway**

Purpose

The Systems Engineering and Integration Operation (SEI) is an IT operation that manages the delivery of a System of Systems that meets 2020 Census Program business and capability requirements.

Changes Made Since Version 2.0 Operational Plan Release: There have been no major changes to this operation.

Lessons Learned

Based on lessons learned from the 2010 Census and other reviews, the following recommendations were made:

- Need to have a well-documented plan that describes the development of the business architecture and the solution architecture. The architecture plan must have buy-in and adoption by all stakeholders.
- Consider greater flexibility for requirements configuration management in the early design and development processes to help minimize the necessity to make subsequent corrections, potentially saving resources and costs associated with unplanned resource needs.

Operational Innovations

Operational innovations include the following:

- Application of the Census Bureau's eSDLC.
- Integration with the Census Bureau's Enterprise Architecture.
- Definition and implementation of performance measurement (performance metrics and reporting).
- Integration with Enterprise systems, as appropriate.
- Dedicated resources for key positions, including Chief Architect, Chief Engineer, and Chief IT Security Engineer.

Description of Operation

The SEI Program Area serves as a centralized functional group with the Decennial Directorate to manage development of the System of Systems that meets 2020 Census Program business and capability requirements. SEI has five major components: Requirements Engineering, Solution Architecture, Technical Integration and Solution Development Oversight, Test and Evaluation, and Deployment Operations and Maintenance. As part of all of these efforts, SEI will use the following standard program management concepts to manage these tasks: Schedule Management, Risk Management, Issue Management, Configuration Management, and Quality Assurance.

Requirements Engineering

Based on the design of the 2020 Census and plans documented in the 2020 Census Operational Plan, the SEI Operation defines and executes a requirements engineering approach for the 2015–2018 Census Tests and 2020 Census that aligns with the Census Bureau's eSDLC, meets agency and Department of Commerce standards and guidelines, and emphasizes a consistent approach across the portfolio of 2020 Census projects. The scope of the Requirements Engineering effort includes the following:

- Ensuring the controlled and consistent application of a standardized approach to requirements engineering throughout the program and project life cycles.
- Conducting early and more frequent user testing and engagement, employing the use of prototypes, models, and simulations wherever practicable.
- Establishing the requirements engineering methodology and tools that must be applied across the decennial and supporting programs:
  - Developing Business Process Models (BPMs) in concert with subject matter experts for each operation for each of the 2015–2018 Census Tests and the 2020 Census as a tool to begin the requirements elicitation process.

- Extracting Project-Level Business Requirements (PLBR) and drafting CAP from the BPM and reviewing with subject matter experts to finalize the initial baseline of PLBR and CAP. This supports the scalability of the System of Systems.

- Facilitating broad program- and project-level understanding of needs for all phases of the 2020 Census.
- Developing 2015–2018 Census Tests and 2020 Census Workload Demand Models, which will aid the 2020 Census Operational Integrated Project Teams in identifying the nonfunctional performance PLBR and CAP.
- Conducting Program Systems Requirements Reviews (SRR) for each major census test and 2020 Census.
  - As the incremental baselines of the PLBR and CAP for 2015–2018 Census Tests and 2020 Census are completed, they will be allocated to the projects for decomposition down to the detailed solution and specification levels. At this point in the process, the role of the SEI Operation is to provide technical oversight and monitoring to ensure that solutions appropriately address the business requirements and specifications. SEI will also ensure traceability from PLBR and CAP through to the implementation of solution-level requirements and specifications.

Solution Architecture

The SEI Operation is responsible for the 2020 Census Solution Architecture and Systems, including Interfaces. The development of the solution architecture is comprised of the following:

- Building upon lessons learned from the 2010 Census, as well as the results and findings of the 2020 Census Research and Testing phase.
- Reviewing and revising BPMs developed as part of the requirements engineering effort to create the Business Architecture.
- Creating the Solution Architecture document including the Systems and Interface Inventory based on the "to be" business processes and capabilities, as well as the Architecture Transition Plan and Systems Engineering Management Plan.
- Providing technical oversight of the 2020 Census IT Project Portfolio to ensure conformance to the prescribed solution architecture.
- Conducting Program Critical Design Reviews for each major census test and 2020 Census.
- Developing the scalability plan for the overall solution architecture to meet the demand models and high availability requirements of the 2020 Census.
- Refining and delivering subsequent baselines of the 2020 Census Solution Architecture and Systems and Interface Inventories.
- Mediating gaps in capabilities between solution providers and operations representatives where required, and subsequently refining architecture to represent output of mediation.

Technical Integration and Solution Development Direction

During solution development, the requirements, architecture, and technical design are used to develop the end-product System of Systems and required interfaces. As part of Technical Integration and Solution Development, the SEI Operation performs the following activities:

- Develops and tracks progress against the IIP.
- Provides support as it relates to interpretation of PLBR, CAP, and BPM.
- Ensures development is completed according to the 2020 Census Solution.
- Oversees the Solution Development process to ensure that the overall solution is developed within cost and schedule constraints in compliance with the Census Bureau's eSDLC process.
- Conducts weekly systems integration meetings with system providers to ensure progress (teams for each system report status, issues, and risks).
- Oversees Interface Working Groups to ensure the systems as developed will function cohesively when exercised in an end-to-end fashion.
- Works with enterprise programs (such as CEDCaP and Center for Enterprise Dissemination Services and Customer Innovation (CEDSCI) to ensure that they are meeting the 2020 Census schedule and functional requirements.

Test and Evaluation

As part of Test and Evaluation area, SEI will perform the following:

- Oversee integration tests of programs that are comprised of multiple projects (CEDCaP, CEDSCI, etc.).
- Oversee integration tests of projects that are not part of a larger enterprise program or collection of projects.
- Conduct Test Readiness Reviews (TRR) for each program release.
- Conduct Integration and Test activities across programs and independent projects to ensure the 2020 Census System of Systems, as a whole, performs as expected. This level of testing could comprise many different types of tests as defined in the Test and Evaluation Management Plan.
- Conduct testing to demonstrate that systems integration and performance meet 2020 Census operational needs.
- Document measures for acceptance in the Test and Evaluation Master Plan and document end-to-end system readiness in a Test Report.

Deployment and Operations and Maintenance (O&M)

The SEI Operation provides oversight and structure around the deployment of systems as well as O&M processes. As part of the Deployment and O&M activities, the SEI Operation will perform the following:

- Provide oversight to ensure that all systems are deployed and ready to support 2015–2018 Census Tests and 2020 Census activities.
- Conduct Production Readiness Reviews (PRR) for each program release.
- Provide oversight to ensure all supporting organizations are set up and ready to support all operational activities.

Work Completed

The following work has been completed for this operation:

2017 Census Test:

- Printing and Mailing Release TRR.
- Self-Response TRR.

2018 End-to-End Census Test:

- Critical Design Review (CDR).
- Release A in production.

2020 Census:

- Two of the 4 SRRs and CDRs have taken place.
- In-Office ADC.
- GEOP.
- LUCA.
- Business process models and business and capability requirements are baselined for all business operations defined so far.
- Solutions for the 2015 Optimizing Self-Response Test, 2015 Census Test, 2015 National Content Test, and 2016 Census Test were delivered.
- The solution architectures for the 2016 Census Test and the Address Canvassing Test were baselined.
- The IIP was developed, and several key IIP Reviews were held, including:
  - SRR for the 2017 Census Test and initial SRR for the 2018 End-to-End Census Test.
  - CDR for the Address Canvassing Test and 2017 Census Test.
  - TRR for 2016 Census Test and ADC releases.
  - PRR for the 2016 Census Test releases.

Decisions Made

The following decisions have been made for this operation:

- ✓ The following key roles were filled to support the SEI Operation:
  - 2020 Systems Coordinator.
  - Chief Program Engineer.
  - Business Integration Manager.
  - Release Manager.
  - Test Lead.
  - Chief Program Architect.
  - Chief IT Security Engineer.
  - Chief Data Architect.
  - Mobile Engineering Lead.
  - IT Infrastructure Lead.

- ✓ The 2020 Census Program will leverage the enterprise infrastructure and enterprise solutions as appropriate.
- ✓ The following test tools will be used during program-level testing:
  - HP, ALM, HP Unified Functional Tester, JAWS (documented on Page 7 in Test and Evaluation Management Plan, version 2.0, 12/22/16).
  - HP Performance Center, Apache IMeter, AppDynamics (documented on page 20 in Performance and Scalability Test Plan, version 1.0, 3/6/17).
  - Perfecto Mobile (documented on page 19 in Mobile Application Performance Test Plan, version 0.1, 3/31/17).
  - HP Virtual User Generator, HP PC Monitors, HP SiteScope, cloud-based distributed testing tool—Web & Mobile Apps, CloudWatch, AppDynamics APM (documented on page 20 in Performance Test Strategy, version 1.0, 12/30/16).
  - The following test materials will be used during program-level testing:
    - Project-level Test Analysis Report, a list of known defects/issues and the associated severity, test scenarios used for project-level testing, release notes and Requirements Traceability Matrix, interface documentation (ISA/ICDs), and the security authorization (ATT/ATO) required for production operations (documented on page 18 in 2020 Census Integration and Implementation Plan, version 3.3, 3/14/17).
    - Simulated data are being generated by using the patented ExactData's Dynamic Data Generator® software tool. Simulated data are safe and inherently not Title 13 or Title 26 with the characteristics of scale, correlation, realism, and truth (documented on page 1 in Simulated Data Requirements, version 1.0, 1/30/17).
    - Types of simulated data include field data, happy path and erroneous datasets, and interface-level data (documented on page 22 in Mobile Application Performance Test Plan, version 0.1, 3/31/17).

Design Issues to Be Resolved

Additional work is required to make decisions on the following questions:

Question	Expected Date
What is the sourcing approach for each capability supporting the 2020 Census?	October 2017

Cost and Quality

SEI activities have a critical impact on the 2020 Census. Because many of the innovations aimed at reducing the cost of the census rely on IT solutions, the effectiveness of this operation could have an effect on the overall cost of the 2020 Census.

Impacts of this operation on overall 2020 Census quality include the following:

- ↑ Increase quality by setting up robust processes for system development.
  - Integration Test.
  - Performance and Scalability.
  - Design.
  - Architecture.
  - Testing.

Risks

Major concerns for the SEI Operation are covered by the IT-related 2020 Census Program risks listed in Chapter 6.

Milestones

Date	Activity
2012	Baseline the initial 2020 Census SEI Plans for each component described in this section.
2013	Create architecture and requirements artifacts for the 2014 Census Tests.
2014	Initial Baseline PLBR and CAP (to be updated as design matures).
2015	Establish Baseline 1 of Solution Architecture. Establish Baseline 1 of PLBR and CAP, which includes requirements for 2016 Census Test. Determine the approach for conducting integrated tests for 2016, 2017, and 2018 Census Tests (Design Decision 1). Determine tools and test materials required to support the integrated tests (Performance, Test Services, Representative Test Data, etc.) (Design Decision 2).

Date	Activity
April 2016	Complete deployment of systems supporting 2016 Census Test.
July 2016	Conduct CDR and TRR for Address Canvassing Test. Conduct SRR and CDR for 2017 Census Test and establish Baseline 2 of PLBR, CAP and Solution Architecture.
August 2016	Conduct SRR and CDR for 2018 End-to-End Census Test and establish Baseline 3 of PLBR, CAP and Solution Architecture. Conduct PRR and complete deployment of systems supporting Address Canvassing Test.
October 2016	Complete deployment of systems for 2016 Census Test.
November 2016	Complete TRR for 2017 Census Test. Complete TRR for 2018 End-to-End Census Test for AdCan Recruiting.
December 2016	Complete PRR for 2018 End-to-End Census Test for AdCan Recruiting/Deployment.
January 2017	Complete PRR and deployment of systems supporting 2017 Census Test recruiting, training and self-response releases. Complete TRR for 2017 Census Test.
March 2017	Complete TRR for 2018 End-to-End Census Test AdCan Training.
May 2017	Complete TRR for 2018 End-to-End Census Test In-Field ADC.
June 2017	Conduct Initial SRR and CDR for 2020 Census. Complete PRR for 2018 End-to-End Census Test AdCan Training. Conduct TRR for 2018 End-to-End Census Test Peak Operation Recruiting.
July 2017	Complete deployment for 2018 End-to-End Census Test AdCan Training and PRR for 2018 End-to-End Census Test In-Field ADC. Conduct 2018 End-to-End Census Test PRR for Peak Operation Recruiting.
August 2017	Complete deployment for 2018 End-to-End Census Test In-Field ADC and Peak Operation Recruiting. Complete second SRR and CDR for 2020 Census.
October 2017	Complete PRRs and deployment of systems supporting first four releases of the 2018 End-to-End Census Test. Conduct TRR for systems supporting self-response and field enumeration releases of the 2018 End-to-End Census Test. Complete TRR for systems supporting 2018 End-to-End Census Test self-response and field enumeration training.
December 2017	Complete TRR for systems supporting 2018 End-to-End Census Test field enumeration.
January 2018	Complete PRR and deployment of systems supporting self-response and field enumerations releases of the 2018 End-to-End Census Test.
February 2018	Complete PRR for 2018 End-to-End Census Test field enumeration.
April 2018	Complete TRR for tabulation/dissemination release of 2018 End-to-End Census Test.
May 2018	Conduct TRR for 2020 Census Recruiting, Selection, and Hiring.
July 2018	Conduct PRR for 2020 Census Recruiting, Selection, and Hiring.
October 2018	Complete PRR and deployment of systems supporting tabulation/dissemination for the 2018 End-to-End Census Test.
November 2018	Conduct TRR for 2020 Census In-Field AdCan, Training, and Peak Operation Recruiting.
February 2019	Complete TRR for 2020 Census Self-Response, Post Enumeration Survey (PES), and Peak Operations.
March 2019	Complete PRR and deployment of systems supporting the 2020 Census. Conduct Final Performance Testing. Complete PRR for 2020 Census In-Field AdCan, Training, and Peak Operation Recruiting.
June 2019	Complete PRR for 2020 Census Self-Response, PES, and Peak Operations.
October 2019	Complete TRR for 2020 Census Tabulation/ Dissemination.
February 2020	Complete PRR for 2020 Census Tabulation/ Dissemination.
September 2020	Release final as-built, and Operated Solution Architecture.
Annually	Refresh and reissue strategic program documentation and the 2020 Census Operational Plan based on lessons learned, test results, and other feedback.

5.3.2 Security, Privacy, and Confidentiality

Detailed Planning Status:	**Underway** **DOP delivered in FY 2017**

Purpose

The Security, Privacy, and Confidentiality (SPC) Operation ensures that all operations and systems used in the 2020 Census adhere to laws, policies, and regulations that:

- Ensure appropriate systems and data security.
- Protect respondent and employee privacy and confidentiality.

Changes Made Since Version 2.0 Operational Plan Release: There have been no major changes to this operation.

Lessons Learned

Based on lessons learned from the 2010 Census and other reviews, the following recommendations were made:

- Ensure IT systems and applications supporting the 2020 Census have the proper security authorization prior to start of operations.
- Ensure all 2020 Census accepted IT security risks are in alignment with the Census Bureau's security program policies.
- Ensure all of the 2020 Census IT system security risks are monitored by the 2020 Census Risk Review Board, as well as an Information System Security Officer and the Office of Information Security.
- Embed an Office of Information Security security engineer in the 2020 Census Program to ensure compliance with the IT security program and integration with the Census Bureau's Enterprise environments.
- Ensure all employees supporting IT security are certified in accordance with the Census Bureau's IT security program.

Operational Innovations

Operational innovations include the following:

- Implement an IT Security Program Risk Management Framework in accordance with National Institute of Standards and Technology guidelines.
- Hire a 2020 Census Chief IT Security Engineer to support application development, mobile computing, and enterprise systems.
- Increase staff in the Census Bureau Office of Information Security to provide penetration testing services and more extensive scanning for vulnerabilities and configuration management.
- Align all Privacy Impact Assessments and Privacy Threshold Assessments to the System Security Plans.

Description of Operation

The SPC Operation ensures that all operations and systems used in the 2020 Census adhere to the appropriate systems and data security, respondent and employee privacy and confidentiality policies, laws, and regulations. Specific requirements are outlined below.

Security

Ensure Compliance with the following laws and Census Bureau policies:

- IT Security Program Policy: Ensure all 2020 Census systems meet federal, Department of Commerce, and Census Bureau IT security policy requirements as identified in the Census Bureau IT Security Program Policy and relevant National Institute of Standards and Technology documentation.
- Ensure that the 2020 Census only collects information necessary for complying with the 2020 Census mission and legal requirements.
- Ensure all 2020 Census systems have an Authority to Operate.
- Ensure each system has a designated Information System Security Officer.
- Ensure all 2020 Census Program systems are covered by the Risk Management Framework, which includes processes to ensure systems undergo a security review before testing and a full security assessment before obtaining an Authority to Operate.
- Ensure Appropriate Suitability Screening Processes are in place.

Privacy and Confidentiality

- Ensure that the Census Bureau meets its legal obligations to protect privacy and confidentiality as prescribed by Title 5 and the Privacy Act of 1974, the E-Government Act of 2002, the Census Act (Title 13 U.S.C.) and the Internal Revenue Code (Title 26 U.S.C.); and adheres to the data stewardship policies that support these legal obligations.

- Ensure that all employees of the Census Bureau and temporary staff authorized under Title 13 U.S.C. §23(c) supporting 2020 Census operations have sworn to uphold the confidentiality provisions of Title 13 U.S.C. §9. These individuals must:
  - Sign an affidavit of nondisclosure and receive Special Sworn Status.
  - Complete the necessary Data Stewardship and IT Security Awareness training.
- Ensure that all employees and temporary staff working with data protected by Title 26 U.S.C. have completed the necessary Title 26 Awareness training and that their access is controlled and tracked per Internal Revenue Service standards.
- Ensure that the 2020 Census complies with the Census Bureau's data stewardship policies including:
  - The Census Bureau's Privacy Principles.
  - Controlling Nonemployee Access to Title 13 Data Policy (DS-006).
  - Safeguarding and Managing Information Policy (DS-007).
  - Data Linkage Policy (DS-014).
  - Respondent Identification and Sensitive Topics in Dependent Interviewing Policy (DS-016).
  - Control of Access to Personally Identified Survey and Decennial Census Data: Unauthorized Browsing Policy (DS-018).
  - Policy On Conducting Privacy Impact Assessments (DS-019).
  - Data Breach Policy (DS-022).
- Ensure that all 2020 Census operations only collect information necessary for complying with the 2020 Census mission and legal requirements.
- Ensure Decennial Privacy Impact Assessments and Privacy Threshold Analyses are current.
- Ensure that each system of record has an appropriate System of Record Notice published in the Federal Register.
- Establish a System of Record Notice for Device as a Service technology to be used in the 2020 Census.
- Ensure a privacy notice is available on all Census Bureau social media sites and other third-party Web sites operated by or on behalf of the agency.
- Align the Privacy Impact Assessments and Privacy Threshold Assessments to security plans as part of the accreditation process; work with training operations to ensure 2020 Census managers and staff are prepared to notify the respondents about the purpose and planned statistical uses of the information collected.
- Ensure Personally Identifiable Information Incident Handling process is operational.
- Recharter the decennial policy team to serve as an interdisciplinary body of experts in the area of security, privacy, confidentiality, law, policy, methodology, information technology, and communications to advise the 2020 Census in policy issues that arise during the planning and execution of the program.

Work Completed

The following work has been completed for this operation:

Encryption

- Researched securely managing data on mobile devices using Mobile Application Manager (MAM) software solution.

Cloud Technology

- Adopted the "Cloud First" strategy.
- Examined the requirements of the applications and underlying infrastructure from a security compliance perspective.
- Examined the requirements for hybrid cloud capabilities to allow flexibility in leveraging cloud technology to meet future program requirements.
- Enabled the deployment of cloud-based services.

Decisions Made

The following decisions have been made for this operation:

✓ The 2020 Census will access Title 13 and Title 26 data, including administrative records and third-party data, remotely using the Virtual Desktop Infrastructure, Virtual Private Network, and other secure infrastructure.

✓ In Decision Memorandum 2016.01, the Census Bureau decided to implement the Device as a Service strategy for provisioning equipment to enumerators in the 2020 Census. The mobile devices that will be provisioned to enumerators in the 2020 Census through the Device as a Service strategy will be managed by an Enterprise Mobility Management[4] (EMM) solution that offers Mobile Device Management (MDM) and MAM capabilities.

Design Issues to Be Resolved

There are no remaining design issues to be resolved for this operation.

Cost and Quality

Investment in SPC is projected to have minimal influence on the overall cost and quality of the 2020 Census.

Risks

In accordance with the Census Bureau's security policy, all IT systems must undergo an independent security assessment and acquire the authorization to operate prior to operating in the production environment. In addition, all systems must meet the Census Bureau's Risk Management Framework continuous monitoring requirements. **IF** an IT system supporting the 2020 Census encounters an unexpected configuration change which affects the system's security posture, **THEN** additional security assessments are required which may result in an increase in security support costs, an increase in the system security risk rating, and schedule delays.

Milestones

Date	Security Activity
April 2015	Monitor security of systems used in the 2015 Census Test.
January 2016	Conduct security reviews and assessments on system releases for the 2016 Census Test.
October 2016	Conduct security reviews and assessments on system releases for the 2017 Census Test.
March 2017	Release SPC DOP.
October 2017	Conduct security reviews and assessments on system releases for the 2018 End-to-End Census Test.
October 2018	Conduct security reviews and assessments on system releases for the defect resolution testing and post end-to-end performance testing in 2019.

[4] Both MDM and MAM fall under the umbrella term of EMM. MDM and MAM each perform different functions. MDM manages device functions such as connectivity and device policies. MAM typically involves a secure workspace to manage and protect mobile applications and its data.

5.3.3 Content and Forms Design

Detailed Planning Status:	**Underway** **DOP delivered in FY 2016**

Purpose

The Content and Forms Design (CFD) Operation performs the following activities:

- Identify and finalize content and design of questionnaires and associated nonquestionnaire materials such as letters, postcards, inserts, envelopes, and field enumeration materials.
- Ensure consistency across data collection modes and operations, including (but not limited to) questionnaire content, help text, mailing materials, and field enumeration materials.
- Provide the optimal design and content of the questionnaires to encourage high response rates.

Changes Made Since Version 2.0 Operational Plan Release: Although there have been no major changes to this operation, in this fiscal year, the Census Bureau finalized the subjects planned for the 2020 Census and submitted this documentation to Congress.

Lessons Learned

Based on lessons learned from the 2010 Census studies and reviews, the following recommendations were made:

- Ensure sufficient time for testing the questionnaire content. Also include testing of associated nonquestionnaire materials.
- Consider forms design elements (size, color, spacing implications, etc.), mode, and language when finalizing questionnaire content and design. Also test for successful data capture before implementation.
- Conduct comprehensive testing of optimized content in the usability lab and in a field test to

prevent unanticipated negative impacts on data quality.

- Determine if a bilingual initial or replacement questionnaire in bilingual selected tracts is beneficial.

Operational Innovations

Operational innovations include the following:

- Create consistent content for automated data collection instruments needed for Self-Response and NRFU.
- Redesign the bilingual paper questionnaires to flip-style design.
- Create questionnaires and associated nonquestionnaire materials in languages beyond English and Spanish.

Description of Operation

The CFD Operation is responsible for identifying and finalizing the content and design of questionnaires and associated nonquestionnaire materials. To support the 2020 Census, the CFD Operation ensures content consistency across data collection modes and operations, as question wording varies depending on mode of data collection. The CFD Operation is responsible for creating, refining, and finalizing instrument specifications for all data collection modes—Internet, phone, paper, and field enumeration. This is a significant departure from the 2010 Census, which relied on paper for data collection.

Specific activities of the CFD Operation include the following:

- Developing instrument specifications for all data collection modes: Internet, phone, paper, and field enumeration.
- Pretesting questionnaire content (e.g., cognitive testing, focus groups) before making final decisions on questionnaire topics and wording.
- Finalizing content development and design of questionnaires across all modes: Internet, phone, paper, and field enumeration.
- Finalizing content development and design of associated nonquestionnaire materials including letters, postcards, inserts, envelopes, notice of visit, and confidentiality notice.
- Optimizing questionnaire designs for each mode and all supporting materials, in alignment with systems specifications.
- Ensuring questionnaire content and supporting materials are accurate, appropriate, consistent, inviting, and easy to understand across self-response and nonresponse data collection modes.

Research Completed

The following research has been completed for this operation:

- Qualitative Research on Content:
  - Conducted qualitative research on alternative questionnaire wording for the following topics: race and Hispanic origin, relationship, within-household coverage.
    - Findings: Informed questionnaire wording (for content variations) tested in the 2015 National Content Test and other Research and Testing Phase testing.
  - Conducted expert review of paper questionnaire design and inclusion of write-in fields for all race categories.
    - Findings: Informed layout of paper questionnaire design for the 2015 National Content Test.
- Usability and Systems Testing:
  - Conducted usability testing of automated data collection instruments (Internet, field enumeration).
    - Findings: Informed final instrument layout and navigation for 2014, 2015, and 2016 Census Tests and the 2015 National Content Test.
  - Conducted testing on data capture of paper questionnaire responses.
    - Findings: Informed paper questionnaire layout for the 2014, 2015, and 2016 Census Tests and the 2015 National Content Test.
  - Conducted 2014 Census Test (relationship response categories).
    - Findings: Continue testing new relationship response categories.
  - Conducted 2015 Census Tests (content and questionnaire design).
    - Findings: Coverage questions added to respondent burden (based on observations

of field operations and respondents' reactions to questionnaire content).

- 2015 National Content Test (content and questionnaire design):
  - Finalized content to be tested during the 2015 National Content Test.
  - Developed content specifications for Internet data collection instrument.
  - Developed English and Spanish bilingual paper questionnaires (10 versions: eight for stateside, two for Puerto Rico).
  - Developed Computer-Assisted Telephone Interview instrument specifications for the 2015 National Content Test Race and Coverage Reinterview.
- 2016 Census Test (content and questionnaire design):
  - Finalized content to be tested during the 2016 Census Test.
- 2017 Census Test (content and questionnaire design).
  - Finalized content to be tested during the 2017 Census Test.

Decisions Made

The following decisions have been made for this operation:

✓ Flip-style bilingual paper questionnaires will be used for household enumeration.

✓ Coverage questions will be streamlined to reduce respondent burden while maintaining data quality (based on 2014 and 2015 Census Test field observations).

✓ The subjects planned for the 2020 Census were submitted to Congress on March 28, 2017, and are unchanged from 2010. The subjects planned for the 2020 Census include age, gender, race/ethnicity, relationship to householder, and tenure of occupied HU. The questions included on the questionnaire for the 2020 Census will be submitted to Congress by March 31, 2018.

✓ The paper questionnaire layout for respondents living in residences other than households, such as GQ and transitory locations, will be 9 x 11 inches in size, similar to the HU questionnaires.

Design Issues to Be Resolved

Additional work is required to make decisions on the following questions:

Question	Expected Date
What is the final questionnaire wording for the 2020 Census?	March 2018
What are optimal designs of questionnaires (including size and page layout) and nonquestionnaire materials for the 2020 Census?	August 2018

Cost and Quality

Investment in CFD is projected to have minimal influence on the overall cost of the 2020 Census.

Impacts of this operation on overall 2020 Census quality include the following:

↑ Internet questionnaire design is anticipated to improve the quality of self-response.

↑ Automated NRFU instrument is anticipated to improve quality of response

Risks

Changes in the content of the 2020 Census questionnaire may be requested after the content has been finalized in 2017. **IF** changes are approved for the final 2020 Census questionnaire content in 2017 or later, **THEN** the English and non-English material will need to be redesigned and reprinted, requiring additional time in the schedule and potentially delaying deliverables.

Changes in the content of the 2020 Census questionnaire may be requested after the content has been finalized in 2017. **IF** there are significant additions to the content of the questionnaire, **THEN** the number of pages in the paper questionnaire will exceed the 16-page limit for serialization and the postage cost will increase (from letter to flat rate).

Milestones

Date	Activity
May 2015	Complete cognitive testing of paper questionnaire content for 2015 National Content Test (English, Spanish). Complete cognitive testing of paper questionnaire content and associated nonquestionnaire materials in multiple languages.
August 2015	Complete cognitive testing of Internet questionnaire content for 2015 National Content Test for English and Spanish. Start conducting the 2015 National Content Test.
October 2015	Complete the 2015 National Content Test (data collection). Final questionnaire content for the 2016 Census Test: Race, Relationship, Coverage Baselined instrument specifications for the 2016 Census Test.
February 2016	Complete cognitive and usability testing of Chinese and Korean Internet and NRFU instruments and associated nonquestionnaire materials.
June 2016	Receive analysis of 2015 National Content Test results. Cognitive testing of possible additional topics (e.g., tribal enrollment).
August 2016	Receive results from cognitive test of possible additional topics (e.g., tribal enrollment).
September 2016	Release the CFD DOP.
October 2016	Analysis of the 2016 Census Test results. Finalize questionnaire content for the 2017 Census Test. Baselined instrument specifications for the 2017 Census Test.
April 2017	Submit 2020 Census topics to Congress.
October 2017	Finalize questionnaire content for the 2018 End-to-End Census Test. Baselined instrument specifications for the 2018 End-to-End Census Test.
April 2018	Submit 2020 Census question wording to Congress.
October 2018	Analyze the 2017 Census Test results.
May 2019	Finalize 2020 Census paper questionnaires for print. Finalize 2020 Census questionnaires design and layout across all modes.
March 2020	Deploy 2020 Census questionnaires across all modes.

5.3.4 Language Services

Detailed Planning Status:	**Underway** **DOP delivered in FY 2016**

Purpose

The Language Services (LNG) Operation performs the following activities:

- Assess and support language needs of non-English speaking populations.
- Determine the number of non-English languages and level of support for the 2020 Census.
- Optimize the non-English content of questionnaires and associated nonquestionnaire materials across data collection modes and operations.
- Ensure cultural relevancy and meaningful translation of 2020 Census questionnaires and associated nonquestionnaire materials.

Changes Made Since Version 2.0 Operational Plan Release: There have been no major changes to this operation.

Lessons Learned

Based on lessons learned from the 2010 Census studies and reviews, the following recommendations were made:

- Conduct further research on language selection criteria.
- Conduct cognitive testing earlier in the decade to allow for high-quality translation of questionnaires and nonquestionnaire materials.
- Optimize non-English materials to ensure cultural relevance for intended audiences.
- Allow Internet responses in English and other languages.
- Test a Spanish version of the questionnaire on the Internet.

Operational Innovations

Automated data collection instruments available in multiple languages.

Description of Operation

The LNG Operation is responsible for assessing language needs of the nation and identifying ways to reduce language barriers to enumeration for respondents within limited English-speaking

households. To support the 2020 Census, the LNG Operation will determine the number of non-English languages and level of support and optimize the non-English content of questionnaires and associated nonquestionnaire materials. The operation will ensure cultural relevancy and meaningful translation of these materials across data collection modes and operations.

To achieve the goal of reducing language barriers to enumeration, the LNG Operation supports the 2020 operations by providing data collection instruments in non-English languages, optimizing the format of bilingual paper questionnaires, and enhancing the content of all non-English mailing and field materials—such as questionnaires, letters, postcards, the notice of visit, and the confidentiality notice—through pretesting to ensure question wording and messages are consistent and culturally relevant.

To achieve the goals of assisting and creating multiple modes of collecting information from non-English-speaking respondents, the LNG Operation conducts research on language needs and trends and relies on sociolinguistic approaches to provide language operations and assistance and to identify, create, and refine non-English materials for Limited English Proficiency (LEP) respondents. The operation also includes a National Advisory Committee Language Working Group for National Advisory Committee members and subject-matter experts to jointly strategize on language operations for the 2020 Census.

Specific activities of the LNG Operation include the following:

- Determining the number of non-English languages and level of support during the 2020 Census.
- Optimizing the content of non-English questionnaires for each data collection mode, as appropriate, for LEP populations.
- Ensuring culturally and functionally appropriate questionnaire design and content across translations (e.g., through pretesting).
- Optimizing non-English content of mailing materials to: (1) ensure non-English speakers receive the same message as English speakers prior to going online; (2) determine whether non-English speakers respond differently to number and ordering of contacts than English speakers; and (3) determine whether or not adding multilanguage public-use forms increases participation by non-English speakers.
- Providing language guides in multiple languages, including American Sign Language, large print, and braille.

Research Completed

The following research has been completed for this operation:

- Qualitative Research on Non-English Content:
  - Tested for accuracy and cultural appropriateness of translated questionnaire content for the following languages: Spanish, Chinese, Korean, Vietnamese, Russian, Arabic.
    - Findings: Informed questionnaire wording for 2015 National Content Test and other mid-decade testing.
- In-House Review of Materials:
  - Conducted expert review of field materials in non-English languages.
    - Findings: Informed translated content of Notice of Visit for the 2015 Census Test; Revised Language Identification Card.
- Language Needs Assessment:
  - Assessed current language needs using American Community Survey (ACS) data.
    - Findings: Informed non-English support for 2015, 2016, and 2017 Census Tests and the 2015 National Content Test.
- Research on Translation Technology:
  - Conducted research on translation machines.
    - Findings: Machine translations generally show severe structural, grammatical, and contextual errors and should not replace human translations.
- Usability and Systems Testing:
  - Conducted usability testing of Spanish automated data-collection instruments (Internet, field enumeration).
    - Findings: Informed final instrument layout and navigation for the 2014, 2015, 2016, and 2017 Census Tests and the 2015 National Content Test.
  - Conducted usability testing of Chinese and Korean automated data-collection instruments (Internet, field enumeration).

        - Findings: Informed final instrument layout and navigation for the 2016 Census Test.
    - Conducted testing on data capture of Spanish paper questionnaire responses.
        - Findings: Informed paper questionnaire layout for the 2014, 2015, 2016, and 2017 Census Tests and the 2015 National Content Test.
- Field Testing of Non-English Instruments and Materials:
    - Conducted testing of data collection instruments (Internet, phone, paper, field enumeration) and mailing/field materials in Spanish, Chinese, and Korean.
        - Findings: Informed final instrument layout and navigation for the 2016 Census Test.

Decisions Made

The following decisions have been made for this operation:

✓ Flip-style bilingual paper questionnaires will be used instead of the swimlane style.

✓ The LNG Operation will utilize a National Advisory Committee Language Working Group for early engagement on language assistance plans for the 2020 Census.

✓ Supported languages proposed by the LNG Operation were included in the Request for Proposal (RFP) released in January 2016. Supported languages will be revised on an on-going basis, as needed.

Design Issues to Be Resolved

Additional work is required to make decisions on the following questions:

Question	Expected Date
What are the number of non-English languages and level of support needed for the 2020 Census?	September 2017

Cost and Quality

Investment in LNG is projected to have minimal influence on the overall cost of the 2020 Census.

Impacts of this operation on overall 2020 Census quality include the following:

↑ Automated data collection instruments in non-English languages anticipated to improve quality of responses from non-English speaking respondents.

↑ Culturally appropriate, translated questionnaires and associated nonquestionnaire materials anticipated to improve quality of responses of non-English speaking respondents.

Risks

Any changes to the finalized 2020 Census content will impact all non-English content. **IF** the final English content changes after April 2018, **THEN** there will not be adequate time in the schedule to translate, design, and produce non-English questionnaires for the 2020 Census.

Milestones

Date	Activity
March 2016	Deploy Internet and NRFU instruments in Spanish, Chinese, and Korean for the 2016 Census Test. Deploy bilingual paper questionnaire and associated nonquestionnaire materials in Spanish, Chinese, and Korean for the 2016 Census Test.
September 2016	Release the LNG DOP.
2016–2019 (ongoing)	Conduct qualitative research on data collection instruments and materials in additional languages.
September 2017	Determine number of non-English languages and level of support for the 2020 Census.
March 2018–2019	Continue development of Internet instrument in additional non-English languages for 2020.
March 2020	Deploy 2020 Census non-English data collection instruments and materials.

5.4 FRAME

The operations in this area have the goal of developing a high-quality geospatial frame that serves as the universe for the enumeration activities. This area consists of three operations: Geographic Programs (GEOP), Local Update of Census Addresses (LUCA), and Address Canvassing (ADC). Each is described below.

5.4.1 Geographic Programs

Detailed Planning Status:	**Underway** **DOPs delivered in FY 2016**

Purpose

The Geographic Programs (GEOP) Operation provides the geographic foundation in support of the 2020 Census data collection and tabulation activities within the Master Address File/Topologically Integrated Geographic Encoding and Referencing (MAF/TIGER) System. The MAF/TIGER System (software applications and databases) serves as the national repository for all of the spatial, geographic, and residential address data needed for census and survey data collection, data tabulation, data dissemination, geocoding services, and map production.

Components of this operation include:

- Geographic Delineations.
- Geographic Partnership Programs.
- Geographic Data Processing.

Changes Made Since Version 2.0 Operational Plan Release: There were changes made to the Types of Enumeration Areas (TEA) to accommodate the new Update Leave (UL) Operation and the addition of New Construction to the 2020 Census.

Lessons Learned

Based on lessons learned from the 2010 Census studies and reviews, the following recommendations were made:

- Consider consolidation of field operations, and TEA values used to support field operations.
- To the greatest extent possible, attempt geographic reconciliation activities of boundaries on an ongoing basis throughout the decade.
- To the greatest extent possible, geographic extracts and updates should be made in an electronic form to reduce the production, shipping, and handling of paper maps and paper listings by the Census Bureau and its program participants.
- Update the MAF through partnership programs in order to increase the Census Bureau's ability to geocode addresses from the USPS Delivery Sequence File (DSF).

Operational Innovations

Operational innovations include the following:

- Use of varied data sources (e.g., imagery and third-party data) to validate and augment the MAF/TIGER System throughout the decade:
  - As part of the Geographic Support System Initiative (GSS-I) the Census Bureau has obtained address and road center-line data from state and local partnerships and has updated the MAF/TIGER System with these data since 2013.
  - Ongoing investigation of potential use of third-party data sources.
- Development of a modular, multimode, Geographic Update Partnership Software (GUPS) to streamline partners' participation.
- Delineation of BCUs to:
  - Eliminate operation specific Assignment Area delineations.
  - Incorporate data and information not previously used in delineation such as predominant HU characteristics (e.g., single unit, GQ, and mobile homes).

Description of Operation

The GEOP Operation includes components of the 2020 Census that are geographic in nature. The components of the GEOP project fall into three general categories as shown in Figure 29:

- Geographic Delineations.
- Geographic Partnership Programs.
- Geographic Data Processing.

Geographic Delineations

The Geographic Delineation component of the GEOP determines, delineates, and updates the geographic area boundaries for 2020 Census data collection and data tabulation. Census data collection relies on the delineation of various geographic areas, known as "collection geography," to support the capture of data during census activities. This includes both the delineation of the methods used to enumerate households and the definition of field management areas. The following collection geography is delineated during the 2020 Census:

- **TEA:** In an effort to ensure the most cost effective and efficient process to enumerate

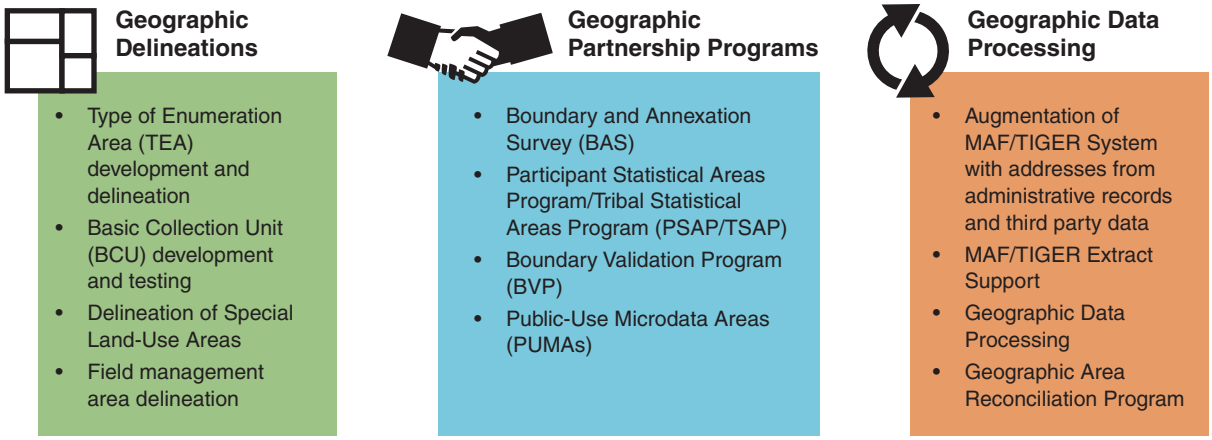

Figure 29: Summary of Geographic Programs Components

households, every BCU in the United States is assigned to one specific TEA. The TEA reflects the methodology used to enumerate the households within the block. The TEA assignment utilizes a variety of information to identify the most cost effective enumeration approach for all of the United States, District of Columbia, Puerto Rico, and the Island Areas.

