2020 Census Operational Plan

A New Design for the 21st Century

Issued September 2016
Version 2.0

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 v2.0* reflects the operational design for the 2020 Census as of August 31, 2016. The operational plan has not been updated to reflect the decision announced on October 18, 2016 to stop work on two field test operations in FY 2017 to mitigate program risk amidst funding uncertainty. For more information on this announcement, please view the 2020 Census Decision Memorandum Series: "Adjustment of the FY 2017 Test Scope" at the following URL:

www.census.gov/programs-surveys/decennial-census/2020-census/planning-management/memo-series/2020-memo-2016_21.html

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1. Introduction

1.1 PURPOSE

The U.S. Census Bureau's 2020 Census Operational Plan documents the current design for conducting the 2020 Census. As the initial version of an emerging concept of operations, it reflects and supports evidence-based decision making by describing design concepts and their rationale, identifying decisions still to be made, and describing significant issues and risks related to the implementation of the 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 are informed through research, testing, and analysis of the cost and quality impacts of different design options. The operational design also drives the requirements for Information Technology (IT) capabilities and acquisitions.

The 2020 Census is being designed and developed on a rolling schedule. Accordingly, this process is iterative. Preliminary design decisions have been made based on early research, testing, and analysis, and these have been used to determine initial requirements for capabilities and acquisitions. As the design matures and more decisions are finalized, the requirements will be updated to reflect the revised design.

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

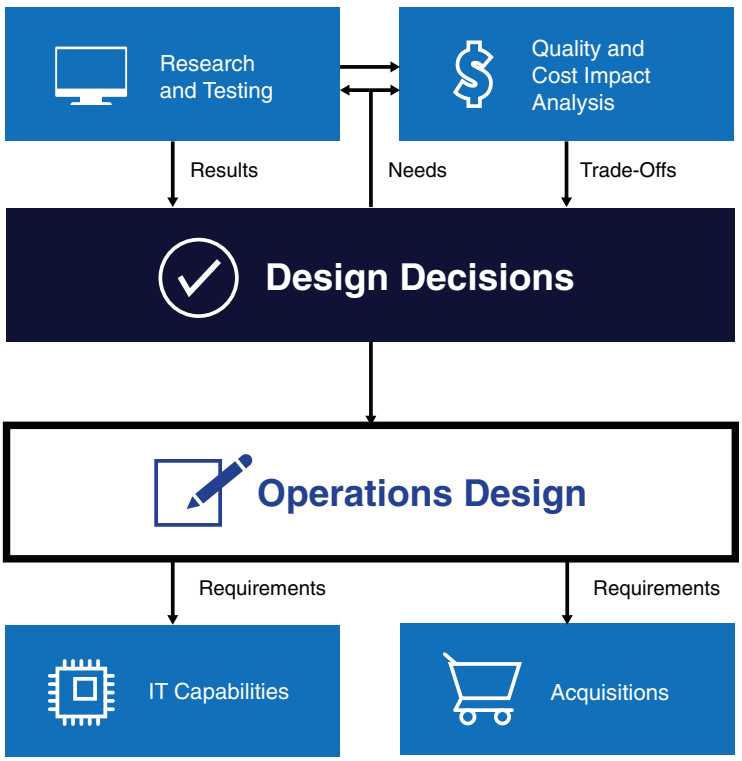

Figure 1: Approach to the Operational Design

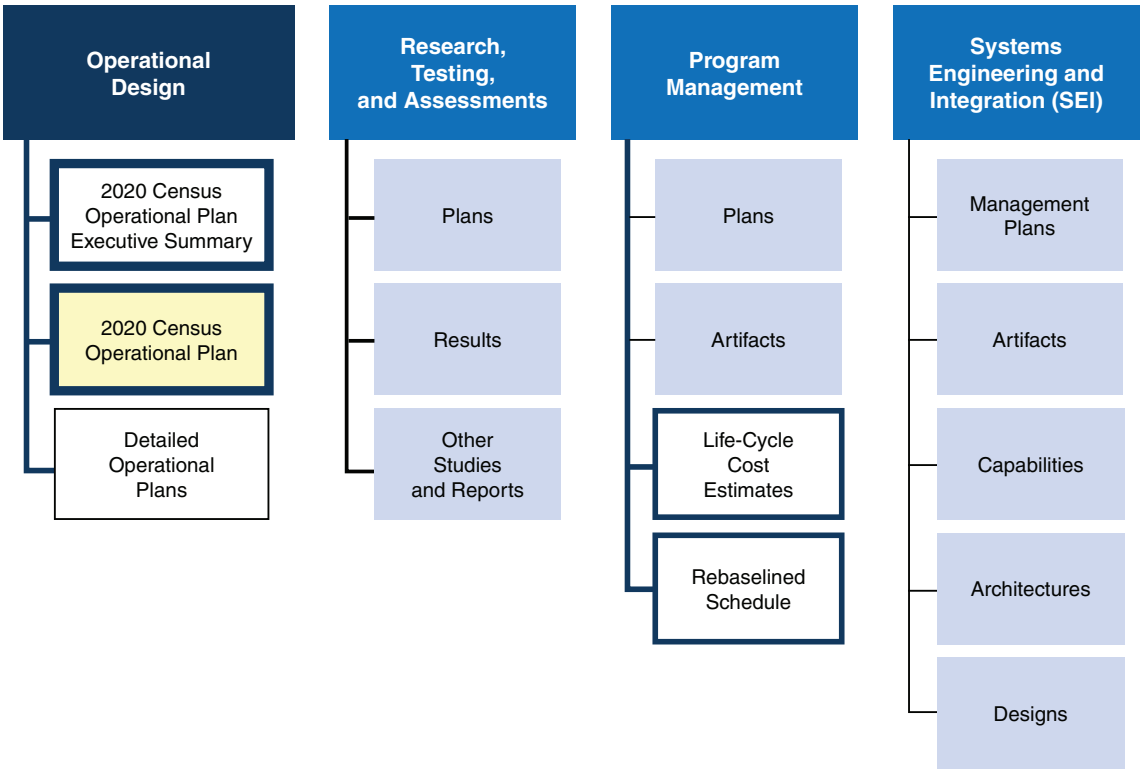

Figure 2: 2020 Census Program Documentation Structure

(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 2.0 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 detailed operational plans, which are being created on a rolling schedule. These detailed plans will include the business process models and requirements that have been developed for each operation.

While this document is a comprehensive plan, the initial research and testing phase focused on those areas that provided the greatest opportunity for cost savings. The maturity level of the plan varies by operation. For each operation, the plan presents the decisions made to date and the design issues to be resolved. Research and testing to refine and improve all operations will continue through the 2018 End-to-End Census Test.

As shown in Figure 2, this Operational Plan, shaded in yellow, is part of a broader set of documentation for the 2020 Census Program that will be developed as the Program matures. Those items outlined in dark blue (i.e., the 2020 Census Operational Plan Executive Summary, the Life-Cycle Cost Estimates, and the Rebaselined Schedule) are being completed in conjunction with this Plan.

[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.

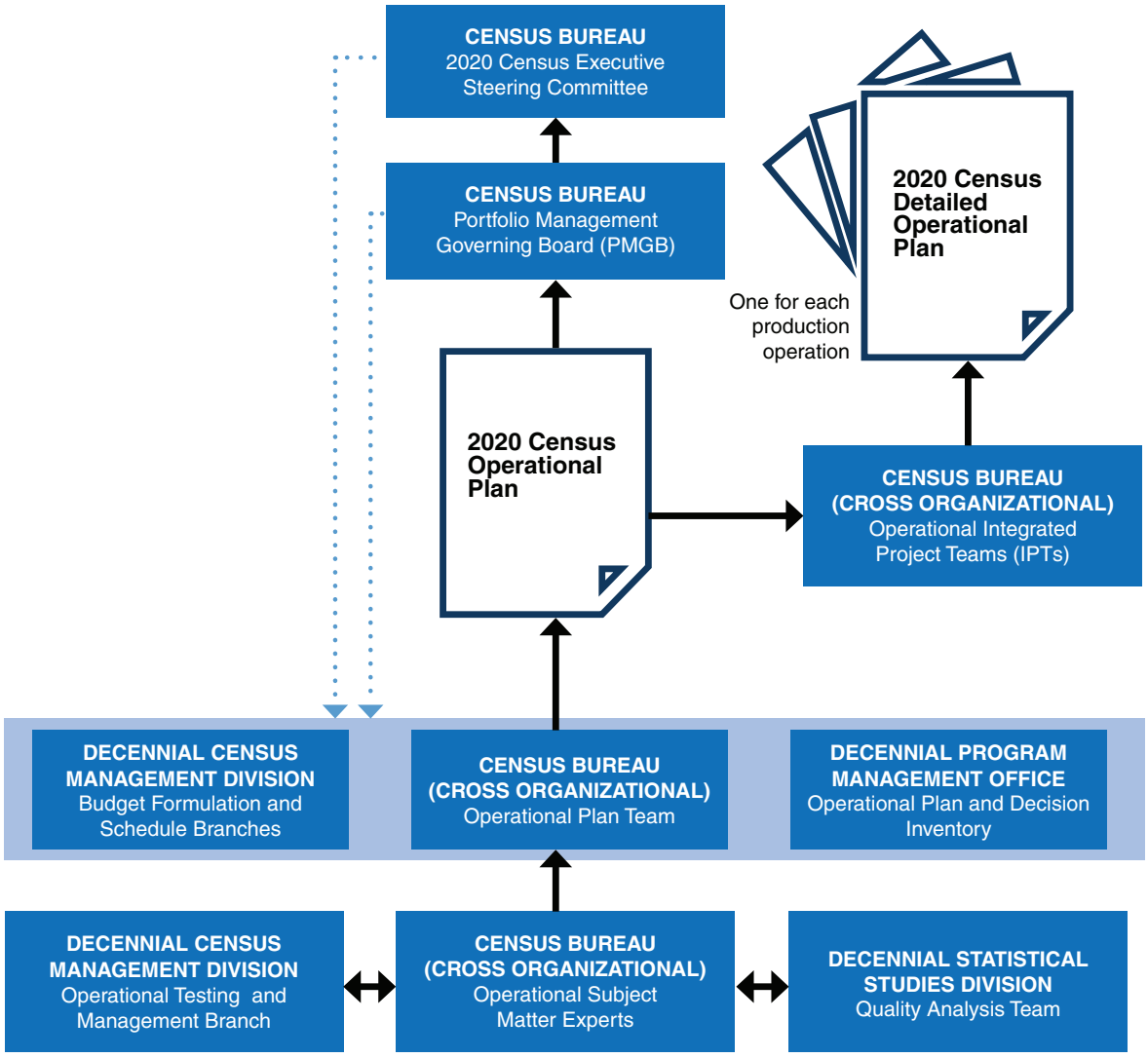

Figure 3: Organizations and Governance Boards for the 2020 Census Operational Plan