- **BCU:** BCU serves as the smallest unit of collection geography for all 2020 Census listing operations. The BCU replaces both the collection block and assignment area geographies used for the 2010 Census.
- **Special Land-Use Area:** A key component of collection geography is the delineation of land areas that may require unique field treatment or tabulation. This includes military areas, GQ areas (e.g., correctional facilities and colleges and universities), and public lands. The main purpose of the special land use delineation is to improve tabulation block boundaries, to allow field operations to manage special land use areas in the field effectively, to assist in maintaining the GQ address list, to allow for public lands to be removed from In-Field Address Canvassing (see Section 5.4.3) and other field operations, and to maintain relationships between these areas and other geographic entities such as incorporated places and American Indian Areas.
- **Field Management Area Delineation:** This component of collection geography includes delineation of geographic areas, other than BCUs and TEA, which are necessary to manage and accomplish fieldwork for the 2020 Census. In past censuses, this has included Crew Leader Districts, Field Operation Supervisor Districts, and Area Census Office (ACO) boundaries. For the 2020 Census, this will consist of the Area Census Office boundaries, the Census Field Management areas, and on an operation-by-operation basis, Census Field Supervisor areas.

Census results are dependent on the delineation of various geographic areas to both tabulate and report person and household statistics. The delineation of these geographic areas, known as "tabulation geography" is based on input from partnership programs (such as the Participant Statistical Areas Program/Tribal Statistical Areas Program [PSAP/TSAP], or internally defined tabulation criteria, such as the Urbanized Area delineation. After rules are defined or tabulation geographies are proposed by partners, the tabulation geography is delineated in the MAF/TIGER System through a series of batch and interactive delineations and then followed by a series of data integrity validations, renumbering, and certification steps. Once the tabulation geographic areas are certified, they are loaded into the MAF/TIGER database and used for the tabulation of statistical data and as the base for various geographic data products that support the 2020 Census. Tabulation geography planned for the 2020 Census includes:

- American Indian Areas.
- Metropolitan and Micropolitan Statistical Areas and Related Statistical Areas.

- Counties.
- County Subdivisions.
- Census Designated Places.
- Census Tracts.
- Block Groups.
- Blocks.
- Congressional Districts.
- State Legislative Districts.
- Voting Districts.
- Zone Improvement Plan Code Tabulation Areas.
- Urban Areas.

These geographies are used to tabulate and disseminate data from the decennial census, the ACS, and other censuses and surveys, and are used outside of the Census Bureau by other government agencies in program administration and in determining program eligibility and fund allocation.

Geographic Partnership Programs

Prior to the 2020 Census, the Census Bureau will conduct geographic partnership programs to make the address list as up-to-date as possible and ensure complete coverage of all HU. The geographic partnership programs also help define statistical geographic area boundaries that will provide meaningful data from the 2020 Census. Following are the 2020 Census Geographic Partnership Programs:[5]

- **Boundary and Annexation Survey (BAS):** An ongoing survey for collecting and maintaining information about the inventory of the legal boundaries for, and the legal actions affecting the boundaries of, counties and equivalent governments, incorporated places, Minor Civil Divisions, Consolidated Cities, Urban Growth Areas, Census Areas of Alaska, Hawaiian Homelands, and federally recognized legal American Indian and Alaska Native areas (including the Alaska Native Regional Corporations). This information provides an accurate identification and depiction of geographic areas for the Census Bureau to use in conducting the decennial and economic censuses and ongoing surveys such as the ACS.
- **PSAP/TSAP:** Programs that allow designated participants, following Census Bureau guidelines, to review and suggest modifications to the boundaries of block groups, census tracts, Census County Divisions, and Census Designated Places. Participants can also propose new Census Designated Places based on specific criteria. The 2020 Census PSAP includes all tribal statistical boundaries, which were administered through the TSAP in the 2010 Census, combining the two programs. The TSAP geographies are Oklahoma Tribal Statistical Areas, Tribal Designated Statistical Areas, State Designated Tribal Statistical Areas, tribal census tracts, tribal block groups, statistical tribal subdivisions, Alaska Native Village Statistical Areas, and for administrative purposes, one legal area, state reservations.
- **Boundary Validation Program (BVP):** The intent of the BVP is to provide the Highest Elected Official a last opportunity to review the entity boundary, and any address range breaks where the boundary of their jurisdiction intersects a road, before the tabulation of census data.
- **Public-Use Microdata Areas:** Geographic units used for providing statistical and demographic information. Public-Use Microdata Areas do not overlap and are contained within a single state.

Geographic Data Processing

The Geographic Data Processing component of GEOP includes all activities that relate to the extract, update, and maintenance of the features, boundaries, and addresses in the MAF/TIGER System. Geographic data captured as part of the 2020 Census, including address updates, structure coordinate locations, boundaries, and roads data will be processed to ensure that the MAF/TIGER System is up to date. Following are the major geographic data processing activities that will occur in the 2020 Census:

- **Frame Development** includes the receipt and processing of various address records from sources such as the USPS, state and local governments, and third-party data sources. These data help ensure accurate address coverage within the 2020 Census Frame.
- **MAF/TIGER Extract Support** includes activities related to preparing extracts or services

[5] Components of the RDP and the LUCA are also Geographic Program Partnership Programs, but they are covered in other sections of this document.

enabling 2020 Census systems access to addresses from the MAF/TIGER System, as well as activities related to the production of spatial extracts or services for use in various field data-collection instruments and control systems and printing of paper.

- **Geographic Data Processing** includes activities related to extract from and update to the features, boundaries, and addresses within the MAF/TIGER System. The MAF/TIGER updates include any changes to the features, addresses, or boundaries that result from 2020 Census data collection operations or geographic partnership programs. The geographic data processing activities establish benchmarks from the MAF/TIGER System by taking a snapshot of the database at various points during the decade. Each benchmark becomes the foundation on which future updates are applied. These benchmarks support the collection, tabulation, and dissemination of census and survey information and providing geocoding services and geospatial data products.
- **Geographic Area Reconciliation Program (GARP)** includes editing and reconciliation of boundaries within the MAF/TIGER System. This reconciliation resolves boundary and feature discrepancies provided by separate partnership programs at different points in time or updates prior to release of 2020 Census tabulation products.
- **Paper Map Creation and Plotting/Printing** includes the creation of large- and small-format maps for use electronically and potentially for plotting or printing.

Research Completed

The following research has been completed for this operation:

- Research conducted and completed within the initial phases of the GSS-I program:
  - **Findings:** Demonstrated that commercial spatial data are a valuable additional source when a local spatial file is not available or the local spatial file does not meet our feature minimum guidelines.
- Research on use of public lands data:
  - **Findings:** Demonstrated that public lands data will be useful in the delineation of 2020 Census TEAs and collection geography.
- Post Census analysis of 2010 Census Assignment Area definitions:
  - **Findings:** Helped lay the foundation for establishing a consistent assignment unit—the BCUs.

Decisions Made

The following decisions have been made for this operation:

Geographic Delineations:

- ✓ BCUs have been used for tests since the 2016 Address Canvassing Test.
- ✓ Special Land-Use Areas and public lands will be used in the delineation of collection geographies. The current focus is on military and national park lands.
- ✓ The Statistical Areas programs (PSAP/TSAP) will be used in the delineation of 2020 Census tabulation geography.
- ✓ The 2020 Census will include delineation of:
  - Tabulation geography (Blocks, Block Groups, Tracts, etc.).
  - Zone Improvement Plan Code Tabulation Areas.
  - Urban Areas as defined by the 2020 Census Urban Area Delineation Program.
- ✓ The following are the TEA required for the 2020 Census:
  - TEA 1 = Self Response.
  - TEA 2 = UE.
  - TEA 3 = Island Areas.
  - TEA 4 = Remote Alaska.
  - TEA 5 = Military.
  - TEA 6 = UL.

Geographic Partnership Programs:

- ✓ The geographic programs conducted in the 2010 Census will occur in the 2020 Census. New Construction will be a part of the 2020 Census and will be conducted similar to the LUCA operation.

- ✓ The GUPS will support:
  - º All geographic partnership programs (i.e., BAS, PSAP/TSAP, Boundary Validation Program, and Public-Use Microdata Areas).
  - º Redistricting Data Program (RDP)
  - º LUCA
  - º Count Question Resolution
  - º GARP
  - º New Construction
  - º Count Review
- ✓ Partnership programs will offer limited paper materials.
- ✓ Data received from partnership programs will be processed at the National Processing Center (NPC).

Geographic Data Processing:

- ✓ Enterprise solutions will be used to capture relevant geographic data.
- ✓ Imagery will be available as a backdrop in field listing and field enumeration instruments.
- ✓ The MAF/TIGER System will leverage a Service-Oriented Architecture for dissemination products and tools.
- ✓ The USPS DSF will continue to be used as the primary source of address updates for the MAF/TIGER System.
- ✓ Frame development will include the receipt and processing of administrative records and third-party data sources.
- ✓ Boundary reconciliation within the MAF/TIGER System will be ongoing.
- ✓ MAF/TIGER will interact with other systems using service-oriented architecture.
- ✓ MAF/TIGER is the source for all data collection and field management applications.

Design Issues to Be Resolved

Additional work is required to make decisions on the following questions:

Question	Expected Date
In which 2020 Census operations will addresses and features be updated and added? What are the expectations for the capture and availability of field updates? Available in real time? Available with the timeframe of the operations? Available for the next operation? Available for the final tabulation?	August 2017
How will the MAF/TIGER System be used in support of reengineered field operations? For example, what are the data input and output processing and timing requirements and the workflows needed to support field data collection operations?	October 2017

Cost and Quality

Investment in GEOP is projected to have minimal influence on the overall cost of the 2020 Census.

Impacts of this operation on overall 2020 Census quality include the following:

- ↑ Address and spatial data in the MAF/TIGER System are validated using multiple data sources.
- ↑ Address and spatial data in the MAF/TIGER System are updated continuously.
- ↑ Ongoing reconciliation of boundaries across programs, such as the BAS and the RDP, will result in higher quality tabulation boundaries.

Risks

Programs must inform Geography Division if printed maps will be required. **IF** program managers do not plan their budgets adequately in regard to the costs required to create maps, including staff hours, plotters, supplies, and shipping, **THEN** there may not be the budget allocation required to fund the automated batch creation, Quality Assurance, and printing/plotting of maps.

The Geography Programs Quality Control and Plotting System used in 2010 has not been maintained. **IF** requirements for batch automated maps are delivered without sufficient lead time, **THEN** no Quality Assurance, plotting control system, or servers will be in place to support any steps following the batch creation of the maps.

Milestones

Date	Activity
Geographic Delineation Programs	
April 2014	Initiate Development of Tabulation Block Criteria.
March 2016	Initiate Conducting Initial BCU Delineation.
June 2016	Initiate Conducting Initial TEA Delineation.
August 2016	Initiate Delineation of Field Offices.
September 2016	Release the Geographic Delineation Programs DOP.
January 2017	Complete Delineation of Field Offices.
December 2017	Initiate Delineation of Field Management Areas.
April 2019	Update and Finalize BCUs.
July 2019	Update and Finalize 2020 TEA Delineation.
September 2020	Complete Delineation of Field Management Areas.
Geographic Partnership Programs	
December 2015	Initiate Delivery and Maintenance of GUPS.
September 2016	Release the Geographic Partnership Programs DOP.
October 2016	Open Geographic Partnership Support Desk.
August 2017	Complete 2017 BAS.
August 2018	Complete 2018 BAS.
May 2019	Complete PSAP Delineation.
August 2019	Complete 2019 BAS.
February 2020	Complete PSAP Verification.
August 2020	Complete 2020 BAS.
August 2022	Complete BVP.
September 2022	Complete Public Use Microdata Area. Complete Delivery and Maintenance of GUPS. Close Geographic Partnership Support Desk.
Geographic Data Processing	
December 2015	Initiate Geographic Data Processing.
September 2016	Release the Geographic Data Processing DOP.
June 2019	Deliver Address Canvassing In-Field Universe.
January 2020	Deliver 2020 Census Initial Universe (Internet Self-Response, UE).
June 2020	Initiate GARP.
July 2020	Complete 2020 Census Field Operations Updates (Addresses, Mapspots, and Features).
September 2020	Deliver Final Tabulation Geographic Products.
September 2022	Complete Geographic Data Processing.

5.4.2 Local Update of Census Addresses

Detailed Planning Status:	**In Production DOP delivered in FY 2016**

Purpose

The Local Update of Census Addresses (LUCA) Operation provides an opportunity for tribal, federal, state, and local governments to review and improve the address lists and maps used to conduct the 2020 Census. This operation is required by the Census Address List Improvement Act of 1994 (Public Law (P.L.) 103-430).

Changes Made Since Version 2.0 Operational Plan Release: There have been no major changes to this operation. The 2020 Census LUCA Operation implementation started in January 2017.

Lessons Learned

Based on lessons learned from the 2010 Census studies and reviews, the following recommendations were made:

- Provide program materials (i.e., address lists and maps) in standard, off-the-shelf commercial software formats.
- Simplify the process for small (6,000 or fewer HU), lower-level governments (i.e., minor civil divisions and places).
- Explain the definition and use of addresses and HU better, so that participants will understand why post office boxes and rural route numbers are not in scope for the Census Bureau's LUCA Program.

Operational Innovations

Considering recommendations from the 2010 Census and the 2020 Census Research and Testing Phase, and the design of a reengineered 2020 Census, operational innovations include the following:

- Reduce the complexity of the LUCA Program as compared with the 2010 Census program.
- Eliminate the full address list submission options that were available in 2010 Census LUCA in order to:
  - Reduce the number of deleted LUCA records during verification activities.
  - Reduce the burden and cost of processing addresses and LUCA address validation.
  - Provide early access to the address count list, detailing the count of every address in each block.
  - Provide partners with automated tools for geocoding and reviewing their address list.

Description of Operation

The LUCA Operation provides the opportunity for tribal, federal, state, and local governments to review and comment on the Census Bureau's address list and maps to ensure an accurate and complete enumeration of their communities. The Census Address List Improvement Act of 1994 (P.L. 103-430) authorized the Census Bureau to provide individual addresses to designated local officials of tribal, federal, state, and local governments who agreed to conditions of confidentiality in order to review and comment on the Census Bureau's address list and maps prior to the decennial census. The basic process for LUCA includes:

- Census Bureau provides address list and maps to the governmental entities.
- Governmental entities review and add, delete, or change address records or features.
- Census Bureau incorporates the updates to MAF/TIGER System.
- Census Bureau validates the updates through a clerical review, automated address matching, and ADC.
- Census Bureau provides feedback to the governmental entities.
- Governmental entities can appeal the ADC validation outcomes.

Research Completed

The following research has been completed for this operation:

- The LUCA Program Improvement Project completed their recommendations for the 2020 Census LUCA Operation. The research focused on improving the LUCA Operation with research by the following four research areas (2020 Census LUCA Program Recommendations 4/13/2015):
  - Looking back at previous LUCA and related programs.
    - Findings: Simplify the 2020 Census LUCA program as the 2010 Census LUCA program was too complicated.
  - Validating LUCA records without ADC.
    - Findings: It is possible to validate LUCA addresses in an office environment.
  - Utilizing GSS-I for LUCA.
    - Findings: Data and tools used for the GSS-I should be used and repurposed for the LUCA program.
  - Focus Groups.
    - Findings: Focus group participants agreed with the proposal to remove the full address list submission options for the 2020 Census LUCA program.
- As part of the 2020 Census Research and Development efforts, staff evaluated the 2010 LUCA and 2010 lessons learned and conducted a series of focus groups with former LUCA participants. This effort resulted in 12 major recommendations for the 2020 Census LUCA Operation. (Note: These recommendations are described in more detail in the 2020 Census LUCA Project Improvement Report):
  1. Continue the 2010 Census LUCA Program improvements that were successful:
     - Continue to provide a 120-day review time for participants.
     - Continue the 6-month advance notice about the LUCA program registration.

- Continue a comprehensive communication program with participants.
- Continue to provide a variety of LUCA media types.
- Continue to improve the Partnership Software application.
- Continue state participation in the LUCA program.

2. Eliminate the full address list submission options that were available in 2010 LUCA. This will:
   - Reduce the number of deleted LUCA records in field verification activities.
   - Reduce the burden and cost of processing addresses and LUCA address validation.
3. Reduce the complexity of the LUCA Program as compared with the 2010 Census program.
4. Include census structure coordinates in the census address list and allow partners to return their structure coordinates as part of their submission:
   - Benefits participants and the Census Bureau in the review of materials because it enables more information about each address to be considered in both the participants review and the Census Bureau's validation of the submitted addresses.
5. Provide ungeocoded U.S. Postal Service Delivery Sequence File addresses to state and county partners in LUCA materials:
   - Provides more complete data for participants to review.
   - May result in participants being able to geocode previously ungeocoded addresses for the census.
   - Should reduce the number of duplicate addresses submitted by LUCA participants.
6. Provide the address list in more standard file formats so that lists are easier to load into common software packages.
7. Include an in-house verification of LUCA submitted addresses to align with the reengineered ADC.
8. Utilize and modify existing GSS-I tools and data to validate LUCA submission.
9. Encourage governments at the lowest level to work with larger governments to consolidate their submission.
10. Eliminate the Block Count Challenge, as previously this did not result in useful information for the Census Bureau to determine specifically what addresses were missing from a block.
11. Eliminate the option for participants to use an asterisk (*) for multiunits submitted without unit designations.
12. Encourage LUCA participants to identify E-911 Addresses used for mailing, location, or both addresses so that the Census Bureau has more information available during MAF update.

Decisions Made

The following decisions have been made for this operation:

- ✓ Conduct a comprehensive communication program with LUCA participants.
- ✓ Include census structure coordinates in the census address list and allow partners to return their structure coordinates as part of their submission.
- ✓ Provide ungeocoded addresses to state and county partners in LUCA materials.
- ✓ Provide the address list in more standard file formats so that lists are easier to load into common software packages.
- ✓ Encourage governments at the lowest level to work with larger governments to consolidate their submissions.
- ✓ Provide a variety of LUCA media types.
- ✓ Simplify the 2020 Census LUCA program and make it compatible with the GSS-I and ADC.
- ✓ Utilize administrative records and third-party data to improve validation process.
- ✓ Use the GUPS to support automated exchange of information for LUCA participants.
- ✓ Validation of LUCA submissions will occur primarily by matching to existing MAF, GSS, and administrative records. Those LUCA addresses

needing further validation will go to In-Office Address Canvassing. There will be no In-Field Address Canvassing validation for LUCA submissions.

- ✓ The Census Bureau will provide an option for partners to access registration materials online and return them by email. Scanned signatures will be accepted, but not E-signatures.
- ✓ LUCA will instruct participants to provide mailing address, location address, or both. All data will be used to match to the Census Bureau's MAF.
- ✓ The strategy for late decade GSS activities during LUCA is to continue GSS partner file activities through the 2020 Census and beyond. GSS is an ongoing program.
- ✓ There will be a separate New Construction Program for the 2020 Census.

Design Issues to Be Resolved

Additional work is required to make decisions on the following questions:

Question	Expected Date
What is the 2020 Census LUCA Appeals process?	October 2018

Cost and Quality

Investment in LUCA is projected to have minimal influence (reduce ↓ or increase ↑) on the 2020 Census overall costs in the following ways:

Impacts of this operation on overall 2020 Census quality include the following:

- ↑ Removing the full address list submission options, thereby reducing the number of addresses that need to be validated.
- ↑ Use of administrative records and third-party data to validate incoming addresses from tribal, federal, state, and local governments to independently validate submitted addresses prior to adding them to the MAF.

Risks

The Census Bureau needs to work with the Office of Management and Budget to determine the requirements for the LUCA Appeals Office by October of 2018. **IF** the LUCA Appeals Office is not planned in coordination with the Office of Management and Budget, **THEN** the Census Bureau will be required to play a larger role in the development of the LUCA Appeals Office.

Milestones

Date	Activity
September 2016	Release the LUCA DOP.
February 2017	Mail Advance Notice Package.
July 2017	Mail Invitation Package.
February 2018	Mail Review Materials.
October 2018	Complete Initial Processing of LUCA submissions for delivery to ADC.
June 2019	Complete ADC validation of LUCA addresses.
August 2019	Deliver Feedback Materials.
March 2020	Complete the processing of LUCA Appeal addresses.
September 2021	Complete LUCA.

5.4.3 Address Canvassing

Detailed Planning Status:	**Underway DOP delivered FY 2016**

Purpose

The Address Canvassing (ADC) Operation serves two purposes:

- Deliver a complete and accurate address list and spatial database for enumeration.
- Determine the type and address characteristics for each LQ.

Changes Made Since Version 2.0 Operational Plan Release: Based on funding uncertainty and reprioritization of critical components of the 2020 Census, Active Block Resolution (ABR) was discontinued. The discontinuation of ABR will result in a larger workload being sent to In-Field Address Canvassing.

Lessons Learned

Based on lessons learned from the 2010 Census studies and reviews, the following recommendations were made:

- Continuously update the maps and address lists throughout the decade, supplementing these activities with ADC at the end of the decade.

- Allow more time in the schedule to fully develop and test the listing instrument.
- Improve the ADC training to emphasize working from the ground to the Handheld Computer.

Operational Innovations

Operational Innovations include the following:

- Conducted In-Office Address Canvassing for the entire nation.
- Target 30 percent of LQs in the self-response areas for In-Field Address Canvassing.
- Use of automation and data (imagery, administrative records, and third-party data) for In-Office Address Canvassing.
- Implement MAF Coverage Study to validate In-Office Address Canvassing procedures, measure coverage, and improve In-Field Address Canvassing data collection methodologies.
- Use of reengineered field management structure and approach to managing fieldwork, including new field office structure and new staff positions.

Description of Operation

The Census Bureau needs the address and physical location of each LQ in the United States to conduct the census. During ADC, the Census Bureau verifies that its master address list and maps are accurate so the tabulation for all HU, GQ, and TL is correct. A complete and accurate address list is the cornerstone of a successful census.

The Census Bureau has determined that while there will be a full ADC of the nation in 2020, a full In-Field Address Canvassing of the nation is no longer necessary. Advancements in technology have enabled continual address and spatial updates to occur throughout the decade as part of the In-Office Address Canvassing effort. This has made it possible to limit In-Field Address Canvassing to only the most challenging areas. The scope of the ADC Operation for the 2020 Census includes:

- In-Office Address Canvassing: Process of using empirical geographic evidence (e.g., imagery, comparison of the Census Bureau's address list to partner-provided lists) to assess the current address list. This process also removes geographic areas from the In-Field Address Canvassing workload based on the availability of administrative data sets (e.g., military lands, national forests) and the method of enumeration planned for the 2020 Census (e.g., areas that will be subject to UL or UE operations, which will not be part of In-Field Address Canvassing). This process detects and identifies change from high-quality administrative and third-party data sources to reduce the In-Field Address Canvassing workload. This process determines the In-Field Address Canvassing universe.
  - In-Office Address Canvassing assesses the extent to which the number of addresses—both HU and GQ—in the census address list is consistent with the number of addresses visible in current imagery. This process is known as Interactive Review.
  - A follow-up process seeks to research and update areas identified with growth, decline, undercoverage of addresses, or overcoverage of addresses from the comparison of the two different vintages of imagery and counts of addresses in the MAF. This process is known as Active Block Resolution (ABR). ABR was suspended in support of the 2020 Census in early 2017. All other In-Office Address Canvassing processes are fully operational.
  - In-Office Address Canvassing also includes three additional components that review address-level records:
    - **Ungeocoded Resolution** geocodes addresses in the MAF/TIGER system that are not currently assigned to a specific block.
    - **In-Office Address Canvassing GQ** reviews and updates GQ and TL addresses and their associated information.
    - **LUCA Address Validation** confirms the existence of the LUCA address submissions by tribal, federal, state, and local governments.
- In-Field Address Canvassing: Process of doing a dependent listing in the field to identify where people live, stay, or could live or stay. Field staff compare what they see on the ground to the existing census address list and either verify or correct the address and location information, adding addresses to the list as necessary. Field staff also classify each LQ as a HU or GQ.

- Quality Assurance: Process of reviewing the work of field and office staff. Both In-Field Address Canvassing and In-Office Address Canvassing work will be validated using quality assurance techniques.
- MAF Coverage Study: A field activity that validates In-Office procedures, measures coverage, improves In-Field data collection methodologies, and updates the MAF on a continuous basis.

Research Completed

The following research has been completed for this operation:

- September 2014: Released the *Address Canvassing Recommendation Report.*
  - Findings: A recommendation was made to not walk every block and to implement the reengineered ADC (In-Field and In-Office).
- February 2015: Completed the 2015 Address Validation Test, which consists of the MAF Model Validation Test and the PBC Test.
  - Findings:
    - The statistical models were not effective at identifying specific blocks with many adds or deletes.
    - The statistical models were not effective at predicting national totals of MAF coverage errors.
    - PBC was successfully implemented as an alternative field data collection methodology; future work will determine how the PBC method impacts cost and quality.
    - Imagery Review successfully identified areas requiring updates; future research is needed to refine the process and determine impacts on quality.
- November 2016: Completed the ADC Test, which included the Buncombe County, North Carolina, and the St. Louis, Missouri, test sites.
  - Findings:
    - The Census Bureau should continue pursuing the use of In-Office Address Canvassing methods to reduce the workload for In-Field Address Canvassing.
    - In-Office Address Canvassing methods are generally effective in detecting where the MAF has remained accurate, where it is keeping pace with changes on the ground, and where fieldwork is needed to acquire address updates.
    - Assumptions about situations that pose challenges to detecting change through imagery analysis are generally correct.
- December 2016: Completed the 2016 MAF Coverage Study.
  - Findings:
    - For the census frame, the national estimate of overcoverage is 5.5 percent and the national estimate of undercoverage is 6.6 percent.
    - The MAF Coverage Study estimated that there were 7.4 million addresses in the census frame that are deletes, duplicates, or nonresidential.
    - The MAF Coverage Study estimated that the census frame and the MAF were missing 3.3 million new addresses.

Decisions Made

The following decisions have been made for this operation:

- ✓ The ADC Operation consists of:
  - In-Office Address Canvassing.
  - In-Field Address Canvassing.
  - MAF Coverage Study.
  - Quality Assurance.
- ✓ Administrative records and third-party data sources will be used to validate addresses within each block.
- ✓ GQ will be identified and classified during ADC.
- ✓ Geographic areas (e.g., LQ and feature), which are covered by enumeration operations that include a listing component, will no longer be canvassed by In-Field Address Canvassing (e.g., UE, UL, and Remote Alaska areas).
- ✓ Based on funding uncertainty and reprioritization of critical components of the 2020 Census, the Census Bureau will not be able to meet the 25 percent In-Field Address Canvassing goal. ABR was discontinued in the winter of 2017 in order to evaluate and redesign the operation to streamline production and improve quality control. The discontinuation of ABR will result in

a larger workload being sent to In-Field Address Canvassing.

- ✓ The current estimate is that 30 percent of the LQ in the self-response areas will be canvassed during In-Field Address Canvassing.
- ✓ Production ADC began in September 2015.
- ✓ ADC provides training for both production and quality assurance processes for in-office work.
- ✓ ADC relies on automated training for production and quality assurance processes for in-field work.
- ✓ ADC updates the Census Bureau's address list using a dependent canvass (from ground to list).
- ✓ ADC validates and collects coordinates for every structure with a LQ.
- ✓ The MAF Coverage Study is planned for implementation throughout the decade. The Census Bureau completed the first MAF Coverage Study during FY 2016. Based on funding uncertainty and reprioritization of critical components of the 2020 Census, the Census Bureau completed the first half of the 2017 MAF Coverage Study but paused it on April 1, 2017.
- ✓ In-Office Address Canvassing creates the universe for In-Field Address Canvassing.
- ✓ In-Office Address Canvassing will review public lands.
- ✓ Results from In-Office Address Canvassing can add and remove BCUs into and from the In-Field Address Canvassing universe.
- ✓ All BCUs in the In-Field Address Canvassing universe will be identified prior to the start of In-Field Address Canvassing.
- ✓ Statistical modeling will not be used in ADC.
- ✓ Imagery will be available on the Listing and Mapping Instrument to use during In-Field Address Canvassing.
- ✓ ADC will validate LUCA submissions.
- ✓ Validation of LUCA submissions will occur during In-Office Address Canvassing.
- ✓ The Census Bureau will canvas the whole block (or BCU) during In-Field Address Canvassing.
- ✓ ADC will leverage the same capabilities developed for NRFU for In-Field Address Canvassing including automated payroll, routing to assignments, and various alerts.
- ✓ Ungeocoded addresses will be worked via the In-Office Address Canvassing Operation. See the 2020 DOP for the ADC Operation for details on the process.
- ✓ Coordinates captured for features and LQ will be collected using available technology. Metadata will be collected and provided for use in improving the spatial accuracy if deemed necessary.
- ✓ Spatial feature data will not be captured in the field. Field staff will identify where features are missing and report that back to Headquarters (HQ) for processing.
- ✓ In-Field Address Canvassing Quality Control will be conducted in the field, with specific BCUs selected primarily based on their characteristics.
- ✓ The business processes that the Census Bureau will use to handle TL during In-Field Address Canvassing are conceptually based on the 2010 Census. Field staff will attempt to verify the address, name, and contact information for the TL while canvassing. TL will also be handled as part of the In-Office Address Canvassing GQ Review project.

Design Issues to Be Resolved

There are no remaining design issues to be resolved for this operation.

Cost and Quality

Investment in ADC is projected to influence (reduce 🡻 or increase 🡹) the 2020 Census overall costs in the following ways:

- 🡻 Reduction in the amount of In-Field Address Canvassing and associated infrastructure by implementing In-Office Address Canvassing.
- 🡻 Use of additional sources of administrative records and third-party data to validate the frame.

In addition:

- 🡹 ADC is expected to require additional people, process activities, data, technology, and facilities to support In-Office Address Canvassing, including the resolution of ungeocoded addresses, review of GQ and TL addresses, and validation of LUCA submissions.

Impacts of this operation on overall 2020 Census quality include the following:

- The MAF Coverage Study will provide a continuous improvement process to:
  - Test In-Field Address Canvassing methodologies.
  - Verify in-office methodologies.
  - Update the MAF with results.
- Better detection of changes in the address list resulting from new ADC approach.

Risks

In-Office Address Canvassing is a new approach for the 2020 Census, and there are concerns that some higher levels of government (i.e., state and federal) may believe an In-Field Address Canvassing may yield a greater "quality" canvassing than In-Office Address Canvassing, and they may be concerned about the lack of census jobs within their jurisdiction because of a decreased In-Field Address Canvassing**. IF** the Census Bureau is unable to gain acceptance at the higher levels of government for the proposed ADC methodology, **THEN** the workload for In-Field Address Canvassing may increase dramatically.

External data sources, including Geographic Information System (GIS) viewers, will be used in the 2020 In-Office ADC Ungeocoded Resolution (UR) project as a source to update the MAF/TIGER database where needed. Ungeocoded records, which are not spatially linked to a block location, are not included in the 2020 Census address frame user for enumeration. **IF** sufficient external data sources are not available for use in UR, **THEN** the ungeocoded records within the areas lacking local data sources may not be resolved and therefore, not included as part of the address frame for enumeration during 2020 Census operations.

The Interactive Review (IR) process relies heavily on current, high-resolution imagery acquired at no cost through partner agencies. The FY2019 budget for the National Geospatial-Intelligency Agency, which provides this imagery to the Census Bureau at no cost, does not include funding for high-resolution imagery. **IF** free, current, high-resolution imagery is unavailable for use in IR beginning in FY2019, **THEN** the IR program will be unable to use high-resolution imagery to identify change, resulting in decreased quality assessments of change; the inability to assess change in some areas during FY2019; and a potential increase in the In-Field ADC universe, which could increase the cost of the 2020 ADC Operation.

Milestones

Date	Activity
August 2015	Release Address Validation Test Results.
September 2015	Begin 2020 Census ADC (In-Office Interactive Review).
December 2015	Release ADC DOP.
April 2016	Begin MAF Coverage Study (In-Field). MAF Coverage Study was paused on April 1, 2017.
April 2016	Begin ABR. ABR work was paused in February 2017.
October 2016	Begin ADC Test (In-Field).
April 2017	Begin ungeocoded resolution.
June 2017	Complete first review of all blocks by Interactive Review project of In-Office Address Canvassing.
September 2017	Begin In-Office Address Canvassing GQ Review.
August 2017	Begin In-Field Address Canvassing for 2018 End-to-End Census Test.
December 2017	Release updated ADC DOP.
May 2018	Begin LUCA Address Validation process.
March 2019	Define universe of addresses to be sent for In-Field Address Canvassing.
August 2019	Begin In-Field Address Canvassing for 2020 Census.

5.5 RESPONSE DATA

The Response Data area includes all operations associated with the collection of responses, management of the cases, and initial processing of the data. This area consists of 13 operations that are described in the following sections:

1. Forms Printing and Distribution
2. Paper Data Capture
3. Integrated Partnership and Communications
4. Internet Self-Response
5. Non-ID Processing
6. Update Enumerate
7. Group Quarters
8. Enumeration at Transitory Locations

9. Census Questionnaire Assistance
10. Nonresponse Followup
11. Response Processing
12. Federally Affiliated Count Overseas
13. Update Leave

5.5.1 Forms Printing and Distribution

Detailed Planning Status:	**Underway** **DOP delivered in FY 2017**

Purpose

The Forms Printing and Distribution (FPD) Operation prints and distributes the following paper forms to support the 2020 Census mailing strategy and enumeration of the population:

- Internet invitation letters.
- Reminder cards or letters or both.
- Questionnaire mailing packages.
- Materials for other special operations, as required.

Other materials required to support field operations are handled in the Decennial Logistics Management (DLM) Operation.

Changes Made Since Version 2.0 Operational Plan Release: In addition to supporting self-response, which includes Puerto Rico, the FPD Operation will print materials for the UL, UE, GQ, NRFU, and Island Areas Censuses (IAC) operations.

Lessons Learned

Based on lessons learned from the 2010 Census studies and reviews, the following recommendations were made:

- Use USPS tracing data to monitor large-scale inbound and outbound census mailings.
- Provide a comprehensive 2020 Census forms list to be used by the contractor for printing planning.

Operational Innovations

Operational Innovations include the following:

- Shifting from paper questionnaires to the Internet as the primary response mode to the 2020 Census, thus reducing the number of questionnaires that will be processed through the PDC Operation.
- Using paper questionnaires for the enumeration of Internet nonrespondents and targeted areas or populations with low Internet usage.

Description of Operation

The FPD Operation is responsible for the printing and distribution of mailed Internet invitations, reminder cards or letters, and questionnaire mail packages in multiple languages as determined by the LNG Operation.

- The contact strategy will include printing and mailing of paper invitations and reminder cards or letters.
- Paper questionnaires will be printed and mailed initially to a portion of the population. Nonresponding households in the self-response TEA 1 will also receive paper questionnaires.
- Printing and mailing will be acquired through the Government Publishing Office.
- The print requirements will include the capability to produce and deliver conditional mailings to nonresponding households.
- A serialized barcode will be printed on each sheet of a questionnaire to ensure all pages for a household are properly captured.
- The questionnaires for nonresponding households will be addressed in near real time to minimize distribution to households who have engaged in the digital or other nonpaper response channels.

Research Completed

The following research has been completed for this operation:

- Multiple studies on the use of USPS tracing:
  - 2010 Census Paper: Optimizing Integrated Technologies and Multimode Response to achieve a Dynamic Census, February 29, 2012.
  - 2010 Census Assessment: 2010 Census Postal Tracking Assessment, April 2, 2012.
  - Cost assessment for the PDC check-in operation.
    - Findings:

- USPS tracing data are cost-effective and accurate.
- Postal tracing services are deemed reliable and could be used on a nationwide scale.

Decisions Made

The following decisions have been made for this operation:

- ✓ Paper questionnaires, which will be available in English and bilingual English/Spanish, will be printed and mailed to some portions of the population as part of the initial contact strategy.
- ✓ Printing and mailing of 2020 Census invitation letters, reminder postcards, questionnaires, and other self-response materials (questionnaires for GQ, IAC, and other operations) will be contracted out through the Government Publishing Office.
- ✓ USPS barcodes will be used for various postal services, such as tracing and identification of vacant or other undeliverable addresses.
- ✓ Print contract requirements are written to enable addressing mail packages that are preassembled before address files are available. Successful vendor(s) must have demonstrated ability and capacity to adhere to the Census mailings schedule.
- ✓ In addition to supporting self-response, which includes Puerto Rico, the FPD Operation will print materials for the UL, UE, GQ, NRFU, and IAC operations.

Design Issues to Be Resolved

There are no remaining design issues to be resolved for this operation.

Cost and Quality

Investment in FPD is projected to have minimal influence on the overall cost of the 2020 Census.[6]

Impacts of this operation on the overall 2020 Census quality include the following:

[6] Although the number of printed questionnaires for mailing is expected to be lower in the 2020 Census as compared to the 2010 Census, other factors contribute to unknowns related to the total cost of printing. These include booklet questionnaires, multiple mailings of nonquestionnaire materials, and a dynamic universe for questionnaire printing and mailing with printing occurring later than it would have with a bulk printing process.

- ↑ Robust printing quality assurance measures have a direct positive impact on the quality of data from PDC.

Risks

The 2020 Census mailout materials will be printed and assembled at multiple secure facilities throughout the nation. **IF** an event (natural or otherwise) prevents or impedes the timely printing and assembly of materials for the 2020 Census without an alternative, **THEN** the mailout of materials could be delayed.

Milestones

Date	Activity
October 2016	Receive final contact strategies from the ISR Operation. Receive design concepts for questionnaires and other mailing materials from the CFD Operation. Define the printing and mailing workload estimates.
June 2017	Release the FPD DOP. (Delayed)
October 2018	Refine the printing and mailing workload estimates.
January 2017–March 2019	Start print contract planning. Start USPS mailing planning.
June 2019–April 2020	Implement printing, addressing, and mailing of Internet invitations, reminder cards or letters, and paper questionnaire packages.

5.5.2 Paper Data Capture

Detailed Planning Status:	**Underway DOP delivered in FY2017**

Purpose

The Paper Data Capture (PDC) Operation captures and converts data from 2020 Census paper questionnaires. This operation includes:

- Mail receipt
- Document preparation
- Scanning
- Optical Character Recognition (OCR)
- Optical Mark Recognition (OMR)
- Key from Image (KFI)
- Data delivery

- Checkout
- Form destruction

Changes Made Since Version 2.0 Operational Plan Release: There have been no major changes to this operation.

Lessons Learned

Based on lessons learned from the 2010 Census studies and reviews, the following recommendations were made:

- A timely and comprehensive forms list is required.
- Every field on a questionnaire must have an owner.
- Realistic and timely contingency planning is essential in order to properly estimate the PDC workload.
- Postal tracing monitors inbound and outbound mailings.
- Barcode serialization retains the integrity of separated booklets, i.e., single sheets, within batches and offers an essential automated data component to data capture and batching processes.

Operational Innovations

Operational innovations include:

- A reduction in PDC operational workloads and associated infrastructure by using ISR and automating field operations.
- Using an in-house system, i.e., the integrated Capture-Assisted Data Entry (iCADE), for PDC.
- Using USPS tracing data to identify questionnaires prior to arrival at the processing center. This information may be used to reduce follow-up workloads.

Description of Operation

The PDC Operation is responsible for the capture and conversion of data from self-response and personal visit paper questionnaires. Paper forms delivered by the USPS are processed by the NPC at one of two PDC sites. For the 2020 Census, there will be a site in Jeffersonville, Indiana, and in the Phoenix/Tucson, Arizona, area.

Questionnaires go through several steps described in the DOP for PDC. Note that questionnaire images are archived. The paper questionnaires themselves are stored until verification that data are received by HQ and then they are destroyed per security regulations.

The PDC Operation is driven largely by the timing of the questionnaire mailout, volume of forms received, timing of the nonresponse workload universe cut, and any priority capture requirements needed for the 2020 Census. Data are captured from the paper forms in the most efficient manner possible, and both data and images of the forms are maintained. The data are sent to the Response Processing Operation area for further work. The images are sent to the ARC Operation.