1.4 DOCUMENT DEVELOPMENT PROCESS

Many organizations across the Decennial Census Directorate and the Census Bureau have been involved in developing the 2020 Census operational design. Figure 3 illustrates these organizations. The Operational Plan Team consists of subject matter experts from the key Census Bureau organizations with significant roles in supporting the 2020 Census. This team, supplemented with additional subject matter experts from across the Census Bureau, plays a key role in identifying research needs, preparing for and analyzing the results of tests, and recommending design decisions. The Decennial Census Management Division is leading the development of the schedule, life cycle cost analysis, and the testing. The Decennial Statistical Studies Division is leading the quality analysis. The Decennial Program Management Office is leading the annual review and revision of the 2020 Census Operational Plan. The 2020 Census Operational Plan has been reviewed and approved by both the 2020 Census Portfolio Management Governing Board and the 2020 Census Executive Steering Committee. Over the next two years, Operational Integrated Project Teams are developing Detailed Operational Plans (DOPs) for each production operation.

1.5 DOCUMENT ORGANIZATION

This document is organized into eight 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
8. Life-Cycle Cost Estimate

Section 5 describes each of the 34 census operations and constitutes the bulk of this Operational Plan. All decisions in this section are current as of August 31, 2016.

2. The 2020 Census Overview

2.1 PURPOSE, GOAL, AND CHALLENGE

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, and the challenge is to conduct the 2020 Census at a lower cost per household (adjusted for inflation) than the 2010 Census, while maintaining high-quality results.

2.2 USES OF DECENNIAL DATA

As the operational design of the 2020 Census is finalized, it is important to keep in mind the purpose of the 2020 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 $400 billion annually); 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 increasing focus of the census design.

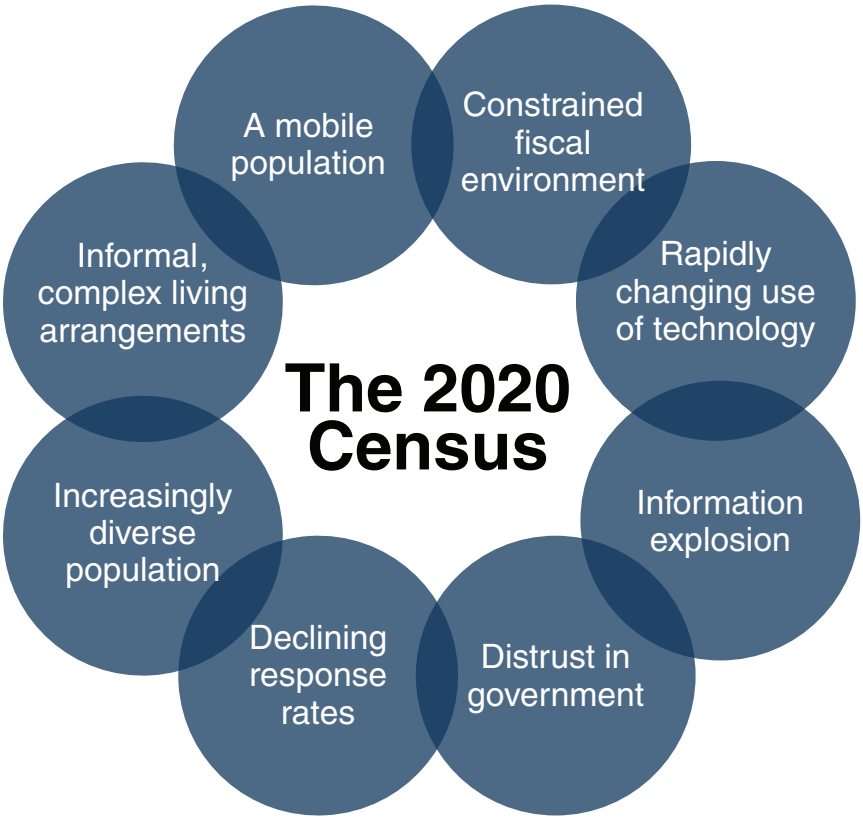

Figure 4: 2020 Census Environment

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

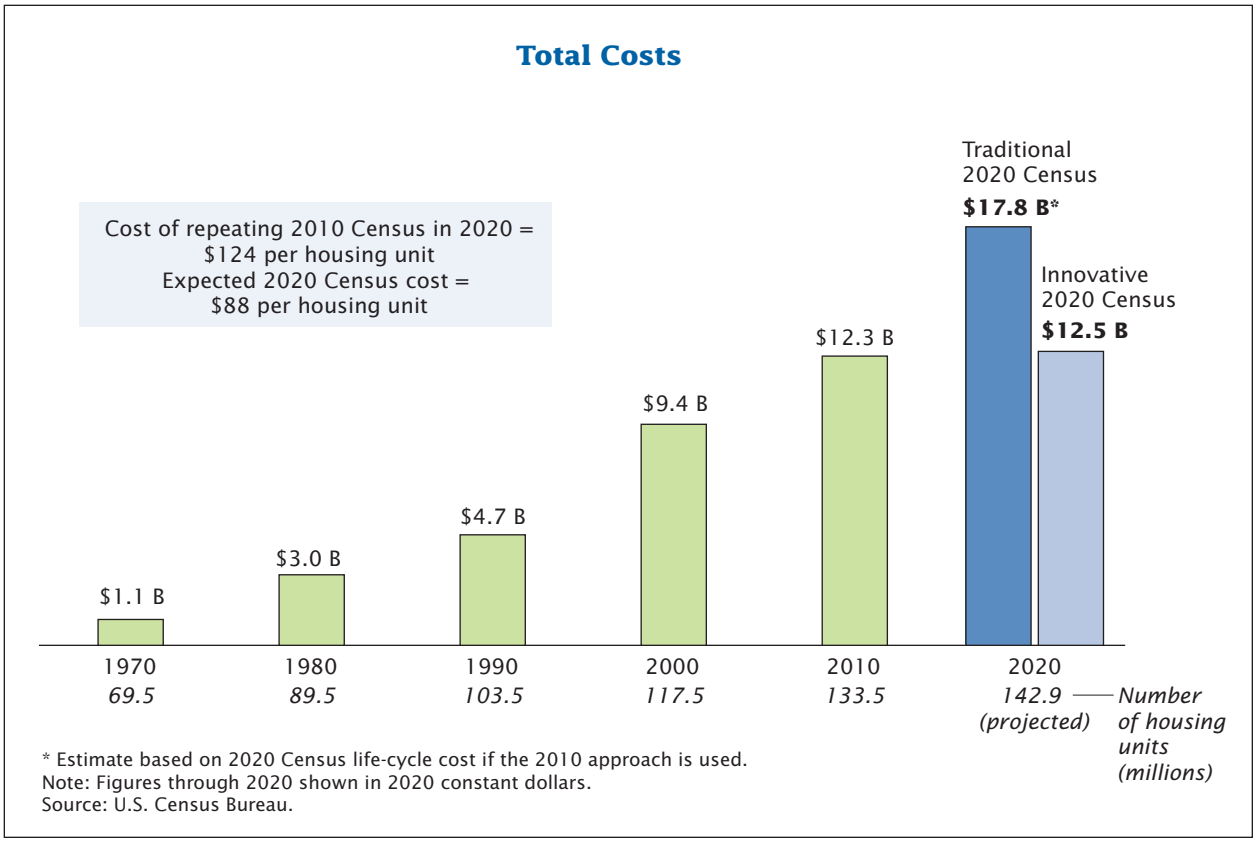

Figure 5: Costs—Traditional vs Innovative 2020 Census

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 12 percent of the population moves in a given year, based on results from the ACS conducted in 2012–2013 and 2013–2014. 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. As shown in Figure 5, on average, the total costs—in constant dollars—of conducting the decennial census have increased significantly each decade. Initial estimates for expected total costs for the 2020 Census are $17.8 billion if the Census Bureau repeats the 2010 Census design and methods. With the innovations described in this Operational Plan, the Census Bureau estimates that it can conduct the 2020 Census for $12.5 billion.

2.4 FOUR KEY INNOVATION AREAS

With cost reductions in mind, the 2020 Census team focused on four Key Innovation Areas:

Field costs associated with Address Canvassing 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 Address Canvassing operation is expected to reduce the field workload for address updating by 75 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 6 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.

While fieldwork began in 2016 on a small scale for address coverage measurement, the bulk of the In-Field Address Canvassing will begin in 2019 and is anticipated to cover approximately 25 percent of all addresses, a significant reduction from the 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) as 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 not require people to enter a unique Census identification with their response. Online responses will be accurate, secure, and convenient. If people are at the bus stop, waiting at the doctor's office, or watching TV and do not have their Census ID handy, they can provide their address instead.

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 by using available data from government administrative records and third-party sources. These

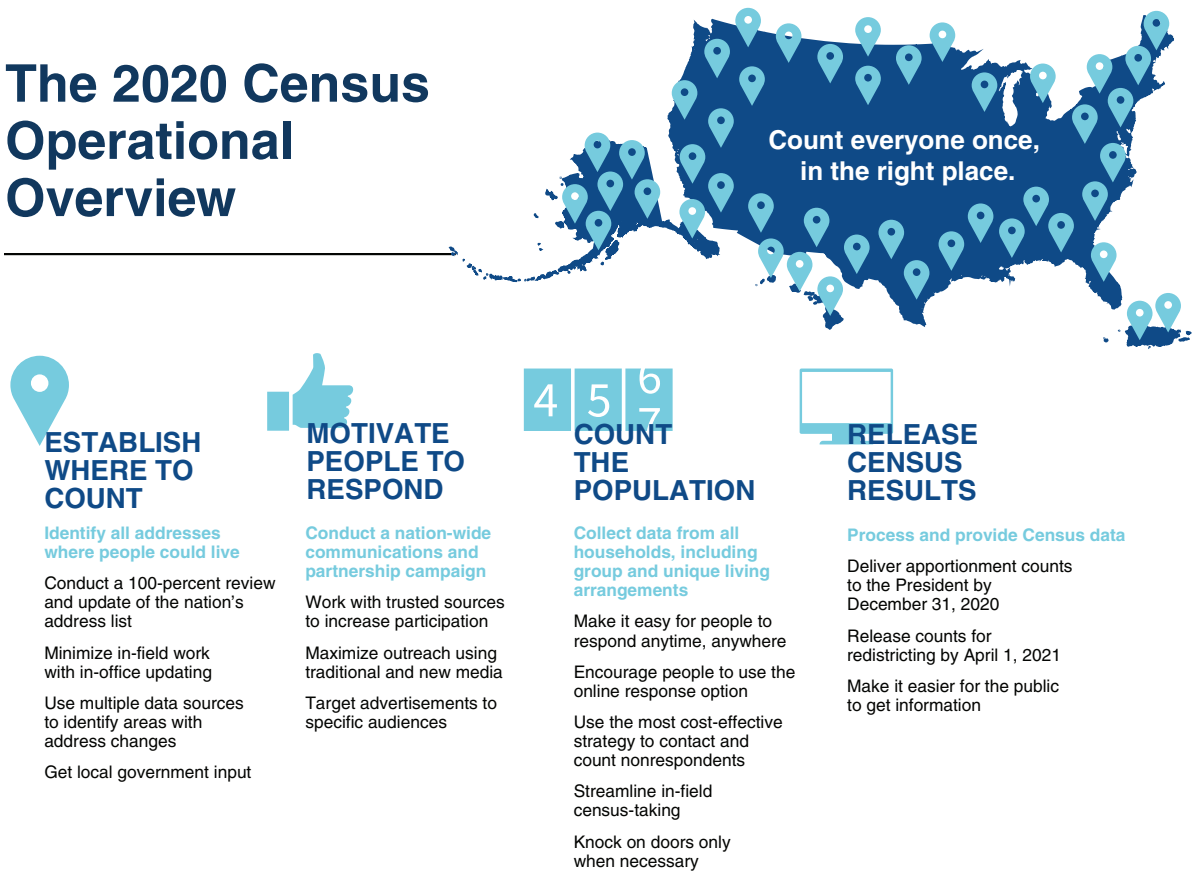

Figure 6: The 2020 Census—A New Design for the 21st Century

data may be used to identify vacant households, determine the best time of day to visit a particular household, or 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 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.

Additional cost savings are expected to result from the use of automation to streamline in-field census taking. Fieldworkers will use handheld 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 the work, 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 March 31, 2021, and to the public beginning in December 2021.

2.6 THE 2020 CENSUS OPERATIONS

The 2020 Census includes 34 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 Address Canvassing 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 the appropriate systems and data security and 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 determine the type and address characteristics for each living quarter.

Table 1: Operations and Purpose—Con.

Operations	Purpose
Response Data	
Forms Printing and Distribution (FPD)	Print and distribute Internet invitations 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 or Field Infrastructure operations.
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, editing, and checkout.
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 and 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 NRFU.
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 and conducting validation of all non-ID responses.
Update Enumerate (UE)	Update the address and feature data and enumerate respondents in person. UE combines listing methodologies with enumeration methodologies by verifying and updating the address list and feature data for tabulation of the 2020 Census, determining the type and address characteristics for each living quarter and enumerating respondents at housing units for which a 2020 Census response was not received within the UE geographical areas.
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.
Nonresponse Followup (NRFU)	Determines 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, and run postdata collection processing actions in preparation for producing the final 2020 Census results, and check for invalid or potential fraudulent returns.

Table 1: Operations and Purpose—Con.

Operations	Purpose
Federally Affiliated Americans Count Overseas (FAA)	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 CQR 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 provides 2020 Census records deemed permanent, including files containing individual responses, to the National Archives and Records Administration for archiving and to the National Processing Center to use as source materials to conduct the Age Search Service.
Other Censuses	
Island Areas Censuses	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 postenumeration survey for the 2020 Census and produce estimates of census coverage based on a post enumeration survey.
Coverage Measurement Matching (CMM)	Identify matches and nonmatches between the 2020 Census and the Census Coverage Measurement Survey for both housing units and people, including computer and clerical components of the matching process.
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 Coverage Measurement Survey and 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 coverage via Demographic Analysis in addition to and separate from those produced via the Coverage Measurement Operations.
Infrastructure	
Decennial Service Center (DSC)	Support 2020 Census Field Operations and handle all service requests initiated by field staff.
Field Infrastructure (FLDI)	Coordinate space acquisition for and lease management of the Regional Census Centers and field offices and provide the administrative infrastructure for data collection operations covering the 50 states, the District of Columbia, and Puerto Rico.
Decennial Logistics Management (DLM)	Provide logistics management services to include procuring warehouse space, warehousing, inventory management, kit assembly, deployment of materials, and receiving and accessing materials.

Table 1: Operations and Purpose—Con.

Operations	Purpose
IT Infrastructure (ITIN)	Provide the IT-related Infrastructure support the 2020 Census, including enterprise systems and applications, 2020 Census-specific applications, Field IT infrastructure, mobile computing, and cloud computing.

Figure 7 presents a graphic representation of the 34 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

- Program Management

Census/Survey Engineering

- Systems Engineering and Integration
- Security, Privacy and Confidentiality
- Content and Forms Design
- Language Services

Infrastructure

- Decennial Service Center
- Field Infrastructure
- Decennial Logistics Management
- IT Infrastructure

FRAME

- Geographic Programs
- Local Update of Census Addresses
- Address Canvassing

RESPONSE DATA

- Forms Printing and Distribution
- Non-ID Processing
- Census Questionnaire Assistance
- Paper Data Capture
- Update Enumerate
- Nonresponse Followup
- Integrated Partnership and Communications
- Group Quarters
- Response Processing
- Internet Self-Response
- Enumeration at Transitory Locations
- Federally Affiliated Americans Count Overseas

PUBLISH DATA

- Data Products and Dissemination
- Redistricting Data
- Count Review
- Count Question Resolution
- Archiving

OTHER CENSUSES

- Island Areas Censuses

TEST AND EVALUATION

- Coverage Measurement Design and Estimation
- Coverage Measurement Matching
- Coverage Measurement Field Operations
- Evaluations and Experiments

Figure 7: Operations by Work Breakdown Structure

3. The Four Key Innovation Areas

The 2020 Census is designed to cost less per housing unit than the 2010 Census (when adjusted for inflation), while continuing to maintain high quality. The Census Bureau plans to achieve this by conducting the most automated, modern, and dynamic decennial census in history. The 2020 Census includes sweeping 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 dramatic cost savings by:

- Adding new addresses to the Census Bureau's address frame using geographic information systems and aerial imagery instead of sending Census 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.

The Census Bureau estimates that conducting a 2020 Census that includes these major cost-saving innovations has the potential to save approximately $5.2 billion compared with repeating the 2010 Census design in the 2020 Census.

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 is developing innovative methodologies for updating the Master Address File/Topologically Integrated Geographic Encoding and Referencing (MAF/TIGER) System throughout the decade. Figure 8 highlights the key concepts in the Reengineering Address Canvassing approach.

Continual research and updating will be conducted through In-Office Address Canvassing that 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 25 percent of the total number of addresses. These design changes have the potential to save the Census Bureau an estimated $900 million.

The operations shaded in darker blue in Figure 9 include innovations related to Reengineering Address Canvassing.