Mail returns are identified using USPS postal tracing to indicate that a form is en route to the processing office. Upon receipt at the processing office, mail return questionnaires will be processed in First-In-First-Out order, unless otherwise specified.

The document preparation area removes mail returns from the envelopes and prepares them for scanning. Damaged forms are transcribed to new forms of the same type and a new barcode label (same ID) is affixed to the new form. Booklet forms have the binding (spine) removed.

The questionnaires are delivered to scanning to begin the data capture process. All questionnaires are scanned by iCADE (no key from paper). Once scanned, the physical paper forms are moved to the checkout operation. There, forms await confirmation that questionnaire data are deemed valid responses (see Response Processing in Section 5.5.11).

Scanned images are sent forward for further processing using the iCADE system where OMR and OCR are performed. Data fields with low confidence OMR and OCR results are sent to the KFI process. Both data and images are maintained (data are sent to response processing and images are archived locally). Once all data have been received at HQ, the questionnaires can be checked out to ensure each form has been fully captured. These forms are then eligible for destruction.

Research Completed

The following research has been completed for this operation:

- Conducted Improving Operational Efficiency technical evaluation project:
  - Expanding the use of iCADE system to support the 2020 Census.
    - Findings: iCADE has the capability to be the paper capture solution for the 2020 Census. Additional testing will be conducted to determine scalability.
- Multiple studies on the use of USPS tracing:
  - 2010 Census Paper: Optimizing Integrated Technologies and Multimode Response to achieve a Dynamic Census, February 29, 2012.
  - 2010 Census Assessment: 2010 Census Postal Tracking Assessment, April 2, 2012.
  - Cost assessment for the PDC check-in operation.
    - Findings:
      - USPS tracing data are cost-effective and accurate.
      - Postal tracing services are deemed reliable and could be used on a nationwide scale.

Decisions Made

The following decisions have been made for this operation:

- ✓ iCADE is the planned paper capture system for the 2020 Census.
- ✓ Paper questionnaires will be mailed to targeted areas or populations with low Internet usage as part of the initial contact strategy and to Internet nonrespondents.
- ✓ All HU questionnaires are booklets that require separation. All GQ questionnaires are single-sheet forms.
- ✓ USPS tracing data will be used to identify questionnaires in the mail stream prior to arrival at the PDC centers.
- ✓ All self-response and GQ questionnaires will be scanned by iCADE.
- ✓ The 2010 Census target quality levels will be used for OMR (99 percent), OCR (97 percent), and KFI (99 percent).
- ✓ There will be two PDC centers.
- ✓ Contingency planning is underway and will continue to mature in the coming year.
- ✓ The 2020 Census paper questionnaire will be a booklet format with dimensions of 9 by 11 inches. The PDC workloads are identified in the PDC DOP, and will be further refined before the 2020 Census.

Design Issues to Be Resolved

Additional work is required to make decisions on the following questions:

Question	Expected Date
What other operations have PDC requirements (e.g., UE, UL, and GQ)?	December 2017

Cost and Quality

Investment in PDC is projected to influence (reduce ↓ or increase ↑) the 2020 Census overall costs in the following ways:

- ↓ Use of an enterprise solution iCADE for PDC.
- ↓ Provision of a low-cost response mode (other than the Internet) to increase self-response rates.
- ↓ Use of postal tracing to reduce field operation follow-up workloads for NRFU and, therefore, the need for a larger equipment footprint used for a traditional check-in operation.

Impacts of this operation on overall 2020 Census quality include the following:

- Plan to maintain the same quality level as the 2010 Census for OCR, OMR, and KFI.
- The possible use of a Spanish OCR engine on English fields will have quality implications for PDC.

Risks

In order to make informed decisions regarding paper capture facilities and equipment, timely guidance must be provided on the workloads and priorities for questionnaire capture. **IF** guidance regarding questionnaire capture workloads and priorities is not provided on time, **THEN** paper capture facility and equipment decisions will be negatively impacted.

The design for the 2020 Census contains several innovations. These innovations (e.g., enterprise IT solutions, data collection from the Internet and

mobile devices) are expected to drastically reduce the need for paper for many of the operations. **IF** the innovations being developed to reduce the use of paper for the 2020 Census do not get implemented as planned, **THEN** operations may need to be fully or partially paper-based, which will require a more robust solution than currently planned, resulting at a minimum in additional cost and schedule delays.

Milestones

Date	Activity
October 2016	Develop PDC NRFU plan.
March 2017	Release the PDC DOP.
December 2017	Determine which other operations require PDC.
December 2018	Release updated PDC DOP.
March–August 2020	Conduct PDC Operation.

5.5.3 Integrated Partnership and Communications

Detailed Planning Status:	**Underway DOP delivered in FY2016**

Purpose

The Integrated Partnership and Communications (IPC) Operation communicates the importance of participating in the 2020 Census to the entire population of the 50 states, the District of Columbia, and Puerto Rico to:

- Support field recruitment efforts for a diverse, qualified census workforce.
- Engage and motivate people to self-respond, preferably via the Internet.
- Raise and keep awareness high throughout the entire 2020 Census to encourage response.
- Effectively support dissemination of census data to stakeholders and the public.

Changes Made Since Version 2.0 Operational Plan Release: There have been no major changes to this operation.

Lessons Learned

Based on lessons learned from the 2010 Census studies and reviews, the following recommendations were made:

- Integrate Census Bureau subject-matter experts into all phases of the 2020 Census IPC Program.
- Improve coordination of communications among the Decennial, Field, and Communications Directorates and others.
- Align timing, funding, and design decisions between the development of the IPC Program Plan and the Census Bureau's operational milestones to effectively support all phases of the 2020 Census.
- Establish more specific program metrics for the IPC Program to assist in evaluation and assessment.

Based on the lessons learned from the 2015 Census Test studies and reviews, the following recommendations were made:

- Prioritize minimizing break-offs from the landing page of the online survey instrument.
- Create tailored, customizable, and changeable landing pages in the online survey instrument for each audience that also captures the "look and feel" of advertisements.
- Use digital advertisements to push decennial census response and raise awareness.
- Use digital advertisements and communications and the Internet specifically to reach and increase response from young, single mobiles.
- Perform additional research and testing to determine the appropriate balance between advertisements for a general audience and hard-to-survey audiences.
- Integrate the "look and feel" of mail materials with other communications including advertisements.
- Perform additional research to test which communication channels and messages most increase awareness.
- Perform additional research to test the use of messages targeted to specific audiences via addressable media outlets, such as digital advertising.

Operational Innovations

Operational innovations include the following:

- Microtargeted messages and placement for digital advertising, especially for hard-to-count populations at a cluster-type level (i.e., neighborhood, block, etc.).

- Advertising and partnership campaign adjusted based on respondent performance.
- Expanded predictive modeling to determine the propensity to respond.
- Expanded use of social media to encourage response.
- Localized advertising to encourage response.

Description of Operation

Inspiring every household in the country to complete the census is an enormous, increasingly complex, and unparalleled challenge. With an increasingly diverse population and a drop in public participation, an effective communications strategy is critical to the success of the census.

The IPC Program must reach every household in the nation, delivering the right messages to the right audiences at the right time. It must allocate messages and resources efficiently, ensuring consistent messaging, as well as look and feel, across all public-facing materials across communication efforts as well as operations.

An IPC Program contractor has been engaged to support the 2020 Census Program from recruitment through data dissemination. The program will offer the following components:

- Advertising, using print, radio, digital, television, and out-of-home.
- Earned media and public relations.
- Partnership, including both regional and national efforts.
- Social media, to include blogs and messages on platforms such as Facebook, Twitter, Instagram, Snapchat, etc.
- Statistics in Schools.
- Rapid Response.
- Web site.

These and other potential components of the IPC Operation will communicate the importance of participating in the 2020 Census to the entire population.

Research Completed

The following research has been completed for this operation:

- ºPromote "Notify Me," allowing individuals to provide contact information to receive future email and text message notifications when it is time to participate in the test.
- ºMeasured the effects of different mailing contact strategies including mail that encouraged potential respondents to preregister for reminder emails or texts and a postcard sent to residents who had yet to submit a form.
  - Findings: "Notify Me" is not a successful contact strategy as designed and tested with a very low percentage of mail panel responding.

- The 2015 Census Test:
  - ºMeasured the effects of digital advertising and communications techniques on increasing self-response rates. The test assessed various levels and types of digital advertising (e.g., social media ads, keyword search ads, and display ads), as well as the use of recorded influencer phone calls on increasing self-response.
  - ºSimulated a decennial census environment through traditional advertising (e.g., television, radio, and print ads) and included a partnership program for outreach and information dissemination through the entire Designated Market Area.
    - Findings: Results from this test show considerable promise for the use of digital and targeted digital advertising as a primary means to increase awareness about the 2020 Census, motivate respondents and connect them directly to the online response instruments, and to reach hard-to-survey populations. Finally, the influencer phone calls were less successful at encouraging response, and attempting to use prominent local figures to deliver the messages had no affect either. Overall, partnership activities were successful.

Decisions Made

The following decisions have been made for this operation:

✓ The Census Bureau will use partnerships to communicate the importance of the 2020 Census to the entire population of the 50 states, the

District of Columbia, and Puerto Rico to encourage self-response.

- ✓ The 2020 Census will use digital advertising and social media.
- ✓ The 2020 Census will use a variety of modes of communication to motivate self-response. Research into the most appropriate methods to reach and motivate self-response among different audiences, especially hard-to-count areas, will be conducted in late 2017 to early 2018. The results will be incorporated into the 2020 Census Integrated Communications Campaign Plan v2.0, which is expected to be released in the fall of 2018.
- ✓ The 2020 Census will use traditional advertising methods, including the use of local advertising.
- ✓ An online portal will be developed that will allow for posting and downloading materials, providing online fulfillment, and sharing experiences.
- ✓ Where available, the partnership specialists and local partners will provide an Internet connection through the use of tablets or laptops which will be made available in public spaces for respondents to complete their census questionnaire online.
- ✓ The IPC Operation encompasses an integrated communications campaign with multiple components. The main components of the operation are advertising, earned media and public relations, partnerships, Statistics in Schools, social media, rapid response, and a Web site.
- ✓ The segmentation scheme will enable the Census Bureau to develop messaging that will most resonate with each group, purchase media by group in the appropriate channels, and to monitor performance by segment during campaign execution. The Census Bureau will develop self-response propensity models to determine each households' likelihood to respond, when, and by which mode.
- ✓ The IPC will be communicating the possibility of answering the 2020 Census using CQA in several areas of the communications campaign, such as paid advertising, partnerships, social media, information on our Web site and through interviews landed through media outreach. Most of these tactics will start to be used during the Motivation Phase of the IPC which will occur between March and April 2020. However, communications efforts will start during the Strategic Early Education Phase (for hard-to-count populations during the whole year in 2019) and Awareness Phase (January–February 2020), and respondents may start hearing about CQA during those phases.

Design Issues to Be Resolved

Additional work is required to make decisions on the following questions:

Question	Expected Date
What metrics will be used to evaluate the success of the IPC Operation as well as each individual component? Microtargeted digital advertising? Automated telephone messaging by local influencers? Providing donated thank you incentives to respondents? Social media? Email?*	March 2018

* Over the past year, faced with funding uncertainty, the program has made decisions to prioritize certain critical components of the 2020 Census while in turn redesigning others that have not received sufficient planning resources throughout the decade. As a result, the metrics that will be used to evaluate the success of the IPC operation will be determined later in the decade.

Cost and Quality

Investment in IPC is projected to influence (reduce 🡻 or increase 🡹) the 2020 Census overall costs in the following ways:

- 🡻 A campaign aimed at promoting the Internet as the primary response option may reduce census data collection costs.

Impacts of this operation on overall 2020 Census quality include the following:

- 🡹 Increase in overall self-response rates.
- 🡹 Potential increase in self-response from traditional hard-to-count populations.
- 🡹 Ability to adjust advertising using real-time metrics to focus advertising in low response areas.

Risks

The IPC Operation may not be able to use newly emerged communication channels as it may be too late to incorporate these new technologies. In addition, internal policies may not be flexible enough to accommodate new communication channels. **IF** the IPC Operation is unable to leverage new communication channels to encourage the public

to complete the 2020 Census, **THEN** messages may not get to some segments of the population, resulting in lower self-response rates.

Milestones

Date	Activity
August 2016	Award the IPC contract.
September 2016	Release the IPC DOP.
October 2016	Kick off the IPC contract.
October 2016	Release the 2020 Census Community Partnership and Engagement Program Plan.
June 2017	Start the 2020 Census Partnership Program.
July 2017	Release the 2020 IPC Plan version 1.0.
September 2018	Release the 2020 IPC Plan version 2.0.
December 2018	Release the updated IPC DOP.
August 2019	Release the 2020 IPC Plan version 3.0

5.5.4 Internet Self-Response

Detailed Planning Status:	**Underway DOP delivered in FY 2017**

Purpose

The Internet Self-Response (ISR) Operation performs the following functions:

- Maximize online response to the 2020 Census via contact strategies and improved access for respondents.
- Collect response data via the Internet to reduce paper and NRFU.

Changes Made Since Version 2.0 Operational Plan Release: There have been no major changes to this operation.

Lessons Learned

Based on lessons learned from the 2010 Census studies and reviews, the following recommendations were made:

- Determine optimal contact strategies for eliciting responses to the 2020 Census for Internet and other response modes.
- Optimize the instrument for mobile devices to provide for better user experiences and to improve overall response rates.
- Determine if a bilingual initial or replacement questionnaire in bilingual selected tracts is beneficial.

Operational Innovations

Operational innovations include the following:

- Internet Data Capture:
  - Real-time edits.
  - Ability to capture larger households than is possible in a traditional paper-based survey.
  - Develop and deploy an application that can be used across most modern Internet devices and browsers.
  - Develop an application user interface that is available in English and non-English languages identified by the LNG Operation.
  - Self-response mail contact strategy:
    - Tailored to demographic or geographic area.
    - Designed to encourage Internet self-response.
    - Integrated messaging with the IPC Operation.

Description of Operation

Two significant pieces of the program reside in this operation: Internet Self-Response and Contact Strategies.

Internet Self-Response

The Census Bureau estimates that 45 percent of U.S. households in areas that receive mailouts from the Census Bureau will respond via the Internet. High Internet response is critical for cost savings and major efforts are underway to minimize the amount of self-response via telephone, paper questionnaire, and in-person visits. Internet response was not available in previous decennial censuses and, therefore, represents a substantial innovation for the enterprise. The Census Bureau recognizes that the Internet response option is not feasible or acceptable to the entire population. Therefore, alternate modes will be provided for respondents to complete their 2020 Census questionnaire, such as the paper methods used in the past.

Planning and development activities to support ISR are centered around four organizing principles: (1) providing a responsively designed application, (2) providing the best user experience possible, (3) utilizing the Internet to increase data quality, and (4) ensuring that the ISR systems have the capacity to support anticipated volumes of responses and other systems usage, while following the most robust procedures for ensuring data security. Each is discussed below.

The first way to maximize ISR is to design and develop a Web application that can be used across multiple Internet devices and browsers. The ISR application will be responsibly designed so that it is convenient and easy to use on most modern Internet devices (from desktop to mobile devices), and on most modern Web browsers. A responsibly designed Web application makes response more convenient, a user can respond anywhere, at any time, provided they have a connected Internet device.

Secondly, designing and developing an ISR application that is centered on the best possible user experience also facilitates higher rates of Internet response. The overall user experience includes such factors as a person's perception of the system aspects (i.e., utility, ease of use, and efficiency). The survey questions and response options will be displayed within the ISR user interface such that they are as intuitive and straightforward as possible. The user experience will be further enhanced by including non-English user interfaces in the application. Additional information on the LNG program, which determines the languages in which the ISR instrument will be available, is described in section 5.3.4.

Thirdly, the Internet as a medium for data collection lends itself to improvements in data quality. For example, the ISR application will include built-in data validation checks to identify user error as the user is inputting responses and progressing through the survey. These checks will include messaging to respondents indicating missing or incomplete data, as well as messages alerting respondents when incorrect or inconsistent information is entered. These functionalities will help ensure high-quality data in the 2020 Census. To further improve data quality, users will be able to contact a CQA agent for assistance while completing their questionnaire online.

Lastly, the ISR application and all support systems will be designed to handle the volume of responses that are expected. It is imperative that the ISR application and other systems are built to service the scale of the operation in order to ensure that users do not experience delays when completing the survey, or that the application is unavailable during the self-response operation. Also of note, in order to increase self-response through Internet response, the ISR application and other associated systems are being developed to adhere to the highest standards of data security. All respondent data are encrypted throughout the data collection process, and all encrypted data are made inaccessible as soon as possible. Every effort is made to ensure that any data provided by the respondent is secure and confidential throughout the data collection process.

Contact Strategies

All attempts by the Census Bureau to make direct contact with individual households by mail are referred to as "contact strategies." These are complementary but distinct from the community-level outreach described under the IPC Operation. Types of contact strategies include invitation letters, postcards, and questionnaires mailed to households.

Prior to the 2010 Census, research yielded distinct attitudinal segments or messaging mindsets. A primary objective of the 2020 Census is for a majority of respondents to complete their census questionnaire online. Communication of this objective to individual households is the purpose of the Census Bureau's mail contact strategies. The Census Bureau is looking to develop a contact approach that produces an "actionable" response on the part of the respondent.

One approach, termed "Internet First," has been developed to encourage respondents to use the Internet. Currently, this model includes the mailing of a letter inviting respondents to complete the questionnaire online, two follow-up reminders and, if necessary, a mailed paper questionnaire followed by a final reminder. All correspondence will contain a telephone number respondents may use to complete the questionnaire over the telephone.

This approach, however, may not be appropriate for all respondent types. The "Internet Choice" contact strategy will be utilized in areas with low Internet connectivity or other characteristics that

make it less likely the respondents will complete the census questionnaire online. In Internet Choice areas, a paper questionnaire is provided on the first contact in addition to the information about how to respond online or by phone.

Research Completed

The following research has been completed for this operation:

- ACS ISR Research.
  - Findings:
    - People living in areas with lower Internet usage and accessibility require paper or telephone questionnaire assistance or both.
    - Certain messaging strategies are more effective in motivating self-response.
- 2012 National Census Test tested contact strategy and Internet option.
  - Findings:
    - Initial contact to invite participation, followed by two reminder prompts as needed, and subsequent mailing of a paper questionnaire was a promising strategy (Internet First).
    - Advance letter was not shown to improve response rates.
    - Telephone assistance needed for respondents without Internet access.
- 2014 Census Test tested "Notify Me" mailed invitation, contact strategies, and Internet option.
  - Findings:
    - Neither email nor automated voice messages showed a significant impact on response rates.
    - Low participation rate for "Notify Me" component, but high questionnaire completion rate among those who preregistered.
- The 2015 Optimizing Self-Response (OSR) Test offered an Internet response option, including real-time NID processing, and again tested the "Notify Me" option, along with advertising and partnerships support.
  - Findings:
    - The total response rate was 47.5 percent, and the Internet response rate was 33.4 percent.
    - An additional 35,249 Internet responses from HU not selected in mail panels as a result of advertising and promotional efforts.
    - "Notify Me" again had low participation.
    - A new postcard panel, designed to test how HU not originally included in the sample would respond to an invitation after being exposed to advertising, generated response of approximately 8 percent.
- 2015 National Content Test.
  - Findings:
    - The total self-response rate was 51.9 percent, and the Internet response rate was 35.6 percent.
    - Adding a fifth mailing, a reminder sent after the paper questionnaire, significantly increased response rates.
    - Sending the first reminder sooner by a few days prompted quick responses, thus reducing the size of the third mailing.
    - In low responses areas, the "choice" strategy of sending a paper questionnaire in the first mailing, is effective.
    - Providing the letters in English and Spanish, rather than just English with a Spanish sentence, elicits more Spanish language responses.
- Small-scale, opt-in email testing experimented with email messaging, including subject lines, timing of delivery, and look and feel.
  - Findings:
    - A text-based email out-performed graphical emails.
    - Short email subject lines that include the "10-minute" burden and the "U.S. Census Bureau" name seem to perform better than other subject lines, especially those including the word "Help" as the first word in the subject line.

- Longer email content with "Dear Resident" and signature of the Director email outperformed a shorter email invitation without the greeting and signature.
- Response rates did not differ by link type (i.e., the full Uniform Resource Locator [URL] or "Click here") with this population.
- The time of day the email is sent did not appear to have a big impact on the response rate.
- Respondents prefer a mailed invitation, including a link to respond over all other options.

- 2016 Census Test.
  - Findings:
    - The total self-response rate was 53.4 percent, and the Internet response rate was 31.4 percent at the Los Angeles County, California, test site.
    - The total self-response rate was 39.6 percent, and the Internet response rate was 27.4 percent at the Harris County, Texas, test site.
    - Continued mail strategy deployed in the 2015 National Content Test.
    - Building on the success of providing some mail material in English and Spanish in the 2015 National Content Test, all mail materials were available in English and Spanish.
    - ISR application user interface was made available in six languages (English, Spanish, Korean, Chinese, Vietnamese, and Russian).
- 2017 Census Test.
  - Findings:
    - The total self-response rate was 43.14 percent and the Internet response rate was 22.94 percent.
    - Utilized a commercial off-the-shelf product for development of the ISR application.
    - ISR application was deployed in the cloud for the first time.
    - ISR application was developed using Web design best practices and guidelines developed by U.S. Digital Standards.
    - Continued the mail strategy used in the previous two tests.

Decisions Made

The following decisions have been made for this operation:

ISR:

- ✓ An ISR option will be provided for the 2020 Census.
- ✓ Invitation letters and mailed materials will encourage people to respond using a unique census identifier; however, the 2020 Census will allow people to respond without a unique Census ID.
- ✓ The Census Bureau will offer an Internet response option in languages other than English and Spanish, including those requiring non-Roman alphabets. The languages selected will be based on national prevalence rates of low-English proficiency households and the available technology.
- ✓ The Census Bureau will not provide a mobile application for ISR.

Contact Strategy:

- ✓ An advance letter will not be used; most HU will receive a letter inviting online response to the census. The Census Bureau will provide a paper questionnaire (including bilingual questionnaires) for populations where Internet access and usage prompts us to offer Internet Choice (questionnaire and Internet invitation) and for whom language assistance optimizes self-response.
- ✓ The 2020 Census will offer alternative response options to respondents without Internet access.
- ✓ Messaging will be coordinated with the IPC Campaign.
- ✓ A formal "Notify Me" option will not be offered.
- ✓ Respondents will receive direct contacts inviting their participation in the census. Contacts may include some or all of the following: postcard mailings, letter mailings, prerecorded telephone messages, questionnaire mailings, and in-person visits by an enumerator.
- ✓ Respondents more likely to respond online will receive the "Internet First" mailing strategy, where they will receive invitations to respond online. Those who do not respond online will receive reminders to respond, and a paper questionnaire before NRFU begins. Respondents least likely to respond online (as determined

by modeling response likelihood, using ACS data in the planning database tool and Federal Communications Commission Internet connectivity data), will receive the "Internet Choice" mailing strategy. The Choice strategy consists of receiving an invitation to respond online, but with a paper questionnaire in the first mailing. Respondents will then receive reminders to respond either online or via the questionnaire they received earlier. Those who do not respond will receive another paper questionnaire before NRFU begins. Anyone who does not either respond online or with a paper return will be sent a final reminder to respond before NRFU begins.

- ✓ The Census Bureau will not use USPS barcode scanning technology to optimize the respondent access to Internet.
- ✓ The Census Bureau looked into the benefits and risk associated with using contact frame and will not be using it to reach respondents via email and text message.

Other Self-Response:

- ✓ Text messaging will not be used as a data collection mode.
- ✓ HU from whom an Internet questionnaire is not received will be mailed a paper questionnaire.
- ✓ ISR will not be part of the GQ enumeration. While GQ enumeration cannot prevent GQ residents from responding via the Internet, this method of data collection is not part of 2020 GQ enumeration plans.
- ✓ The 2020 Census printing and mailing workload as part of the OSR contact strategy is identified in the Life Cycle Cost Estimate.

Design Issues to Be Resolved

Additional work is required to make decisions on the following questions:

Question	Expected Date
In what languages will Internet self-response be available?	September 2017
What are the response rate projections for all self-response modes?	October 2017
What is the timing for the various mailings?	October 2018

Cost and Quality

Investment in ISR is projected to influence (reduce 🡻 or increase 🡹) the 2020 Census overall costs in the following ways:

- 🡻 Reduced amount of self-response through paper questionnaire.
- 🡻 Increased self-response, which will decrease the NRFU workload, thereby reducing field costs.

In addition:

- 🡹 ISR is expected to increase the workload for CQA.

Impacts of this operation on overall 2020 Census quality include the following:

- 🡹 Increase in overall self-response rates.
- 🡹 Real-time edits to respondent data.
- 🡹 More complete self-response for large households.
- 🡹 Potential increase in self-response from traditionally hard-to-count populations.

Risks

Major concerns for the ISR Operation are covered by the 2020 Census Program risks listed in Chapter 6.

Milestones

Date	Activity
January 2016	Decide on the use of mobile applications as a self-response mode.
March 2016	Begin the 2016 Census Test.
June 2017	Release the ISR DOP. (Delayed)
March 2017	Begin the 2017 Census Test.
March 2018	Begin the 2018 End-to-End Census Test.
March 2020	Begin 2020 Census ISR data collection.
September 2020	End 2020 Census ISR data collection.

5.5.5 Non-ID Processing

Detailed Planning Status:	**Underway** **DOP delivered in FY 2016**

Purpose

The Non-ID Processing (NID) Operation is focused on making it easy for people to respond anytime, anywhere to increase self-response rates. The operation accomplishes this by:

- Providing response options that do not require a unique Census ID.
- Maximizing real-time matching of NID respondent addresses to the census LQ address inventory.
- Accurately assigning nonmatching addresses to census blocks.

Changes Made Since Version 2.0 Operational Plan Release:

- The validation of NID responses is part of the scope of work for an overall self-response fraud detection activity, which is described in the section for response processing (5.5.11).
- Based on completed research, NID removed the map interface and ability for users to self-geocode from the self-response instrument.

Lessons Learned

Based on lessons learned from the 2010 Census studies and reviews, the following recommendations were made:

- The automated and manual NID processes should be planned and developed in parallel, rather than sequentially, as was done when preparing for the 2010 Census NID Operation.
- Involve NPC throughout the life cycle of the 2020 Census NID Process.
- The delivery of addresses from NID processing that require independent verification should occur on a flow basis during self-response and NRFU, rather than at the end of these operations.

Operational Innovations

Operational innovations include the following:

- Public can respond to the census anytime, anywhere without a unique Census ID.
- Mechanism to increase self-response from traditionally hard-to-count populations.
- Real-time matching and geocoding of responses.
- Use of administrative records and third-party data to augment respondent-provided address data.

Description of Operation

During the self-response phase, the NID Operation will allow respondents to complete a questionnaire without a Census ID. By collecting the address from the respondent and then matching it real-time to the MAF/TIGER System, the Census Bureau will attempt to associate a Census ID with the response. The address collection interface facilitates obtaining complete and accurate data from a NID response.

Key capabilities of NID are:

- Address standardization and a feedback loop with the respondent to confirm the address data they provide.
- Automated address matching during the response.
- Automated address geocoding during the response.
- For NID cases not matched in real time, use of administrative records and third-party data to augment respondent-provided address data, followed by an additional address matching attempt.
- Manual matching and geocoding when automated NID Processing has not determined an acceptable match or geocode.

Research Completed

The following research has been completed for this operation:

- 2013 National Census Contact Test:
  - Findings: The use of administrative records and third-party data was effective in enhancing NID addresses to allow for a match to the MAF/TIGER System.
- 2014 Census Test:
  - Findings:
    - The address collection interface in the Internet instrument yielded a much greater proportion of higher quality address data from NID responses than in 2010.
    - Use of administrative records and third-party data matching improved the overall address matching rate.
    - There was no significant benefit to applying the administrative record matching process to all NID responses. Therefore, the use of administrative records and third-party data matching should follow an

initial matching attempt using the MAF/TIGER System.

- 2015 OSR Test:
  - Findings:
    - When a NID respondent address matches a record in the census address inventory, rules can be applied for accepting the geocode or subjecting it to further verification. These rules can account for the source of the geocode, whether or not coordinates were collected in the field for the address location.
    - Respondents geocoded themselves accurately only about one third of the time. However, before making a recommendation on the use of the map interface during self-response, results from 2015 testing will be compared with those from the 2016 Census Test.
    - Use of administrative records and third-party data continued to result in an increase in the match rate for NID cases compared to the census LQ address inventory during automated processing.
- 2016 Census Test.
  - Findings:
    - Respondents geocoded themselves accurately only about one quarter of the time. Based on this information, results from 2015 testing, and research conducted on the collection of users' location, a decision was made to remove the map interface during NID self-response.
    - Use of administrative records and third-party data continued to increase the match rate during automated processing for NID cases compared to the census LQ address inventory.

Decisions Made

The following decisions have been made for this operation:

- ✓ The 2020 Census will offer a NID option for self-response and telephone agent-assisted response.
- ✓ The 2020 Census ISR instrument and the CQA interviewer instrument will utilize capabilities and requirements for the address collection interface as specified for NID responses, as used in the 2014, 2015, and 2016 Census Tests.
- ✓ The NID work flow will include real-time matching and geocoding, post real-time processing that will utilize administrative records and third-party data, and manual (interactive) matching and geocoding.
- ✓ NID respondents can help confirm the location of their LQ descriptive information (i.e., cross streets) provided to the NID Operation. This method, which was used in the 2000 Census and 2010 Census, has also been tested during the 2015 and 2016 Census Tests. Clerks from NPC call NID respondents when they are unable to match or geocode the respondent-provided address using available geographic reference materials. This will enable the Census Bureau to associate the respondent's address with the correct block for tabulation purposes.
- ✓ Administrative records and third-party data will be used to attempt to enhance the respondent's address data if the initial attempt to match to a MAF record was not successful.
- ✓ Testing of Office-Based Address Verification (OBAV) during 2015 and 2016 indicated that this approach should be used for 2020. However, each test had varying results, and only 2017 had 100 percent of the OBAV cases worked, so specific proportions of addresses verified have been different for each test.

Design Issues to Be Resolved

Additional work is required to make decisions on the following questions:

Question	Expected Date
What will be the estimated workload of post-capture NID Processing?	September 2017
What methodology will be used to conduct NID response validation?	September 2018
If the proportion of NID responses increases in the 2020 Census, can the Census Bureau accommodate the corresponding increase in workload for downstream operations, such as manual matching and geocoding, or address verification (office- and field-based)?	September 2018
What is the expected scale of the 2020 Census NID workload?	September 2018

Cost and Quality

Investment in NID is projected to influence (reduce ↓ or increase ↑) the 2020 Census overall costs in the following ways:

↓ Increased self-response rates.

↓ Improved coverage through self-response.

Impacts of this operation on overall 2020 Census quality include the following:

↑ May increase self-response from traditionally hard-to-count populations.

↑ May increase overall self-response rates, which can contribute to higher quality for the overall census.

Risks

The primary reason for conducting real-time NID is to provide respondents the opportunity during the response to resolve NID cases that are not matched or not geocoded or both. Any NID case that is successfully matched to a valid record in the census address inventory and is geocoded can be considered a complete response. In other words, it would not be necessary to manually match/geocode the respondent address or to send an enumerator to the HU if the NID case can be fully resolved during the response. **IF** the IT infrastructure is not adequately scaled to support real-time NID, **THEN** fewer addresses from NID responses will be matched in real time, negatively affecting the speed at which cases are removed from additional automated processing, the clerical processing workload, or NRFU workload.

The option of submitting a response via the Internet instrument could potentially lead to an increase in fraudulent responses, as well as new methods of committing fraud. Research is being conducted to determine the methods that will be used for fraud detection and prevention during the 2020 Census, and to establish criteria to decide what further investigation may be needed for potential fraud cases. **IF** the 2020 Census Program is unable to determine prior to the 2020 Census an acceptable means of conducting fraud detection using multiple methods to identify suspect patterns of returns, **THEN** an individual or group may be able to use ISR, including NID ISR, as a means of defrauding the Census Bureau and calling into question the legitimacy of the 2020 Census results.

Milestones

Date	Activity
April 2015	Deliver real-time address matching and geocoding for the 2015 OSR Test.
April 2016	Utilize multiple respondent validation methods for the 2016 Census Test.
September 2016	Release the NID DOP.
April 2017	Deliver real-time processing in the cloud for the 2017 Census Test.
March 2018	Release the updated NID DOP.
April 2018	Conduct manual matching and geocoding at the NPC for the 2018 End-To-End Census Test.
April–July 2020	Conduct the 2020 Census NID Processing.
August 2021	Complete the 2020 Census NID Assessment Report.

5.5.6 Update Enumerate

Detailed Planning Status:	**Underway**

Purpose

The Update Enumerate (UE) Operation is designated to occur in areas where the initial visit requires enumerating while updating the address frame. The majority of the operation will occur in remote geographic areas that have unique challenges associated with accessibility. This operation includes both the UE TEA and the Remote Alaska TEA. In the UE Operation, field staff update the address and feature data and enumerate respondents in person. The primary functions of UE include:

- Verifying and updating the address list and feature data for tabulation of the 2020 Census.
- Determining the type and address characteristics for each LQ.
- Enumerating respondents at HU within the UE TEA. HU, GQ, and TLs will be enumerated in the Remote Alaska TEA during this operation.

UE can occur in the following geographic areas:

- Remote Alaska.
- Areas that were a part of the 2010 Census Remote UE Operation, such as northern parts of Maine.

- Select tribal areas and American Indian areas that request to be enumerated in person during the initial visit.

Changes Made Since Version 2.0 Operational Plan Release:

The UE Operation was modified in May 2017, when the new UL Operation was created. The majority of the LQ that were originally designated in the UE TEA were moved to the UL TEA. UE will continue to update the address and feature data and enumerate respondents in person, but will deploy proven paper-based methodologies in the field.

Lessons Learned

Based on lessons learned from the 2010 Census studies and reviews, the following recommendations were made:

- Develop a robust method to enumerate GQ in UE areas.
- Do not require a 100-percent certification of vacant and deleted addresses.

Operational Innovations

Operational Innovations include the following:

- Combine methodologies from the 2010 UL, Remote Update/Enumerate, Remote Alaska, and UE Operations.
- Use a reengineered field management structure and approach to managing fieldwork, including a new field office structure and new staff positions.
- Reuse processes and procedures from In-Field Address Canvassing and NRFU to the extent feasible.

In addition, the following operational design assumptions result in an innovative UE Operation:

- UE utilizes a reengineered field management structure.
- UE areas will not have an In-Field Address Canvassing.
- UE will employ real-time or near-real time data processing.
- UE will be able to assign a final HU status of vacant.

Description of Operation

The UE Operation is comprised of the following components: UE Production, UE Listing QC, and UE Reinterview.

UE Production

The UE enumerators visit every place where people could live or stay, comparing what they see on the ground to the existing census address list and either verifying or correcting the address and location information. Much like ADC, enumerators classify each LQ as a HU, a GQ, a TL, or as nonresidential. If the LQ is not classified as a HU in the UE TEA, it is either reassigned to the appropriate enumeration operation or removed from the list for enumeration. (In the Remote Alaska TEA, an enumerator will attempt to conduct an interview at all LQ types, including HU, GQ, and TL.)

For both UE TEA and Remote Alaska TEA, at each HU an enumerator will attempt to conduct an interview. If someone answers the door, the enumerator will provide a Confidentiality Notice and ask about the address in order to verify or update the information, as appropriate. The enumerator will then ask if there are any additional LQs in the structure or on the property and collect or update that information, as appropriate. The enumerator will then interview the respondent using a paper questionnaire. If no one is home, the enumerator will return to the nonresponding HU for two additional attempts. If there is still no response, the enumerator can contact a proxy to complete the interview.

UE Listing QC

QC compares what is on the ground to the work of the production enumerator and verifies or updates the listing work as necessary. If the production enumerator's work passes, then the QC assignment is complete. If the production enumerator's work does not pass, then a full canvass of the production enumerator's work is conducted.

UE Reinterview

A sample of cases enumerated through UE will be selected for UE Reinterview. This helps pinpoint possible cases of enumerator falsification. The Reinterview can take place in the field or on the telephone.

Research Completed

Research that directly supports this operation has not yet been completed.

Decisions Made

The following decisions have been made for this operation:

- ✓ Based on funding uncertainty and reprioritization of critical components of the 2020 Census, the Census Bureau replanned the UE operation and will deploy a paper-based solution for UE. The Census Bureau will use paper-based solutions to enumerate GQ during UE.
- ✓ Based on funding uncertainty and reprioritization of critical components of the 2020 Census, the Census Bureau replanned the UE operation and will deploy a paper-based solution for UE. The Census Bureau will use paper-based solutions to enumerate TLs during UE.
- ✓ There will be a universe of processing IDs created before the operation begins. Enumerators will select a unique processing ID for all newly identified living quarters.
- ✓ The UE Operation will not attempt to contact respondents by mail.
- ✓ The UE Operation will not leave a notice-of-visit form. If no one is home during a contact attempt, the Census Bureau will leave a record of visit and return to complete the enumeration at a later time.
- ✓ The UE Operation will use the same business rules implemented for the ADC Operation. For example, UE will add, delete, verify, move, etc.
- ✓ UE address and map updating will occur during daylight hours. If during daylight hours, a respondent is home and willing to respond, the enumerator will capture that data at that time. If no one is home, the follow-up enumeration will occur using some of the same business rules established for NRFU.
- ✓ UE enumerators will conduct all follow-up enumeration in person. The UE Operation will not make outbound phone calls.
- ✓ The UE Operation will not leave a notice-of-visit form at a HU. An enumerator will conduct the enumeration at every HU during the operation.
- ✓ Remote Alaska will use the same listing and enumeration methodologies as in the 2010 Census.

Design Issues to Be Resolved

Additional work is required to make decisions on the following questions:

Question	Expected Date
Can administrative records and third-party data be used to validate units in Quality Control?	October 2017
What is the cost/benefit to only visiting the living quarter once?	October 2017
How are Census IDs from the address list associated with or linked to the questionnaires?	December 2017

Cost and Quality

Investment in UE is projected to have minimal influence on the overall cost and quality of the 2020 Census.

Risks

It is essential that in-field production assignments for UE be closed out on time at the end of each assignment period so that the schedule stays on course with minimal delays in completing the MAF update process and all other future activities. **IF** there are significant delays in completing the in-field production assignments for UE, **THEN** this will affect the start date of the MAF update process, which may contribute to substantial delays in future schedule activities and downstream activities.

The UE Operation was descoped from the 2018 End-to-End Census Test. Subsequently on May 16, 2017, the 2020 Census Executive Steering Committee approved a proposal to redesign the UE Operation. As a result of that redesign, the plan is to use methodologies similar to those used for 2010 Remote Alaska and remote UE. **IF** the UE Operation deviates from the methods used in 2010 or cannot utilize other operational methods being tested in 2018, **THEN** the UE Operation will have difficulty completing the goals and objectives for the 2020 Census.

Milestones

Date	Activity
April 2016	Begin detailed planning of UE.
May 2017	UE redesign approved.
December 2017	Release the UE DOP.
January 2020	Begin UE for the 2020 Census in Remote Alaska.
March 2020	Begin UE for 2020 Census.
July 2020	End UE for 2020 Census.

5.5.7 Group Quarters

Detailed Planning Status:	**Underway DOP delivered in FY 2017**

Purpose

The 2020 Census Group Quarters (GQ) Operation will:

- Enumerate people living or staying in GQ.
- Provide an opportunity for people experiencing homelessness and receiving service at a service-based location, such as a soup kitchen, to be counted in the census.

Changes Made Since Version 2.0 Operational Plan Release: There have been multiple refinements to each component of this operation. The In-Field Advance Contact component has been removed. The GQ Enumeration component will be mainly paper-based, but GQ contacts will be offered the option to provide electronic resident-level data (eResponse) via a secure server using a standardized template.