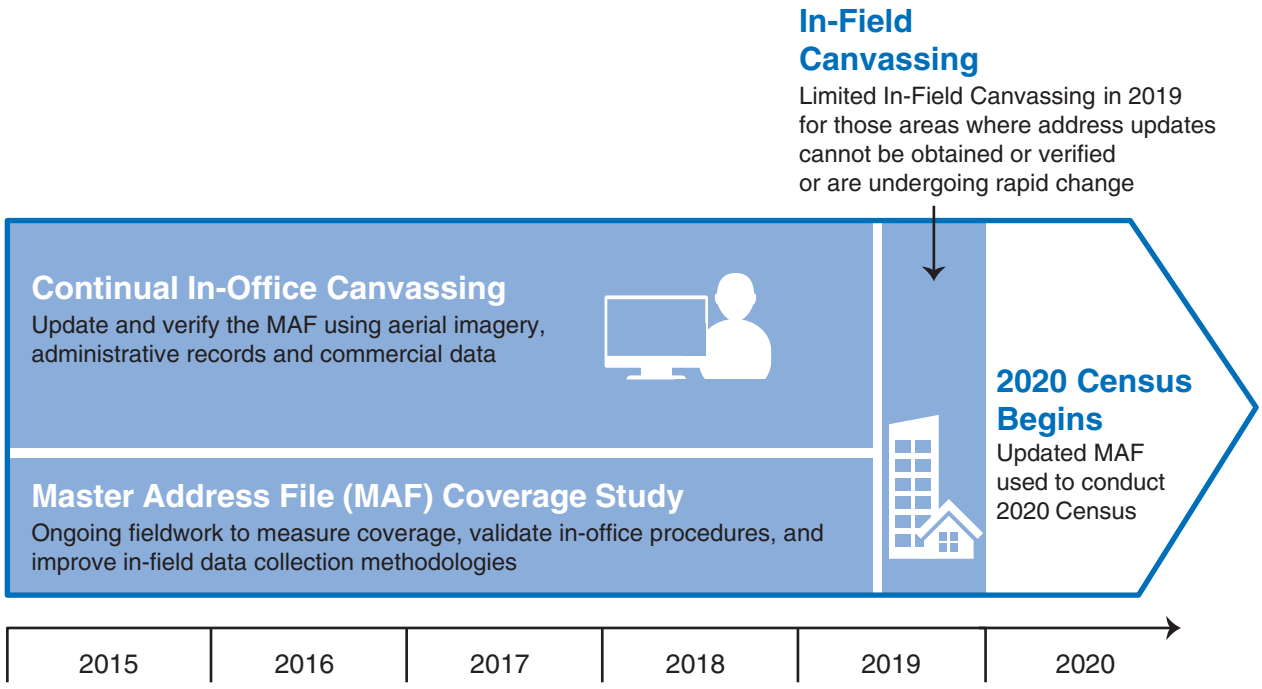

Figure 8: Summary of Reengineering Address Canvassing

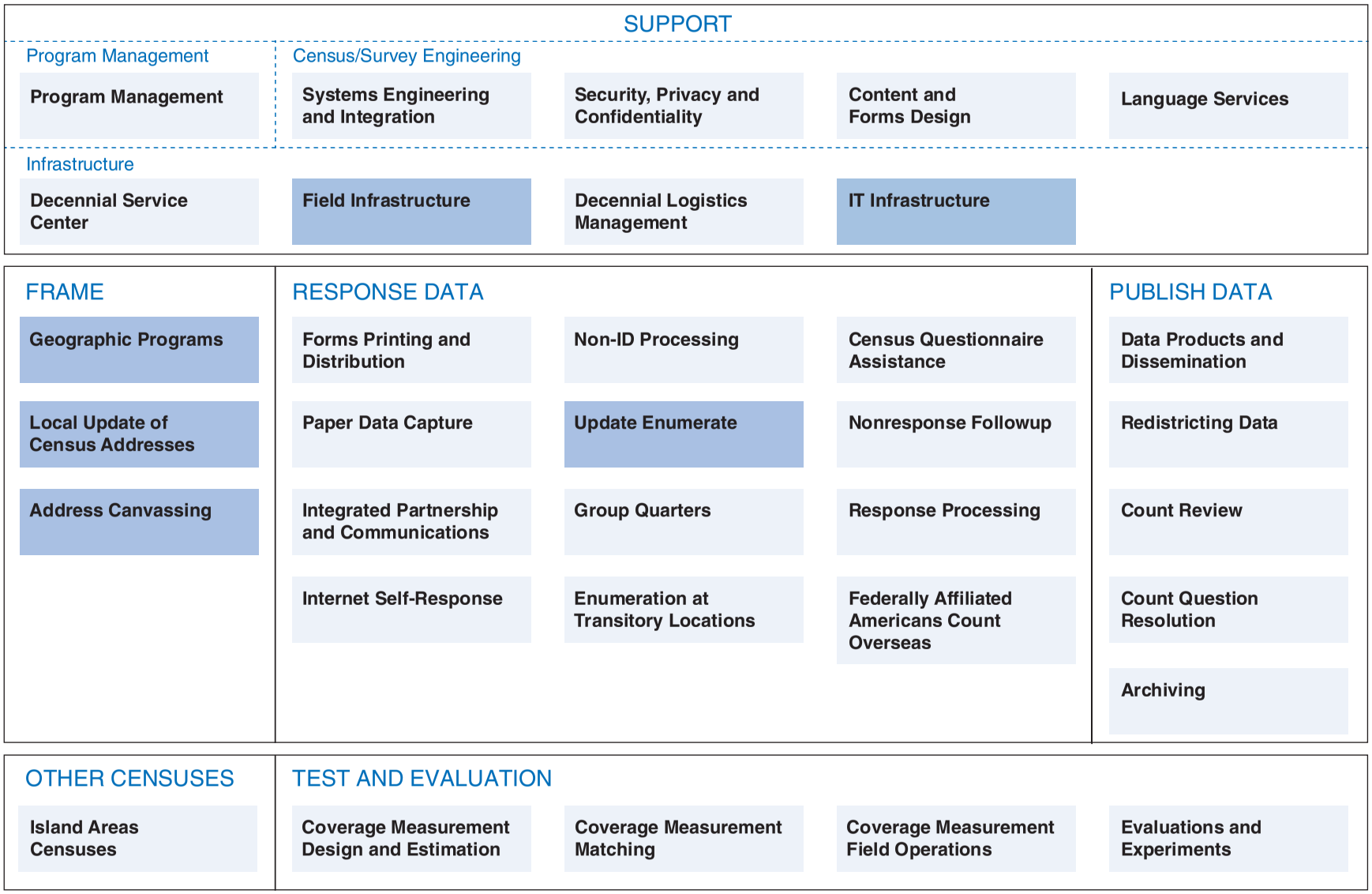

Figure 9: Operations That Contribute to Reengineering Address Canvassing

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	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	Local Update of Census Addresses submissions validated as part of In-Office or In-Field Address Canvassing.
Address Canvassing	100 percent of address canvassing conducted in-office. Target 25 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	Geography in Update Enumerate areas not included in the in-field workloads.
Field Infrastructure	Reduced office infrastructure needed for In-Field Address Canvassing. Automated administrative functions.
IT Infrastructure	Listing applications for In-Field Address Canvassing with flexibility to support decennial Device as a Service (dDaaS). Enterprise solutions with flexible architecture. Additional IT infrastructure to support In-Office Address Canvassing.

Additional operations that contribute to Reengineering Address Canvassing include Decennial Service Center (DSC); Security, Privacy, and Confidentiality; and the Systems Engineering and Integration (SEI).

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 10, the Census Bureau plans to 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 plans to utilize 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, when Census Bureau enumerators visit a house and no one is home, the notice of visit will encourage self-response.

Figure 10: 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.

These design changes have the potential to save the Census Bureau an estimated $400 million.

The operations shaded in darker blue in Figure 11 include innovations related to Optimizing Self-Response.

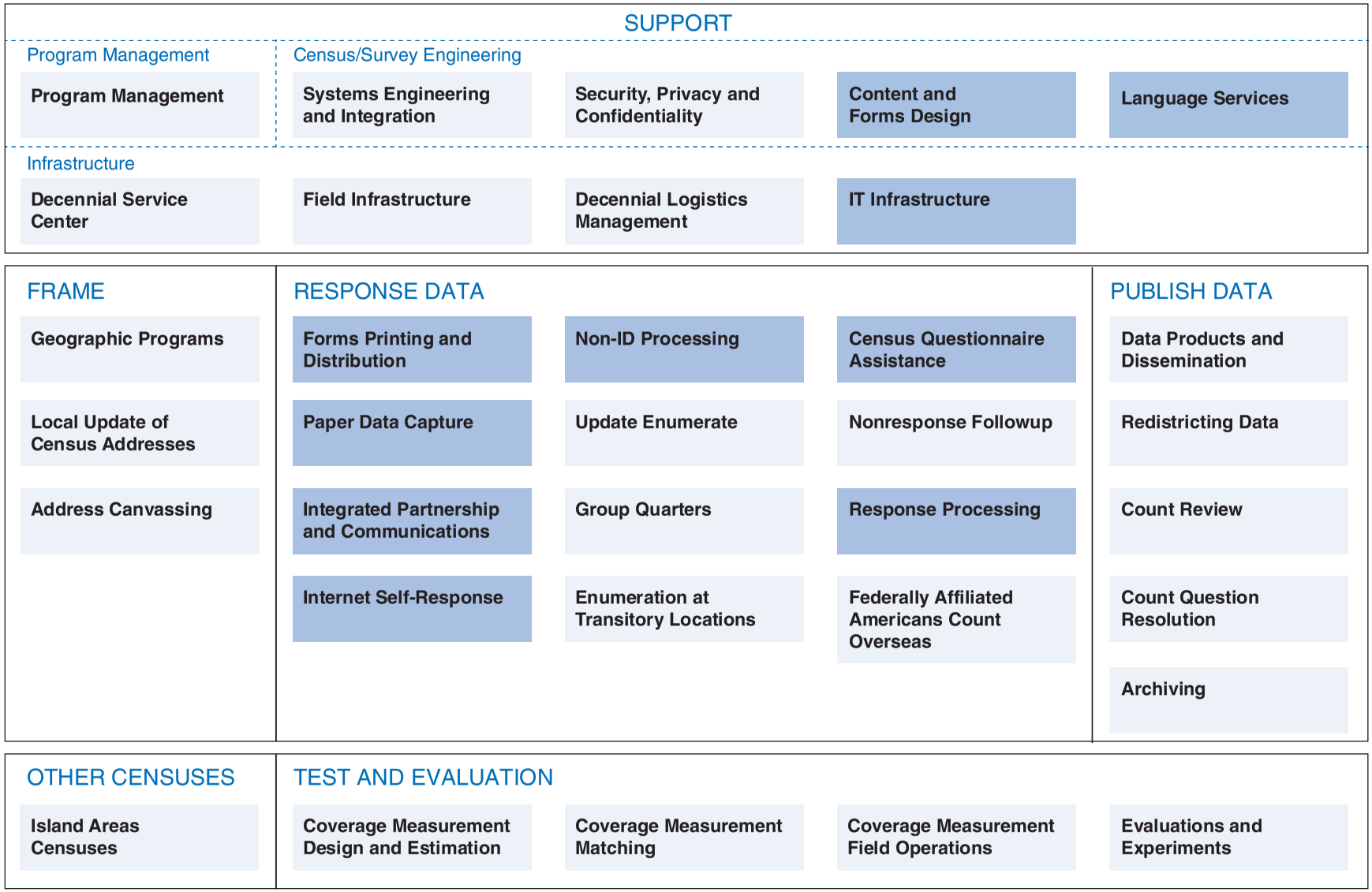

Figure 11: Operations That Contribute to Optimizing Self-Response

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	Questionnaire designed for multiple modes and devices.
Language Services	Non-English questionnaires available across modes. Non-English content development of contact materials (e.g., invitation letters and postcards).
Forms Printing and Distribution	Census mailing that encourages people to respond via the Internet.
Paper Data Capture	Paper available as a response mode.
Integrated Partnership and Communications	Microtargeted 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 via traditional and new media sources (e.g., social media).
Internet Self-Response	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	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	Flexible and adaptive language support. Web chat. Respondent-initiated telephone response collection.
Response Processing	Single operational control system that tracks case status across all modes.
IT Infrastructure	Infrastructure built and sized to meet demand and ensure adequate performance for Internet Self-Response. Secure Internet response capability.

In addition, the Security, Privacy and Confidentiality operation and the Systems Engineering and Integration operation contribute to the Optimizing Self-Response innovation area.