Lessons Learned

Based on lessons learned from the 2010 Census studies and reviews, the following recommendations were made:

- Integrate GQ frame validation and enumeration data collection methodologies.
- Research and test automation to collect GQ data to reduce data capture and processing time, which incorporates tracking and linkage capabilities (eliminates manual transcription of administrative records and third-party data onto paper instrument).
- Explore ways to reduce the number of visits on military installations. (Research and test the enumeration of military personnel through the use of administrative records and third-party data.)
- Maintain consistent answer categories regarding the question on having a UHE on all census data collection instruments, the Individual Census Report, and Shipboard Census Report (now referred to as the Individual Census Questionnaire [ICQ] and Shipboard Census Questionnaire).
- Conduct outreach to professional organizations, such as education, health care, and tribal organizations, as part of the 2020 Census GQ planning.

Operational Innovations

Operational Innovations include the following:

- Use of an integrated approach including administrative records, third-party data, and ADC (In-Field and In-Office) to improve the GQ frame.
- Use of multiple modes of enumeration, including electronic exchange of client-level data, and automated field listing and enumeration.
- Integration of GQ Validation and enumeration in all field operations that allow for accurate classification of LQ.
- Staff trained in multiple operational steps increase efficiency for completing the operation.
- Use of both in-office and in-field methods for enumeration.

Description of Operation

Before the enumeration at GQ can occur, the Census Bureau must validate the GQ frame. This validation activity is part of the 2020 Census ADC Operation.

The 2020 Census GQ Operation consists of these components:

- **In-Office GQ Advance Contact (known as GQ Advance Visit in the 2010 Census):** For the 2020 Census, this will be an in-office function only. In an effort to reduce respondent burden, cases for which the staff is unable to contact or resolve during the In-Office Advance Contact will go directly to GQ enumeration versus sending field staff to the GQ during the Advance Contact Operation and then returning during the GQ

enumeration for data collection. The functions of GQ Advance Contact include:

- Verifying the GQ name, address information, contact name, and phone number.
- Collecting an expected Census Day population count, addressing concerns related to privacy, confidentiality, and security.
- Inquiring whether the GQ has a data file that can be transmitted electronically to the Census Bureau for enumeration.
- Obtaining an agreed-upon date and time to conduct the enumeration.

- **GQ Enumeration:** This includes enumeration of all group quarters through in-field visits or administrative records data.

The Residence Criteria and Residence Situations for the 2020 Census will determine what is considered a GQ. The following types of enumeration will be included in the GQ Enumeration Operation:

- **General GQ Enumeration:** Enumeration of people living in group living arrangements in LQ that are owned or managed by an entity or organization providing housing or services for the residents (e.g., college/university student housing, residential treatment centers, nursing/skilled nursing facilities, group homes, correctional facilities, workers' dormitories, and domestic violence shelters).

  Planned data collection modes for GQ Enumeration include:

  - In-Office GQ Enumeration mode:
    - Electronic Response Data Transfer (eResponse) enumeration:
    - The eResponse involves the electronic transfer of client-level data from systems maintained by GQ administrators that will be transferred to a standardized Census Bureau system that will accept electronically transmitted data in a standardized template.
  - In-Field GQ Enumeration modes include:
    - In-Person interview using a paper Individual Census Questionnaire (ICQ).
    - Self-Enumeration—This method will be offered only to medical facilities and correctional facilities. A GQ administrator or point of contact is sworn in and trained to collect the response data from the GQ residents/clients using paper ICQs.
    - Drop Off/Pick up paper questionnaires.
    - Pick up paper roster listings and upload onto the eResponse data collection system.

- **Service-Based Enumeration:** Enumeration of people experiencing homelessness or utilizing transitional shelters, soup kitchens, regularly scheduled mobile food vans, and targeted non-sheltered outdoor locations.
  - The planned modes of data collection for Service-Based Enumeration are:
    - In-Person interview using paper ICQs.
    - Pick up paper roster listing to be used as a supplemental tool to ensure data collection of the entire facility on Census Day—Transitional shelters only.

- **Military GQ Enumeration:** Enumeration of people living in a GQ or HU on military installations, defined as a fenced, secured area used for military purposes and the enumeration of people residing on U.S. military ships at the time of the 2020 Census. A military vessel is defined as a United States Navy or United States Coast Guard vessel assigned to a homeport in the United States.
  - The mode of enumeration for Military Quarters is through electronic administrative records (eADRec). The eAdRec file will contain data for personnel assigned to military installations and U.S. military vessels.

- **Maritime Vessel (Shipboard) Enumeration:** Enumeration of people living on U.S. maritime vessels in operation at the time of the 2020 Census. A maritime vessel is defined as a U.S. Flag vessel that is a commercial vessel registered and operated under the laws of the United States, owned and operated by United States citizens, and used in the commercial trade of the United States.
  - Data collection will be managed by staff at the NPC using 2010 Census procedures.

Research Completed

- Issued Federal Register Notice on May 20, 2015, requesting public comment on the 2020 Census Residence Rule and Residence Situations. Expect to publish the final 2020 Census Residence Rule and Residence Situations in late 2017.

- Ongoing partnership with the Department of Defense's Defense Manpower Data Center to discuss 2020 Census goals and objectives for enumerating personnel living on stateside military installations.
  - Findings:
    - Census Bureau received a sample of administrative records from one military installation.
    - Defense Manpower Data Center identified military installations for administrative record testing.
- Conducted a small-scale data collection test at several service-based locations (soup kitchens, regularly scheduled mobile food van stops, and transitional shelters).
  - Findings:
    - An automated data collection device successfully replicated the content of the GQ paper questionnaire.
    - There are minimal challenges associated with the use of an automated instrument for enumerating persons at service-based locations (soup kitchens, regularly scheduled mobile food vans, transitional shelters), which are equal to the challenges of the use of a paper data collection instrument. However, the decision of the Census Bureau is to use paper data collection instruments for all In-Field GQ operations.

Decisions Made

The following decisions have been made for this operation:

- ✓ The GQ frame development and validation will be integrated with the ADC Operation.
- ✓ The GQ Operation will allow GQ administrators to self-identify the GQ type for the facility.
- ✓ An electronic data exchange of GQ and client-level response data records will be part of the GQ methodology.
- ✓ The Census Bureau will design a standardized system that will accept electronically transmitted response data files in a standardized template.
- ✓ During field enumeration operations, newly identified GQ will be validated and enumerated using a combination of methodologies.
- ✓ Current goals for various types of GQ include the following:
  - Enumerate 25 to 30 percent of people residing in GQ through in-office methodologies (i.e., electronic transfer of response data files) and the remainder in the field using paper.
  - Enumerate military GQ using administrative records.
- ✓ Administrative records will be pursued from FSCPE and Internet research performed by NPC staff for frame building but not for enumeration.
- ✓ A standardized template will be used to receive data from GQ administrators. This will be tested in the 2017 independent eResponse data transfer test.
- ✓ The current assumption is that approximately 70 to 75 percent of GQ enumeration will be in-field.
- ✓ Cases for quality control interviews are sampled by the Sampling, Matching, Reviewing, and Coding System according to requirements provided by subject-matter experts.

Design Issues to Be Resolved

Additional work is required to make decisions on the following questions:

Question	Expected Date
How will varying administrative records or third-party data formats be processed?	December 2017
What is the impact on quality and productivity of field staff if they are required to conduct multiple operations?	December 2017
What is the optimal linkage methodology to ensure self-response data are linked to the correct GQ?	December 2018
How will field reengineering concepts be used for integrating GQ with multiple HU enumeration operations (e.g., NRFU and UE)?	December 2018

Cost and Quality

Investment in GQ is projected to have minimal influence on the overall cost of the 2020 Census.

Impacts of this operation on overall 2020 Census quality include the following:

- ↑ Electronic transfer of administrative records and response data reduces transcription errors.
- ↑ Administrative records and response data may provide more comprehensive demographic information.
- ↓ Administrative records and response data may provide less current data than data received through in-field enumeration.

Risks

Each person from a GQ must be linked to a GQ address, as it is part of the GQ enumeration process. **IF** the linkage to electronically associate each ICQ to its GQ identification number does not work, **THEN** this negatively impacts the ability to tabulate GQ residents in their correct geography.

Milestones

Date	Activity
June 2015	Conduct Electronic Transfer Capability Survey—Puerto Rico.
December 2015	Conduct Electronic Transfer Capability Survey—Stateside.
May 2016	Conduct 2016 Service-Based Enumeration Census.
December 2016	Conduct Electronic Response Independent Census Test.
July 2017	Conduct 2017 Electronic Response Data Independent Census Test.
September 2017	Release the GQ DOP.
February 2018	Conduct the 2018 End-to-End Census Test.
February 2020	Conduct GQ Advance Contact.
April 2020	Conduct GQ Enumeration.

5.5.8 Enumeration at Transitory Locations

Detailed Planning Status:	**Underway**

Purpose

The 2020 Census Enumeration at Transitory Locations (ETL) Operation enumerates individuals in occupied units at TLs who do not have a UHE. TLs include recreational vehicle parks, campgrounds, racetracks, circuses, carnivals, marinas, hotels, and motels.

Changes Made Since Version 2.0 Operational Plan Release: Over the past year, faced with funding uncertainty, the program has made decisions to prioritize certain critical components of the 2020 Census, while in turn redesigning others that have not received sufficient planning resources throughout the decade. As a result, automation will be used where possible, but the ETL operation will be paper-based.

Lessons Learned

Based on lessons learned from the 2010 Census, the following recommendations were made:

- Automate the questionnaire and all related sources of paradata used to record contact details during an interview.
- Learn more about the living situations of people counted in the ETL Operation.
- Clearly define and identify TLs, as well as procedures on how to list transitory units appropriately in operations that feed the ETL universe.
- Conduct intercensal testing of the TL population.

Operational Innovations

Operational innovations include the following:

- Use of reengineered field management structure, staff positions, and approach to managing fieldwork.
- Use of automation and technology for data collection.

Description of Operation

The goal of the ETL Operation is the enumeration of individuals in occupied units at TLs who do not have a UHE.

The ETL Operation will:

- Use automation, where possible, to facilitate data collection and streamline operations.
- Use reengineered staffing and management of the field operation.
- Use in-person enumeration as the primary mode of data collection.
- Have Quality Assurance infused throughout workload management and data collection.

Research Completed

The 2020 Census ETL Operation will implement a similar design and methodologies as those used in the 2010 Census. While enhancements will be pursued, the planning and design of the 2020 Census ETL Operation is about the operational implementation rather than research into new or different methodologies. Automated solutions were pursued this decade, but this operation will remain a paper-based operation for the 2020 Census.

Decisions Made

The following decisions have been made for this operation:

- ✓ The goals and objectives of the ETL field operation is to enumerate individuals at occupied units at TLs who do not have a UHE. The ETL Operation is designed to enumerate eligible populations that inhabit TLs, such as Recreational Vehicle (RV) parks, campgrounds, hotels, motels, marinas, racetracks, circuses, and carnivals.
- ✓ The Census Bureau will follow an approach similar to the approaches used in other operations, which will involve a comprehensive approach to quality. All cases will be subject to edits and checks within the Operational Control System and, as needed, the chance at being selected for a "reinterview" involving telephone contact in the ACOs.

Design Issues to Be Resolved

Additional work is required to make decisions on the following questions:

Question	Expected Date
What does success for the 2020 Census ETL Program look like and how is it measured?	September 2017
Given other aspects of the 2020 Census design, what is the operational timing for the 2020 Census ETL Program?	September 2017
What is the impact of self-response via the Internet and NID processing on ETL?	September 2017
Are there administrative records or third-party data sources that could be used for the frame development by type?	September 2017

Cost and Quality

Investment in ETL is projected to have minimal influence on the overall cost and quality of the 2020 Census.

Risks

One of the lessons learned from the 2010 Census ETL Operation is the importance of field testing. **IF** field testing of the ETL Operation is not conducted before the 2020 Census, **THEN** the operation may encounter unforeseen operational issues, potentially increasing cost and reducing data quality.

A complete and accurate address frame is required to implement an efficient ETL Operation. The ETL frame development and validation will be integrated with the ADC Operation along with efforts from ongoing geographic update operations and other 2020 Census operations. **IF** the address frame does not contain all the instances of the types of LQ covered by the ETL Operation, **THEN** some LQ may not get enumerated by the ETL Operation and the people living at those TLs may not get included in the final 2020 Census population count.

Milestones

Date	Activity
October 2015	Initiate the 2020 Census ETL Integrated Project Team.
September 2018	Release the ETL DOP.
March 2020	Begin 2020 Census ETL enumeration.
April 2020	Conclude 2020 Census ETL enumeration.
April 2021	Issue 2020 Census ETL operational assessment.

5.5.9 Census Questionnaire Assistance

Detailed Planning Status:	**Underway** **DOP delivered in FY 2016**

Purpose

The Census Questionnaire Assistance (CQA) Operation has three primary functions:

- Provide questionnaire assistance for respondents by answering questions about specific items on the census form or other frequently asked questions about the census:

- Tier 1: Provide telephone assistance via an automated menu (Interactive Voice Response, or IVR).
- Tier 2: Provide real-time assistance by CQA agents via the telephone or Web chat.

- Provide an option for respondents to complete a census interview over the telephone.
- Provide outbound calling in support of NRFU Reinterview and Coverage Improvement.

Changes Made Since Version 2.0 Operational Plan Release: Email was eliminated as a formal communication channel in the CQA operation.

Lessons Learned

Based on lessons learned from the 2010 Census studies and reviews, the following recommendations were made:

- CQA Operation requires very specialized contact center personnel throughout the development and operational cycles.
- CQA operations needs to be synchronized with the IPC Program.
- Agent desktop applications need to have the ability to easily update FAQ content so that all relevant information is in one place.

Operational Innovations

Operational innovations include the following:

- Integration with the Internet questionnaire development team to deliver assistance via Web chat.
- Speech and text analytics to determine what is trending in real-time across CQA.

Description of Operation

The main objective of CQA is to assist Internet and paper self-respondents by answering questions coming from telephone and Web chat. CQA will provide support through the following:

- A toll-free telephone number for respondents to call for help completing the 2020 Census questionnaire.
- IVR to resolve basic questions from respondents calling on the telephone to minimize the number of agents required.
- Answers to respondent questions on the Internet via real-time Web chat functionality.
- Real-time assistance to callers (inbound) in completing the 2020 Census questionnaire (with and without a unique Census ID).
- IVR capability for the 2020 Census Jobs Line.
- Outbound telephone calls made by agents to respondents for quality follow-up (coverage improvement).
- Outbound telephone calls made by agents to respondents for NRFU quality assurance (reinterview).

Scope of 2020 Census CQA includes:

- Multichannel contact center with a central command functionality.
  - Voice channel (telephone via IVR and agents).
  - Nonvoice channel (Web chat).
- Staffing of contact center.
- Training of contact center staff.
- Assistance in multiple languages.
- Assistance for individuals with special needs (visual- or hearing-impaired).
- Assistance for individuals in Puerto Rico.
- Assistance for individuals receiving experimental forms.
- Integration with the Internet questionnaire development team to deliver assistance.
- Integration with the hiring and recruiting team to assist with 2020 Census Jobs Line.
- Determination of expected call volumes (inbound and outbound), and for Web chat—including timing of peak volumes and a rollover plan for unanticipated volumes.

Research Completed

The following research has been completed for this operation:

- Market Research:
  - Conducted vendor meetings to benchmark contact center industry and identify best practices.
  - Released a Request for Information to identify industry capabilities.
    - Findings: Most large contact center providers have the capacity to provide

all services identified in the Request for Information. Small businesses do not have the facilities, staff, or experience to meet the full range of services and size required by CQA. However, the Census Bureau did specify small business goals within the RFP and allow the contact center service providers and system integrators to determine how to best meet the small business goals.

- Call Workload Modeling:
  - Looked at call data from the 2014 Census Test, the 2015 Census Test, the 2015 OSR Test, the 2015 National Content Test, the 2016 Census Test, and the 2017 Census Test to assist in forecasting workload for the 2020 Census.
    - Findings: The mailing strategy of pushing respondents to answer the Census on the Internet has created an increase in assistance calls, specifically related to lack of Internet access and technical issues.

Decisions Made

The following decisions have been made for this operation:

- ✓ CQA will use an acquisition with the RFP release date of November 2015.
- ✓ CQA will complete interviews by telephone.
- ✓ CQA will provide respondent assistance relating to specific items on the questionnaire.
- ✓ CQA will handle calls relating to general questions on 2020 Census processes and frequently asked questions.
- ✓ CQA telephone number will be provided in selected materials.
- ✓ The contractor will be required to provide an adaptive infrastructure (e.g., staffing levels and communications capabilities) that can be adjusted on demand as data collection occurs.
- ✓ The contract will include options to provide flexibility to support future operations or capabilities that have not yet been fully defined.
- ✓ The 2020 Census CQA Operation will utilize and integrate a nonvoice communication channel, such as Web chat, to support in-bound census questions.
- ✓ The RFP will require the vendor to develop the application that the agents use to respond to calls, including the data collection instrument to complete the questionnaire.
- ✓ CQA will mail paper questionnaires to people who call to request them for the 2020 Census if the respondent is unwilling to conduct the interview over the phone.
- ✓ CQA agents will be available to provide assistance and complete 2020 Census questionnaires for all specified languages.
- ✓ CQA will assist individuals with special needs (visual- or hearing-impaired).
- ✓ CQA will not collect 2020 Census questionnaire information via texting or Web chat communication channels.
- ✓ CQA will not accept emails, faxes, or Internet uploads of completed 2020 Census questionnaire. Respondents will be directed to mail their responses.
- ✓ CQA will not support centralized outbound calling for NRFU production cases.
- ✓ CQA will include the ability to offer respondents an option to check on the status of the questionnaire they submitted.
- ✓ CQA will handle calls about technical issues (e.g., Internet problems, lack of access to Internet) by offering to complete the 2020 Census questionnaire instead of offering technical assistance to respondents.
- ✓ The CQA will offer a Web chat functionality to provide assistance to respondents while completing their questionnaire online.
- ✓ The RFP included preliminary service level and quality standards.
- ✓ The initial language requirements were specified in the RFP.
- ✓ The Census CQA will not utilize IVR as a data collection mode to complete questionnaire items.
- ✓ The CQA will include a Quality Outbound calling operation.
- ✓ Mailing Strategy models were included in the RFP released in January 2016. The mailing strategy will be iteratively revised and refined on an ongoing basis, as needed.
- ✓ CQA will support centralized outbound calling for NRFU Reinterview and Coverage Improvement.

Design Issues to Be Resolved

Additional work is required to make decisions on the following questions:

Question	Expected Date
When do CQA operations start and end? By component?	January 2018
Will CQA take calls to support field enumerators who are having language issues?	January 2018

Cost and Quality

Investment in CQA is projected to influence (reduce ↓ or increase ↑) the 2020 Census overall costs in the following ways:

- ↓ Increased self-response rates resulting from increased promotion of telephone response.
- ↓ Decreased NRFU workload because of increased self-response.
- ↓ Reduced quantities of paper questionnaires because of increased self-response by telephone.

In addition:

- ↑ Internet Self-Response is expected to increase the workload for CQA.

Impacts of this operation on overall 2020 Census quality include the following:

- ↑ Increase in overall self-response rates.
- ↑ Real-time edits to respondent data collected over the phone.
- ↑ More complete self-response for large households.
- ↑ Potential increase in self-response from traditionally hard-to-count populations.

These four items are also included in the ISR section (5.5.4).

Risks

Adequate staffing is required in order to properly manage the contract supporting the CQA Operation. **IF** adequate program management staff is not in place for the CQA Operation for the 2018 End-to-End Census Test, **THEN** the contract may not be managed properly due to the scope and complexity of the operation.

Adequate funding for the contract supporting the CQA Operation is needed to ensure the contractor can work continuously. **IF** adequate funding for CQA is not allocated in a timely fashion, **THEN** the contractor may need to stop work, which would lead to delays in the delivery schedule.

Multiple Census Bureau and other stakeholders will be involved throughout the CQA Operation. Emerging requirements, lessons learned, and changing conditions have the potential to alter the requirements of the operation in order for the larger 2020 Census Program to be successful. **IF** CQA stakeholders request new requirements, **THEN** the CQA Operation may need to accept higher costs, greater risks to quality, or both.

Milestones

For acquisition purposes, the major milestone dates are:

Date	Activity
January 2016	Release RFP for 2020 CQA acquisition.
July 2016	Award contract for 2020 CQA.
September 2016	Release the CQA DOP.
April 2017	Participate in 2017 Census Test.
December 2017	Release CQA DOP.
April 2018	Participate in 2018 End-to-End Census Test.
January–September 2020	Conduct CQA operations.
September 2020-June 2021	Conduct CQA Post Production Analysis and Close-out.

5.5.10 Nonresponse Followup

Detailed Planning Status:	**Underway** **DOP delivered in FY 2017**

Purpose

The Nonresponse Followup (NRFU) Operation serves two primary purposes:

- Determines or resolves HU status for addresses included in the NRFU workload.
- Enumerates HU that are determined to have a HU status of occupied.

The NRFU workload includes nonresponding addresses in both the self-response TEA and the UL TEA.

In addition, NRFU data collection workload will also:

- Verify the existence and location of addresses received through the 2020 Census NID Processing Operation that could not be reconciled through automated or clerical methods. These are known as Field Verification cases.
- Resolve potential erroneous enumerations and omissions from the initial self-response and field enumeration data collection. These are known as Coverage Improvement cases.
- Resolve the status from some categories of self-responses, such as self-reported vacants, paper returns that were returned blank, etc., and enumerate, as appropriate.
- Re-collect the census responses in select instances to ensure the accuracy of the self-reported census response. These are known as Response Re-collect cases.

Documentation of the various types of cases included in the NRFU workload is found below.

Changes Made Since Version 2.0 Operational Plan Release: Since the FY 2016 release of the 2020 Census Operational Plan, the operational scope of NRFU has expanded to incorporate:

- The enumeration of nonresponding addresses in the UL TEA (TEA 6).
- Coverage Improvement cases. The goal of Coverage Improvement is to resolve erroneous enumerations (where people were counted in the wrong place or counted more than once) and omissions (when people were missed) from all census enumeration operations.

Lessons Learned

Based on lessons learned from the 2010 Census studies and reviews, the following recommendations were made:

- Traditional enumeration and management of workload, as implemented in the 2010 Census, is no longer viable in an era of an ever-evolving, demographically, culturally, and technologically diverse nation.
- Reduce the maximum number of NRFU contact attempts.
- Include the use of a handheld enumeration device that would have the ability to track when an enumerator opens a case.
- Explore additional sources and criteria for inferring occupancy status and population size of HU from administrative records or third-party data.
- Avoid having to add late-planned operations and procedures.

Operational Innovations

Operational innovations include the following:

- Use of administrative records and third-party data to remove vacant HU from the NRFU workload.
- Use of administrative records and third-party data to remove occupied HU from the NRFU workload when sufficient information about the HU and its members are known.
- Automation of administrative functions such as recruiting, onboarding, and payroll.
- Automated training for field staff.
- Automation of the field data collection.
- Use of a reengineered field management structure and approach to managing fieldwork.
- Assignment and route optimization.
- Use of Device-as-a-Service as an alternative to traditional procurement methods for smartphone and tablet devices used in the operation.
- Use of a manager interview for multiunit dwellings to determine vacancy status of units before the enumerator contact attempts at nonresponding addresses.
- Reengineered quality assurance approach.

Description of Operation

For the 2020 Census, the NRFU Operation will be different from the NRFU Operation conducted in the 2010 Census. The Census Bureau will implement a NRFU operational design that utilizes a combination of the following:

- Administrative records and third-party data usage to reduce the workload.
- Reengineering of staffing and management of field operations.

- A Best-Time-to-Contact model to increase the likelihood of making contact attempts when an enumerator will find people at home.
- Automation to facilitate data collection.

The NRFU workload is comprised of addresses from a number of sources, including:

- Nonresponding addresses in the self-response and UL TEAs.
- Blank mail returns or mail returns otherwise deemed to be insufficient.
- Addresses from operations such as New Construction, HU Count Review, the spring 2020 USPS Delivery Sequence File, addresses upheld in the LUCA appeals process, and potentially other addresses determined after the initial enumeration universe is established.
- Self-reported vacants from Internet Self-Response.
- Field Verification cases.
- Coverage Improvement cases.
- Response Re-collect cases.

After giving the population an opportunity to self-respond to the 2020 Census, the Census Bureau will use the most cost-effective strategy for contacting and counting people to ensure fair representation of every person in the United States and Puerto Rico. Once we know the addresses that did not respond through Internet, telephone, or paper, we will use administrative records to identify vacant addresses and addresses that do not exist to reduce the workload of addresses that enumerators will visit. Undeliverable-as-Addressed (UAA) information from the USPS will provide the primary administrative records source for the identification of vacant addresses and addresses that do not exist.

For the remaining addresses in the initial NRFU workload, enumerators will make an in-person contact attempt to determine the status of the address (vacant, occupied, does not exist) and, when occupied, collect the census response. If the contact attempt was unsuccessful, the address is believed to be occupied, and where the Census Bureau has high-quality administrative records from trusted sources, administrative records will be used as the response data for the household. Examples of source of administrative records and third-party data used to enumerate occupied HU include Internal Revenue Service Individual Tax Returns, Internal Revenue Service Information Returns, and Center for Medicare and Medicaid Statistics Medicare Enrollment Database.

Addresses removed from the NRFU workload as administrative records vacant, administrative records nonexistent, or administrative records occupied will receive a final mailing that encourages occupants to self-respond to the 2020 Census. Those addresses that are determined to be administrative records vacant or administrative records occupied will immediately be mailed a final postcard encouraging self-response; for those addresses that are determined to be occupied and are incomplete after one personal visit attempt, a final postcard encouraging self-response will be mailed within 7 days.

Addresses will also be removed from the workload throughout the course of the NRFU Operation as self-responses are received. Addresses may be added to the NRFU workload from other census operations, such as addresses from the LUCA Appeals process and addresses received through the NID Processing Operation that require a field visit for final resolution. See other sources contributing to the NRFU workload, listed above.

The NRFU Operation will use a reengineered field management structure and approach to managing fieldwork, which includes:

- Using a new field structure, including field staff roles and staffing ratios.
- Using automation for:
  - Training of enumerators and managers.
  - Enhanced operational control system.
  - Optimization of daily enumerator assignments.
  - Near real-time operational information for decision making.
  - Payroll submission and approval processing.

A foundational innovation of the NRFU operational design is the optimization of enumerator assignments. On a daily basis, based on an enumerator's home location, work availability, the availability and location of NRFU workload, and other operational business rules, the enumerator will be assigned NRFU addresses. The enumerator will work the addresses in a prescribed order to determine the Census Day status of the HU, and when occupied, enumerate the HU. Enumerators

will use an automated data collection application on a handheld device to record the Census Day HU status and to enumerate occupied HU. If a respondent is not at home, a notice of visit will be left directing the respondent to the Internet or CQA to self-respond.

The assignment and completion of the NRFU workload are also governed by:

- Best-Time-to-Contact probabilities that are considered in making assignments and are used to increase the likelihood of finding people at home.
- Business rules that prescribe the number of contact attempts for an address and when a proxy response is acceptable. A proxy response is a response provided by a knowledgeable source, such as a neighbor.

Operational efficiencies are also gained through the use of manager visits. When a number of NRFU addresses share the same street address, such as an apartment building or condo unit, the cases will be grouped together for a manager visit. In the manager visit interview, the enumerator will ask the building manager to identify which units were occupied, vacant, or not a HU on Census Day. Units identified as vacant or not a HU will be enumerated as such, reducing the number of enumerator visits and respondent burden. Addresses the building manager identifies as occupied are subject to contact attempts by an enumerator to collect their census response.

The 2020 Census NRFU operational design will infuse quality throughout the workload management and data collection processes. Examples of aspects of the NRFU Operation designed to maintain or improve quality include:

- Use of real-time paradata and editing capabilities to increase accuracy and quality check data.
- Use of a Best-Time-to-Contact model in assigning work to increase the likelihood of finding respondents at home.
- Capabilities available through an enhanced operational control system with real-time supervisory alerts to provide early opportunities to identify and take corrective action in defined situations.

In addition, the NRFU Operation will include a reinterview component designed to deter and detect enumerator falsification. Reinterviews will be conducted by telephone to reduce costs, but if the respondent cannot be reached by telephone, the reinterview will be completed by field staff. A check of administrative records will also be part of the QC process. A roster match case between the NRFU case and administrative records does not need to be verified by field reinterview.

Since the October 2016 release of version 2.0 of the 2020 Census Operation Plan, a decision was reached to include a coverage improvement operation component. The coverage improvement component is to resolve erroneous enumerations and omissions from the initial census self-response data collection operation and all field enumeration and follow-up operations to achieve the overall objective to count all people and HU once and in the right place. Coverage improvement cases have traditionally been completed through a telephone reinterview. The reinterview is conducted with a household respondent to determine if changes should be made to their household roster as reported on their initial census return. The questions in the reinterview probe to determine if people were missed, or if people were counted in error because they should be counted at a different address.

In the past, the coverage improvement reinterview collected missing demographic data for all persons in the household, especially for those in the continuation roster in large households. For 2020, the proposed coverage improvement design will:

- Only send large households to coverage improvement if another coverage issue is identified.
- Only collect demographic items for people added to the roster during the coverage improvement telephone operation. Only collect a subset of demographic items.
- Not collect missing demographics for people on the initial response roster.
- For electronic modes, including the Internet, collect initial census response data only. The Census Bureau hopes to use the capabilities of electronic modes to allow the respondent to resolve count discrepancies during the initial census response, thus reducing the number of count discrepancy cases to send to coverage

improvement. Therefore, the Census Bureau expects far fewer count discrepancies to come from electronic modes.

- Not use administrative records to identify cases with potential coverage issues or for telephone number lookup.

Research Completed

The following research has been completed for this operation:

- The 2013 Census Test (Philadelphia, PA) explored methods for using administrative records and third-party data to reduce the NRFU workload:
  - Findings:
    - The Census Bureau was able to remove approximately 8 percent of vacant units and 31 percent of occupied units prior to NRFU using administrative records and third-party data.
    - The use of administrative records and third-party data and the implementation of an adaptive design case management approach have the potential to reduce costs.
- The 2014 Census Test (Montgomery County, MD, and Washington, DC) built upon the results of the 2013 Census Test specific to administrative records and third-party data usage to reduce the NRFU workload:
  - Findings: A high self-response rate of 65.9 percent resulted in a NRFU universe of 46,247 HU. The Census Bureau was able to identify approximately 4 percent of the NRFU cases as vacant and 55 percent of NRFU cases as occupied based on administrative records and third-party data.
- The 2014 Human-in-the-Loop Simulation Experiment (SIMEX).
  - Findings:
    - The field management structure can be streamlined and ratios increased.
    - Messaging and alerts within the operational control system provide real-time and consistent communication.
    - The enhanced operational control system or MOJO is intuitive—users were able to use the system with a small amount of up-front training.
    - Smartphones were usable by all people—even those with little technology experience were able to adjust and adapt.
- The 2015 Census Test (Maricopa County, AZ) explored the reengineering of the roles, responsibilities, and infrastructure for conducting field data collection. It also tested the feasibility of fully utilizing the advantages of planned automation and available real-time data to transform the efficiency and effectiveness of data collection operations. The test continued to explore the use of administrative records and third-party data to reduce the NRFU workload and tested the technical implementation of a Bring Your Own Device (BYOD) option.
  - Findings:
    - A high self-response rate of 54.9 percent resulted in a NRFU universe of 72,072 HU. The Census Bureau was able to identify approximately 12 percent of the NRFU cases as vacant and 20 percent of NRFU cases as occupied based on administrative records and third-party data.
    - Successfully removed vacant HU and enumerated occupied HU using administrative records and third-party data.
    - A combination of automated online training and classroom training enabled a reduction in the overall number of training hours, compared with the 2010 Census NRFU Operation, from 32 to 18 hours.
    - Management of the field data collection utilizing new roles, responsibilities, and staffing ratios were successfully implemented.
    - Entry of enumerator work availability, workload optimization, and electronic payroll were effective and efficient.
    - Use of a BYOD option did not generate any observable concerns from respondents. Please see decisions made section.
- The 2016 Census Test (portions of Los Angeles County, CA, and Harris County, TX) was the first opportunity to operationally test the new 'manager visit' procedures for enumeration of multiunit structures. Also tested were different supervisor to enumerator staffing ratios, and

incremental improvements and updates to the field data collection software that guided an enumerator through the interviews. Finally, this test allowed the continued evaluation of the use of administrative records to reduce the NRFU workload, with the new addition of a postcard mailout to any cases removed from the NRFU workload in this way. Findings are underway and will be forthcoming.

Decisions Made

The following decisions have been made for this operation:

- ✓ The NRFU Operation will consist of production and quality assurance components.
- ✓ The NRFU Operation will utilize automated tools and systems for:
  - º Recruiting, onboarding, and training.
  - º Time and attendance and payroll.
  - º Case load management.
  - º Data collection.
  - º Cost and progress monitoring.
- ✓ The NRFU Operation will utilize a reengineered field management and staffing structure.
- ✓ Administrative records and third-party data will be used to identify vacant units.
- ✓ Administrative records and third-party data will be used to enumerate nonresponding HU, as appropriate.
- ✓ A contact attempt will be made prior to using administrative records or third-party data for enumeration of occupied units.
- ✓ A final postcard, encouraging self-response, will be mailed to NRFU cases that are removed from the workload based on the administrative records modeling.
- ✓ Telephone contact attempts from a central location (i.e., CQA) will not be part of the initial NRFU contact strategy, but will be used as part of the NRFU reinterview contact strategy.
- ✓ All administrative records and third-party data will be used in compliance with data-use agreements.
- ✓ The core set of administrative records and third-party data to support the 2020 Census NRFU operations include the following:
  - º Internal Revenue Service Individual Tax Returns.
  - º Internal Revenue Service Information Returns.
  - º Center for Medicare and Medicaid Statistics Medicare Enrollment Database.
  - º Indian Health Service Patient Database.
  - º Social Security Number Identification File.
  - º USPS DSF.
  - º USPS Undeliverable-as-Addressed Information.
  - º Targus Federal Consumer File.
  - º 2010 Census Data.
  - º ACS Data.
- ✓ Detailed agreements with each data provider for the core administrative record and third-party data sources are established. The agreements document details, such as delivery cycles, duration of agreements, and renewal cycles, etc. Each agreement includes text that allows the data to be used by the Census Bureau for statistical purposes including activities that support the Decennial Census Program.
- ✓ The Census Bureau will pursue multiple avenues to minimize error associated with administrative records usage. The use of USPS UAA information is the core source in our usage of administrative records determination of vacant addresses and addresses that do not exist. To minimize error in the use of the USPS UAA information in determining the status of an address, the Census Bureau is partnering with the USPS to understand the procedures and steps used by letter carriers when assigning specific reasons to mail pieces that are UAA. The Census Bureau observed the USPS assignment of the UAA reasons/codes and participated in focus groups with USPS carriers to discuss their process. To strengthen the Census Bureau's overall approach to utilization of administrative records and third-party data, we continue to pursue additional sources of data such as Supplemental Nutrition Assistance Program data from the 50 states and the District of Columbia, as well as the National Directory of New Hires. The acquisition of such sources will enable analysis and an assessment regarding use of these sources to strengthen the Census Bureau's approach and minimize error.

- ✓ The Census Bureau will apply specific, pre-identified criteria for each HU to make a determination regarding its status.
- ✓ Enumerators will not make specific appointments with respondents to conduct interviews. Rather, the enumerator will collect windows of time for a future attempt. The optimizer takes into account "Best-Time-to-Contact" respondents when making case assignments.
- ✓ Administrative Records and Third-party data will be stored and accessed through a repository known as Production Environment for Administrative Record Staging, Integration, and Storage (PEARSIS). The Current Analysis and Estimation System will access data in PEARSIS to support administrative records modeling for the NRFU Operation. The Decennial Response Processing System will provide the response processing capabilities to identify and ingest administrative records and third-party data for the purposes of providing case status (vacants) and census responses (occupied).
- ✓ The Census Bureau will build upon the approach used in the 2016 Census Test involving an upfront Manager Visit to ascertain the unit status for nonresponding addresses in the NRFU workload.
- ✓ Proxy responses are used in the NRFU Operation when a resident of the nonresponding address is not available or cannot be found. Proxy responses will be allowed after the third unsuccessful contact attempt to reach a resident of a nonresponding address. Proxy responses are allowable on the first unsuccessful contact attempt for addresses deemed to be vacant or not meeting the definition of a HU. A refinement of proxy eligibility may occur if administrative records research can identify types of cases that should be subject to more than three unsuccessful attempts before allowing for a proxy response.
- ✓ Based on results from the 2016 Census Test, the following staffing structure will be used: Census Field Manager, Census Field Supervisor, and enumerator. The ratio of Census Field Supervisor to enumerator will be 1:20.
- ✓ Administrative records and third-party data will be used for the identification and removal of addresses from the NRFU workload deemed to be vacant or delete before any contact attempts. Administrative records and third-party data will be used for the identification and enumeration of addresses deemed to be occupied after one unsuccessful attempt at in-person enumeration. All other addresses in the NRFU workload will be subject to up to six contact attempts with cases becoming proxy eligible after the third unsuccessful attempt. Refinement of this contact strategy may be possible if additional efforts to acquire administrative records and third-party data yield new sources and/or if additional research can target demographic groups that would benefit from additional contact attempts.
- ✓ Field verification will be conducted using NRFU enumerators with case assignment interspersed with their NRFU assignments. For Field Verification, enumerators will be expected to locate the problem address and collect GPS coordinates of the HU using the automated instrument. There does not need to be contact with HU.
- ✓ The operational design for the NRFU quality assurance component includes the following:
  - º Use of an improved contact strategy to increase the likelihood of self-response.
  - º Use of an automated data collection application for conducting NRFU.
  - º Use of real-time paradata and editing capabilities to validate and quality check data.
  - º Use of Best-Time-to-Contact model in the assignment optimization to increase the likelihood of finding respondents at home.
  - º Use of Notice of Visit to push to self-response.
  - º Use of follow-up postcard mailing to push to self-response in the case of administrative records and third-party data vacant removal and occupied removal.
  - º Use of administrative records and third-party data to remove vacant and occupied HU from the NRFU workload may impact HU coverage.
  - º Use of administrative records and third-party data to reduce the number of contact attempts may decrease the quality of responses.
  - º Use of new or revised methodologies will change results in ways not yet determined.

- Use of adaptive design protocol and proxy rules may impact the quality of response data in ways not yet determined.
- A reinterview component designed to deter and detect enumerator falsification.

✓ All units identified as vacant or delete will be verified by either a proxy response or a second enumerator. Vacants from self-response will be verified by an enumerator.

✓ There will not be a priority variable contact strategy based on geography. However, the Census Bureau will have the capability to keep cases active during the closeout procedures to aid in obtaining adequate response rates.

✓ Enumerators, as part of their normal conducting of NRFU assignments, will not be looking for missing addresses and adding them to their workload. Enumerators will not have access to the complete address list so determining if an address is missing is not feasible. However, the staff in the ACO will have the capability to add addresses to the NRFU workload that have been deemed to be missing from the address list and require enumeration. Real-time NID processing is not part of the process for adding missing addresses to the NRFU workload.

✓ Case assignments are optimized based on the location of enumerators, the location of the NRFU cases, the hours the enumerator is available to work, and Best-Time-to-Contact probabilities associated with the NRFU cases.

✓ The NRFU field data collection will occur from early-April 2020 through the end of July 2020. Field work in preidentified geographic areas surrounding colleges or universities with concentrations of off-campus housing will begin in early April. This is necessitated in areas where the spring semester will conclude prior to mid-May when the bulk of the NRFU workload begins.

✓ NRFU will receive supplemental addresses from sources such as LUCA appeals, Count Review, New Construction, and a refresh from the spring 2020 Delivery Sequence File from the Postal Service. Other sources of cases contributing to the NRFU workload include, but are not limited to, Reverse Check-ins, Response Validation Re-collect Cases, and Self-Responding Vacant Cases.

✓ Enumerator performance indicators include:
- Number of completed interviews.
- Completed interview rate.
- Number of attempts.
- Ratio of resolved cases per attempt.
- Hours worked.
- Ratio of resolved cases per hour.
- Number of alerts triggered.
- Number of refusal conversions.
- Number of production interviews that had a reinterview conducted.
- Rate of production interviews that were reinterviewed and passed.
- Indication of overall performance score (Current Surveys clustering or Hard-to-Enumerate Score).