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 12, data from both sources can help 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 U.S. Postal Service 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. These data may also be used to create a contact frame that includes telephone numbers, which enables the Census Bureau to expand its contact methods beyond traditional postal mail.

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	Create the contact frame (e.g., telephone numbers)
Validate respondent submissions	Validate respondent addresses for those without a Census ID 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

Figure 12: Summary of Utilizing Administrative Records and Third-Party Data

Administrative records and third-party data will also be used to validate respondent addresses for those who respond without providing a unique Census ID. 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 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. 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.

These design changes have the potential to save the Census Bureau an estimated $1.4 billion. The operations shaded in darker blue in Figure 13 include innovations related to Utilizing Administrative Records and Third-Party Data.

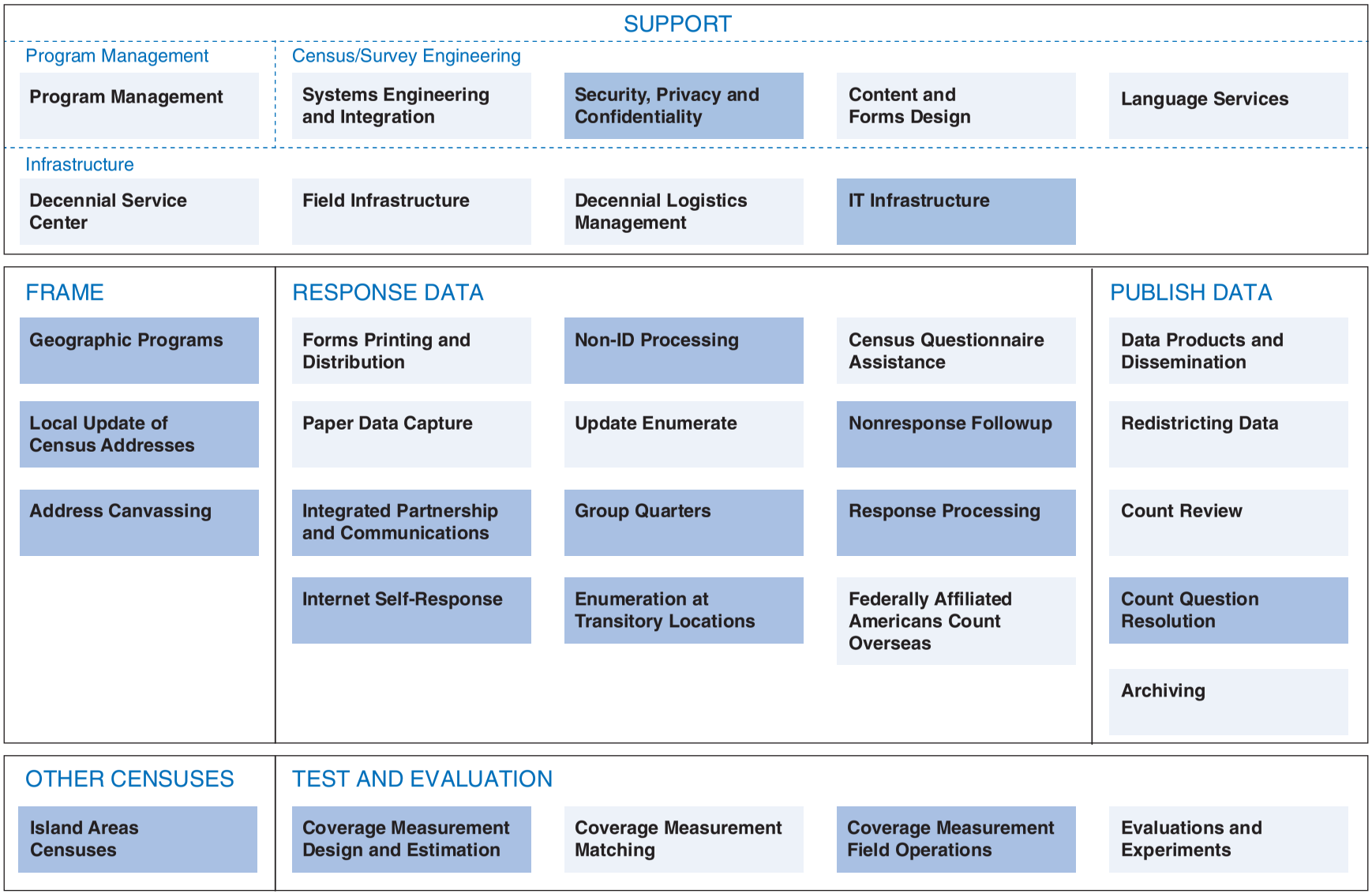

Figure 13: Operations That Contribute to Utilizing Administrative Records and Third-Party Data

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
Security, Privacy, and Confidentiality	Ongoing monitoring of public perception of decennial application of administrative records and third-party data.
Geographic Programs	Administrative records and third-party data used to determine types of enumeration areas, basic collection units, and geographic boundaries.
Local Update of Census Addresses	Administrative records and third-party data used to validate incoming data from tribal, federal, state, and local governments.
Address Canvassing	Additional sources of administrative records and third-party data used to update the address frame in lieu of fieldwork.
Integrated Partnership and Communications	Expanded use of administrative records and third-party data to support microtargeted IPC program.
Internet Self-Response	Administrative records and third-party data used to tailor the contact strategy.
Non-ID Processing	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	Electronic transfer and expanded use of administrative records and third-party data to enumerate group quarters where possible.
Enumeration at Transitory Locations	Administrative records and third-party data used to update addresses of transitory locations.
Nonresponse Followup	Expanded use of administrative records and third-party data to remove vacant and occupied housing units from the NRFU 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	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.
Count Question Resolution	Administrative records and third-party data used to resolve Count Question Resolultion challenges.
Coverage Measurement Design and Estimation	Administrative records and third-party data used for estimation. Administrative records and third-party data used for sample design.
Coverage Measurement Field Operations	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.
Island Areas Censuses	Administrative records and third-party data used where appropriate to support both listing and enumeration.
IT Infrastructure	Use of administrative records requires that systems be Title 13 and Title 26 compliant.

Additional operations that contribute to utilizing Administrative Records and Third-Party Data include Field Infrastructure, Federally Affiliated Americans Count Overseas, and SEI.

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 14 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 Listers and Enumerators with the capability to work completely remotely and perform all administrative and data collection tasks directly from a handheld 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. The agency hired over 516,000 Enumerators to conduct NRFU activities. The new design for the 2020 Census field operations includes six RCCs with up to 250 Administrative Support Operation Centers.

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 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.

In total, these design changes have the potential to save the Census Bureau an estimated $2.5 billion.