✓ Based on our current understanding of the 2020 Census operational design, where paper will be used as a data collection mode, the use of automation, etc., it is not felt that priority capture of paper responses will be required in support of the NRFU Operation; a first in, first out approach should be sufficient. Postal tracing information will be used to inform the cut for the NRFU workload resulting in the removal of cases for which postal tracing indicates a paper response is on its way back to the Census Bureau. If upon data capture, it is determined that the paper response has insufficient data to be considered a complete response, those cases will be added back into the NRFU workload. In the event that priority capture does become a concern/requirement, paper responses should be captured in the following order: Update Enumerate paper responses, Paper Returns from TEA 1 Choice Areas (low response areas); Bilingual Paper Returns (TEA 1), Fulfillment Returns (if we have them), Experimental Paper Returns (if we have them), Paper Returns from TEA 1 Nonchoice, Service-Based Enumeration, and Group Quarters (colleges and universities, shipboard/maritime vessels, correctional facilities, and medical facilities).If our understanding of the 2020 Census operational design changes with regard to the use of paper, this decision will be revisited.

Design Issues to Be Resolved

Additional work is required to make decisions on the following questions:

Question	Expected Date
What is the final set of administrative records and third-party data (including state-level data sources) that are necessary to support the 2020 Census NRFU Operation?	September 2018
For each of the final administrative record and third-party datasets, what is the allowable use, required timing, and acquisition approach for the data?	September 2018

Cost and Quality

The investment in NRFU, which includes the use of administrative records and third-party data and reengineered field operations, is projected to influence (reduce ↓ or increase ↑) the 2020 Census overall costs in the following ways:

- ↓ Reducing field workload by:
  - Using administrative records and third-party data to remove vacant LQ and deleted addresses from the NRFU workload.
  - Using administrative records and third-party data to reduce the number of contact attempts.
  - Using administrative records and third-party data to enumerate nonresponding HU.
  - Removing self-responses on a near-real-time basis.
  - Interviewing managers of multiunit buildings to identify and remove vacant units from the NRFU workload.
- ↓ Improving productivity of field staff by:
  - Streamlining staffing structure through the use of automation.
  - Automating and optimizing the assignment process.
  - Using language information from the planning database to match enumerator language skills to neighborhood language needs.
  - Using administrative records and third-party data to determine the best time of day for contact attempts.
- ↓ Reducing the reinterview workload through a reengineered quality assurance approach.
- ↓ Reducing the number of hours devoted to classroom training through the use of online training.

Impacts of this operation on overall 2020 Census quality include the following:

- ↑ Use of an improved contact strategy to increase the likelihood of self-response.
- ↑ Use of an automated data collection application for conducting NRFU.
- ↑ Use of real-time paradata and editing capabilities to validate and quality check data.
- ↑ Use of Best-Time-to-Contact model in the assignment optimization to increase the likelihood of finding respondents at home.
- ↑ Use of Notice of Visit to push to self-response.
- ↑ Use of follow-up postcard mailing to push to self-response in the case of administrative records and third-party data vacant removal and occupied removal.
- ↓ Use of administrative records and third-party data to remove vacant and occupied HU from the NRFU workload may impact HU coverage.
- ↓ Use of administrative records and third-party data to reduce the number of contact attempts may decrease the quality of responses.
- ↔ Use of new or revised methodologies will change results in ways not yet determined.
- ↔ Use of adaptive design protocol and proxy rules may impact the quality of response data in ways not yet determined.

Risks

Many aspects related to the NRFU operational design and the infrastructure necessary to support it are based on workload assumptions. A key input to those workload assumptions is the self-response rate. **IF** the 2020 Census self-response rate falls below expectations, **THEN** the initial NRFU workload will be higher than expected and the infrastructure to support an increased field data collection volume may be insufficient.

The NRFU workload will be impacted by other operations that are striving to develop and improve the coverage and quality of the address frame used for the 2020 Census. **IF** there is an increase in the NRFU operational workload due to the results of the upstream address frame operations, **THEN** the

expected cost savings from the NRFU Operation may not be realized.

Technical innovations such as assignment optimization are key elements to the operational design for conducting NRFU. **IF** any aspect of the planned technical innovations does not perform as expected, **THEN** the operational design for NRFU may fail.

Technical innovations are expected to reduce the cost of the NRFU Operation, but the cost of the operation can be greatly impacted by economic conditions beyond the Census Bureau's control. **IF** economic conditions are not favorable at the time of the 2020 Census, **THEN** the costs to implement the NRFU Operation may prevent the expected cost savings from being realized.

The utilization of administrative records and third-party data to reduce the NRFU workload is a foundational tenet on which the 2020 Census Program expects to realize cost savings. **IF** the Census Bureau is unable to use administrative records and third-party data as planned, **THEN** increased costs will be incurred to conduct NRFU.

Milestones

Date	Activity
November 2013	Begin NRFU for 2013 Census Test.
August 2014	Begin NRFU for 2014 Census Test.
November 2014	Conduct 2014 SIMEX.
May 2015	Begin NRFU for the 2015 Census Test.
September 2015	Determine preliminary NRFU Design.
May 2016	Begin NRFU for 2016 Census Test.
September 2016	Determine strategy for use of administrative records and third-party data in NRFU.
June 2017	Release the NRFU DOP (delayed).
May 2018	Begin NRFU for 2018 End-to-End Census Test.
April 2020	Begin NRFU data collection for the 2020 Census.
August 2020	End NRFU data collection for the 2020 Census.
August 2021	Issue operational assessment of the 2020 Census NRFU Operation.

5.5.11 Response Processing

Detailed Planning Status:	**Underway** **DOP delivered in FY 2017**

Purpose

The Response Processing Operation (RPO) supports the three major components of the 2020 Census: pre-data collection activities, data collection activities, and post-data collection activities:

Specifically, the operation supports the following:

- Create and distribute the initial 2020 Census enumeration universe of LQ.
- Assign the specific enumeration strategy for each LQ based on case status and associated paradata.
- Create and distribute workload files required for enumeration operations.
- Track case enumeration status.
- Run post-data collection processing actions in preparation for producing the final 2020 Census results.
- Check for fraudulent returns.

Changes Made Since Version 2.0 Operational Plan Release: The scope of the operation now includes processing of the IAC response data and management of the operational functions of the Census Data Lake.

Lessons Learned

Based on lessons learned from the 2010 Census studies and reviews, the following recommendations were made:

- Make response data available as soon as possible to the data review teams in order to facilitate a more thorough review.
- Include more staff members from more areas in the Primary Selection Algorithm determination process. This will result in broader expertise for design planning, rather than limiting to a small team of mathematical statisticians or analysts.
- Make user testing of the Quality Control program component part of the schedule for residual coding, to facilitate development of procedures and training of data coding staff.

Operational Innovations

Operational innovations include the following:

- Use of enterprise-developed tools to facilitate intelligent business decisions prior to and during data collection:
  - Interface with all printing systems for production of paper products.
  - Serve as the overall integration "manager" of response data collection, including Internet, telephone, and paper.
  - Create models based on established business rules to determine the appropriate course of enumeration action for cases (e.g., person visit, use of administrative records and third-party data, or imputation) and assign each case to the specific mode for data collection.
- Expanded use of administrative records and third-party data in post-data collection processing activities to support improved data coverage.
- Expand the use of automated technology, communications monitoring, and improved computational modeling and data analytic techniques to provide early warnings of potentially fraudulent returns.

Description of Operation

Pre-Data Collection Activities

The pre-data collection phase of RPO creates and populates a respondent data collection universe of LQ for use during the later data collection and post-data collection phases of RPO. This universe contains census addresses and geographic attributes for all known HU, GQ, and TL within the boundaries of the United States and Puerto Rico. Each known LQ in the universe is populated with address information, a Census ID, geocoding information, case management information, and a contact strategy. The Census ID will be used during later phases of RPO to associate a particular set of response data back to a specific LQ.

Data Collection Activities

For data collection activities, the RPO starts with receiving and managing updates to the initial 2020 Census universe. These updates come from various address frame update operations including LUCA and some Geographic Programs activities. The results from the address updates establish a revised 2020 Census enumeration universe. The RPO uses this universe to control and track questionnaire response data. As responses are received, cases containing a Census ID are designated as received in the universe. Cases returned

Pre-Data Collection Activities	Data Collection Activities	Post-Data Collection Activities
• Receive address and geographical input data for all known living quarters. • Apply criteria to create the initial 2020 Census enumeration universe. • Assign the specific contact strategy for each living quarters based on defined criteria.	• Receive updates to the initial 2020 Census Universe. • Create the 2020 Census self-response universe. • Create and distribute workloads to data collection modes based on modeling results or specification criteria. • Record response data and enumeration case status. • Deliver response data to Postdata Collection Activities.	• Apply data codes to write-in responses to facilitate data tabulation. • Identify potential fraudulent returns from self-responses and record final fraud investigation disposition. • Resolve potential duplicate responses. • Identify the return of record for housing units with multiple returns. • Repair missing or conflicting data. • Provide final census results.

Figure 30: Response Processing Operation

without Census IDs are sent to the NID Processing Operation for matching and geocoding. All cases are returned to the RPO and those that were successfully resolved are removed from further enumeration follow-up.

For nonresponding cases, the RPO supports the NRFU Operation by facilitating administrative records modeling techniques to determine the most effective and efficient enumeration strategy, including removal of vacant and deleted cases before follow-up, provision of a "best time to contact" recommendation to be used by the operational control system, and removal of cases from the workload based on established "stopping rules" to maximize efficiency in the NRFU Operation.

Additionally, the RPO provides response collection support to UL, UE, GQ, and ETL operations. In general, the activities include creating and managing the enumeration workloads and follow-up universes, as well as the enumeration and, as applicable, address listing quality control functions.

Post Data Collection Activities

The RPO supports post-data collection activities by preparing the data for tabulation. As the data are received, write-in responses (i.e., alpha characters for race and ethnicity responses) are coded for tabulation purposes. Coding is conducted by both automated and computer-assisted manual processes. In addition, automated checks are run to detect potentially fraudulent returns from self-response that require further investigation, and a final disposition from the investigation is recorded prior to tabulation. Response Processing also applies computer-based person matching software to unduplicate multiple responses for the same person across census records. Then, a Primary Selection Algorithm is run to establish the single enumeration record for a case when multiple responses are received. Following the Primary Selection Algorithm, count imputations are applied and missing data resolved to fix discrepancies in household population counts and the status of HU. This output is called the Census Unedited File. The Census Unedited File is used as a data source for coverage measurement operations and a final independent CRO. Finally, the Census Unedited File is the source used to produce the apportionment counts delivered to the President of the United States via the Data Products and Dissemination Operation.

The next steps are to perform preliminary and complex consistency edits, apply Disclosure Avoidance techniques, apply tabulation recodes, and produce a Microdata Detail File for delivery to the Data Products and Dissemination Operation for creation of the P.L. 94-171 Census Redistricting Data File and dissemination of data to the public. As part of a final closeout, Response Processing prepares census response data for delivery by the ARC Operation to the National Archives and Records Administration (NARA) for the Title 13 prescribed 72-year secured storage.

Figure 30 summarizes the RPO by component.

Research Completed

The following research has been completed for this operation:

- The 2014 Census Test evaluated the interface between the response processing system and the matching and geocoding system. In addition, it tested the data file exchange.
  - Findings: The tests concluded with no major system or workload-related issues.
- The 2015 OSR Test, the 2015 Census Test, and the 2016 Census Test included processing of NID cases in real time (during response collection for Internet and telephone data collection modes).
  - Findings: The tests concluded with no major system or workload-related issues.

Decisions Made

The following decisions have been made for this operation:

- ✓ The RPO will use the enterprise-developed system solution Control and Response Data System for universe creation, the Enterprise Census and Survey Enabling Operational Control System for data collection control and management, and the Decennial Response Processing System for final data processing.
- ✓ The enterprise-developed Concurrent Analysis and Estimation System and its modeling output will use established business rules to determine the appropriate course of enumeration action for cases and assign the case to the specific mode for data collection to improve efficiency and reduce cost.

- ✓ Administrative records and third-party data will be used to improve post-data collection activities, such as coding and editing, Primary Selection Algorithm, Invalid Return Detection (IRD), and imputation.
- ✓ The RPO will comply with Title 13 and Title 26 security requirements.
- ✓ Methodology, processes, and systems have been defined. Methodology will continue to be adjusted as operational development, integration, and demand models are refined through conducting and evaluating results from the 2017 and 2018 tests.
- ✓ The specific use of administrative records and third party data in support of reducing the field workload associated with the NRFU Operation is known and has been effectively utilized during past census tests. In addition, usage of the records is known regarding address enhancement to improve matching NID responses through the asynchronous NID process. Finally, fraud detection's (including response validation) use of administrative records and third-party data has been defined. However, the Census Bureau will continue to adjust as integrated operations and demand models are refined throughout the conduct and evaluating the results from the 2017 and 2018 tests.
- ✓ Character sets have been defined and will continue to be adjusted as integrated operations, language options, and data architecture are refined throughout conducting and evaluating results from the 2017 and 2018 tests.
- ✓ Inputs to the response file layout have been defined and will continue to be adjusted as integrated operations and the data architecture are refined throughout conducting and evaluating results from the 2017 and 2018 tests.

Design Issues to Be Resolved

There are no remaining design issues to be resolved for this operation.

Cost and Quality

Investment in RPO is projected to influence (reduce ↓ or increase ↑) the 2020 Census overall costs through:

- ↓ Real-time adjustment of the universe based on response status.
- ↓ Use of administrative records and third-party data (see NRFU).
- ↓ Flexible, rule-based decisions on most cost-effective approach for collecting responses (expected to reduce in-field workloads).

Impacts of this operation on overall 2020 Census quality include the following:

- ↑ Use of administrative records and third-party data to improve imputation, editing and coding, Primary Selection Algorithm, and fraud detection processing.

Risks

The 2018 End-to-End Census Test is the greatest opportunity to test the enterprise and nonenterprise system solutions prior to the 2020 Census. The test allows the system capabilities and system interfaces to be validated for operational readiness. **IF** all systems being utilized for response processing in the 2020 Census are not tested and accepted as part of the 2018 End-to-End Census Test, **THEN** there may not be time before the 2020 Census to validate any solution not in scope for the 2018 End-to-End Census Test.

After the 2018 End-to-End Census Test, time is required for final operational decisions concerning content and forms design, self-response contact strategies, enumeration strategies, and coverage improvement operations. The final operational designs will affect response processing for the 2020 Census. **IF** final operational decisions are not complete by the end of September 2018, **THEN** the RPO may not be able to support the other 2020 Census operations successfully.

Milestones

Date	Activity
March 2015	Establish the development, test, beta, staging, and production environments for RPO.
December 2015	Go live to support the 2016 Census Test universe creation and response tracking.
December 2016	Go live for the 2017 Census Test.
January 2017	Deliver revised 2020 Census business requirements for RPO.

Date	Activity
April 2017	Release the RPO DOP. Note: This initial release reflects the state of the RPO as of January 13, 2017. In addition, the post-data collection phase of this operation is not fully presented, as some details about the process continue to be worked out.
June 2018	Release the updated RPO DOP.
September 2018	Deliver final 2020 Census business requirements for RPO.
October 2019	Create the initial 2020 Census enumeration universe for early census operations.
January 2020	Create the 2020 Census enumeration universe. Begin the 2020 Census RPO.
November 2020	Deliver the 2020 Census Unedited File for apportionment counts.
February 2021	Deliver the 2020 Census Microdata Detail File for Tabulation.

5.5.12 Federally Affiliated Count Overseas

Detailed Planning Status:	**Recently Begun**

Purpose

The FACO Operation obtains counts by home state of U.S. military and federal civilian employees stationed or deployed overseas and their dependents living with them.

Changes Made Since Version 2.0 Operational Plan Release: The name and the acronym of the operation have been changed to reflect that counts will not be exclusively for Americans. Census counts include everyone who meets the residence criteria.

Lessons Learned

Based on lessons learned from the 2010 Census studies and reviews, the following recommendations were made:

- Explore new technology, including an Internet option for collecting data on the federally affiliated population living overseas.
- Automate this operation fully.
- Consider new data fields to identify the residency of the military personnel living overseas.
- Maintain a strong relationship with the Department of Defense.

Operational Innovations

Operational innovations include creating a secure interactive database for Department of Defense to submit their enumeration counts.

Description of Operation

For the 2020 Census, overseas is defined as anywhere outside the 50 states and the District of Columbia. Counts are obtained from administrative records and are used to allocate the federally affiliated population living overseas.

FACO performs the following activities:

- Engages and communicates the Census Bureau's methodology and procedures with the Defense Manpower Data Center.
- Compiles address list of federal agencies with personnel overseas.
- Prepares letters and data collection materials.
- Requests the name of a contact person for each agency.
- Obtains agencies' overseas counts by state.
- Uses the tabulated data file from the Department of Defense to obtain total counts of military and civilian personnel stationed/assigned overseas and their dependents living with them.
- Submits final counts in the apportionment counts.

Assumptions Made

Based on the design from previous censuses, the following assumptions have been made:

Early Findings:

- The U.S. Air Force is again using the Home of Record field for its military personnel, based on a meeting with the Defense Manpower Data Center in March 2014 to discuss any suggested updates from the 2010 Census enumeration.

Decisions Made

✓ Data sharing agreement between the Department of Defense and the Census Bureau stipulated that the Department of Defense will

electronically send the Census Bureau a secure tabulated file of Department of Defense personnel and their dependents living with them overseas.

Design Issues to Be Resolved

Additional work is required to make decisions on the following questions:

Question	Expected Date
What other data sources are available for tabulating the overseas counts?	September 2017

Cost and Quality

Investment in the FACO Operation is projected to have minimal influence on the overall cost and quality of the 2020 Census.

Risks

The FACO Operation plans to use an external-facing SharePoint portal as an automated data collection system for the 2020 Census overseas count. **IF** the external-facing SharePoint portal cannot be used as the automated data collection system because it did not meet the Census Bureau's IT security requirements, **THEN** the data collection methods used for the 2010 Census may have to be reused for the 2020 Census overseas count.

The FACO Operation plans to use an external-facing SharePoint portal as an automated data collection system for the 2020 Census overseas count. **IF** there is a cybersecurity incident with the external-facing SharePoint portal, **THEN** the information collected for the FACO Operation may be compromised.

Milestones

Date	Activity
February 2014	Establish contact with Defense Manpower Data Center.
February 2017	Review final guidelines for counting federally affiliated population living overseas.
September 2018	Obtain Office of Management and Budget clearance.
May 2018–February 2020	Design, prepare, send contact letters, count letters and instructions, and follow-up count request.
September 2018	Release the FACO DOP.
September 2019	Obtain from the Office of Personnel Management the most recent Federal Civilian Workforce Statistics publication.
July 2020	Prepare and review overseas counts.
August 2020	Deliver overseas counts to include in apportionment count.

5.5.13 Update Leave

Detailed Planning Status:	**Underway** **DOP delivered in FY 2017**

Purpose

The Update Leave (UL) Operation is designed to occur in areas where the majority of HU do not have either mail delivered to the physical location of the HU, or the mail delivery information for the HU cannot be verified. The purpose of the operation is to update the address and feature data for the area assigned and to leave a choice questionnaire package at every HU identified to allow the household to self-respond. Occupants will be offered three different ways to complete the questionnaire including Internet, phone, or by mailing back a completed paper questionnaire.

The primary functions of UL include:

- Verifying and updating the address list and feature data for tabulation of the 2020 Census.
- Determining the type and address characteristics for each LQ.
- Leaving a questionnaire package at every HU for the household to respond to the census.

UL can occur in geographic areas that:

- Do not have city-style addresses.
- Do not receive mail through city-style addresses.
- Receive mail at post office boxes.
- Have been affected by major disasters.
- Have high concentrations of seasonally vacant housing.

Changes Made Since Version 2.0 Operational Plan Release:

UL was introduced as a new operation in late May 2017 and was not a part of the Version 2.0 Operational Plan Release. A new TEA was created for the UL operation. It is expected that a majority

of the housing units currently delineated in the UE TEA will be transferred to the new UL TEA.

Lessons Learned

Based on lessons learned from the 2010 Census studies and reviews, it has been recommended to determine ways to closely track the fieldwork during the UL field operation in order to monitor any falsification or procedural issues that may arise during production.

Operational Innovations

- Use a reengineered field management structure and approach to managing fieldwork, including a new field office structure and new staff positions.
- Reuse processes and procedures from In-Field ADC to the extent feasible.
- Use software to update the address list and collect feature data to provide updates in real time and reduce back-end paper processing.
- Have the ability to link a questionnaire to addresses at the time of the update so the response is later linked to the correct address.

Description of Operation

During the UL operation, enumerators will compare address information on the ground to their address list, and verify, correct, delete, or add addresses. UL will utilize software on a device for an automated listing process. The UL Operation will use the same business rules implemented for the ADC Operation.

After updating the address information, enumerators will link a paper questionnaire to a HU, and then leave the questionnaire package at the HU for the household to self-respond. UL will leave a choice questionnaire package at every HU. When the enumerator adds a new address, the system will create an ID in real time. (This will be tested in the 2018 End-to-End Census Test.)

Occupants will be offered three different ways to complete the questionnaire, including Internet, phone, or by mailing back a completed paper questionnaire.

UL instructs enumerators to visit each HU only once. If the household does not respond using the information left by the enumerator, the HU will be visited again by an enumerator during NRFU.

Research Completed

Research that directly supports this operation has not yet been completed.

Decisions Made

The following decisions have been made for this operation:

- GQ will not be enumerated during the UL Operation. Those cases will be enumerated via the GQ Operation.
- TL will not be enumerated during the UL Operation. Those cases will be enumerated via the ETL Operation.

Design Issues to Be Resolved

There are no remaining design issues to be resolved for this operation.

Cost and Quality

Investment in UL is projected to have minimal influence on the overall cost and quality of the 2020 Census.

Risks

Limited resources are in place to design and develop the necessary systems and instrument(s) to conduct QC in the field for UL listing operations. **IF** priorities are not set appropriately for listing QC design and development, **THEN** a statistically sound QC program for the 2018 End-to-End Census Test may not be implemented and an outgoing level of quality for data cannot be ensured for UL.

Major disasters in the form of hurricanes, floods, epidemics, etc., are uncontrolled events that could affect the willingness and ability of the population in TEA 1 designated areas to participate in the 2018 End-to-End Census Test. **IF** a major disaster occurs in a TEA 1 designated area at or around the time of the 2018 End-to-End Census Test, and the decision is made to redesignate the area as TEA 6, transferring the workload to the UL Operation, **THEN** UL will need the ability to be expanded in time to provide full coverage of the impacted geographic area.

Milestones

Date	Activity
May 2017	Create the UL operation.
September 2017	Release the UL DOP. (Delayed)
March 2018	Begin UL for 2018 End-to-End Census Test.
April 2018	End UL for 2018 End-to-End Census Test.
March 2020	Begin UL for 2020 Census.
April 2020	End UL for 2020 Census.

5.6 PUBLISH DATA

The Response Processing (RPO) Operation provides to the CRO Operation preliminary counts so that FSCPE members have an opportunity to ensure the counts appear correct.

RPO also delivers the data to the DPD Operation to prepare the final 2020 Census data products, including apportionment counts, redistricting data, and other data products for the public. DPD coordinates the dissemination of the redistricting data with the RDP Operation. DPD also delivers final counts to the CQR Operation so challenges to Census Counts can be resolved.

All data products and response data are sent to the ARC Operation for public release 72 years after the census.

5.6.1 Data Products and Dissemination

Detailed Planning Status:	**Underway**

Purpose

The Data Products and Dissemination (DPD) Operation performs three primary functions:

- Prepare and deliver the 2020 Census apportionment data for the President of the United States to provide to Congress by December 31, 2020.
- Tabulate 2020 Census data products for use by the states for redistricting.
- Tabulate and disseminate 2020 Census data for use by the public.

Changes Made Since Version 2.0 Operational Plan Release: There have been no major changes to this operation.

Lessons Learned

Based on lessons learned from the 2010 Census studies and reviews, the following recommendations were made:

- Provide an approach to restructure and enhance data dissemination activities across the entire agency.
- Improve customer satisfaction.
- Expand the Census Bureau's audience and customer base.

Operational Innovations

Operational innovations include the following:

- Use of enterprise solutions for preparing the 2020 Census data products and disseminating the information to the public.
- Enhancements to existing tabulation systems to support 2020 Census tabulation as an enterprise solution.
- Leveraging new solutions to allow data users greater flexibility in using 2020 Census data for research, analytics, application development, etc. The focus is on user-centric capabilities and dissemination functionality.

Description of Operation

The DPD Operation covers the aggregation and tabulation of the processed response data, employs any additional guidance from the Disclosure Review Board, and prepares these data for delivery to the President, the states, and the public.

An enterprise-level dissemination system, CEDSCI, will provide access to prepackaged data products via an interactive Web site. Data users will have access to the prepackaged data products, application programming interfaces (API), and metadata documentation. This system is the replacement for the previous dissemination system known as American FactFinder.

The 2020 Census data products will be determined and defined in the summer of 2018. For the 2018 End-to-End Census Test, the prototype P.L. 94-171 is the only data product that will be tabulated and released by April 1, 2019.

Research Completed

Research was conducted to test the feasibility of using the ACS tabulation system as the solution for the 2020 Census. In late summer of 2016, testing of the tabulation system using select 2010 Census data products proved the feasibility of scaling to 2020 Census production.

Assumptions Made

Based on planning of other operations, the following assumptions have been made:

- The apportionment for the 2020 Census will be calculated using the method of equal proportions, according to the provisions of Title 2, U.S. Code. Congress decides the method used to calculate the apportionment. This method has been used in every census since the 1940 census.
- This operation will:
  - Define data products.
  - Define metadata.
  - Generate metadata and mapping for API.
  - Generate data products (Apportionment, Redistricting data, and all other products) and associated data documentation.

Decisions Made

- ✓ The CEDSCI data user interface will be developed and released in a 40-day cadence called "Program Increments" based on prioritized functionality identified at the enterprise level and guided by CEDSCI's Integration and Implementation Plan.
- ✓ The tabulation system supporting the ACS will be generalized and enhanced to support both the ACS and the 2020 Census. The generalized system will be scaled to support both ACS and decennial tabulation needs during the 2020 Census production.
- ✓ The 2020 Census data products will be determined and defined in the summer of 2018. For the 2018 End-to-End Census Test, the prototype P.L. 94-171 is the only data product that will be tabulated and released by April 1, 2019.

Design Issues to Be Resolved

There are no remaining design issues to be resolved for this operation.

Cost and Quality

Investment in DPD is projected to have minimal influence on the overall cost and quality of the 2020 Census.

Risks

The 2020 Census Program is dependent on CEDSCI to develop and deliver a data dissemination system. **IF** CEDSCI is unable to deliver a dissemination system for the 2020 Census, **THEN** a new data dissemination system will not be available and traditional systems will have to be explored for reuse.

Milestones

Date	Activity
March 2014	Release the concept of operations for a more customer-centric, streamlined, and flexible enterprise solution for data dissemination.
July 2014	Establish the Center for Enterprise Dissemination Services and Consumer Innovation.
October 2017	Release the DPD DOP.
September 2018	Deliver final 2020 Census business requirements to support 2020 Census Data Product Plan.
December 2018–April 1, 2019	Deploy tabulation system and deploy dissemination platform for production and release of the P.L. 94-171 Redistricting Data Prototype.
December 2020	Provide apportionment counts to the President of the United States.
By April 1, 2021	Complete the release of the P.L. 94-171 Redistricting Data to the states, the District of Columbia, and Puerto Rico.
May 2021–September 2022	Deliver 2020 Census statistical data to the enterprise data dissemination platform for the release of quick tables and API.
April 2023	Complete release of 2020 Census data products.

5.6.2 Redistricting Data Program

Detailed Planning Status:	**In Production DOP delivered in FY 2016**

Purpose

The purpose of the 2020 Census Redistricting Data Program (RDP) is to provide to each state the legally required P.L. 94-171 redistricting data tabulations by the mandated deadline of 1 year from Census Day: April 1, 2021.

Changes Made Since Version 2.0 Operational Plan Release:

Phase 2 of the RDP has been modified. The original plan for Phase 2 included one round of voting district delineation and one round of verification of those updates. The new plan adds a second round of verification, thereby extending the end of Phase 2 from May 2019 to March 2020.

While not a change to the design, the Census Bureau successfully completed Phase 1 of the RDP, the Block Boundary Suggestion Project. This phase allowed states to provide suggestions to the upcoming 2020 Census tabulation blocks, as well as provide updates and corrections to features and areas in the census geographic database.

Lessons Learned

Based on lessons learned from the 2010 Census studies and reviews, the following recommendations were made:

- Provision of a prototype product is necessary.
- The ability to provide legal boundary updates is needed.
- Delivery of the data prior to public release is necessary.

Operational Innovations

Operational innovations include the following:

- Separation of the program's Block Boundary Suggestion Project from the Voting District Project to allow greater external participation.
- Inclusion of a BAS component to capture and improve underlying geography.
- Processing at HQ and the NPC to provide states with consistent guidance, to enhance coordination between BAS and RDP, and to reduce burden on the GARP.
- State legislative district updates captured at the time of collection of Congressional district updates to reduce the need for multiple efforts.

Description of Operation

The RDP Operation provides the 50 states, the District of Columbia, and Puerto Rico with the opportunity to identify, delineate, and update geographic boundaries for data tabulation. It also allows for continuous process improvement through an evaluation of the program with recommendations for the next cycle in an official publication called "The View From the States."

The five major components in the 2020 Census RDP include:

- Phase 1—Block Boundary Suggestion Project.
- Phase 2—Voting District Project.
- Phase 3—P.L. 94-171 data and geographic support products design and delivery.
- Phase 4—Collection of changes to Congressional and State Legislative Districts.
- Phase 5—Evaluation of the 2020 Census RDP and recommendations for the 2030 RDP.

Research Completed

The following research has been completed for this operation:

- January 2015: Released the *Designing P.L. 94-171 Redistricting Data for the Year 2020 Census—The View From the States.*
  - Findings:
    - Need for a "one number" census.
    - Need for a prototype data product.
    - Need for data delivery prior to public release.
    - Need for GQ data.
    - Need for support products using the most current (2020) geography.
    - Need for tabulation block and voting district data.
    - Need for states to have the option to use their resident GIS systems for program participation.

Decisions Made

The following decisions have been made for this operation:

- ✓ Prototype P.L. 94-171 redistricting data tabulations and geographic support products from the 2018 Census End-to-End Test will be generated and distributed to official liaisons by April 1st, 2019.
- ✓ Use GUPS as one of the methods for interaction with and collection of partner updates.

✓ GQ tabulations by race for the seven main GQ types will be included as part of the official P.L. 94-171 redistricting data file for total population only.

✓ The Block, Block Group, and Tract crosswalk files can be released prior to the April 1, 2021, P.L. 94-171 redistricting data file deadline.

Design Issues to Be Resolved

Additional work is required to make decisions on the following questions:

Question	Expected Date
What changes, if any, to the structure of the P.L. 94-171 redistricting data file may result from research on changing the separate race and ethnicity questions to a single question and the possible inclusion of a Middle Eastern North African category?	January 2018
Can the Census Bureau produce Citizen Voting Age Population by Race tabulations in early 2021 using the new 2020 Census tabulation geography?	March 2019
What IT capabilities and data distribution methodology will be used for the 2020 Census (including maps)?	June 2019

Cost and Quality

Investment in RDP is projected to have minimal influence on the overall cost of the 2020 Census.

Impacts of this operation on overall 2020 Census quality include the following:

↑ Improvements in underlying geography through iterated update cycles.

↑ Improvements in the P.L. 94-171 data product design, including the addition of a GQ table, will better meet the needs of the states for small area tabulations to conduct legislative redistricting.

Risks

As part of its mission to provide the states with the small area tabulations needed to conduct legislative redistricting and to deliver that product within 1 year of Census Day, the Census Bureau produces a full suite of prototype products. **IF** the P.L. 94-171 prototype data products for small-area population totals are not accessible for stakeholders through CEDSCI and after the 2018 End-to-End Census Test, **THEN** the delivery will be delayed and/or the Census Redistricting and Voting Rights Data Office will have to expend resources to develop an alternative method to disseminate data to its stakeholders, such as providing products on removable media.

Milestones

Date	Activity
July 2014	Submit Federal Register Notice proposing the 2020 Census RDP.
January 2015	Publish "Designing P.L. 94-171 Redistricting Data for the Year 2020 Census—The View From the States."
December 2015–May 2017	Conduct Phase 1: Block Boundary Suggestion Project.
September 2016	Release the RDP DOP.
October 2017	Finalize the P.L. 94-171 prototype products design.
December 2017–May 2019	Conduct Phase 2: The Voting District Project.
March 2018	Release the revised RDP DOP.
March 2019	Deliver P.L. 94-171 prototype products.
November 2020–March 2021	Conduct Phase 3: Data Delivery for the 2020 Census RDP.
April 1, 2021	Deliver the P.L. 94-171 data (legal deadline).

5.6.3 Count Review

Detailed Planning Status:	**Recently Begun**

Purpose

The 2020 Census Count Review Operation (CRO) enhances the accuracy of the 2020 Census through remediating potential gaps in coverage by:

- Implementing an efficient and equitable process to identify missing HUs.
- Identifying and correcting missing or geographically misallocated large GQs, such as college/university student housing, and their population.
- Positioning remaining count issues for a smooth transition to the CQR Operation.
- ***Changes Made Since Version 2.0 Operational Plan Release:*** There have been no major changes to this operation.

Lessons Learned

Based on lessons learned from the 2010 Census, the following recommendations were made:

- Planning for the CRO Program needs to begin earlier in the decennial planning cycle to be more easily and fully integrated with decennial census operations.
- Address-level precision is essential to an effective count review program.
- Consider working with the Emergency Services data (E911) system, tax assessor records, and other federal agencies to develop a common format and address updating protocol.
- Have both GQ and HU address information available during the review.

Operational Innovations

For the 2020 Census, the CRO will be timed such that the results of the reviews are fully integrated with the other operations. For example, the review of HU will be conducted in time to include any changes resulting from the review into the supplemental universe for potential mailings and for nonresponse follow-up.

Description of Operation

The operational description provided below is based primarily on the operational design of the 2010 Census CRO. As was the case in past censuses, the 2020 Census CRO relies heavily on participation from members of the FSCPE. Under the joint partnership between the FSCPE and the 2020 Census Working Group, other aspects were established to explore opportunities to leverage the knowledge and experience of the FSCPE members to benefit the overall 2020 Census Program. Membership of the working group includes representatives from the FSCPE Steering Committee, as well as Census Bureau subject-matter experts from FLD, Decennial Census Management Division, Geography Division, and Population Division (POP).

The CRO consists of the following:

- A partnership with the FSCPE members for a HU count review. The HU CRO identifies HU addresses the Census Bureau did not have on its address list that are potentially missing from the census. In preparation for the HU CRO, members of FSCPE from all 50 states, the District of Columbia, and Puerto Rico will be invited to participate in the HU CRO.

  The FSCPE participants will obtain address and coordinate data from various sources, with the historically most common sources being tax assessor records and E911 data. State participants will be required to provide their HU addresses and Global Positioning System (GPS) coordinate data in a specified digital format so that these data can be used in an application that enables a review and comparison of the state-provided data to Census Bureau data. Census Bureau staff will perform quality checks on the data, ensuring that all records have state and county codes, GPS coordinates, etc.

  The application available to the FSCPE reviewers will provide information showing the differences between tallies of the Census Bureau and FSCPE HU in a given county, tract, or block. The prescribed review process will focus the reviewers on the geographies where the FSCPE counts showed more HU than the Census Bureau did.
- A partnership with the FSCPE members for a GQ count review focusing on large missing or misallocated GQ. The GQ review identifies GQ missing from the 2020 Census. A secondary goal will be to identify GQ in the 2020 Census that were misallocated to the wrong census block. FSCPE participants will be asked to focus first on finding GQ missing from the 2020 Census. In 2020, we will conduct two GQ reviews: GQ frame review and GQ post-enumeration review. GQ frame review will use the GQ Universe file, and the purpose is to identify missing and/or misallocated GQ to be able to send them to GQ enumeration. The GQ post-enumeration review data will come from a file of the GQ records enumerated in the 2020 Census available at the time of the review. The purpose of the GQ post-enumeration review is to identify any missing GQ while GQ enumeration is still be conducted. Both GQ reviews will allow the Census Bureau to collect demographic characteristics data of the population living in those GQ.

  Similar to the 2010 Census, the GQ types in-scope for the review are expected to include nursing/skilled-nursing facilities, college/university student housing, military barracks, adult correctional facilities, and workers' dormitories and job corp centers with populations of 50

or more. The primary reason these GQ types will be selected for the review is because they represent more than 80 percent of the nation's GQ population and are the majority of large GQ. Juvenile institutional facilities, medical institutional facilities, and all other noninstitutional facilities will likely be out of scope for the review. A review application will be available to the FSCPE participants. The application will allow users to sort tables by county or by GQ type to look for where the FSCPE has more GQ than the 2020 Census does. After a potentially missing GQ is identified, a second research step will be conducted to determine if the GQ record was under another GQ type code that was ineligible for the review.

- Review by Census Bureau staff of the following census files for systematic or large anomalies in population, HU, and GQ counts (Census Count and File Review [CCFR]):
  - Decennial Response File
  - Census Unedited File
  - Census Edited File
  - Microdata Detail File.

The objective of the CCFR is to determine how reasonable the results of our data collection efforts appear to be at several levels of geography compared to multiple sets of benchmark data. If CCFR finds anomalies or unexpected results, they will report their finding to the RPO so they can review their processing steps to determine if the issues are correctable.

The design and schedule for the CRO will consider the necessary inputs and outputs to ensure a smooth transition to downstream operations, such as the GQ Enumeration, NRFU, and CQR Operations.

Work Completed

- Developed the BPM and requirements.
- Selected FSCPE early participants from Colorado, New York, Pennsylvania, and Washington.
- Engaged with FSCPE early participants in biweekly meetings with the subject-matter experts.
- Assigned GUPS for the FSCPE review process.

Decisions Made

The following decisions have been made for this operation:

- ✓ Similar to the approach used in the 2010 Census CRO, there will be two distinct opportunities for FSCPE knowledge and experience to remediate potential gaps in coverage associated with missing HU and missing or misallocated GQ. FSCPE representatives will leverage information from their respective states along with data and GUPS software provided by the Census Bureau to identify clusters of missing HU (timing: post In-Field Address Canvassing and before enumeration time frame) and missing or misallocated GQ in the summer of 2020.
- ✓ Success for the 2020 Census Count Review Program will be that a majority of states participate and complete their review on time, and the Census Bureau is able to investigate and resolve the majority of identified count issues before the 2020 Census is complete.
- ✓ The planned level of geography for conducting HU, GQ, and population count review is the following:
  - HU—County and address level.
  - GQ—County.
  - Population count review—Nation, states, counties, collection tracts, places, and BCU.
- ✓ In 2020, the Census Bureau will do two GQ reviews. The early GQ review will be in February 2020, after Address Canvassing. FSCPEs will identify missing and misallocated GQ, they will be sent to GQ Enumeration. The late GQ review will happen after GQ enumeration is almost completed to be sure that there are no missing GQ. Any missing GQ will be sent to GQ enumeration.
- ✓ The approaches that will be used for validating missing HU provided by FSCPEs will be aerial imagery and alternative sources (property tax file, etc.).
- ✓ The approaches that will be used for validating GQ count discrepancies will be aerial imagery and alternative sources (property tax file, etc.).

Design Issues to Be Resolved

Additional work is required to make decisions on the following questions:

Question	Expected Date
What are the objectives, scope, and operational timeline of the 2020 Census CRO?	September 2017
What is the timing of the CRO? Can the Census Bureau conduct the CRO in time to impact the counts?	September 2017

Cost and Quality

Investment in the CRO is projected to have minimal influence on the overall cost and quality of the 2020 Census.

Risks

Agreements with FSCPEs are required for their participation in count review. **IF** the contracts for FSCPE state representatives are not funded, **THEN** the entire count review will not be completed with the local expertise and the review may not be as precise or efficient without local knowledge.

It has been recommended that FSCPE personnel have the capability to conduct the data review remotely. **IF** FSCPE representatives are not able to review data remotely, **THEN** the review will be delayed and may incur additional costs.

Milestones

Date	Activity
October 2015	Initiate the 2020 Census Count Review Program Integrated Product Team.
September 2018	Release the CRO DOP.
February 2020	Conduct 2020 Census HU and early GQ Count Review.
June 2020	Conduct 2020 Census late GQ Count Review.
November 2020	Conduct 2020 Census Review of Census Unedited File, Census Edited File, and Microdata Detail File.
August 2021	Issue 2020 Census Count Review Program Operational Assessment.

5.6.4 Count Question Resolution

Detailed Planning Status:	**Not Started**

Detailed planning for this operation has not started. The narrative that follows represents the Census Bureau's preliminary thoughts as of the release of this document.

Changes Made Since Version 2.0 Operational Plan Release: There have been no major changes to this operation.

Purpose

The Count Question Resolution (CQR) Operation provides a mechanism for governmental units to challenge their official 2020 Census results.

Lessons Learned

Based on lessons learned from the 2010 Census, studies and reviews, the following recommendations were made:

- Create a milestone schedule and ensure it is followed.
- Meet early and often so that all stakeholders involved make decisions up front, before beginning to program control systems or write procedures.
- Make sure planning tasks are completed on time and everyone is aware of key decisions.

Operational Innovations

No specific operational innovations have been identified for this operation.

Description of Operation

The CQR Operation provides a mechanism for governmental units to challenge the accuracy of their final 2020 Census counts.

The CQR Operation includes the following activities:

- Draft proposed process and rules and publish in the Federal Register.
- Finalize process and rules and publish in the Federal Register.
- Identify staffing needs and make temporary appointments and reassignments.
- Receive, investigate, and respond to all challenges, including correcting errors found within the established guidelines of the program.

Research Completed

Because detailed planning for this operation has not yet started, research that directly supports this operation has not yet been completed.

Assumptions Made

Based on initial discussions, the following assumption has been made:

- This program will be conducted in a similar manner to both the 2000 and 2010 Censuses.

Decisions Made

No decisions have been finalized for this operation.

Design Issues to Be Resolved

Additional work is required to make decisions on the following questions:

Question	Expected Date
What is the approach for addressing unexpected issues related to count or geographic discrepancies? For example, in the 2010 Census, there were some very specific issues with the way the Census Bureau geocoded Navy ships in U.S. harbors.	September 2018
Will the Census Bureau require challenging governments to provide location information for each HU they provide on their list?	September 2018
What types of challenges will be in scope?	September 2018
What documents and systems will be needed to research and respond to challenges?	June 2019

Cost and Quality

Investment in CQR is projected to have minimal influence on the overall cost and quality of the 2020 Census.

Risks

No risks have been identified to date for this operation.

Milestones

Date	Activity
January 2017	Begin planning and development of program schedule, process, and initial Federal Register Notice.
September 2018	Release the CQR DOP.
May 2020	Publish initial Federal Register Notice identifying process and types of challenges to be considered.
March 2021	Publish final Federal Register Notice to establish process, timing, and types of challenges in scope for the program.
June 2021	Begin accepting challenges from governmental units.
2021–2023	Issue revised certified counts as appropriate and make available on <census.gov> through the Census Bureau dissemination system.
June 2023	Deadline for governmental units to submit challenges.
Sept 2023	End program and issue assessment and lessons learned report.

5.6.5 Archiving

Detailed Planning Status:	**Underway**

Purpose

The Archiving (ARC) Operation performs the following functions:

- Coordinates storage of the materials and data and provides records deemed permanent as the official data of the 2020 Census, including files containing the individual responses to the 2020 Census, to National Archives and Records Administration (NARA).
- Provides similar files to the NPC to use as source materials to conduct the Age Search Service.
- Stores data to cover in-house needs.

Changes Made Since Version 2.0 Operational Plan Release: There have been no major changes to this operation.

Lessons Learned

Based on lessons learned from the 2010 Census studies and reviews, the following recommendations were made:

- Make sure staff are regularly reminded of their records management responsibilities. They need to understand the distinction between permanent and temporary records, and the Census Bureau's legal obligation to archive permanent records.
- Start archiving planning (with an interdivisional team) earlier in the life cycle—suggest FY 2018 at the latest.

- Keep a log or spreadsheet on the materials that the records schedule requires to be sent to NARA, how they will be sent, dates promised, and actual transfer date.

Operational Innovations

Participate in cloud implementation as a solution for archiving electronic records.

Description of Operation

The Census Bureau must provide copies of the individual responses to the 2020 Census (including names and addresses) to the NARA. The specific format, media, and timing for the delivery is negotiated between the Census Bureau and NARA. Because the primary use of this information is for genealogical searches (to be released no sooner than 72 years after Census Day), the Census Bureau may also have to provide a linkage between the individual response data and the copies of questionnaires on paper, microfilm, or through electronic data. This operation also provides similar data to support the Census Bureau Age Search Program at the NPC in Jeffersonville, Indiana.

The ARC Operation is responsible for the Census Bureau Record Schedule relating to the 2020 Census. The schedule that is established with NARA is only intended to encompass final records used to capture, process, and tabulate respondent data, and final records used to collect and update address and map information.

Research Completed

Planning for this operation has started, but research that directly supports this operation has not yet been completed.

Decisions Made

No decisions for records have been finalized for this operation.

Design Issues to Be Resolved

Additional work is required to make decisions on the following questions:

Question	Expected Date
What are the format, media, and timing for the delivery of individual responses to NARA?	July 2018

Cost and Quality

Investment in ARC is necessary to support legislative and constitutional mandates and will require funding for 10 years to support all archiving solutions that will influence the cost and quality of the 2020 Census.

Risks

In the 2010 Census, Congress requested that the Census Bureau provide all images of the paper questionnaires to NARA for archiving. **IF** Congress or NARA requires that the Census Bureau provide the paper images, as well as the response data collected via the Internet and telephone, in a template with the response data from the 2020 Census, **THEN** there will be an impact to the 2020 Census Architecture design as it relates to data storage and dissemination.

The archiving solution for 2020 Census-related data will need to support the storage of data and materials from several large sources, as well as provide access to the data and materials. Because of the length of time that the archiving materials and data have to be maintained, there will be significant cost associated with supporting the systems for storage and providing access to data stored in the archiving solution. **IF** the funding is not provided for the systems supporting the archiving solution, **THEN** the solution may not be able to store all the required 2020 Census data required by law to send to NARA nor provide the access necessary to reference for legal inquiries or to conduct research for planning future censuses.

Milestones

Date	Activity
Annually, beginning in 2016	Update official records plan performed by Records Manager for each participating division.
August 2016	Begin identification and review of all records that will be generated by or for the 2020 Census.
October 2016	Begin negotiations with NARA to make preliminary determinations of which records will be deemed permanent, and must be archived.
September 2018	Release the ARC DOP.
April 2021	Develop final records schedule with NARA and submit for approval by the Archivist.
July 2022	Begin transfer of permanent records to NARA.

Date	Activity
January 2023	Complete transfer of all permanent records to NARA. Complete destruction of all temporary records no longer needed by the Census Bureau.

5.7 OTHER CENSUSES

Other Censuses comprises all functions associated with the decennial censuses for American Samoa, the Commonwealth of the Northern Mariana Islands (CNMI), Guam, and the U.S. Virgin Islands, collectively known as the Island Areas. There is one operation in this area: Island Areas Censuses.

5.7.1 Island Areas Censuses

Detailed Planning Status:	**Underway**

Purpose

The purpose of the Island Areas Censuses (IAC) Operation is to enumerate all residents of American Samoa, the Commonwealth of the Northern Mariana Islands (CNMI), Guam, and the U.S. Virgin Islands; process and tabulate the collected data; and disseminate data products to the public.

Changes Made Since Version 2.0 Operational Plan Release:

- Field enumerators will list addresses using paper address registers and paper maps, while using the same listing procedures used in Remote Alaska and UE. They will conduct interviews with household members who are at home or leave paper questionnaires for the households' self-response. Based on funding uncertainty and reprioritization of critical components of the 2020 Census, the Census Bureau is no longer planning to produce a MAF of Island Areas' addresses prior to the 2020 Census.
- All data collection activities will rely on the use of paper questionnaires, paper maps, and address registers to record the physical addresses of HU and GQ.

Lessons Learned

Based on lessons learned from the 2010 Census studies and reviews, the following recommendations were made:

- The contracts with the Island Areas' local governments need to stipulate the roles and responsibilities of the census office managers, the onsite Census Advisors, the officials of the local governments, and the officials at Census Bureau headquarters.
- The IAC data collection operations and data processing needs to be more in-line with stateside operations and data processing.
- The planning phase of the IAC should involve data processing staff who can help create testing strategies.

Operational Innovations

Use of enterprise solutions for processing data, creating data products, and disseminating the information to the public.

Description of Operation

The Census Bureau will conduct the 2020 Census of the Island Areas through partnerships with local government agencies in American Samoa, CNMI, Guam, and the U.S. Virgin Islands. The Census Bureau will provide the materials and guidance to the local government agencies that are then responsible for recruiting and hiring the staff to conduct the data collection phase. The data collection phase will consist of:

- Opening and closing of IAC Offices.
- Creating the Address List.
- Enumerating residents.
- Follow-up operations.
- Local Count Review.
- Shipping completed questionnaires, address registers, and paper maps to the NPC.

Research Completed

Detailed planning for this operation is integrated with many of the stateside operations. This collaboration leverages the results obtained through the stateside operations' research and testing activities.

Decisions Made

The following decisions have been made for this operation:

✓ Continuously engage and communicate the Census Bureau's plans with liaisons in the local Island Areas' governments, and with the Office of Insular Affairs in the Department of Interior.

- ✓ Establish agreements with the local Island Areas' governments to conduct the census data collection.
- ✓ Establish five local census offices: two in the U.S. Virgin Islands and one in each of the Pacific Island Areas.
- ✓ Use a "long-form like" questionnaire.
- ✓ Use the ACS questionnaire with minor wording changes to accommodate time reference differences, incorporate the final 2020 Census questions taking into account Island Area local government concerns where possible.
- ✓ Based on funding uncertainty and reprioritization of critical components of the 2020 Census, the Census Bureau is no longer planning to produce a MAF of Island Areas' addresses prior to the 2020 Census. The Census Bureau will conduct an address listing operation instead.
- ✓ Use existing systems whenever possible; some modifications may be needed.
- ✓ Deploy Census Advisors to the local census offices in 2019 to provide guidance throughout the data collection process and to report back to HQ—one advisor for each of the Pacific Island Areas (American Samoa, CNMI, and Guam), and two advisors for the U.S. Virgin Islands (one for St. Thomas and St. John, and one for St. Croix).
- ✓ Field enumerators will list addresses using paper address registers and paper maps, using the same listing procedures used in Remote Alaska and UE. For every living quarter the enumerators visit, they will conduct interviews with household members who are at home or leave paper questionnaires for the households' self-response. Later, the enumerators will return to collect the completed questionnaires or to assist the respondents in completing their questionnaires.
- ✓ The IAC will use paper questionnaires, paper maps, and paper address registers.
- ✓ The Automated Tracking and Control System currently used by the NPC will be used as a control system in the IAC Offices. The NPC will receive bulk shipments of completed matrials, and use iCADE to capture the data.
- ✓ The questionnaires for the IAC will align with ACS questionnaires with some modifications, such as the addition of questions on parents' place of birth, reasons for migration, sewage disposal, and source of water.

Design Issues to Be Resolved

There are no remaining design issues to be resolved for this operation.

Cost and Quality

Investment in IAC is projected to have minimal influence on the overall cost and quality of the 2020 Census.

Risks

Island Areas residents will be exposed to the stateside advertisement campaign and will likely expect that the messages of Internet self-response, brief questionnaires, and mail-back options apply to them. **IF** the 2020 Census message for stateside cannot be effectively counteracted, **THEN** the number of calls to our local offices will increase, the level of self-response will decrease, and the number of refusals will increase.

Milestones

Date	Activity
September 2013	Establish quarterly contact with IAC government officials.
June 2018	Decide what, if any, stateside systems can be used for the 2020 IAC operations.
September 2018	Obtain Office of Management and Budget clearance for data collection materials.
June 2018	Finalize plans for the IAC operations.
January 2019	Finalize agreements with the Island Areas governments.
September 2018	Release the IAC DOP.
June 2019	Open Area Census Offices in American Samoa, CNMI, Guam, and St. Thomas, St. John, and St. Croix of the U.S. Virgin Islands.
September 2020	Close the Area Census Offices in the IAC.

5.8 TEST AND EVALUATION

The Test and Evaluation area performs two primary functions:

- Evaluate the quality of the 2020 Census.
- Prepare for the 2030 Census.

This area includes four operations:

- **Coverage Measurement Design and Estimation (CMDE):** Designs the PES, including sampling and estimation.
- **Coverage Measurement Matching (CMM):** Identifies matches and nonmatches between the 2020 Census and the PES for the enumerated HU and people.
- **Coverage Measurement Field Operations (CMFO):** Collects person and HU information (independent from the 2020 Census operations) for the sample of HU in the Coverage Measurement Survey.
- **Evaluations and Experiments (EAE):** Measure the success of critical 2020 Census operations. Formulate and execute an experimentation program to support early planning and inform the transition and design of the 2030 Census.

Each operation is described below.

5.8.1 Coverage Measurement Design and Estimation

Detailed Planning Status:	**Underway**

Purpose

The Coverage Measurement Design and Estimation (CMDE) Operation develops the survey design and sample for the PES of the 2020 Census. It also produces estimates of census coverage based on the PES.

Changes Made Since Version 2.0 Operational Plan Release: The Coverage Measurement Survey has been renamed the 2020 PES.

Lessons Learned

Based on lessons learned from the 2010 Census studies and reviews, the following recommendations were made:

- Simplify the sampling operations, the data collection, the matching operations, and the estimation by eliminating the creation and use of block cluster, provided the basic collection unit concept is similar to 2010 block cluster.
- Follow best practices from the 2010 Census Coverage Measurement operations where the Census Bureau anticipated potential changes in implementing the sample design, allowing changes to sample design requirements to be easily handled given the implementation approach.
- Use the Planning Database for designing the PES sample.

Operational Innovations

The 2020 PES will use the BCU instead of the block cluster as the primary sampling unit. This will reduce the need for creating block clusters and simplify operations.

The 2020 PES sample will be allocated based on state-specific measures of size, instead of national measures of size. This will improve the within-state stratification and allocation.

The CMDE Operation is currently researching methods to:

- Reduce the sampling error of coverage estimates by using area-level covariates from the Planning Database and the ACS in stratification and estimation.
- Improve coverage estimates for young children and babies by using demographic analysis results by age in the correlation bias adjustment.
- Improve the saliency and timeliness of estimates by researching the feasibility of releasing coverage estimates in Fiscal Year 2021.

Description of Operation

The operational design of the 2020 PES will be based on the 2010 Census Coverage Measurement operational design.

The CMDE Operation performs the following functions:

- Develop the survey design for the PES survey.
- Design and implement the sample to support the estimation of coverage estimates in the 2020 Census for the United States and Puerto Rico, excluding Remote Alaska.
- Produce estimates of net coverage error and the components of census coverage for HU and persons living in HU for the United States and Puerto Rico, excluding Remote Alaska.

  Similar to the 2010 Census Coverage Measurement approach, net coverage estimates will be made using the capture-recapture, dual-system estimation methodology.

Research Completed

Research comparing the block clusters and BCUs were a suitable replacement with the block clusters.

Assumptions Made

Based on the 2010 Census design and planning of other operations for the 2020 Census, the following assumptions have been made:

- Maintain the independence of the PES operations from the 2020 Census operations.
- Continue to use Demographic Analysis as an input to coverage measurement estimation as in the 2010 Census.

Decisions Made

The following decisions have been made for this operation:

✓ The Census Bureau will estimate the net coverage error and the components of census coverage for HU and persons living in HU. The components of census coverage will include correct enumerations, erroneous enumerations (which include census duplicates), whole-person imputations, and omissions.

✓ Based on funding uncertainty and reprioritization of critical components of the 2020 Census, the Census Bureau may experience a delay in releasing the estimates as compared to the original 2020 Census plan.

✓ First drafts of the sampling research results reports were complete by September 30, 2016. These reports document the findings to the research questions outlined in the "2020 Coverage Measurement: Sample Design Research Plan."

The "2020 Coverage Measurement: Sample Design" memo has been drafted. This memo documents the sample design for the 2020 Coverage Measurement. It describes the methodology that will be used to select the sample. The design recommended for 2020 is similar to 2010.

✓ The Census Bureau will produce estimates for the United States (including Washington, DC) and Puerto Rico, by major demographic subgroups, and by specified census operations. Other domains are being considered.

✓ The Census Bureau will implement processes and procedures as they were done in the 2010 Census.

✓ The systems will undergo standard testing prior to the 2020 Census operations.

Design Issues to Be Resolved

Additional work is required to make decisions on the following questions:

Question	Expected Date
What are the effects on estimates of potential operational and systems changes?*	September 2018

* Over the past year, faced with funding uncertainty, the program has made decisions to prioritize certain critical components of the 2020 Census, while in turn redesigning others that have not received sufficient planning resources throughout the decade. As a result, the effects on the estimates of the potential operational and systems changes will be determined later in the decade.

Cost and Quality

Investment in CMDE is projected to have minimal influence on the overall cost and quality of the 2020 Census.

Risks

CMDE Operation was descoped from the 2018 End-to-End Census Test. Funding and resources for the 2020 Census CMDE Operation are uncertain. **IF** sufficient resources are not provided for the 2020 Census CMDE Operation, **THEN** all expected innovations for CMDE may not be fully implemented for the 2020 Census.

To meet the release date for coverage estimates, the CMDE IPT needs software development and production within a specified timeframe. It is possible that resources will be pulled from the PES to work on other decennial-related projects. **IF** the PES developers are pulled off PES development or not available to implement change requests during production, **THEN** coverage estimates may be delayed.

Ratios from demographic analysis are used to reduce correlation bias in the dual system estimates. This requires matching tabulations from demographic analysis and the census and PES by age-race-sex. Differences in the reporting and classification of race in these systems can add measurement error to the correlation bias adjustment. For 2020, this would relate to the Black vs.

non-Black tabulations for adult age groups, and potentially also to Hispanic tabulations for young children. Changes in the census questions for 2020, especially with regard to Hispanic origin, could reduce the integrity of the correlation bias adjustment. **IF** the difference between the demographic analysis and 2020 Census race or Hispanic origin classifications is large enough, **THEN** the PES may not be able to accurately correct for correlation bias within race and Hispanic origin.

Any changes to the PES design will likely require changes to the sampling and estimation. **IF** changes are made to the PES design any time after specifications and requirements have been started, **THEN** estimates may be delayed, staff morale may be reduced, and development resources will be increased to rewrite the specifications and software.

Milestones

Date	Activity
January 2016	Start CMDE.
September 2018	Release the CMDE DOP.
June 2019–July 2019	Select PES BCUs.
August–September 2019	Start 2020 Census PES sample design.
April 2020	Conduct small BCUs subsampling.
May 2020–August 2020	Identify PES Person Interview sample.
June 2021	Release National Net Person Coverage Error and National Components of Person Coverage Estimates.
October 2021	Release National Net Housing Unit Coverage Error and National Components of Housing Unit Coverage Estimates.
October 2021	Release State and Other Local Results of Net Error and Components of Coverage for Persons and Housing Units.

5.8.2 Coverage Measurement Matching

Detailed Planning Status:	**Underway**

Purpose

The Coverage Measurement Matching (CMM) Operation identifies matches and nonmatches and discrepencies between the 2020 Census and the PES, for both HU and people in the sample areas. Both computer and clerical components of matching are conducted.

Changes Made Since Version 2.0 Operational Plan Release: The Coverage Measurement Survey has been renamed the 2020 PES.

Lessons Learned

Based on lessons learned from the 2010 Census studies and reviews, the following recommendations were made:

- Simplify the Coverage Measurement clerical matching tasks.
- Rely more on the automated matching systems than the clerical matchers.
- Move HU matching and follow-up operations closer to the listing operation.
- Automate the assignment of status codes and address information where possible.

Operational Innovations

The person who is computer matching will use telephone numbers from administrative records for census records in the sample areas when no telephone number was reported in the census. As a result, the use of the updated telephone numbers could improve computer match rates, thereby reducing the need for clerical matching and potential HU follow-up operations Also, to simplify the PES clerical matching tasks, the Census Bureau will reengineer the business process to improve the efficiency of the analyst by relying more on the automation of the clerical matching system.

Description of Operation

The CMM Operation includes:

- Housing Unit Matching: Links the HU addresses in the sample and the initial census addresses after address canvassing in the MAF using automated computer matching and clerical matching techniques.
- Person Matching: Links the people in the sample and the census using automated computer and clerical matching techniques.
- Final Housing Unit Matching: Links the HU addresses in the sample and the final census addresses using automated computer matching and clerical matching techniques.

Housing Unit, Person, and Final Housing Unit Matching utilize two different methods:

- Computer matching of addresses or people is conducted using software that assigns a probability that the addresses or people match. One threshold identifies cases that are definite matches, another indicates cases that are definite nonmatches, and the cases in between these points are considered possible matches. A similar process identifies duplicates, resulting in a set of duplicate cases, nonduplicate cases, and possible duplicate cases.
- Clerical matching is conducted by clerical matchers utilizing the matching software designed to assist them in all tasks involved in clerical matching and coding. The software displays the results of computer matching and allows the matchers to review and correct any results. Matchers must review and code all the possible matches or duplicates and can also correct cases determined as linked or nonlinked by the computer matcher. In addition, clerical matchers must geocode new addresses collected for people rostered at the sample address that are not computer geocoded and assign residence status codes and HU status codes. The clerical matchers receive the actual respondent information from PES follow-up activities, so they can review a whole household composition and any interviewer notes about the case to help with their analysis. The software also displays maps of the locations (mapspots) assigned to addresses in the sample area by 2020 Census operations versus the PES.

Research Completed

Research was undertaken to determine if the Initial Housing Unit Follow-up (HUFU) and Final HUFU operations are needed. A decision was made to conduct both Initial HUFU and Final HUFU.

Decisions Made

The following decisions have been made for this operation:

✓ The systems will undergo standard testing prior to the 2020 Census operations.

✓ The contract was awarded on September 30, 2016, to use the 'person' Matching, Coding, and Review (MaCRS) system to assist Coverage Measurement clerical matchers on matching the PES to census HU and people living in HU.

Design Issues to Be Resolved

There are no remaining design issues to be resolved for this operation.

Cost and Quality

Investment in CMM is projected to have minimal influence on the overall cost and quality of the 2020 Census.

Risks

The solution for the PES Housing Unit Clerical Matching System is yet to be determined. **IF** the development and testing of the PES Housing Unit Clerical Matching System is not completed in time for training and production, THEN this could create delays in matching production for the 2020 PES.

The solution for the PES Person Clerical Matching System, including geocoding of respondent-provided alternate addresses, is yet to be determined. Various alternatives are still under consideration. **IF** the development and testing of the PES Person Clerical Matching System is not completed in time for training and production, **THEN** this could create delays in matching production for the 2020 PES.

Milestones

Date	Activity
September 2018	Release the CMM DOP.
April 2020	Conduct Initial Housing Unit Computer Matching.
April–July 2020	Conduct Initial Housing Unit Clerical Matching.
December 2020	Conduct Person Computer Matching.
January–April 2021	Conduct Person Clerical Matching.
March–April 2021	Conduct Final Housing Unit Computer Processing and Matching.
April–July 2021	Conduct Final Housing Unit Clerical Matching.

5.8.3 Coverage Measurement Field Operations

Detailed Planning Status:	**Recently Begun**

Purpose

The Coverage Measurement Field Operation (CMFO) collects person and HU information (independent from 2020 Census operations) for the sample of PES HU in selected BCUs. The PES collects the same data as the 2020 Census for both HU and persons. Additional information is collected by PES to help the Census Bureau understand census coverage and to detect erroneous enumerations.

Changes Made Since Version 2.0 Operational Plan Release: The survey conducted by the Coverage Measurement Program was renamed from the Coverage Measurement Survey to the PES.

Lessons Learned

Based on lessons learned from the 2010 Census studies and reviews, the following recommendations were made:

- Automate all CM data collection instruments.
- To ensure more accurate data, minimize the time lag between the follow-up operations where beneficial.
- Consider including an early telephone phase prior to personal visit for the Person Interview Operation.

Operational Innovations

Operational innovations include the following:

The initial plan for 2020 Census PES field data collection was for full automation of the five PES collection activities. However, due to funding uncertainty and reprioritization of critical components of the 2020 Census, only two of the five PES data collection activities (Independent Listing and Person Interviewing) will use automated data collection instruments. The other three operations will use paper questionnaires.

Description of Operation

This operation collects person and HU information for the sample of PES HU. The Coverage Measurement Program for the 2020 Census will follow the design of the 2010 Census Coverage Measurement (CCM) Program with some minor differences discussed in CMDE Operation. Accordingly, this operation includes the following five PES field data collection suboperations:

- **Independent Listing:** In this operation, listers walk all areas of the sample BCUs and list all the HU in the sample area from scratch, that is, without using MAF information. This is an independent listing. Listers knock on all HU to inquire if there is more than one HU at the address (like a basement or garage apartment, and if so, these are listed separately).
- **Initial Housing Unit Follow-Up:** Following Independent Listing, the CMM operation matches the list of PES HU addresses in the sample to the initial census list of addresses in the same sample areas to identify matches, possible matches, duplicates, and possible duplicates and nonmatches between the two lists, duplicates and possible duplicates in either list, and nonmatches in either list. The cases (addresses) that are in one list but not in the other (nonmatches) and those identified as possible matches or possible duplicates are sent back for an Initial Housing Unit Follow-Up interview. Additional clerical matching is conducted in CMM using the results of this operation. The results identify the list of HU in the PES sample to be included in the PES person operations.
- **Person Interview:** Collects person information for the PES sample HU by performing in-person interviews using a computer-assisted data collection instrument. The enumerators collect data similar to that collected in the 2020 Census, as well as additional data about people in the household to determine if any of these people may have been counted at other addresses on Census Day.
- **Person Follow-Up:** Collects additional information in the follow-up operation when lacking sufficient information for estimation. CMM matches the list of PES HU people in the sample to the list of people in the census in the same sample areas to identify matches, possible matches, and nonmatches between the two lists, and duplicates and possible duplicates in either list. The nonmatched persons (those in only one list) and those identified as possible matches or possible duplicates are sent back for the Person Follow-Up interview to obtain additional

information. The collected information is used in the CMM Person After Follow-up clerical matching operation to resolve the cases, and the results are used in the estimation of person coverage.

- **Final Housing Unit Follow-Up:** After completion of census operations, CMM matches the updated list of census addresses to the PES list of addresses to identify additional matches, nonmatches, or duplicates. Unresolved cases are sent back to the field to conduct the Final Housing Unit Follow-Up Operation.
- The resulting data are sent to CMM Final Housing Unit Matching, where clerical matchers try to resolve remaining matching, duplication, and HU status issues. The results of Final Housing Unit Matching are then used in the HU coverage estimation.

Research Completed

The CMFO will leverage research conducted to support other field operations such as In-Field Address Canvassing and NRFU.

Assumptions Made

Based on planning of other operations, the following assumptions have been made:

- Directorate and enterprise automation processes will be leveraged whenever possible.
- The operational independence must be maintained between PES and 2020 Census data collection operations.

Decisions Made

The following decisions have been made for this operation:

- ✓ The Coverage Measurement data collection suboperations that are automated may use a laptop.
- ✓ There will be no additional telephone operation prior to the Coverage Measurement Person Interview.
- ✓ The systems will undergo standard testing prior to the 2020 Census operations.
- ✓ ***Design Issues to Be Resolved:*** There are no remaining design issues to be resolved for this operation.

Cost and Quality

Investment in CMFO is projected to have minimal influence on the overall cost and quality of the 2020 Census.

Risks

PES Person Interview (PI) operations cannot start in the field until NRFU operations are complete in a BCU due to potential bias and contamination. **IF** NRFU operations are delayed or extended, **THEN** this will impact the timing of the PES PI and later PES operations.

The PES field operations independence rules require the census to track the 2020 Census assignments by operation and by BCU to be able to execute the independence rules of assignments between census and PES. **IF** PES independence rules requirements are descoped from the Census Operations Control System, then the PES program will be at risk.

Due to budgetary constraints, there is currently uncertainty regarding the system solution allocations for field data collection instruments and the operations control system. **IF** PES final solutions for PES data collection and processing are not identified in a timely manner, **THEN** this will delay final development of business process models, capability requirements, and detailed requirements and/or user stories, possibly delaying the matching operations.

Milestones

Date	Activity
September 2018	Release the CMFO DOP.
January–March 2020	Conduct PES Independent Listing and Quality Control.
May–June 2020	Conduct Initial Housing Follow-Up and Quality Control.
June–September 2020	Conduct PES Person Interview and Quality Control.
February–March 2021	Conduct PES Person Follow-Up and Quality Control.
May–June 2021	Conduct Final Housing Follow-Up and Quality Control.

5.8.4 Evaluations and Experiments

Detailed Planning Status:	**Underway**

Detailed planning for this operation began in 2016. The 2020 Census Evaluations and Experiments (EAE) Operation is unlike other 2020 Census operations in that, at its start, the Census Bureau will follow a process to establish and reach consensus on the set of evaluations and experiments to be conducted as part of the 2020 Census Program. The details that follow address various aspects of the planning process more so than the detailed scope of the 2020 Census evaluations and experiments themselves. The detailed scope of evaluations and experiments will result from the 2020 Census evaluations and experiments formulation process. The initial planning, formation of governing bodies, solicitation of input, and the agreement on scope of the 2020 Census EAE Operation is dependent upon funding.

In addition, the Demographic Analysis Program is included within the scope of the EAE Operation. Demographic Analysis refers to a set of methods that have historically been used to develop national-level estimates of the population for comparison with decennial census counts. Demographic Analysis estimates are developed from historical vital statistics, estimates of international migration, and other sources that are essentially independent of the census. The estimates are then compared with the census counts by age, sex, and limited race and/or ethnicity groups to evaluate net coverage error in the census. The EAE Operation will also sponsor the derivation of housing unit estimates for comparison to the decennial frame used for the 2020 Census.

Purpose

The EAE Operation documents how well the 2020 Census was conducted; evaluations analyze, interpret, and synthesize the effectiveness of census components and their impact on data quality or coverage or both. Experiments identify potential designs of early 2030 Census life cycle research and testing; experiments are quantitative or qualitative studies that must occur during a decennial census in order to have meaningful results to inform planning of future decennial censuses. In general, experiments involve response comparisons between tests, new or modified methods, or procedures against 2020 Census production methods or procedures.

The EAE Operation performs the following functions:

- Measures success of critical 2020 Census operations and processes.
- Formulates a 2020 Census experimental program that will further refine 2030 Census operational design options.
- Capture and manage knowledge stemming from decennial research recommendations.
- Contributes to the formulation of the 2030 Census Research and Testing phase objectives.
- Develops a transition plan and appropriate organizational structures to establish 2030 Census life cycle planning.
- Initiates other early planning activities for the 2030 Census, including the monitoring of policy concerns and technological, societal, and public cooperation trends.
- Produces an independent assessment of population and housing unit coverage.

Changes Made Since Version 2.0 Operational Plan Release:

Since October 2016, when version 2.0 of the 2020 Census Operational Plan was issued, a formal solicitation for proposals was issued for 2020 Census evaluations and experiments. The Decennial Research Objectives and Methods (DROM) working group completed a preliminary assessment of each proposal using predefined criteria. Based on recommendations from the DROM and 2020 Census Executive Leadership, refinement of the proposals is underway. Recommendations from the DROM will be delivered and final decisions on the scope of the 2020 Census EAE Operation will be made by the 2020 Census Executive Leadership governing body.

Lessons Learned

Based on lessons learned from the 2010 Census studies and reviews, the following recommendations associated with the development and management of the 2020 Census EAE Operation were made:

- Deployment of a Knowledge Management database to capture and track 2010 Census

recommendations, recommendations from oversight bodies, and early 2020 Census research and testing results would be valuable for connecting past experiences and research to future research and planning objectives.

- Dedicated resources are needed earlier in the 2020 Census life cycle to initiate 2030 Census life cycle planning efforts to enable a smooth transition from the 2020 Census implementation to the 2030 Census research.

Operational Innovations

At its core, the scope of the 2020 Census EAE Operation will focus on aspects of the 2020 Census design that could lead to 2030 Census innovations. As the 2020 Census operational design solidifies, the EAE operational process will define the 2020 Census EAE Operation, identify data requirements, and document methods to address research objectives.

To date, opportunities to innovate, as documented below, focus primarily on aspects of the planning and scope definition process. These opportunities to innovate include the following:

- Implementing a Knowledge Management system and application for the Decennial Census Programs Directorate.
- Formulating 2020 Census evaluations and experiments that are more formally guided by the decisions on the 2020 Census operational design and the 2030 Census planning and objectives.
- Evaluating how administrative records can be better used or combined with other data sources to improve the Demographic Analysis estimates by age and sex, and to estimate or expand the race and Hispanic origin categories for which the Demographic Analysis estimates are produced.
- Formulating fiscal years 2022–2024 research and testing objectives that are more formally guided by 2030 planning and objectives.
- Formulating 2030 Census life cycle budget simulations that are more formally aligned with strategic planning and research objectives.

Description of Operation

Phases of the EAE Operation include the formulation of research projects; the delivery of requirements to 2020 systems, operations, and independent data collections; implementation of evaluation and experiment activities; data analysis; the publishing of results; and the identification of 2022 to 2024 research and testing objectives.

To initiate the formulation of the 2020 Census EAE Operation, an understanding of the 2020 Census operational design is necessary. In general, the scope for the 2020 Census operations sets the landscape for identifying evaluations. Some aspects of the 2020 Census design options, deemed out-of-scope, provide the initial canvas for potential experiments. The formulation phase involves:

- Executive staff guidance on strategic principles and high-level research targets.
- Feedback from internal program managers, operational subject-matter experts, and senior researchers/methodologists.
- Feedback from oversight groups, advisory committees, the international collaboration consortium, the National Academy of Science, and other external experts.
- Recommendations from census research and testing as captured in the Knowledge Management application.
- Establishment of parameters (e.g., cost, quality, risks, and visibility) and criteria for selecting evaluations and experiment proposals.
- Management of the scope of the 2020 Census program for evaluations and experiments.

The conduct and coordination of the phases and activities that follow program formulation will be described in future versions of the operational plan.

Research Completed

While the ultimate set of 2020 Census evaluations and experiments is considered research, the process for reaching agreement on the scope of the evaluations and experiments and the underlying governance of the formulation process, are not considered research. As such, no research occurs at this stage in the EAE Operation.

Decisions Made

✓ A core set of strategic questions/assumptions to guide the formulation of the evaluations and experiments for the 2020 Census include such factors as whether the evaluation or experiment perfects and improves on the innovations of the

2020 Census operation plan, and explores the possibility of eliminating decennial operations, etc.

- ✓ Crtiteria and considerations for assessing proposed 2020 Census Evaluations and Experiments have been defined. Criteria will include cost, quality, new to census, feasibility, attainment, risk to census, burden, etc. Considerations will include such things as sensitivity, traceability, and whether the scope has benefit to the enterprise.
- ✓ It has been determined that the best use of administrative records in the production of the demographic analysis estimates by age and sex and expanded race categories is through the same component-based historical model used in previous decades. Data continue to be available to allow for the production of demographic analysis estimates for the Black/non-Black race categories for all ages as in past years. Currently available data supports the expansion of the estimates for the Black Alone or in Combination and Not Black Alone or in Combination race categories to include ages zero through 39. Data are also available to expand the demographic analysis estimates by Hispanic origin to include ages zero through 29.

  It has also been determined that data are available to support the production of estimates for the Asian and Pacific Islander population aged zero through 29 on an experimental basis as part of the 2020 demographic analysis effort. In addition to the data previously used in demographic analysis (vital statistics, Medicare records, ACS data), a legal permanent resident file maintained by the Office of Immigration Statistics and Internal Revenue Service tax return data may also be used to assess the uncertainty of the demographic analysis estimates.

Design Issues to Be Resolved

Additional work is required to make decisions on the following question:

Question	Expected Date
Given the strategic principles for guiding formulation of evaluations and experiments and the parameters and criteria for selecting and prioritizing evaluation and experimentation proposals, what is the defined set of 2020 Census Evaluations and 2020 Census Experiments?	December 2018

Cost and Quality

Investment in EAE is projected to have minimal influence on the overall cost and quality of the 2020 Census.

Risks

Identification of the 2020 Census evaluations and experiments is dependent on the Census Bureau having an understanding of what the social, economic, and technological environment will look like in 2030. **IF** notions for a 2030 Census are not logically conceived, **THEN** meaningful results from the 2020 Census evaluations and experiments will be minimized.

Milestones

Date	Activity
December 2017	Baseline program-level research plans for 2020 Census Experiments.[1]
September 2018	Release the EAE DOP.
October 2018	Begin receiving Office of Management and Budget clearances for 2020 Census Evaluations.
December 2018	Baseline program-level research plans for 2020 Census Evaluations.
July 2019	Begin issuing results for 2020 Census Evaluations.[2]
October 2019	Begin receiving Office of Management and Budget clearances for 2020 Census Experiments.
July 2020	Baseline preliminary 2030 Census alternative design options for research.

Date	Activity
October 2020	Finalize preliminary objectives for the 2030 Census research and testing phase.
December 2020	Deliver Demographic Analysis estimates.
October 2021	Begin the 2030 Census research and testing phase.
July 2022	Finalize research results for 2020 Census Experiments.
December 2022	Begin issuing results for 2020 Census Experiments.
April 2023	Finalize research results for 2020 Census Evaluations.

[1] The experiment and evaluation research plans are program-level summaries of what experiments and evaluations will be conducted during the 2020 Census, not detailed study plans.

[2] This aligns with when the earliest results will be available for Census operations, such as for the Local Update of Census Addresses.

5.9 INFRASTRUCTURE

The following four operations support the infrastructure of the 2020 Census:

- **Decennial Service Center (DSC):** Supports 2020 Census field operations for decennial staff.
- **Field Infrastructure (FLDI):** Provides the administrative infrastructure for data collection operations covering the 50 states, the District of Columbia, and Puerto Rico.
- **Decennial Logistics Management (DLM):** Coordinates space acquisition for and lease management of the regional census centers (RCCs), area census offices (ACOs), and the Puerto Rico Area Office (PRAO) and provides logistics support services.
- **IT Infrastructure (ITIN):** Provide the ITIN to support the 2020 Census, including enterprise systems and applications, 2020 Census-specific applications, field ITIN, and mobile computing.

Each operation is described below.

5.9.1 Decennial Service Center

Detailed Planning Status:	**Underway**

Purpose

The Decennial Service Center (DSC) will support 2020 Census field operations for decennial staff (i.e., HQ, PDC, RCC, ACO, IAC, remote workers, and listers/enumerators).

Changes Made Since Version 2.0 Operational Plan Release:

There have been no major changes to this operation.

Lessons Learned

Based on lessons learned from the 2014, 2015, and 2016 Census Tests, the following recommendations are made:

- Implementing the DSC during annual census tests provides insight into potential issues which may arise during full 2020 Census operations.
- Including service center staff in User Acceptance testing helps them gain a better understanding of possible issues which may occur in the field.
- Recommend funding DSC staff support from the beginning of testing through 2020 Census production to enhance knowledge transfer. DSC is only funded on a year-to-year basis. All contractors are dismissed at the end of the contract. Training and appropriately scaling of the DSC absorbs a significant amount of time and resources that are lost if the service center is closed during periods when field operations are not under way.

Operational Innovations

Operational innovations include the following:

- Centralized service center system provides call, incident, and service management systems supporting decentralized service center technicians (e.g., technicians based in ACO answering any call to the DSC).
- Provides online training for service center technicians as opposed to classroom training. Online training is more accessible and less time-consuming than classroom training.
- Cloud technology will support the centralized service center system for call and incident management.

Description of Operation

The overall goal of the 2020 Census DSC Operation is the design and deployment of an integrated service center, which will support field operations and handle all help or service requests initiated by decennial staff during the 2020 Census. Some of the services include the following:

- Application access issues.

- Resolution of software and hardware issues.
- Safety, security, and cyber incident management.
- Communications to and from field sites.

The DSC has three major areas:

- Safety, security, and cyber incident management
  - Provides nontechnical help desk services for safety, security, and cyber incident data entry for all 2020 Census operations.
- Decennial support
  - Provides technical help desk services for 2020 Census field operations.
- PDC IT services
  - Provides on-site technical help desk services (PDC IT support) and system administration (PDC system administration) for all 2020 Census PDC operations.

Work Completed

The following research has been completed for this operation:

- Tested DSC use as part of the 2014, 2015, and 2016 Census Tests.
  - Findings:
    - Changes to PIN and password configurations for enumerators have reduced the number of calls expected for password resets.
    - There was a lower-than-expected call volume for online training-related issues.