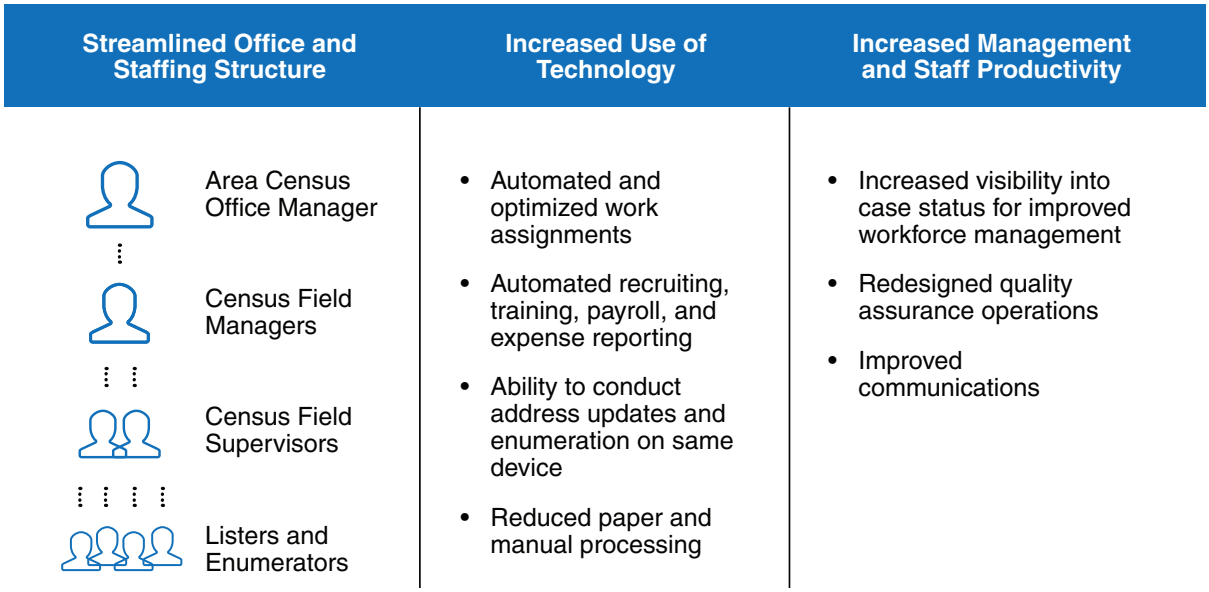

Figure 14: Summary of Reengineering Field Operations

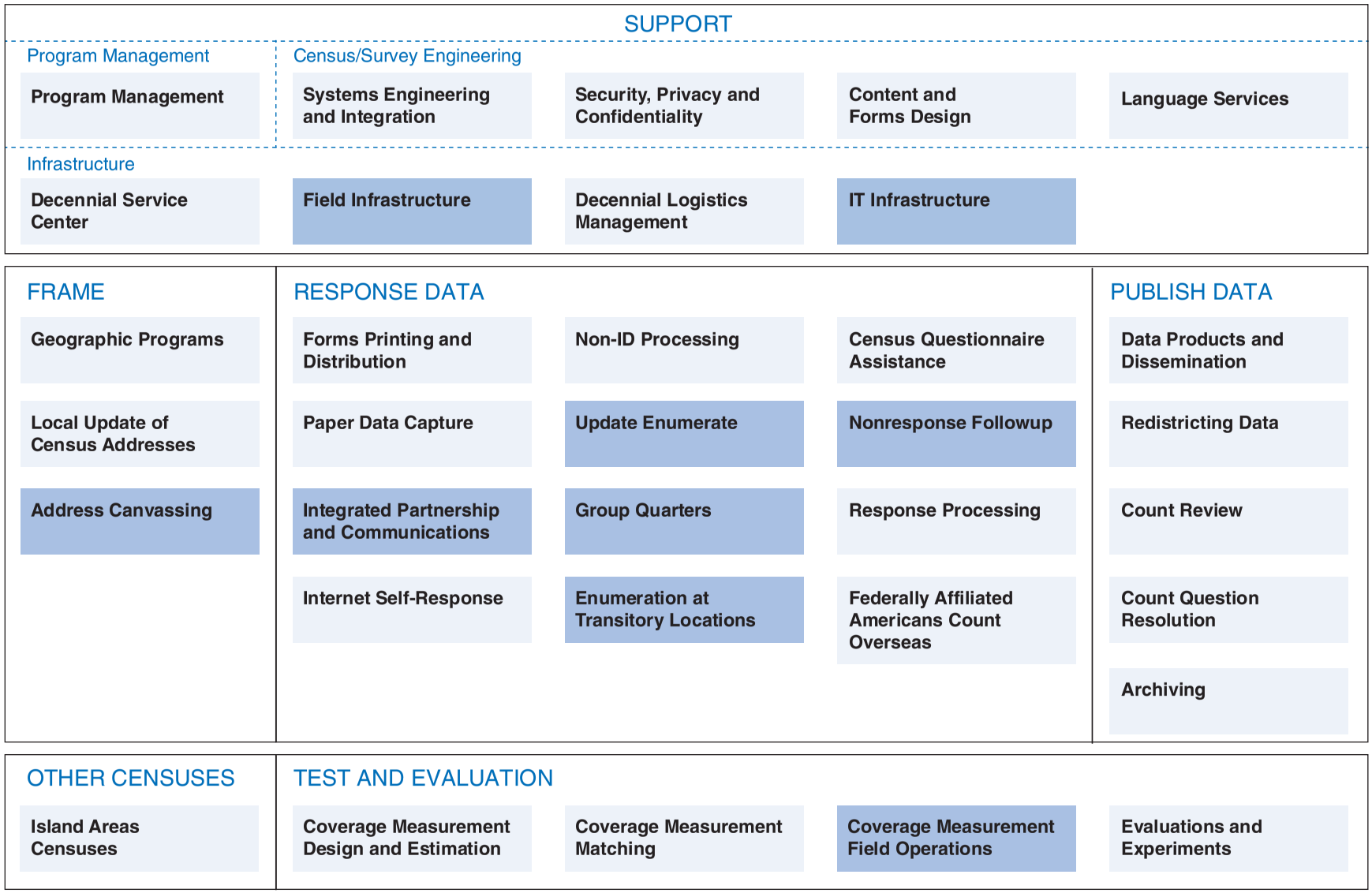

Figure 15: Operations That Contribute to Reengineering Field Operations

The operations shaded in darker blue in Figure 15 include innovations related 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	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.
IT Infrastructure	Enterprise solutions with flexible architecture. Listing and enumeration applications using dDaaS.
Integrated Partnership and Communications	Enhanced communications to support field recruitment.
Field Data Collection Operations: Address Canvassing Update Enumerate Group Quarters Enumeration at Transitory Locations Nonresponse Followup Coverage Measurement Field Operations	Reduced paper via 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. Declaration of work availability and 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. Ability to update address list and enumerate on a single device with a suite of integrated applications. Ability to enumerate addresses when identified through Address Canvassing. Rapid reclassification of living quarter type.

Additional operations that contribute to utilizing Reengineering Field Operations include DSC, Island Areas Censuses, and SEI.

3.5 SUMMARY OF INNOVATIONS

This section summarizes the key innovations planned 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 16 are those that have the most significant innovations.

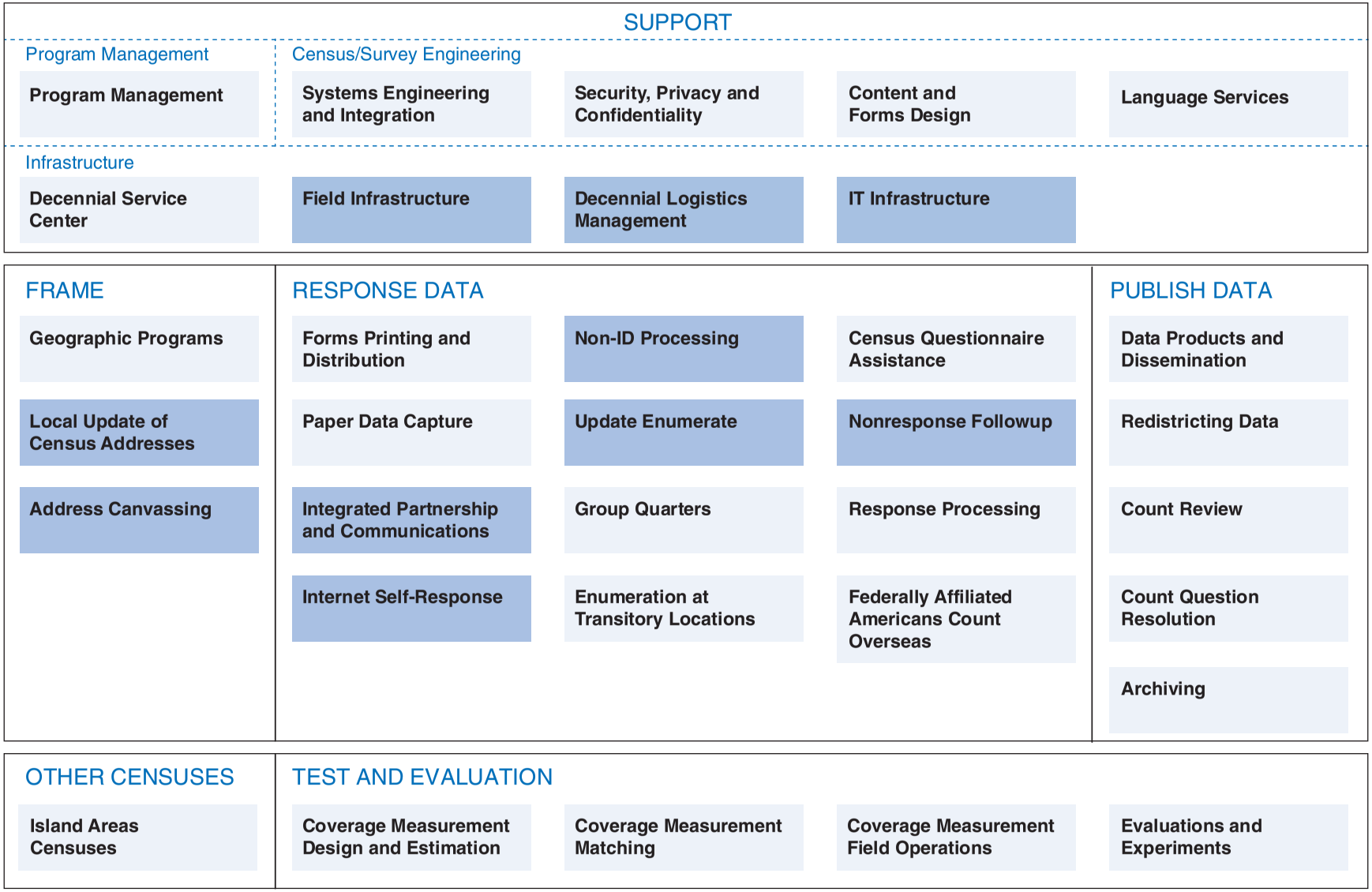

Figure 16: Operations With Significant Innovations Since the 2010 Census

The specific innovations planned for each of these operations are listed in Table 6 below. Note that these innovations are dependent upon funding and decisions on the final design.

Table 6: Summary of Key Innovations by Operation

Operation	Contributions
Local Update of Census Addresses	Reduced complexity for participants. Elimination of the full address list submission options to improve quality and reduce burden and cost.
Address Canvassing	Use of a combination of in-office and in-field methods to achieve 100 percent Address Canvassing (target of 25 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 (MAF 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	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	Internet data capture, providing real-time edits, ability to capture unlimited household size entries, and multi-access 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). A contact frame, including phone numbers, developed from administrative records and third-party data to allow for follow-up if required (e.g., missing or illegible information and reinterview for quality assurance).
Non-ID Processing	Ability for public to respond anytime, anywhere. Real-time matching and geocoding of responses. Validation of non-ID response data. Use of administrative records and third-party data to validate identity and validate and augment address data for non-ID submissions.
Update Enumerate	The 2010 Census Update Leave and Update Enumerate Operations combined into a single operation. Self-Response encouraged through mailings and materials left at the door. Enumeration attempted at time of listing if no self-response received, using NRFU procedures. Use of single device for both listing and enumeration. Use of reengineered field management structure and approach to managing fieldwork, including new field office structure and new staff positions.

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

Operation	Contributions
Nonresponse Followup	Use of administrative records and third-party data to remove vacant housing units from the NRFU workload. Use of administrative records and third-party data to remove nonresponding occupied housing units from the NRFU 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	Reduced number of Regional Census Centers managing a reduced number of Area Census Offices tasked with managing field operations and support activities. 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.
Decennial Logistics Management	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	Early development of solutions architecture. Use of enterprise solutions as appropriate. Iterative deployment of infrastructure aligned with and based on testing. Implementation of dDaaS. Use of demand models to help predict Internet response volume, Census Questionnaire Assistance center staffing, etc. Scalable design. Agile development of applications.

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 and in an integrated master schedule, facilitating the integration and coordination of activities across tests and operations. Refer to Figure 2 in Section 1.2 for how this documentation fits into the broader set of documentation for the 2020 Census Program. Detailed test plans and results are available for review upon request.

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 the 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 17, 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. Starting 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 begins in 2017 and continues through 2018, with final performance testing to ensure scalability occurring in 2019. An end-to-end test in 2018 will test the integration of all 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., MOJO, PRIMUS, and COMPASS) were used for

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

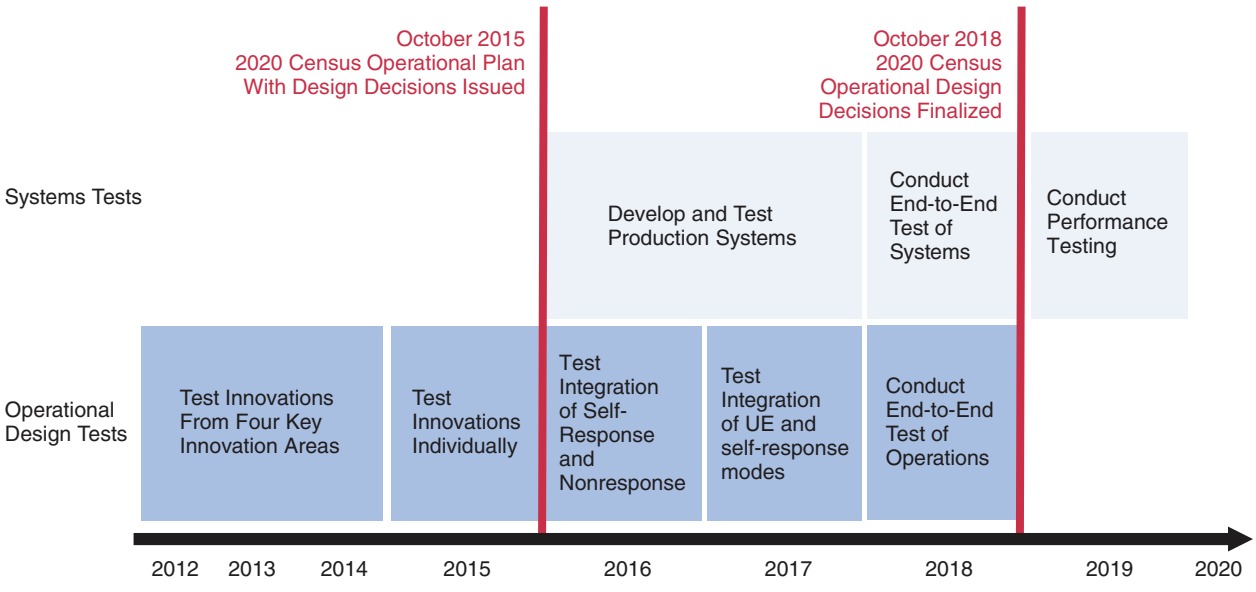

Figure 17: High-Level View of Tests

the 2020 Census Tests in 2014-2016. Beginning in 2017, 2020 Census tests will include 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 (starts in late 2014). 2015 Optimizing Self-Response Test. 2015 Census Test. 2015 National Content Test.
2016	2016 Census Test. Address Canvassing Test.
2017	2017 Census Test. 2017 Puerto Rico Census 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. These may change since future test plans are based on availability of funding as well as the analysis of prior tests.

4.1.1 Tests in 2012–2014

As shown in Figure 18, 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 850 nationally representative housing units per week. Data collection started in February 2012 and will continue on an ongoing basis as needed.

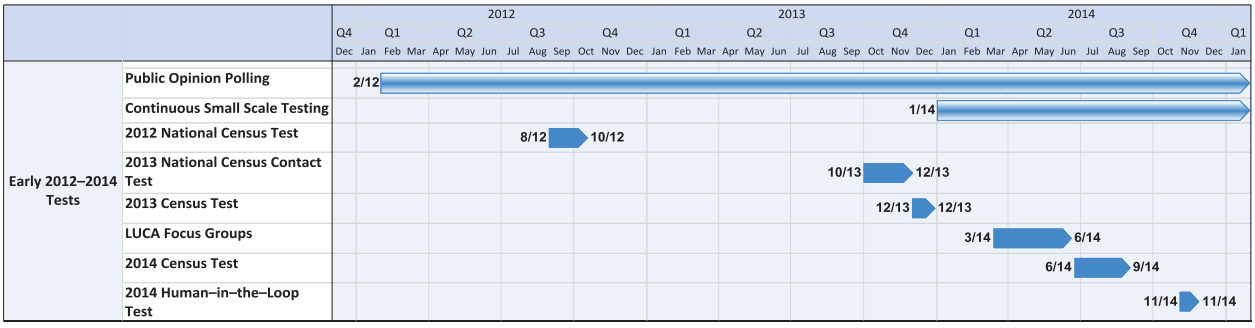

Figure 18: Tests in 2012–2014

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. Collect data on hiring practices for the decennial census and on awareness of the 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. 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.
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. 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, Pennsylvania.

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 assumed to be July 1, 2014. The test involved 192,500 housing units in portions of Montgomery County, Maryland, and Washington, DC.

2014 Census Test	
Objectives	Test various self-response modes, including the Internet, Census Questionnaire Assistance (CQA), 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 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%) 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 percent 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 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: • Continue to provide a 120-day review time for participants. • Continue the 6-month advance notice about the LUCA operation 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 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 (USPS) 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 multi-units 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 (SIMEX) occurred in November 2014. Eighty-seven field and office staff members tested real-time field operations and field management structure in this test.

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 this plan and supporting materials. This design is informed by tests conducted from 2012 through 2015. Future tests will be used to refine the design.

Figure 19 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 MAF Model Validation Test (MMVT) and the Partial Block Canvassing (PBC) Test.

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.

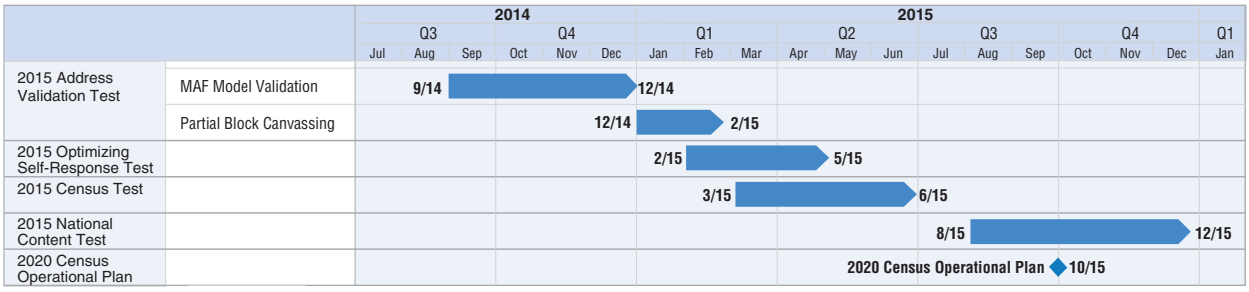

Figure 19: Tests and Key Decisions in 2015

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	
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.

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.

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, Georgia 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. It assumed a Census Day of April 1, 2015. This test included 165,000 sampled housing units in Maricopa County, Arizona.

2015 Census Test	
Objectives	Continue testing of fully utilizing a 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 use of administrative records and third-party data, field reengineering, and adaptive design. Test operational implementation of Bring Your Own Device (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. Census Operations Mobile Platform for Adaptive Services and Solutions (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 multi-units 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 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.

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 fifth mailing, a reminder sent after the paper questionnaire, significantly increased response rates. Sending the first 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 first 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 is not yet completed.
Design Implications	Send a fifth mailing to nonrespondents. Send the first 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 first 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 20, two tests are planned for 2016. The 2016 Census Test focused on the integration of self-response and NRFU. The Address Canvassing Test expands early address canvassing tests to refine the in-office and in-field methods. Each test is described below.

The following operations and systems were or will be 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.	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 Multi-mode Operational Control System. COMPASS Prototype.

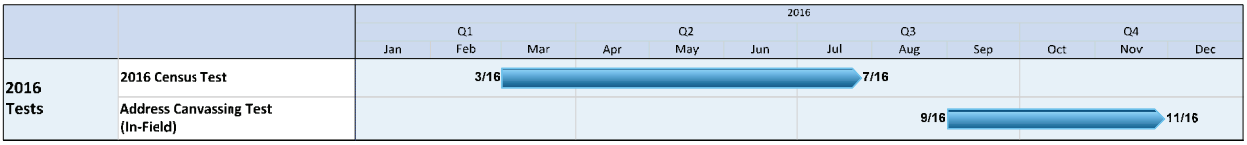

Figure 20: Tests Planned in 2016

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, California, and Harris County, Texas.

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 decennial 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	Analysis is underway, and findings will be forthcoming.

4.1.3.2 Address Canvassing Test

The primary objective of the Address Canvassing Test is to examine the effectiveness of the In-Office Address Canvassing through the results of the In-Field Address Canvassing. In addition, the test will provide 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 will occur in Buncombe County, North Carolina and city of St. Louis, Missouri. Both Address Canvassing components, In-Office and In-Field, will be conducted for all areas of the test sites. All data collection activities for the test will occur 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 (IR), Active Block Resolution (ABR), 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.
Findings and Design Implications	To be completed once the test is conducted.

4.1.4 Tests in 2017

In 2017 the Census Bureau will validate and refine the design for the Update Enumerate (UE) operation and will gain experience with critical operations in Puerto Rico. The Census Bureau will also explore the availability of administrative records and test the capacity to receive these data electronically from Group Quarters administrators within Census Bureau processing systems. As shown in Figure 21, two tests are planned for 2017: The 2017 Census Test and the 2017 Puerto Rico Census Test. Each test is described below.

4.1.4.1 2017 Census Test

The 2017 Census Test is a nationwide self-response test of 80,000 households and a site test on tribal lands. It will allow the Census Bureau to test the feasibility of collecting tribal enrollment information. It will also refine methods for enumerating areas with unique location characteristics where we cannot mail to a street address. In addition to tribal areas, the test will oversample areas with relatively high populations of American Indians and Alaska Natives as a mechanism for testing potential tribal enrollment questions nationwide. This test will have a Census Day of April 1, 2017 and will cover the national sample and two site locations on tribal land: Colville Reservation and Off-Reservation Trust Lands in Washington State and Standing Rock Indian Reservation in North and South Dakota.