Decisions Made

The following decisions have been made for this operation:

✓ The DSC will be limited to providing service center support for 2020 Census field staff with technical issues related to 2020 Census enterprise organization applications.

✓ The DSC will provide support to field staff for the 2020 Census systems and applications.

✓ The DSC will provide support for various types of mobile devices and mobile operating systems.

✓ Automated training will increase volume and it will occur earlier in the schedule. This expected increased volume of calls will lead to additional staff needed for a longer period of time to field additional calls. Telephone, Internet, Paper External Demand Model outputs have been developed. The model has been updated in several significant ways and will continue to be refined.

✓ Based on the changes in the business process, the Census Bureau will no longer support Control Panel field procedures for enumerators. There is no impact to call volume. Field staff will be available during classroom training to assist with IT support.

✓ The methods for contacting DSC will be through online submission and telephone.

✓ The Census Bureau will award the DSC contract and Field IT contract in 2017. Beyond that, there are no plans for any other new contacts for the DSC Operation.

✓ The Census Bureau is planning to use a centralized IT service manager and call manager solution. Staff will be located in the field offices and will access both systems. The Census Bureau is still working on the optimal staffing ratios since the online training schedule changed during the 2016 ADC Test, and additional information will be gathered during the 2018 End-to-End Census Test. The field offices will have tier 1 clerks for troubleshooting calls. The offices will have Wi-Fi access to the Internet only. There will be minimal impact to DSC since Wi-Fi will not be used for the workstations and phones.

Design Issues to Be Resolved

There are no remaining design issues that need to be resolved for this operation.

Cost and Quality

Investment in DSC is projected to have minimal influence on the overall cost of the 2020 Census.

Impacts of this operation on overall 2020 Census quality include the following:

↑ Providing an efficient DSC Operation will enhance quality of data collection by enumerators during the 2020 Census.

Risks

The number of staff hired for the DSC will be heavily based on the expected volume of calls received. **IF** call volumes are not accurately forecast, **THEN** staffing levels for the DSC may be inaccurate.

Adjustments to DSC staffing levels and roles are based on the schedule and scope for the 2020 Census field operations. **IF** late or frequent changes to the 2020 Census field operations schedule or scope occur, **THEN** there may not be sufficient time to hire and train additional DSC staff as needed.

Milestones

Date	Activity
September 2015	Open DSC to support the 2016 Census Test.
September 2016	Start support for the 2017 Census Tests.
July 2017	Start support for the 2018 End-to-End Census Test.
December 2017	Release the DSC DOP.
December 2017	Award the 2020 Census DSC contract.
April 2018	Start support for the 2020 Census RCC.
January 2019	Start support for the 2020 Census Area Census Offices.
June 2021	Close the DSC.

5.9.2 Field Infrastructure

Detailed Planning Status:	**Underway**

Purpose

The Field Infrastructure (FLDI) Operation performs the following functions:

- Provides the administrative infrastructure for data collection covering the 50 states, the District of Columbia, and Puerto Rico including:
  - Recruiting
  - Hiring and onboarding
  - Personnel and payroll administration
  - Training
  - Partnership support
  - Management and supervision
  - Clerical support.

Changes Made Since Version 2.0 Operational Plan Release:

- Space acquisition and lease management activities have been moved to the DLM Operation (Section 5.9.3).
- The RCCs will open on or around April 1, 2018.

Lessons Learned

Based on lessons learned from the 2010 Census studies and reviews, the following recommendations were made:

- Streamline and automate the job application process to replace the paper-based recruitment and testing process.

Operational Innovations

Operational innovations include the following:

- Streamlined field management structure using automation and technology to manage the NRFU caseload.
- Use of automation for the job application and recruiting processes, payroll submission and approval process, and other administrative processes to streamline personnel processes and reduce staffing requirements and related costs.
- Use of automation for training, including providing newly hired staff with electronic training modules.
- Use of a third-party vendor (3PV) to collect fingerprints and potentially take pictures for badging.

Description of Operation

FLDI includes:

- Providing human resources and personnel management support functions, including recruiting, hiring and onboarding (i.e., suitability and background checks), training, payroll, and out-processing (i.e., separation management).

Research Completed

The following research has been completed for this operation:

- Review of other countries' census field infrastructure.
  - Findings: Best practices include consolidation of support functions in the field, specifically payroll, recruiting, and other administrative functions.
- Develop a new concept of operations for field infrastructure and test in the 2015 Census Test.
  - Findings: Field Staff Training:

- Combination of online and classroom training provided standardization of the information, provided tracking capabilities, and offered various learning methods.
- Reduced training hours compared with the 2010 Census NRFU enumerator training from 32 hours to 18 hours.
- Deployment of online videos to provide targeted training to enumerators quickly and efficiently.
- Identified topics requiring additional training in future tests.

º Findings: Field Reengineering.

- Area Operations Support Center and staffing of the Area Operations Support Center successful.
- Electronic payroll successful.

Decisions Made

The following decisions have been made for this operation:

✓ As of June 2017, the RCC staffing model is as follows:

º General Management: one Regional Director and one Deputy Regional Director.

º Field Operations: four Assistant Regional Census Managers (ARCM), eight Area Managers, and one Quality Assurance Manager.

º Other Operations (Geography, IT, and Space, Leasing, and Logistics): one ARCM, one Geographic Coordinator, one IT Coordinator, and one Space, Leasing, and Logistics Coordinator.

º Other Operations (Administrative and Recruiting): one ARCM, one Administrative Coordinator for National Finance Center (NFC) staff, one Administrative Coordinator for non-NFC staff, and one Recruiting Coordinator.

º Partnership: one ARCM and four Partnership Coordinators.

✓ The ACO staff model is as follows:

º General Management: one ACO Manager, one Administrative Manager, one Recruiting Manager, and one IT Manager.

º Data Collection: multiple Census Field Managers, Census Field Supervisors, and Enumerators; specific numbers based on workload; supervisory ratios to be determined.

✓ In-Field Address Canvassing will be managed out of the ACOs.

✓ Recruiting activities will be automated.

✓ The job application and assessment (testing) process will be automated.

✓ Field staff training will employ the use of online training capabilities.

✓ The training pay rate will be lower than the production pay rate.

✓ The time and expense recording and approval process for data-collection field staff will be automated for field operations.

✓ Recruiting for staff out of the ACOs will be conducted by recruiting assistants with help from local partnership staff and through the use of paid advertisement and earned media (news reports, etc.). Recruiting of potential employees will be conducted throughout the ACOs geographic area, based on projected operational workloads and staffing models developed for 2020 Census operations. New to the 2020 Census will be the use of the Recruiting and Selection application, which is part of the Census Schedule A Human Resources and Recruiting Payroll System (C-SHaRPS). For the first time this decade, candidates will apply and take a skills assessment online, as opposed to attending recruiting sessions in person and taking a written test. Candidates will be selected for employment based on the information provided in their online application, the results of the skills assessment, and other factors depending upon the position for which they apply. Selected candidates will be invited to be fingerprinted and submit selected appointment paperwork prior to attending classroom training. The candidates will be sworn in and hired during the first day of training.

✓ The USPS will not perform fingerprinting and on-boarding functions for temporary field staff selected during the 2018 End-to-End Census Test or the 2020 Census.

Design Issues to Be Resolved

There are no remaining design issues to be resolved for this operation.

Cost and Quality

Investment in FLDI is projected to influence (reduce 🡻 or increase 🡹) the 2020 Census overall costs in the following ways:

- 🡻 Reduced office infrastructure for In-Field Address Canvassing and NRFU operations.
- 🡻 Increased efficiencies due to automated administrative functions, including recruiting, onboarding, training, and payroll.
- 🡻 Increased cost savings due to reduced field staffing.

Impacts of this operation on overall 2020 Census quality include:

- 🡹 Fewer enumerator errors resulting from use of automation to improve training methodology and supervision capabilities using:
  - Automated Job Application and Employment Assessment Testing.
  - Automated Personnel and Payroll Administration (e.g., Time and Attendance Submission).

Risks

The infrastructure put in place to support the 2020 Census field operations is expected to manage the workload, regardless of how large it may be. **IF** the field infrastructure is not sufficient to support the work for the 2020 Census, **THEN** the Census Bureau will not be able to effectively or efficiently manage the associated field workload, which could have an impact on cost and data quality.

The staffing levels are heavily based on the expected workload for the field operations that support the 2020 Census. **IF** late design changes occur that impact the workload for the field operations, **THEN** the staffing levels may need to increase.

The Recruiting and Administrative Tools system will be a public-facing Web site utilized by hundreds of thousands of applicants to apply for jobs for the 2020 Census. **IF** the Title 5 data that will be used in the Recruiting and Administrative Tools system (e.g., SSNs) is not protected under adequate security control measures, **THEN** there is a risk of the Web site being hacked and the unauthorized release of applicants' information.

Testing of field office or staffing structure components is necessary to increase confidence that the components will work during implementation for the 2020 Census. **IF** major field structure components are not tested before implementation, **THEN** more costly solutions may be developed than might otherwise be implemented to mitigate risk.

The timing of the award for the 3PV for fingerprinting, document authentication, and non-HSPD12 badging for the employment of hundreds of thousands of temporary workers conducting data collection activities is critical because the vendor needs to be in place with sufficient time to ensure the interfaces have been tested, approved, and ready to support the 2020 Census. **IF** the 3PV fingerprinting contract is not awarded in time for us to test the vendor solution in 2018, **THEN** the Census Bureau will be forced to use a much more costly solution, which involves leasing equipment, hiring additional staff, and will require additional time in the schedule to train that staff.

The Census Bureau expects the 3PV for fingerprinting to cover the majority of the United States for fingerprinting and document collection. The Census Bureau's costs could increase if 3PV is unable to meet the Census Bureau's expectations. **IF** the 3PV cannot provide coverage over the geographic areas required to conduct fingerprinting and document collection nationwide, **THEN** the Census Bureau will incur increased costs to provide fingerprinting and documentation support to cover the remaining geography.

Milestones

Date	Activity
June 2017	Begin 2020 Census recruiting campaign and partnership programs.
December 2017	Release the FLDI DOP.
April 2019	Begin recruiting for address canvassing field staff.
July 2019	Begin early operations training.
October 2019	Begin recruiting for peak operations.
November 2019	Launch advertising campaign.
December 2019	Begin training for peak operations.

5.9.3 Decennial Logistics Management

Detailed Planning Status:	**Underway**

Purpose

The Decennial Logistics Management (DLM) Operation performs the following functions:

- Coordinates space acquisition for and lease management of the RCCs, ACOs, and the Puerto Rico Area Office (PRAO) in collaboration with FLD and the General Services Administration.
- Provides logistics management support services (e.g., kit assembly, supplies to field staff) in collaboration with FLD and NPC.

Changes Made Since Version 2.0 Operational Plan Release: Space acquisition and lease management activities have moved from the FLDI Operation (Section 5.9.2) to the DLM Operation.

Lessons Learned

Based on lessons learned from the 2010 Census studies and reviews, the following recommendations were made:

- Establish an interagency working group to identify and develop effective strategies for space acquisition and build communication among stakeholders.
- Open some field offices earlier than others allowed for a "test" run of implementation in the space acquisition effort and improved the process for opening the remaining (majority) of offices.
- Purchase and deploy an Integrated Logistics Management System to gain cost benefits generated from bulk purchasing and significantly improve inventory control.
- Utilize barcode technology entirely, in conjunction with an Integrated Logistics Management System, to improve inventory control and reduce costs.
- Conduct training at local offices for inventory control, in conjunction with use of an Integrated Logistics Management System.
- Continue the belt-driven kit assembly line process.

Operational Innovations

Operational innovations include the following:

- Implementation of an online, real-time Enterprise Resource Planning system.
- Implementation of a wireless network and bar code technology will automate inventory transactions.
- Extended implementation of and access to the Enterprise Resource Planning system to RCCs and field offices.
- Policy and procedure to require full material and supply inventory accounting throughout the 2020 Census using Enterprise Resource Planning system.

Description of Operation

The DLM Operation for the 2020 Census consists of:

- Space acquisition and lease management for RCCs, ACO, and the PRAO (secure bids, award contracts/leases).
- Building-out space (i.e., specifications, schemas, designs, etc.).
- Physical security.
- Procuring and setting-up warehouse space to support RCCs, ACOs, and PRAO.
- Provisioning RCCs, ACOs, and the PRAO with office furniture, supplies, operating materials, and non-IT equipment.
- Provisioning RCC, ACO, and PRAO field staff with supplies.
- Inventory management.
- Kit assembly (e.g., recruiting, hiring, and training kits).
- Deploying materials to RCCs, ACOs, and the PRAO.
- Receiving and excessing remaining materials after the operation concludes.
- Printing and shipping—NPC or external print vendor.

Work Completed

The following research has been completed for this operation:

- Study of current literature regarding Third-Party Logistics Organizations.
  - Findings: Third-Party Logistics Organizations need well-defined and finalized requirements up front to effectively provide decennial

census logistics support. The iterative development of the 2020 Census logistics requirements prevents the Census Bureau from meeting that criterion.

- Study of current literature on other logistics support models that may fit the characteristics of the 2020 Census:
  - Findings:
    - There were no new logistics models that align with the major characteristics of the 2020 Census: limited and short duration, high variety and high mix of Operating Materials and Supplies per operation, evolving data availability regarding quantities of Operating Materials and Supplies.
    - Distributed warehousing will likely not work for the 2020 Census. The strong implication with distributed warehousing is that whatever is needed in each warehouse is well known ahead of time, which is not characteristic of a decennial census.
- The NPC has implemented the first phase of the Integrated Logistics Management System project, to include inventory management.

Decisions Made

The following decisions have been made for this operation:

- ✓ Logistics support for procurement, assembly, receiving, and deployment of non-IT operating materials, supplies, and equipment will be conducted by the NPC.
- ✓ Field Logistics support conducted by the NPC will occur at an off-site location due to space limitations within the current facility.
- ✓ The preliminary plans for the Operating Materials and Supplies have been developed based on requirements from the census tests to date.
- ✓ The preliminary plans for the quantities of Operating Materials and Supplies have been developed based on requirements from prior census tests (e.g., 2015, 2016) and continued analysis of 2020 Census staffing needs.
  - ✓ The 2020 Census field office infrastructure will include six RCCs.
  - ✓ The RCCs will be located in the same metropolitan areas as the regional offices, with the exception of the Denver region, where the RCC will be located in Dallas, Texas.
  - ✓ Separate office space will be needed in the RCC to support and manage the coverage measurement operations.
  - ✓ The 2020 Census field office infrastructure will include 248 field offices, a subset of which will open a few months early to support early census operations, including In-Field Address Canvassing.
  - ✓ The plan for locating the 248 ACOs takes into account a variety of factors, which determine the actual number of offices and their associated boundaries. Further information is outlined in the pending 2020 Census ACOs decision memorandum.

Design Issues to Be Resolved

There are no remaining design issues to be resolved for this operation.

Cost and Quality

Investment in DLM is projected to influence (reduce 🡻 or increase 🡹) the 2020 Census overall costs in the following ways:

- 🡻 Reduced office infrastructure for In-Field Address Canvassing and NRFU operations.
- 🡻 Online, real-time inventory transaction updates.
  - Better, more up-to-date information for decision-making regarding on-going procurement activities.
- 🡻 Material requirements planning and resource requirements planning.
  - Generate better information about space requirements and staff required to manage inventory, and support field operations.
- 🡻 Production planning and scheduling of logistics activities via proven, automated-system features instead of manual processes.
  - Reduces the reliance on spreadsheet management by providing automated planning and scheduling capabilities.

Investment in DLM is expected to have minimal influence on the overall quality of the 2020 Census.

Risks

NPC delivered baselined space requirements for the logistics operation to the General Services Administration on April 1, 2016, to accommodate an 18-month lead-time before occupancy. Major changes to these requirements could mean issues with space available or the need to increase the amount of space to meet the changes in material requirements. **IF** the NPC receives significant changes to requirements for Operating Materials and Supplies after the requirements for warehousing logistics have been baselined, **THEN** this may result in a change in space requirements necessitating additional warehousing space, or may result in underutilizing space already leased.

The more information NPC receives about operational requirements early on in the planning and development stages tends to mitigate the need for, and the magnitude of, additional resources and costs. **IF** the NPC receives changes to operational requirements as the 2020 Census work progresses, **THEN** this may change the cost of logistics operational support, due to the need to add staff or implement overtime to avoid schedule delays.

Currently, FLD Field Infrastructure Branch (FIB)—Logistics has a draft schedule. Once the schedule is complete and integration has occurred, it allows the FLD FIB to effectively plan for the development of expendable material procurement, kit specifications, and printing. It also allows operational areas to determine when material development should begin/end, and when they should send materials to NPC for kit assembly. **IF** the logistics operation of the FLD FIB does not receive kit specifications, print files, and other material from other operational areas on schedule, **THEN** there will be a delay in kit assembly, which will result in increased costs and delays in delivery of materials for operations.

The Census Bureau plans for every state to include at least one ACO (currently 248 ACOs are planned). These ACOs will meet a variety of boundary and delineation criteria (areas of consideration) provided by the six regional offices (i.e., high population density and strong likelihood of finding office space; centrally located in the state; close to major transportation networks; located in areas with a diverse labor force and substantial applicant pool). The Census Bureau also considers other related factors. **IF** there are no submitted bids that meet the ACO requirements, **THEN** the area of consideration will have to be expanded.

The Census Bureau plans for every state to include at least one ACO (currently 248 ACOs are planned). These ACOs will meet a variety of boundary and delineation criteria (areas of consideration) provided by the six regional offices (i.e., high population density and strong likelihood of finding office space; centrally located in the state; close to major transportation networks; located in areas with a diverse labor force and substantial applicant pool). The Census Bureau also considers other related factors. **IF** the Census Bureau receives a request that changes the criteria for an ACO location, **THEN** the Census Bureau will have to incur additional costs so that field operations will not be impacted.

Milestones

Date	Activity
April 2016	Initiate search and build-out activities for NPC logistics space.
March 2017	Initiate equipment leases for logistics functions.
July 2017	Initiate search for ACO space for Wave 1 offices.
October 2017	Occupy NPC logistics space: installations complete and ready to operate. Initiate search for ACO space for Wave 2 offices.
December 2017	Release the DLM DOP.
February 2018–August 2019	Design and build-out ACO space.
April 2018	Open RCCs.
January 2019–August 2019	Accept field office space for ACOs.
January–September 2019	Open ACOs (flow basis): installations complete and ready to operate.
December 2020	Close ACOs.
June 2021	Close ACOs.

5.9.4 IT Infrastructure

Detailed Planning Status:	**Underway** **DOP delivered in FY 2017**

Purpose

The purpose of the IT Infrastructure (ITIN) Operation is to provide the IT-related infrastructure support to the 2020 Census, including:

- Enterprise systems and applications.
- Decennial-specific systems, applications, and interfaces.
- Field IT infrastructure (RCC, field office, and PDC).
- Mobile computing.
- Cloud computing.

Changes Made Since Version 2.0 Operational Plan Release: There have been no major changes to this operation.

Lessons Learned

Based on lessons learned from the 2010 Census, as well as the 2014, 2015, 2016, and 2017 Census Tests and ADC Test, the following recommendations were made:

- Provide nonfunctional and functional requirements that drive the design of the infrastructure (e.g., performance, availability, information about the users, monitoring, printing, reporting, and security).
- Use of prototypes and a test local census office help validate the design of the IT infrastructure.
- Opening some field offices earlier than the others allowed for a "test" run of the deployment of the IT infrastructure, including the equipment and the telecommunications.
- ITIN readiness preparation and assessment process for the 2015 Census Test was instrumental and should continue to be used to improve remaining tests for the 2020 Census.
- Improvements are needed in assessing and approving requested changes to business and technical requirements.
- Thread testing alone may not be enough to assure quality products.
- Cloud computing has its own limitations.
- Automate deployments.
- More focus is needed on data architecture and data integration.

Operational Innovations

Operational Innovations include the following:

- Alignment to the Enterprise Architecture.
- Early development of solutions architecture.
- Use of enterprise solutions.
- Iterative deployment of infrastructure aligned with and based on testing and the IIP.
- Use of workload demand models to size IT solutions appropriately.
- Scalable IT solutions.
- Agile development of applications.
- Use of cloud computing.

Description of Operation

Each component of the ITIN Operation is described below.

Enterprise Systems and Applications: This support area includes the planning and implementation of all hardware and software to support operations for the 2020 Census, as well as the management and monitoring of those systems, including, but not limited to, the following:

- CEDCaP systems
- CEDSCI system
- C-SHaRPS systems
- Shared Services (Virtual Desktop Infrastructure, etc.).

Decennial Specific Applications: This support area includes the planning and implementation of all hardware and software to support operations for the 2020 Census, as well as the management and monitoring of those systems, including, but not limited to, the following:

- RTNP system
- PEARSIS system
- SMaRCS system
- MaCS system
- Decennial Response Processing system
- Data Editing, Imputation, and Estimation systems
- Evaluation systems

RCC and Field Office IT Infrastructure: This support area covers the deployment of IT capabilities in the form of office automation services to any RCC, field office, facility, or work location opened as part of the 2020 Census operations. It includes support for all field data collection operations through automated recruiting, hiring,

staffing, training, fingerprinting, and mobile device support, including the following:

- Definition of functional and nonfunctional solution requirements for field offices.
- Development of the IT computing environment design.
- Procurement of circuits and IT equipment for the census field offices.
- Shipping, configuration, testing, and staging of IT equipment for the census field offices.
- Tear-down and disposition of IT equipment and circuits at the conclusion of the 2020 Census activities.

Field IT infrastructure requirements will provide, at a minimum, for the following:

- DSC
- NPC
- RCC
- ACO
- Data Capture Centers
- Partnerships, if needed
- Mobile offices and vehicles, if needed
- Offices for Island Areas
- Regional technicians.

Mobile Computing: The Census Bureau will leverage technology innovations such as decennial Device-as-a-Service (dDaaS), the MAM and MDM programs and secure applications provided through Device-as-a-Service. This will result in a flexible and efficient acquisition strategy to procure mobile devices and services for fieldworkers.

Cloud Computing: The Census Bureau will leverage cloud-computing capabilities to transition workloads onto FedRAMP-certified commercial cloud service providers. The Census Bureau will implement cloud computing with configuration-managed automated deployments, automated testing, and auto-scaling to meet demands with a cloud consumption model for cost and billing. Continuity of Operations Planning will also leverage the cloud.

Work Completed

The following work has been completed for this operation:

- Established the Field IT infrastructure for the 2014 Census Test, 2014 SIMEX, 2015 Census Tests, 2016 Census Test, and 2017 Census Test.
- Established the Headquarters IT infrastructure to support the 2014 Census Test, 2014 SIMEX, 2015 Census Tests, 2016 Census Test, and 2017 Census Test. Mapped the IT infrastructure to each operational component tested to evaluate and ensure readiness.
- Used MDM solution and MAM solution to push and securely manage mobile applications on mobile devices.
- Provided cloud infrastructure to support testing of:
  - Internet Data Collection.
  - RTNP.
    - Provided support to the 2017 Census Test and the 2018 End-to-End Census Test.

Decisions Made

The following decisions have been made for this operation:

- ✓ An incremental approach will be used to define, deploy, and test the IT Infrastructure.
- ✓ Mobile devices will be used for field data collection.
- ✓ Whenever technically feasible and cost effective, enterprise solutions will be used in support of the 2020 Census.
- ✓ A hybrid cloud design will be used for all 2020 Census systems requiring scaling wherever possible.
- ✓ Virtual Desktop Infrastructure will be used for all RCC and field office staff.
- ✓ The demand models that the IT Infrastructure and systems need to accommodate have been developed based on data from past census tests and other surveys. These models are being used to support future tests and the System of Systems architecture. Future data will be used to refine these models.
- ✓ The solution architecture was formalized in FY2016 and was officially presented by the Decennial IT Division Chief at the July 22, 2016, 2020 Census Program Management Review.
- ✓ BYOD will not be used moving forward, but lessons learned will inform how we structure and

use the decennial dDaaS program. The dDaaS approach will be used to provide mobile devices, accessories, cellular connectivity, and device provisioning for each 2020 Census operation beginning with the 2018 End-to-End Census Test through 2020 CCM.

- ✓ The 2020 Census will use a variety of mobile devices. For primary data collection, smartphones will be used. Field supervisory staff will use tablets for oversight and for operation control system functionality. Laptops (or tablets) will also be used by field recruiters and outreach staff for ADC, PES, and UL. The security approach will be to encrypt data at rest and in transit through a FIPS 140-2 solution. Mobile devices will also have a secure authentication protocol. BYOD efforts in earlier tests will serve as lessons learned in going forward with a government-furnished equipment approach via the dDaaS acquisition vehicle.
- ✓ The NPC will not have a role in IT deployments to the RCCs and ACOs. The decision is that IT deployments (e.g., keyboards, monitors) will be provided through a contracted service.

Design Issues to Be Resolved

Additional work is required to make decisions on the following questions:

Question	Expected Date
What cloud services are required to support the 2020 Census operational design (to include CEDCaP and non-CEDCaP)?	December 2017

Cost and Quality

Investment in ITIN is projected to influence (reduce 🡻 or increase 🡹) the 2020 Census overall costs through:

- 🡻 Leveraging enterprise solutions.
- 🡻 Leveraging cloud computing to address peak performance requirements.

Impacts of this operation on overall 2020 Census quality include the following:

- 🡹 Use of automation to collect real-time data, enabling better monitoring and management of the data collection activities.
- 🡹 Automated Training and Knowledge Base.
- 🡹 Sufficient mobile and networking infrastructure to effectively support field operations.
- 🡹 Sufficient IT infrastructure to provide necessary levels of performance, to include acceptable interactions by the public, partners, and others.

Risks

Major concerns for the ITIN Operation are covered by the IT-related 2020 Census Program risks listed in Chapter 6.

Milestones

IT Infrastructure Milestones

Date	Activity
September 2016	Finalize definition of Field ITIN solution requirements.
December 2016	Award contract for Field ITIN. Finalize Field Office ITIN design.
April 2017	Release the ITIN DOP.
November 2017	Begin Installation of ITIN for the RCCs.
June 2019	Begin Installation of ITIN for the ACOs.

Cloud Testing and Readiness Milestones

Date	Activity
January 2015	Identify cloud computing as the assumed technical solution in support of the CEDCaP Decennial Infrastructure Scale-Up Project.
June 2015	Conduct initial testing of ISR using cloud computing services.
September 2015	Acquire cloud-computing services in place to support the 2016 Census Tests. Deliver initial output from the 2020 Census workload demand models, including Internet Response.
December 2015	Deliver initial baseline of decomposed 2020 Census solution-level performance requirements provided by 2020 Census Integrated Project Teams.
June 2016	Deliver analyses of alternatives and recommended solutions architecture, to include cloud computing as a solution alternative, in support of technical solution-level requirements. Acquire cloud-computing services to support the 2017 Census tests and future census tests.
August 2016	Complete 2020 Census technical solution-level requirements, including performance requirements.
September 2016	Provision cloud-computing services to support the 2017 Census tests and future census tests. Rebaseline and deliver demand models based on 2016 Census Test results.
December 2016	Phase 2 Cloud contract available, analysis to transition or migrate 2020 Cloud Solutions to Cloud Service Providers for 2020 Census production completed. Conduct performance and scalability testing in the cloud (2017 Census Test Solution).
April 2017	Leverage cloud-computing in support of 2017 Census Test.
June 2017	Modify technical solution architecture—plan for larger-scale performance, scalability, and resilience testing in the cloud.
September 2017	Rebaseline workload-demand models based on 2017 Census Test results.
December 2017	Initiate performance, scalability, and resilience testing in the cloud.
June 2018	Leverage cloud-computing in support of 2018 End-to-End Census Test and analyze test results. Modify workload demand models and technical solution architecture.
September 2018	Review performance, scalability, and resilience testing in the cloud.
September 2019	Ensure readiness of final cloud-computing solution for 2020 Census.

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6. Key Program-Level Risks

The 2020 Census Risk Management process consists of activities performed to reduce the probability and consequences of events that could negatively affect the 2020 Census Program's ability to meet its objectives. The goal of the risk management process is to ensure a common, systematic, and repeatable assessment approach at both the program and project levels so that risks can be effectively identified and managed, and clearly communicated to management, stakeholders, and executive-level decision-makers. Risk management is iterative and designed to be performed continuously throughout the 2020 Census Program life cycle. Therefore, the 2020 Census Program Risk Register is revisited regularly and changes are made on an ongoing basis, including the addition of new risks.

Figure 31 shows the current risk matrix for all risks in the 2020 Census Program Risk Register, as of August 4, 2017.

From the 2020 Census Program Risk Register, 12 key risks are highlighted in the sections below. These risks were selected from the risk register because members of the 2020 Census Risk Review Board agreed these 12 key risks represent the major concerns that could affect the design or the successful implementation of the 2020 Census. Along with the risk statement, the probability rating, the impact rating, the risk exposure level, and the risk color are provided for each risk. Mitigation strategies are also provided. For information about all the program-level risks, the full program risk register is available upon request.

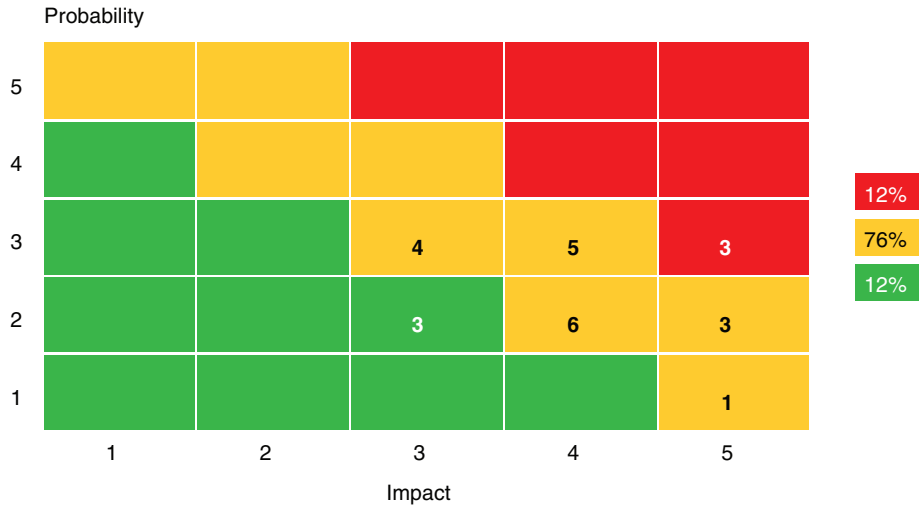

Figure 31: 2020 Census Program-Level Risk Matrix

6.1 ADMINISTRATIVE RECORDS AND THIRD-PARTY DATA—EXTERNAL FACTORS

The Census Bureau is planning to use administrative records and third-party data to reduce need to follow up with nonrespondents through the identification of vacant and deleted housing units (those that do not meet the Census Bureau's definition of a housing unit), the enumeration of nonresponding housing units, and the improvement of the quality of imputation for demographic characteristics that are missing for person and housing unit records. Administrative records will also be used to update the Master Address File, predict the best times to contact nonresponding households, and verify the information provided by respondents and enumerators.

IF external factors or policies prevent the Census Bureau from utilizing administrative records and third-party data as planned, **THEN** the Census Bureau may not be able to fully meet the strategic goal of containing the overall cost of the 2020 Census or to fully utilize the data quality benefits of using administrative records in characteristic imputation.

Probability 3 (Moderately likely)	Impact 5 (Major impact)	Exposure level **HIGH**

Mitigation Strategies include the following:

- Identify external stakeholders that have an interest in Census Bureau policies regarding administrative record and third-party data usage.
- Develop a stakeholder communications plan for identified external stakeholders.
- Regularly communicate to and seek feedback from identified external stakeholders on design decisions and research and testing results related to the use of administrative records and third-party data for the 2020 Census.
- Assess impacts of any changes to the design based on feedback from external stakeholders and update plans accordingly.
- Monitor external factors and policies that may impact the Census Bureau's planned use of administrative records and third-party data for the 2020 Census.

6.2 PUBLIC PERCEPTION OF ABILITY TO SAFEGUARD RESPONSE DATA

The accuracy and usefulness of the data collected for the 2020 Census are dependent upon the ability to obtain information from the public, which is influenced partly by the public's perception of how well their privacy and confidentiality concerns are being addressed. The public's perception of the Census Bureau's ability to safeguard their response data may be affected by security breaches or the mishandling of data at other government agencies or in the private sector.

IF a substantial segment of the public is not convinced that the Census Bureau can safeguard their response data against data breaches and unauthorized use, **THEN** response rates may be lower than projected, leading to an increase in cases for follow-up and cost increases.

Probability 3 (Moderately likely)	Impact 5 (Major impact)	Exposure level **HIGH**

Mitigation Strategies include the following:

- Develop a communications strategy to build and maintain the public's confidence in the Census Bureau's ability to keep their data safe.
- Research other Census Bureau divisions, other government agencies, other countries, and the private sector to understand how they effectively mitigate the issue of public trust and IT security.
- Continually monitor the public's confidence in data security in order to gauge their probable acceptance of the Census Bureau's methods for enumeration.

6.3 CYBERSECURITY INCIDENTS

Cybersecurity incidents (e.g., breach, denial of service attack) could happen to the Census Bureau's authorized IT systems, such as the Internet self-response instrument, mobile devices used for fieldwork, and data processing and storage systems. IT security controls will be put in place to protect the confidentiality, integrity, and availability of the IT systems and data.

IF a cybersecurity incident occurs to the systems supporting the 2020 Census, **THEN** additional technological efforts will be required to repair or replace the systems affected in order to maintain secure services and data.

Probability 3 (Moderately likely)	Impact 5 (Major impact)	Exposure level **HIGH**

Mitigation Strategies include the following:

- Monitor system development efforts to ensure the proper security guidelines are followed during the system development phase.
- Research other Census Bureau programs, other government agencies, other countries, and the private sector to understand how they effectively mitigate cybersecurity incidents.
- Audit systems and check logs to help in detecting and tracing an outside infiltration.
- Perform threat and vulnerability analysis through testing.
- Prepare for rapid response to address any detected cybersecurity incidents.

6.4 ENTERPRISE IT SOLUTIONS

The Census Bureau, wherever feasible, will leverage cross-program IT solutions and has begun the work necessary to ensure this is achieved. However, enterprise solutions may not address all of the 2020 Census Program requirements. In these cases, impacts must be identified and proper actions taken to resolve the situation.

IF enterprise IT solutions cannot meet the 2020 Census Program requirements, **THEN** existing systems may require substantial modifications or entirely new systems may have to be developed, adding complexity and increasing risk for a timely and successful 2020 Census.

Probability 3 (Moderately likely)	Impact 4 (Substantial impact)	Exposure level **MEDIUM**

Mitigation Strategies include the following:

- Engage with enterprise efforts to ensure that solutions architectures align and provide continued support for 2020 Census requirements development and management.
- Participate in agency-wide solution development (i.e., avoid custom solutions where enterprise or off-the-shelf solutions will suffice) and ensure that contingencies (i.e., off-ramps) are developed early and exercised when necessary.
- Determine the extent existing systems from the 2010 Census can be modified and reused if necessary.
- Design IT solutions that are flexible enough to incorporate design changes.
- Establish a change control management process to assess impacts of change requests to facilitate decision-making.
- Prepare for rapid response to implement change based on the results of the change-control process.

6.5 OPERATIONS AND SYSTEMS INTEGRATION

Due to the critical timing of census operations and the potential impact of systems not being ready to support them, the 2020 Census Program must have an accurate gauge of the progress made towards integrating the various operations and systems that support the program, including enterprise solutions. The monitoring of the progress towards integration must take place throughout the planning, development, and testing stages of the operations and systems.

IF the 2020 Census Program does not monitor the various operations and systems to ensure that integration is successful prior to implementation, **THEN** the strategic goals and objectives of the program may not be met.

Probability 3 (Moderately likely)	Impact 4 (Substantial impact)	Exposure level **MEDIUM**

Mitigation Strategies include the following:

- Leverage DITD's Systems Engineering and Integration (SEI) System Development Life Cycle system readiness/phase gate review process, the SEI program metrics dashboard, and various 2020 Census Program's governance forums to provide a current sense of where all solutions providers are in the system development process and to raise issues quickly for corrective action.
- Conduct regularly scheduled operational reviews at the 2020 Census Program governing boards.
- Ensure all operational areas and their associated Integrated Project Teams have adequate

resources assigned to integration efforts and required project artifacts are developed and approved.

- Ensure each planned census test has an approved Goals, Objectives, and Success Criteria document, adequate resources to plan and conduct are identified and assigned, a detailed test plan is developed and approved (including key milestones and roles and responsibilities), and deadlines are being met through a regular management review with the test team.
- Ensure adequate technical review sessions are planned and conducted in conjunction with SEI staff including the systems engineers responsible for developing the solutions).
- Create an operational integration design team to support the 2020 Census through creation and distribution of artifacts which depict integration between the operations.

6.6 LATE OPERATIONAL DESIGN CHANGES

After key planning and development milestones are completed, stakeholders may disagree with the planned innovations behind the 2020 Census and decide to modify the design, resulting in late operational design changes.

IF operational design changes are required following the completion of key planning and development milestones, **THEN** the 2020 Census Program may have to implement costly design changes, increasing the risk for a timely and successful 2020 Census.

Probability 3 (Moderately likely)	Impact 4 (Substantial impact)	Exposure level **MEDIUM**

Mitigation Strategies include the following:

- Identify internal and external stakeholders that have an interest in the 2020 Census operational design.
- Develop a stakeholder communications plan for identified internal and external stakeholders.
- Regularly communicate to and seek feedback from identified internal and external stakeholders on design decisions and research and testing results.
- Monitor external factors and policies that may impact the Census Bureau's planned innovations for the 2020 Census operational design.
- Establish a change-control management process to assess impacts of change requests to facilitate decision-making.
- Prepare for rapid response to address potential changes and make decisions based on the results of the change-control process.

6.7 INSUFFICIENT LEVELS OF STAFF WITH SUBJECT-MATTER SKILL SETS

The 2020 Census Program consists of a portfolio of projects that requires subject-matter skill sets to complete the work. The potential of not having the necessary staffing levels and staff with the appropriate competencies to satisfy program objectives is a current reality. This is a result of both the hiring freezes and budgetary constraints experienced by the 2020 Census Program. In addition, with increasing numbers of staff eligible for retirement before 2020, there is also the potential of losing valuable institutional knowledge, as employees in key positions may not be accessible to share their knowledge and participate in succession planning.

IF the 2020 Census Program does not hire and retain staff with the necessary subject-matter skill sets at the levels required by the projects, **THEN** the 2020 Census Program will face staffing shortages, making it difficult to meet the goals and objectives of the program.

Probability 3 (Moderately likely)	Impact 4 (Substantial impact)	Exposure level **MEDIUM**

Mitigation Strategies include the following:

- Identify high priority competencies and staffing positions needed for the work of the 2020 Census.
- Decennial Directorate Support Services Office will continue to collaborate with managers and the Human Resources Division to facilitate hiring.
- Employ various strategies to facilitate staff retention.

6.8 FUNDING REQUESTS NOT REALIZED

To execute a 2020 Census that counts everyone once and only once, and in the right place, the Census Bureau requires appropriate funding during the entire life cycle of the program. Funding for the 2020 Census Program is required at the beginning of each fiscal year and when funding commitments are realized.

IF the funding appropriated during each fiscal year of the 2020 Census life cycle is less than requested, **THEN** the Census Bureau may not be able to fully meet the challenge of containing the overall cost of the 2020 Census or to fully utilize the data quality benefits of using administrative records in characteristic imputation.

Probability 2 (Not likely)	Impact 5 (Major impact)	Exposure level MEDIUM

Mitigation Strategies include the following:

- Formulate and submit robust cost estimates (including contingencies for known and unknown risks) for planned 2020 Census activities throughout the 2020 Census Program life cycle.
- Develop strong budget justifications that demonstrate the negative impact of insufficient funds in each fiscal year of the 2020 Census Program life cycle.
- Prioritize research, testing, and implementation activities for each fiscal year of the 2020 Census Program life cycle to focus on those areas that can significantly impact cost and quality, and develop contingency plans to quickly respond to budget cuts.
- Conduct quantitative analysis of the cost estimates using 2020 Census risk information.

6.9 ADMINISTRATIVE RECORDS AND THIRD-PARTY DATA—ACCESS AND CONSTRAINTS

The Census Bureau is planning to use administrative records and third-party data to reduce the need to follow up with nonrespondents through the identification of vacant and deleted housing units (those that do not meet the Census Bureau's definition of a housing unit) and the enumeration of nonresponding occupied housing units and the improvement of the quality of imputation for demographic characteristics that are missing for person and housing unit records. Administrative records will also be used to update the MAF, predict the best times to contact nonresponding households, and verify the information provided by respondents and enumerators. The use of administrative records data requires special handling and security protocols that affect the development of the systems and infrastructure supporting the 2020 Census.

IF the Census Bureau does not have timely and continual access to administrative records and third-party data, or the data providers place constraints on the use of the data that conflict with planned 2020 Census operations, **THEN** the Census Bureau may not be able to fully meet the challenge of containing the overall cost of the 2020 Census or to fully utilize the data quality benefits of using administrative records in characteristic imputation.

Probability 2 (Not likely)	Impact 5 (Major impact)	Exposure level MEDIUM

Mitigation Strategies include the following:

- Identify all required administrative records and third-party data sets needed for the 2020 Census Program, including data providers and points-of-contact.
- Review data sharing agreements/contracts in order to understand all the conditions assigned to the administrative records and third-party data sets and to ensure conditions are appropriate.
- Ensure requirements for administrative records and third-party data usage are developed and documented.
- Inform data providers that data agreements/contracts need to be updated.
- Disseminate updated data agreements/contracts to internal stakeholders.
- Negotiate with the source providers to ensure required administrative records and third-party data are available when needed.
- Ensure the build-out for all systems supporting the 2020 Census takes into account the handling of administrative records and third-party data.

- Ensure the security requirements, including physical security, for all systems supporting the 2020 Census cover the handling of administrative records and third-party data.
- Ensure staff has been trained in the proper handling of administrative records and third-party data.

6.10 CLOUD IMPLEMENTATION

Some systems supporting the 2020 Census Program plan to mitigate the surging demand on the systems by utilizing the Cloud as part of the architecture.

IF the Cloud, and the migration to it, is not evaluated, designed, and tested thoroughly, **THEN** any implementation of the Cloud may introduce system failures or process gaps with downstream implications.

Probability 3 (Moderately likely)	Impact 3 (Moderate impact)	Exposure level **MEDIUM**

Mitigation Strategies include the following:

- Develop plans for alternate deployments of each 2020 Census system that is targeted to be hosted on the Cloud.
- Assign the 2020 Census Technical Integrator to develop a physical architecture for the 2020 Census System of Systems, including the assessment and design of a cloud architecture for the 2020 Census.
- Assign the 2020 Census Technical Integrator to assess every system of the 2020 Census System of Systems, including the systems suitability for the Cloud and the migration strategy if the system is determined to be suitable for the Cloud.

6.11 SYSTEMS SCALABILITY

All systems supporting the 2020 Census Program must be able to handle the large, dynamic demands of the operations and support the system of systems.

IF systems are not properly designed, tested, and implemented with the ability to scale, **THEN** critical issues may arise when the need to scale up (or down) any system in the environment occurs, potentially eliminating the ability to scale during the production window of operations, and thereby limiting the capacity to support the operations or leading to failure of the system.

Probability 3 (Moderately likely)	Impact 3 (Moderate impact)	Exposure level **MEDIUM**

Mitigation Strategies include the following:

- Under direction of SEI Chief Architect, conduct scalability assessment with the Technical Integrator team.
- Provide accurate demand models to the systems to ensure proper system of systems design.

6.12 TECHNOLOGICAL INNOVATIONS SURFACING AFTER DESIGN IS FINALIZED

Technological innovations inevitably surface, but the 2020 Census Program must move forward toward building the operational design, which will be finalized and put into production for the 2018 End-to-End Census Test.

IF technological innovations surface after the design for the 2020 Census has been finalized, **THEN** development and testing life-cycle phases must be compressed if the innovations are adopted, resulting in less time to mature innovations in census methodologies and systems.

Probability 2 (Not likely)	Impact 4 (Substantial impact)	Exposure level **MEDIUM**

Mitigation Strategies include the following:

- Design and build versatile operations and systems.
- Keep team members and management aware of evolving technological innovations.
- Devote dedicated resources to track and communicate innovations.
- Dedicate funds to incorporate innovations into the design.
- Bring new technological innovations to the Portfolio Management Governance Board.
- Reach out to data-collection institutions for knowledge-sharing.

7. Quality Analysis

As the Census Bureau continues to evaluate the 2020 Census operational design, an analysis of the impact on the quality of the census results is required to ensure that innovations designed to reduce cost do not have an unacceptable impact on quality. This section describes the processes and analysis performed to date on the quality impacts of the four key innovation areas: Reengineering Address Canvassing, Optimizing Self-Response (OSR), Utilizing Administrative Records and Third-Party Data, and Reengineering Field Operations. The analysis focused on impacts of innovations. For example, the analysis related to administrative records and third-party data focuses on the impact of these innovations on Nonresponse Followup (NRFU), as that operation is where the innovations are expected to provide the greatest cost savings. The Census Bureau analyzed all major frame development and enumeration operations in the 2020 Census design.

This section is organized as follows with supporting operations for the analysis:

- Quality Impacts for Reengineering Address Canvassing
  - Address Canvassing (ADC)
  - Local Update of Census Addresses (LUCA)
  - Geographic Programs (GEOP)
- Quality Impacts for Optimizing Self-Response (OSR)
  - Paper Data Capture (paper as a response mode) (PDC)
  - Internet Self-Response (ISR)
  - Non-ID Processing (NID)
  - Census Questionnaire Assistance (CQA)
- Quality Impacts of Utilizing Administrative Records and Third-Party Data
  - Nonresponse Followup (NRFU)
- Quality Impacts of Reengineering Field Operations
  - Update Leave (UL)
  - Update Enumerate (UE)
  - Group Quarters (GQ)
  - Nonresponse Followup (NRFU)

This release expands prior analysis in version 2.0 of the 2020 Census Operational Plan by including analysis of the Master Address File Coverage Study (MAFCS) results and 2017 Census Test data; additional analysis of the 2016 Census Test data; expected impacts of ungeocoded resolution operations; modifications in the In-Office Address Canvassing (IOAC) Operation; incorporating the new UL Operation; changes to the scope of the UE Operation; improved downstream impacts and integration across operations; and analyzing the Coverage Improvement suboperation.

This analysis produces two major outputs: estimated housing-unit coverage error and person-level coverage error. Reengineering Address Canvassing studies only housing-unit coverage. Enumeration includes integration of both subsections—one for housing units (HUs) and one for people. As was done in the 2010 Census enumeration, final quality metrics for people are divided into three major parts: estimated correct enumerations, estimated erroneous enumerations, and estimated omissions. Although all of these estimates for both HUs and people in 2016 are reported at the national level, lower levels of geography may be analyzed in upcoming years before 2020.

This quality analysis leverages data from the 2010 Census Coverage Measurement Survey (CCM), 2010 Census, census tests from the 2020 Census Research and Testing Program conducted from 2012 through 2016, and the American Community Survey (ACS) to produce specific parameters. A parameter is a measure of X or Y or Z. For example, one parameter for an operation could be an estimated workload, and another parameter could be the number of estimated errors it will produce of a given kind. In some cases, expert judgment was used when data were not available. Expert judgment varies from team to team, but in general, the experts for each parameter were asked to predict a value of the parameter for the 2020 Census as accurately as possible. Typically, a parameter is based on data but then adjusted based on expert judgment to account for deficiencies in the data. An example is provided below in the Methodology Example section.

It is important to realize that the current analysis relies on more than 100 input parameters. As the decade progresses, data from additional tests, research, and analyses may become available and provide for more accurate parameters. Thus, the projections and estimates that are currently being reviewed and analyzed are only preliminary and will change.

The integration of cost and quality drove the quality methodology. In past years, the cost estimation team used parameters produced by subject-matter experts (SME) to define workloads and estimate costs across the operations. To be consistent with cost models, a complex set of parameters drives this quality methodology, and each parameter includes five important components from SMEs:

1. Minimum value.
2. Middle value (typically mean, median, or mode).
3. Maximum value.
4. Distribution (normal, uniform, triangular, log-normal, etc.).
5. Source.

Two models integrate the parameters—one for frame and the other for enumeration. The models interact with each other and produce quality estimates of an **integrated design of the 2020 Census**. In other words, the effects of Address Canvassing quality can be traced through the various self-response methods and all the way down to the nonresponse operations to see the impacts Address Canvassing has on cost and quality of all the later operations of the design. This analysis reviewed the impacts and interactions of all the major operations in the design. This analysis includes HUs and population for the 50 states, the District of Columbia, and Puerto Rico.

These analyses are potentially valuable in several ways, not only to measure quality, but also to predict operational and technical workloads. First, they point out dependencies and gaps among the operations that warrant consideration as the census design moves from planning to implementation. For example, this analysis reviews the impacts of decisions on LUCA to later operations like paper self-response through workloads. If LUCA adds a million correct or erroneous addresses, then paper operations have to prepare to mail materials to them. Second, they help determine which factors (parameters) are the key drivers of cost or quality and must be constantly considered and monitored, versus which factors must be addressed but play a less important role in the design. By changing many parameters together and reviewing impacts, the Census Bureau can prepare for and mitigate extreme circumstances that may arise (risk management). For example, if a major government security breach occurs in early 2020, then all of the parameters for self-response, especially for Internet, may drop considerably. We can very quickly model these possibilities and see extreme examples with relatively minor effort. Finally, by changing the values of one parameter while keeping all others fixed (performing sensitivity analyses), one can study potential effects on quality under alternative operational designs. If we change the percentage of addresses visited in the In-Field Address Canvassing (IFAC) Operation, we can see the impacts of that change to cost and quality for other operations and the overall design of the 2020 Census.

Baseline

The quality of the 2010 Census was measured using the CCM survey.[12] The CCM was a post-enumeration survey designed to assess the coverage of the census for HUs and persons, producing estimates of omissions and erroneous enumerations. The CCM estimated a net overcount of 0.01 percent, or 36,000 persons, which was not statistically different from zero. There were an estimated 10.0 million erroneous enumerations for the household population and 10.0 million omissions, after removing the 6.0 million whole-person imputations. To predict the potential cost and quality implications of the 2020 Census design, the Census Bureau does not have the benefit of a post-enumeration survey. However, the analysis presented here uses some findings from the 2010 CCM survey to make assumptions about what to expect given the 2020 Census design plans. In addition, census test results and simulations with 2010 Census data are used to assess potential cost and quality effects.

The Census Bureau produces quarterly estimates of residential vacancy rates and HU counts. The quality analysis presented in this report used these quarterly estimates from 1965 to 2017 to predict the number of HUs on the ground in 2020, using

[12] The scope of the 2010 CCM excluded people living in GQ and in Remote Alaska.

time series analysis. This process yielded quarters in the future with a 95 percent confidence interval. The projection for the first quarter in 2020 for the United States and Puerto Rico is 140,912,000. This will be the estimated true number of HUs in 2020.

Methodology Example

2020 Census operational teams prepared and provided parameters for predicting the quality of their operations. This example will focus on the Self-Response Team, but all the teams followed a similar process to provide parameters. We focus on paper self-response and the impacts that paper self-response has on the overall quality of the 2020 Census design. The entire country is divided into three basic parts for the purposes of mail contact—Type of Enumeration Area (TEA) 1, which are Self-Response areas; TEA 6, which are UL areas; and TEAs 2 through 5, which are the rest of the country.[13]

The five parameters for Paper self-response include:

1. Percentage of Paper questionnaires completed in TEA 1 (Self-response).
2. Percentage of Paper questionnaires completed in TEA 6 (UL).
3. Percentage of Paper questionnaires with erroneous people (called erroneous enumerations).
4. Percentage of Paper questionnaires with omitted people (called omissions).
5. Percentage of Paper questionnaires with missing Race or Hispanic origin.

Focusing on the first parameter, percentage of paper questionnaires completed in TEA 1, the Self-Response Team provided the following information:

1. Minimum value—9.4 percent.
2. Middle value—12.7 percent.
3. Maximum value—16.0 percent.
4. Distribution (normal, uniform, triangular, log-normal, etc.)—triangular.
5. Source—2012 National Census Test, 2014 Census Test, 2015 Census Test, 2015 National Content Test, ACS, 2010 Census, Pew Research, and expert judgment.

These estimates are based on analysis involving multiple tests and survey data. However, the test and survey data do not yield the same self-response rates that have been seen in past censuses. Based on expert judgment, a factor was applied to the self-response rate to account for the "Census Environment" that is not replicable in any census test or survey. The middle-value estimate of this parameter was applied to the total TEA 1 universe (132.9 million addresses). The second parameter for TEA 6 was applied to the TEA 6 universe (9.2 million addresses) and then the estimates were added together to get approximately 20,300,000. This total, 20.3 million, represents the current point estimate of the number of completed paper questionnaires expected in the 2020 Census. This estimate has uncertainty around it, based on the minimum and maximum values of the parameters. The minimum and maximum, as well as the distribution, are used to feed the Monte Carlo simulation. The outputs of the Monte Carlo simulation, after they are integrated with all other parameters, provide a basis for uncertainty around the parameters and the 2020 Census design as a whole. Finally, the source information helps people outside the team understand the supporting documentation and methodology behind each estimate.

7.1 REENGINEERING ADDRESS CANVASSING

Throughout the entire Reengineering Address Canvassing section, the analysis focuses on three ultimate estimates:

1. **Total living quarters** on the enumeration frame at the beginning of enumeration.
2. **Missed adds**—addresses expected on the ground that are missing from the frame (missed adds include addresses that are on the frame but lack a geocode).[14]
3. **Missed deletes**—addresses on the frame that are not actually valid living quarters on the ground.

The final outputs from Reengineering Address Canvassing are the starting point for enumeration (approximately January 1, 2020). The specific parameters collected to define the Reengineering Address Canvassing outputs are summarized in

[13] TEAs 2 through 5 are not included in this analysis and they make up 0.7 percent of the addresses in the country.

[14] A geocoded address is one that has a block code. This code is critical for the 2020 Census because we must count people and living quarters in a block.

Table 8. Table 8 gives a rough approximation of the level of detail and complexity of the various operations for this analysis.

Table 8: Summary of Quality Parameters Collected for Reengineering Address Canvassing

Operation	Number of parameters collected for quality analysis
Initial frame development	20
MAFCS	2
IOAC	10
LUCA	10
IFAC	5
GEOP	5
Total	**52**

To simplify the analysis, the starting point is the beginning of calendar year 2017, with the estimated number of the three main aggregates. The numbers evolve though the subsequent fiscal years by incorporating growth in the housing stock, and cleaning up the frame by resolving missed adds and missed deletes—errors on the frame. These errors are resolved through several operations, including Ungeocoded Resolution, IOAC, the MAFCS, the LUCA program, and IFAC. The critical point is January 1, 2020, when the enumeration frame is defined and created for census enumerations, such as Self-Response, UL, and others.

This analysis integrates operations. As an example, the errors on the frame are tracked across operations down to the NRFU Operation, so that the same error is not fixed by more than one operation.

Initial Frame Development

The starting point for the frame quality analysis begins with estimates of the state of the frame as of January 1, 2015. Based on analysis of the MAF and using results of the MAFCS that occurred in 2016, some parameters for estimating the initial state of the MAF are:

Table 9: Summary of Quality Parameters Collected for Initial Frame

Parameter	Source
Number of HUs on the frame in 2015 and addresses in 2017 (United States only)—four parameters	Decennial extracts of total addresses and ungeocoded addresses.
Estimated number of HUs in 2020 (Puerto Rico only)—three parameters	HU projections.
Estimated number of actual addresses on the ground in 2020	Decennial Statistical Studies Division.
Errors already on the frame—percentage of missed adds in frame	From analysis of the MAFCS.
Errors already on the frame—percentage of missed deletes in frame.	From analysis of the MAFCS.
Estimated percentage of growth missing from the frame	From analysis of the MAFCS.
Estimated percentage of the growth that is ungeocoded	From analysis of the MAFCS.
Estimated percentage of growth to be overcoverage (missed deletes)	From analysis of the MAFCS.
Expected filter changes—two parameters	ACS extracts and expert judgment.
Number of ungeocoded addresses on the frame in 2017—two parameters	Decennial extracts.
Estimated workload of ungeocoded addresses through 2020	Trend analysis by Geography Division.
Estimates of resolution of geocoding results—two parameters	Past tests, MAFCS results, reports from Geocoding Operation, and expert judgment.

These twenty parameters, once integrated, represent the state of the frame in 2017 including data from the IOAC and the MAFCS, which both started in full production in FY16 and were paused in 2017.

The number of addresses on the frame in 2020 is projected by taking the projected estimate of HUs in 2020, adding an estimate of the missed adds that will be resolved during 2017 to 2020, and adding an estimate of the missed deletes that will be resolved in 2017 to 2020. The missed adds and missed deletes are resolved through the operations mentioned above. These numbers take into

account the projected new growth and the estimated numbers of missed adds and missed deletes that accompany this growth.

For this analysis, estimates of the numbers of missed adds are separated into two categories: addresses on the MAF that are ungeocoded, and other categories of missed adds. Some operations will resolve both types. On the other hand, a planned geocoding operation that started in the middle of 2017 will geocode many addresses. The office work involved in the LUCA Operation will also differentiate between the two types of missed adds as it attempts to resolve cases.

In-Office Address Canvassing and MAF Coverage Study

The Address Canvassing Operation has three major components, as described in section 5.4.3: IOAC, IFAC, and the MAFCS. Both the IOAC Operation and the MAFCS started in full production in FY16 but were put on hold in 2017 due to budget constraints. The IOAC Operation has two phases, Interactive Review (IR) and Active Block Resolution (ABR). IR categorizes the blocks into passive, active, or on-hold blocks. For blocks considered "active," ABR updates the block and adds or deletes addresses. Table 10 describes the five key parameters, out of the 12 total collected, for IOAC and MAFCS conducted in 2016 through 2019, before LUCA. Workload parameters, not described, include the amount of work planned for each year based on approved budgets.

Table 10: Summary of Key Quality Parameters Collected for the In-Office Address Canvassing and MAF Coverage Study

Parameter	Source
Percentage of blocks identified as Passive and Active during IR	Based on observed IR work that occurred in 2016 and 2017.
Percentage of missed adds in Passive blocks	MAFCS results.
Percentage of missed deletes in Passive blocks	MAFCS results.
Percentage of missed adds captured in Active blocks	MAFCS results and expert judgment
Percentage of missed deletes captured in Active blocks	MAFCS results and expert judgment

Recognizing that the frame is the single largest contributor to overall quality, the parameters in Table 9 and 10 show the most critical contributors to quality in the entire 2020 Census design. IOAC can correct hundreds of thousands of addresses for both missed adds and missed deletes each year. The quality outputs from the integration of IOAC parameters illustrate the **core quality improvement** in the 2020 Census design. This ongoing frame improvement work involves inputs and outputs that produce a higher quality frame than the Census Bureau saw coming out of the 2010 Census. Better frame maintenance processes conducted throughout the decade, including the Geographic Support System, geocoding, and improved technology like the use of aerial imagery, helped define the overall quality of the 2020 Census. The addition of this IOAC process shows promise to improve the quality of the 2020 Census, demographic surveys, and future censuses.

Local Update of Census Addresses

In analyzing the effect of the LUCA Operation, the most important input parameter is the number of LUCA submissions from the various governmental entities. The procedures and requirements for submission changed from the 2000 Census to the 2010 Census, and changed again for the 2020 Census. That makes it more difficult to project the volume of submissions the Census Bureau will receive.

Another parameter considered is the number of addresses submitted to the Census Bureau through LUCA and then rejected by the Census Bureau as not valid. These rejections may be appealed to the Office of Management and Budget for additional consideration. Unless the appeals are resolved before the enumeration frame is identified, such cases will be included in the frame.

For the quality analysis, the projected number of submissions is subdivided into several categories according to the Census Bureau's assessment of the addresses provided, including whether the address is valid or not, on the MAF already or not, etc.

Based on results of the LUCA program in past censuses, experts on the LUCA process have projected the total number of submissions the Census Bureau might anticipate, the proportions for the categories (above) those addresses may fall into,

and the chance that rejected submissions will be appealed. Past data are used to estimate how many of those appealed cases will turn out to be valid living quarters and added to the frame and how many will not.

The most important result of the quality analysis for LUCA is summarized in estimates of two numbers from the LUCA program, good addresses missing from the frame and erroneous addresses added to the frame. The first represents the reduction in the number of missed adds, while the second represents additions to the frame in error (missed deletes). The former quantifies a reduction in potential omission of HU (and, eventually, people); the latter quantifies additional cases that may be sent for fieldwork erroneously. Just as important, the sum of these two numbers has a serious effect on census operations and their accompanying cost.

An important dependency included in this analysis is the relative state of the address frame when the LUCA program begins and when submissions are received and processed. As errors on the frame are rectified through other geographic programs, such as IOAC, the number of missed adds and missed deletes should diminish. This may provide for fewer address submissions from the government partners in the LUCA program and should result in fewer actual address corrections, that is, less error reduction. The quality analysis on the frame takes these dependencies into account.

In-Field Address Canvassing

The IFAC Operation will occur in 2019 for no more than 30 percent of the HUs, the key IFAC parameter. This operation incorporates fieldwork identified through the results of IFAC and LUCA submissions. For this final field operation, which prepares the frame for enumeration, the Census Bureau identifies parameters about capture rates of the missed adds and missed deletes expected in these canvassed blocks. After this fieldwork is complete, the **final enumeration universe** as of January 1, 2020, is created and estimated by this analysis.

Measures of Uncertainty for Reengineering Address Canvassing

As described earlier, each input parameter has a minimum, middle, and maximum value, and a distribution. After Reengineering Address Canvassing integration for all these parameters, the final description of the work logically concludes with the outputs from the Monte Carlo simulations that integrate all the uncertainty around these key frame-development parameters. The resulting variability is an input to the next phase, which is enumeration.

Reengineering Address Canvassing Alternatives Analysis

One of the goals of the 2020 Census Quality Analysis Team is to use the models to look at alternative designs and potential refinements to the 2020 Census operational design. To that end, the Quality Analysis Team identified the five key parameters that affect cost or quality. The Census Bureau considers alternative designs that present perspective on quality impacts of these parameters.

- The volume of addresses sent to IFAC is a major cost-driver, so that parameter is included.
- Workload for the Ungeocoded Resolution Operation is expected to add significant numbers of addresses to the frame.
- Expected filter changes are also expected to add significant numbers of addresses to the frame.
- The number of addresses submitted to the Census Bureau through LUCA will impact both missed adds and missed deletes, decreasing one and increasing the other, respectively.
- IFAC capture rates of the missed adds and missed deletes expected in these canvassed blocks are a critical estimate of the quality of the fieldwork expected in 2019 for IFAC.

Analysis of alternatives for the cost and quality tradeoffs began in late summer 2016. The Census Bureau continued conducting a detailed analysis of alternatives in Fiscal Year 2017, as resources permitted.

Geographic Programs

After the frame definition is complete, the GEOP Operation prepares the frame for Enumeration. These parameters from the GEOP Operation subdivide the universe that goes to Enumeration and defines enumeration methods for the specific addresses. Based on the newly updated results of TEA delineation produced in July 2017, all of the parameters collected for Geographic Programs are applied to the estimated total number of HUs predicted for January 1, 2020, and are shown in Table 11.

For this quality analysis, not all of the addresses in TEA 3 through 5 are considered. As seen in Table 11, these TEAs only account for an estimated 300,000 living quarters.

Table 11: Geographic Programs Quality Parameters

Parameter	Percent	Number of living quarters
Total living quarters from reengineering address canvassing	**100.0**	**143,000,000**
Percentage of all addresses in TEA 1 (self-response)	92.9	132,900,000
Percentage of all addresses in TEA 2 (UE)	0.3	500,000
Percentage of all addresses in TEA 3–5 BCUs (all other)[1]	0.2	300,000
Percentage of all addresses in TEA 6 (UL)	6.40	9,200,000

[1] Measurement of the quality of these addresses will occur in FY18 and beyond.

Note: These data do not reflect the uncertainty of the estimates. All the numbers in this table reflect the middle values of a range of estimates provided by the teams.

7.2 OPTIMIZING SELF-RESPONSE

Before the analysis turns to Optimizing Self-Response (OSR), Sections 7.2, 7.3, and 7.4 all focus on **enumeration** operations that impact quality. This analysis of enumeration continues to estimate the number of addresses enumerated, addresses missing from enumeration, and addresses that are enumerated erroneously, as seen in the frame development analysis, as well as an additional dimension added for people. The final outputs from enumeration include:

1. Total living quarters enumerated.
2. Missed adds for living quarters.
3. Missed deletes for living quarters.
4. Correct enumerations for people.
5. Erroneous enumerations for people.
6. Omissions for people.
7. Imputed Race or Hispanic origin.[15]

The results for enumeration are summarized by these seven measures for this quality analysis.

[15] Imputation is the process of replacing missing data with substituted values. Imputations come from three main sources—whole-household imputations, whole-person imputations, and item-missing imputations.

The detailed parameters collected from SMES to define the enumeration, including OSR, using Administrative Records, and Reengineering Field Operations, are summarized in Table 12.

Table 12: Summary of Quality Parameters Collected for Enumeration

Operation	Number of parameters collected for quality analysis
Paper[1]	5
Internet Self-Response (ID only)	5
Non-ID Processing (sources are Internet and telephone)	4
CQA (ID only)	5
NRFU (administrative records)	12
NRFU (Non Ad Rec)	9
UE/UL (frame updates during enumeration	6
GQ	5
Total	**51**

[1] The Quality Analysis Team recognizes that there is not a formal operation called "Paper," but we ask readers to accept this language for simplicity of the analysis.

The remainder of this section focuses on OSR, specifically.

Paper Enumeration

The Census Bureau estimates the percentage of the households in the Self-Response universe that complete their questionnaires on paper and send them back. It also estimates the percentage of households in UE and UL geography that complete their questionnaires on paper. Based on the parameters for this mode, the Census Bureau estimated the total number of completed questionnaires expected from paper in the 2020 Census.

Internet Enumeration (ID only)

The quality parameters collected for Internet were similar to paper. The Census Bureau estimates the percentage of the Self-Response universe that complete their questionnaires on the Internet. The second component of the Internet comes from the UL universe that completes a questionnaire in the Internet based on materials left during the first visit in UL. Because of quality differences

expected for non-ID Internet cases, those cases are analyzed independently from these parameters. Measurement of Internet non-ID occurs in the non-ID subsection. These parameters only estimated Internet ID cases.

Census Questionnaire Assistance Enumeration (ID only)

The CQA quality parameters for SMEs paralleled the Internet parameters. The Census Bureau estimates the percentage of the Self-Response universe that complete their questionnaires using the CQA telephone option. The Census Bureau also estimates the UL universe that completes a questionnaire by calling in based on materials left during the first visit in UL. Because of quality differences expected for non-ID telephone cases, those cases are analyzed independently from these parameters. Measurement of telephone non-ID occurs in the non-ID subsection. The CQA parameters only provide estimates for CQA ID cases.

Non-ID Processing Enumeration (Internet and Telephone)

The Census Bureau estimates the percentage of the enumeration universe that will complete their questionnaires using the non-ID process from either the Internet or CQA. This includes portions from both Self-Response and UL TEAs. Some cases match and get an ID via automated matching; other cases are matched through the clerical process; and finally some require a field-verified visit to confirm the geography. These parameters estimate all completed cases identified and enumerated through the non-ID process from all paths. The NID will add new addresses that the Census Bureau does not have on the initial enumeration frame, which is different from self-response options applied in the 2010 Census. These estimates for real adds through non-ID are based on the outputs from Reengineering Address Canvassing operations, that is, the quality of the frame going into enumeration operations. This is a significant integration point that occurs in upcoming operations as well.

Table 13: Summary of Self-Response Workloads for Housing Units

Cases	Paper	Internet ID	Non-ID		CQA ID
			Internet	CQA	
Completed cases total	**21,000,000**	**55,600,000**	**6,500,000**	**600,000**	**5,200,000**
Occupied	21,000,000	55,600,000	6,500,000	600,000	5,200,000
Vacant	X	X	X	X	X
Delete.	X	X	X	X	X
Adds.	X	X	[1]400,000	[1]40,000	X
Unresolved.	X	X	X	X	X

X Not applicable.

[1] For this analysis, these added non-ID addresses are included as occupied. Some could be vacant, but a very small number is expected.

Note: These data do not reflect the uncertainty of the estimates. All the numbers in this table reflect the middle values of a range of estimates provided by the teams.

Self-Response Housing Unit Summary

Because self-response generally does not add or delete addresses from the enumeration universe, minimal impacts come from self-response on the HU side. The one exception is of course Non-ID processing, as seen in Table 13.

For this analysis, Completed cases includes the total of Occupied, Vacant, and Unresolved addresses. Although deleted cases have cost impacts, there are no quality impacts for person enumeration. The addresses in the "Adds" row are already captured in the occupied and vacant figures in this table.

Self-Response Person Summary

For this analysis, the measurements or parameters of person-level error come from the 2010 CCM with adjustments to include dependencies with the Reengineered Address Canvassing. Similar methods were applied to all the self-response modes to estimate 2020 Census person-level coverage error. Each parameter that feeds Table 14 has detailed methodology based on input from SMEs and only includes within-questionnaire error. Entire addresses either missed or over-counted are not included in these estimates but are considered elsewhere.

Table 14: Summary of Key Quality Parameters Collected for Self-Response Person Error

Parameter	Sources
Number of erroneous enumerations by Self-Response Mode	2012 National Census Test, 2014 Census Test, 2015 Census Test, 2015 National Content Test, ACS, 2010 Census, Pew Research, and expert judgment
Number of missed people (omissions) by Self-Response Mode	2012 National Census Test, 2014 Census Test, 2015 Census Test, 2015 National Content Test, ACS, 2010 Census, Pew Research, and expert judgment
Number of people with missing Race or Hispanic origin by Self-Response Mode	2012 National Census Test, 2014 Census Test, 2015 Census Test, 2015 National Content Test, ACS, 2010 Census, Pew Research, and expert judgment

7.3 USING ADMINISTRATIVE RECORDS

Use of administrative records and third-party data is the third major innovation area introduced in the 2020 Census design. The key parameters from Administrative Records are:

1. Percentage of the NRFU universe removed for Occupied.
2. Percentage of the NRFU universe removed for Vacants.
3. Percentage of the NRFU universe removed for Deletes.
4. Percentage of the NRFU universe removed after the last visit.

Although the percentage removed after the last visit is not yet developed, the Census Bureau built this component into the model for the purpose of analyzing design alternatives. Table 15 shows the person-level parameters for using administrative records. Recognizing that GQ will use administrative records, the analysis team plans to add analysis of GQ administrative records usage in FY18.

The person-level error based on using administrative records seen in Table 15 is a new source of error compared to the 2010 Census design.

Table 15: Summary of Key Quality Parameters Collected for Using Administrative Records Error for Persons

Parameter	Sources
Number of erroneous enumerations	2010 Census simulation using the 2017 test models
Number of missed people (omissions)	2010 Census simulation using the 2017 test models
Number of people with imputed race or Hispanic origin	2010 Census simulation using the 2017 test models

The process implemented to estimate quality for administrative records usage involves applying these rates of error to the NRFU and UE universes removed using administrative records. The quality metrics produced for person-level error came from analysis on the entire 2010 Census NRFU universe.

7.4 REENGINEERING FIELD OPERATIONS

Nonresponse Followup

The NRFU field operation is the most costly operation. After the Census Bureau removes the addresses using administrative records and adds new addresses in the field, what remains is the field workload for NRFU.

For this analysis, "Completed cases" includes the total of Occupied, Vacant, Delete, and Unresolved addresses. Although deleted cases have cost impacts, there are no quality impacts for person enumeration within questionnaires. Added addresses, on the other hand, are included in the occupied and vacant components. NRFU will add new addresses that the Census Bureau did not have on the initial enumeration frame, and NRFU will delete addresses from the frame that do not exist on the ground. The parameters for added and deleted addresses through NRFU are integrated with the missed adds and missed deletes from Reengineering Address Canvassing operations. These are important integration points with Reengineering Address Canvassing. Finally, the unresolved addresses represent cases that are deemed finished without a completed interview. Unresolved cases typically occur after the maximum number of visits is reached.

Table 16 shows the person-level parameters of error for the NRFU Operation.

Table 16: Summary of Key Quality Parameters Collected for Nonresponse Followup Person Error (Non-Ad Rec)

Parameter	Sources
Number of erroneous enumerations by HU respondent type	2010 CCM reports
Number of missed people (omissions) by HU respondent type	2010 CCM reports
Number of people with imputed race or Hispanic origin by HU respondent type	2010 CCM reports

The "unresolved" addresses from NRFU, included in the final row of this table, are one primary source of the imputations. Cost impacts related to the number of visits drive the number of cases that remain unresolved at the end of NRFU. This balance between cost and quality is manifested clearly in this component of the operational design.

Update Leave/Update Enumerate

The UL and UE operations are somewhat more complicated and have a sizable effect on the overall quality of the 2020 Census design. Based on the current, untested methodology, the Census Bureau expects two sources of response data for these geographies.

1. **Self-response through paper, Internet, and telephone** from questionnaires left at the door. This universe will not be included in this section because it has already been included in the paper, Internet, and CQA sections.
2. **Frame updates that come from the listing component of the operations**. This includes adding addresses, deleting addresses, identification of vacant HUs, and unresolved rates.

The quality parameters for the UL and UE operations are less mature because the teams redesigned the 2020 Census to add UL in FY17.

Table 17: Summary of Key Quality Parameters Collected for Update Leave and Update Enumerate for Person Error

Parameter	Sources
Number of erroneous enumerations by type of respondent and visit	2010 CCM reports and expert judgment
Number of missed people (omissions) by type of respondent and visit	2010 CCM reports and expert judgment
Number of people with imputed demographics by type of respondent and visit	2010 CCM reports and expert judgment

Coverage Improvement

The Coverage Improvement suboperation parameters estimate the number of households attempted, number of people added, and number of people deleted during the operation. Only basic quality impacts are covered in this quality analysis for FY17 in an effort to include all significant quality operations in the model. As this suboperation matures, updates are expected to improve this analysis.

Group Quarters

The GQ Operation parameters estimate the number of GQs enumerated and number of people enumerated in GQs. Only basic quality impacts are covered in this quality analysis for FY17 in an effort to include all significant methods of enumeration. Minor adjustments for person-level error occurred in this analysis for GQ.

Measures of Uncertainty for Enumeration

Consistent with prior descriptions, each parameter has a point estimate and measures of uncertainty around the point estimate. After enumeration is completed, the final description of the work logically concludes with the outputs from the Monte Carlo simulations that integrate all the uncertainty around these parameters. As described earlier, each parameter has a minimum, middle, maximum value, and a distribution. These pieces of information are the inputs to perform Monte Carlo simulations on the integration of frame and enumeration to describe the uncertainty of quality for the 2020 Census design.

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8. Approval Signature

Lisa M. Blumerman (signed)

Lisa M. Blumerman September 29, 2017

Associate Director for Decennial Census Programs

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9. Document Logs

9.1 SENSITIVITY ASSESSMENT

This table specifies whether or not the document contains any administratively restricted information.

Verification of Document Content
This document does not contain any: ▪ Title 5, Title 13, or Title 26 protected information ▪ Procurement information ▪ Budgetary information ▪ Personally identifiable information

9.2 REVIEW AND APPROVALS

This 2020 Census Operational Plan document has been reviewed and approved for use. This table documents the necessary approvals leading up to the point of baselining.

Document Review and Approval Tier: Operational Plan		
Name	**Area Represented**	**Date**
Robin A. Pennington	2020 Census Operational Plan Team	September 19, 2017
2020 Census Operational Plan Team Leadership Group:		
Lisa M. Blumerman	Associate Director for Decennial Census Programs	September 29, 2017
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Deborah M. Stempowski	Chief, Decennial Census Management Division	September 29, 2017
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Deirdre D. Bishop	Chief, Geography Division	September 29, 2017
Phani-Kumar A. Kalluri	Chief, Decennial IT Division	September 29, 2017
Burton Reist	Chief, Decennial Communications and Stakeholder Relations Office	September 29, 2017
Louis Cano	Chief, Decennial Contracts Execution Office	September 29, 2017
	2020 Census Portfolio Management Governance Board	
	2020 Census Executive Steering Committee	

9.3 VERSION HISTORY

The document version history recorded in this section provides the revision number, the version number, the date it was issued, and a brief description of the changes since the previous release. Baseline releases are also noted.

Rev #	Version	Date	Description
Final	V 1.0	October 1, 2015	Original baseline.
Final	V 1.1	November 6, 2015	Conversion of 2020 Census Operational Plan content into Communications Directorate Desktop Publisher. Converted all figures and updated figures 8 and 28. Also added Section 8—Lifecycle Cost Estimate and Appendices.
Final	V 2.0	September 30, 2016	Fiscal year 2016 update of 2020 Census Operational Plan.
Final	V 3.0	September 30, 2017	Fiscal year 2017 update of 2020 Census Operational Plan.

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Appendix: List of Acronyms

Acronym	Definition
ABR	Active Block Resolution
ACO	Area Census Office
ACS	American Community Survey
ADC	Address Canvassing Operation
ARC	Archiving Operation
AVT	Address Validation Test
BAS	Boundary and Annexation Survey
BCU	Basic Collection Unit
BPM	Business Process Models
BYOD	Bring Your Own Device
CAP	Capability Requirements
CCM	Census Coverage Measurement Survey
CEDCaP	Census Enterprise Data Collection and Processing
CEDSCI	Center for Enterprise Dissemination Services and Customer Innovation
CFD	Content and Forms Design Operation
CM	Coverage Measurement
CMDE	Coverage Measurement Design and Estimation Operation
CMFO	Coverage Measurement Field Operations
CMM	Coverage Measurement Matching Operation
COMPASS	Census Operations Mobile Platform for Adaptive Services and Solutions
CQA	Census Questionnaire Assistance Operation
CQR	Count Question Resolution Operation
CRO	Count Review Operation
dDaaS	decennial Device as a Service
DLM	Decennial Logistics Management Operation
DOP	Detailed Operational Plan
DPD	Data Products and Dissemination Operation
DSC	Decennial Service Center Operation
EAE	Evaluations and Experiments Operation
eSDLC	Enterprise Systems Development Life Cycle
ETL	Enumeration at Transitory Locations Operation
FACO	Federally Affiliated Count Overseas Operation
FLDI	Field Infrastructure Operation
FPD	Forms Printing and Distribution Operation
FSCPE	Federal-State Cooperative Population Estimate
GAO	Government Accountability Office
GEOP	Geographic Programs Operation

Acronym	Definition
GQ	Group Quarters Operation
GSS-I	Geographic Support System Initiative
GUPS	Geographic Update Partnership Software
HU	Housing Unit
HUFU	Housing Unit Follow-up
iCADE	integrated Computer-Assisted Data Entry
IFAC	In-Field Address Canvassing
IOAC	In-Office Address Canvassing
IPC	Integrated Partnership and Communications Operation
ISR	Internet Self Response Operation
IT	Information Technology
ITIN	IT Infrastructure Operation
IR	Interactive Review
IVR	Interactive Voice Response
LNG	Languages Services Operation
LUCA	Local Update of Census Addresses Operation
MAF	Master Address File
MAM	Mobile Application Manager
MAFCS	MAF Coverage Study
MDM	Mobile Device Management
MMVT	MAF Model Validation Test
MOJO	In-field operational control system
NARA	National Archives and Records Administration
NID	Non-ID Processing Operation
NPC	National Processing Center
NRFU	Nonresponse Followup Operation
O&M	Operations and Maintenance
PBC	Partial Block Canvassing
PDC	Paper Data Capture Operation
P.L.	Public Law
PEARSIS	Production Environment for Administrative Record Staging, Integration, and Storage.
PLBR	Project-Level Business Requirements
PM	Program Management
PSAP	Participant Statistical Areas Program
QC	Quality Control
RCC	Regional Census Center
RDP	Redistricting Data Program Operation
RFP	Request for Proposal

Acronym	Definition
SEI	Systems Engineering and Integration Operation
SIMEX	Simulation Experiment
SPC	Security, Privacy, and Confidentiality Operation
TEA	Type of Enumeration Area
TIGER	Topologically Integrated Geographic Encoding and Referencing System
TSAP	Tribal Statistical Areas Program
UE	Update Enumerate Operation
UL	Update Leave Operation
URL	Uniform Resource Locator
USPS	United States Postal Service
WBS	Work Breakdown Structure