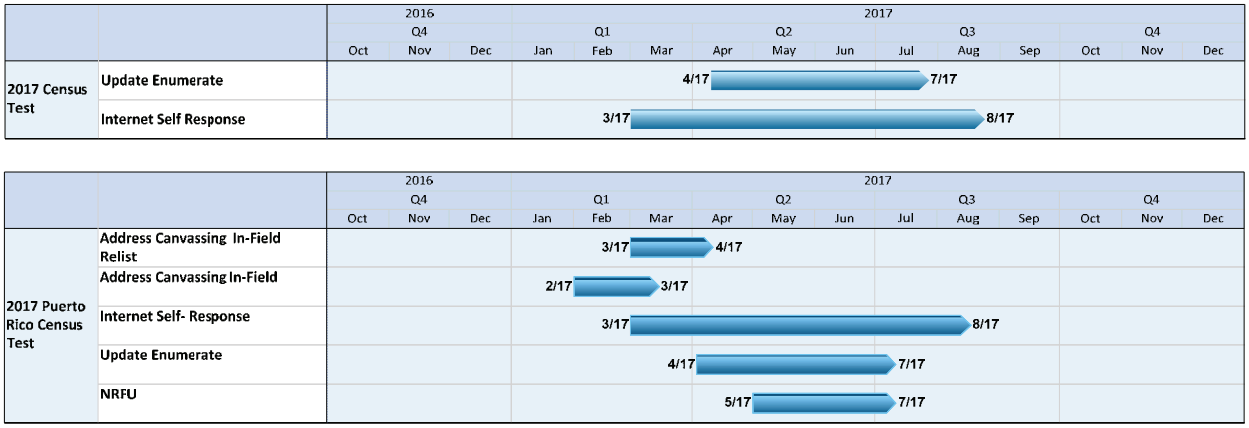

Figure 21: Schedule for the 2017 Census Tests

2017 Census Test	
Objectives	Test the integration of operations and systems for Self-Response. Test the integration of operations and systems for UE. Test the feasibility of collecting tribal enrollment information.
Findings and Design Implications	To be completed once the test is conducted.

4.1.4.3 2017 Puerto Rico Census Test

The 2017 Puerto Rico Census Test will evaluate the effectiveness of address canvassing and integration of the data collection methods—primarily, the data collection geared toward self-response and NRFU. This test will provide the Census Bureau an important opportunity to test components of new technologies to ensure they work independently and together, and also an opportunity to gain some test experience with Puerto Rico residents ahead of the 2020 Census. The test will have a Census Day of April 1, 2017, and will take place in three municipios within the San Juan metro area, with approximately 123,000 addresses within Carolina, Loíza, and Trujillo Alto municipios.

2017 Puerto Rico Test	
Objectives	Test the Address Canvassing operation in Puerto Rico Integrate Self-Response, UE, and NRFU operations Test Spanish versions of the software and systems needed to support Census activities
Findings and Design Implications	To be completed once the test is conducted.

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. This test and its scope are dependent on funding. The 2018 End-to-End Census Test will include significant field data collection components, and the timing of the field operations will mimic the 2020 Census (see Figure 22).

Findings and lessons from prior tests will be used to develop the test plans. 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.

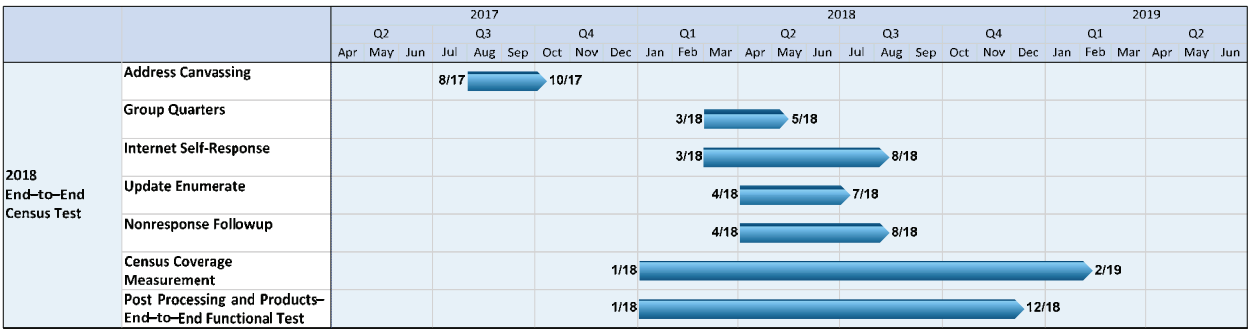

Figure 22: Schedule for the 2018 End-to-End Census Test

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 have a Census Day of April 1, 2018 and will be conducted in three areas: Pierce County, Washington; Providence County, Rhode Island; and, Bluefield-Beckley-Oak Hill, West Virginia. 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.

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 non-functional 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 23, 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 24 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 25 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 26 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.

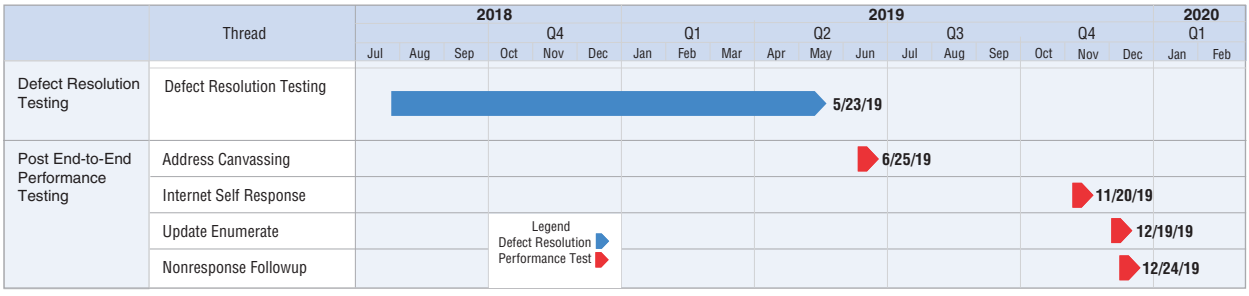

Figure 23: Defect Resolution and Performance Tests in 2019

	Decision	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
		Q2 Q3 Q4	Q1 Q2 Q3 Q4	Q1 Q2 Q3 Q4	Q1 Q2 Q3 Q4	Q1 Q2 Q3 Q4	Q1 Q2 Q3 Q4	Q1 Q2 Q3 Q4	Q1 Q2 Q3 Q4	Q1 Q2 Q3 Q4	Q1 Q2 Q3 Q4	Q1 Q2 Q3 Q4	Q1 Q2 Q3 Q4	Q1 Q2 Q3 Q4 Q1
Key Decision Points/Milestones	Begin 2020 Census	11/11 Begin 2020 Census												
	Launch 2020 Census Website				1/15 Launch 2020 Census Website									
	2020 Census Operational Plan					10/15 2020 Census Operational Plan								
	Award Census Questionnaire Assistance Contract						7/16 Award Census Questionnaire Assistance Contract							
	Award Communications Contract						8/16 Award Communications Contract							
	Census Topics to Congress							4/17 Census Topics to Congress						
	Deliver Final Residence Rules							12/17 Deliver Final Residence Rules						
	Open Regional Census Centers							12/17 Open Regional Census Centers						
	Census Questions to Congress								4/18 Census Questions to Congress					
	Open Field Offices								1/19 Open Field Offices					
	Group Quarters Operations Begin									2/20 Group Quarters Operations Begin				
	2020 Census Day									4/20 2020 Census Day				
	Complete NRFU										8/20 Complete NRFU			
	Count Review Complete										11/20 Count Review Complete			
	Deliver Counts to the President									Deliver Counts to the President 12/20				
	Deliver Redistricting Counts to States									Deliver Redistricting Counts to States 3/21				
	Complete LUCA										Complete LUCA 9/21			
	Release Final 2020 Data Products										Release Final 2020 Data Products 4/23			
	Complete 2020 Census											Complete 2020 Census 9/23		

Figure 24: Key Decision Points and Milestones

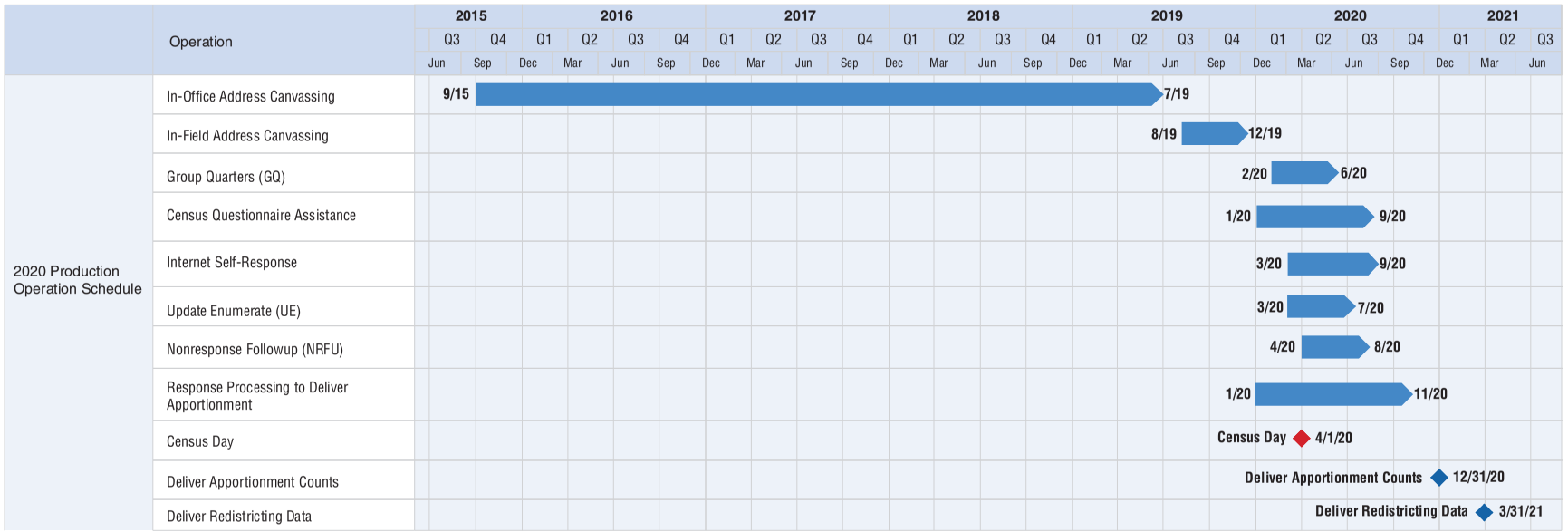

Figure 25: 2020 Census Operations—Production Timeline

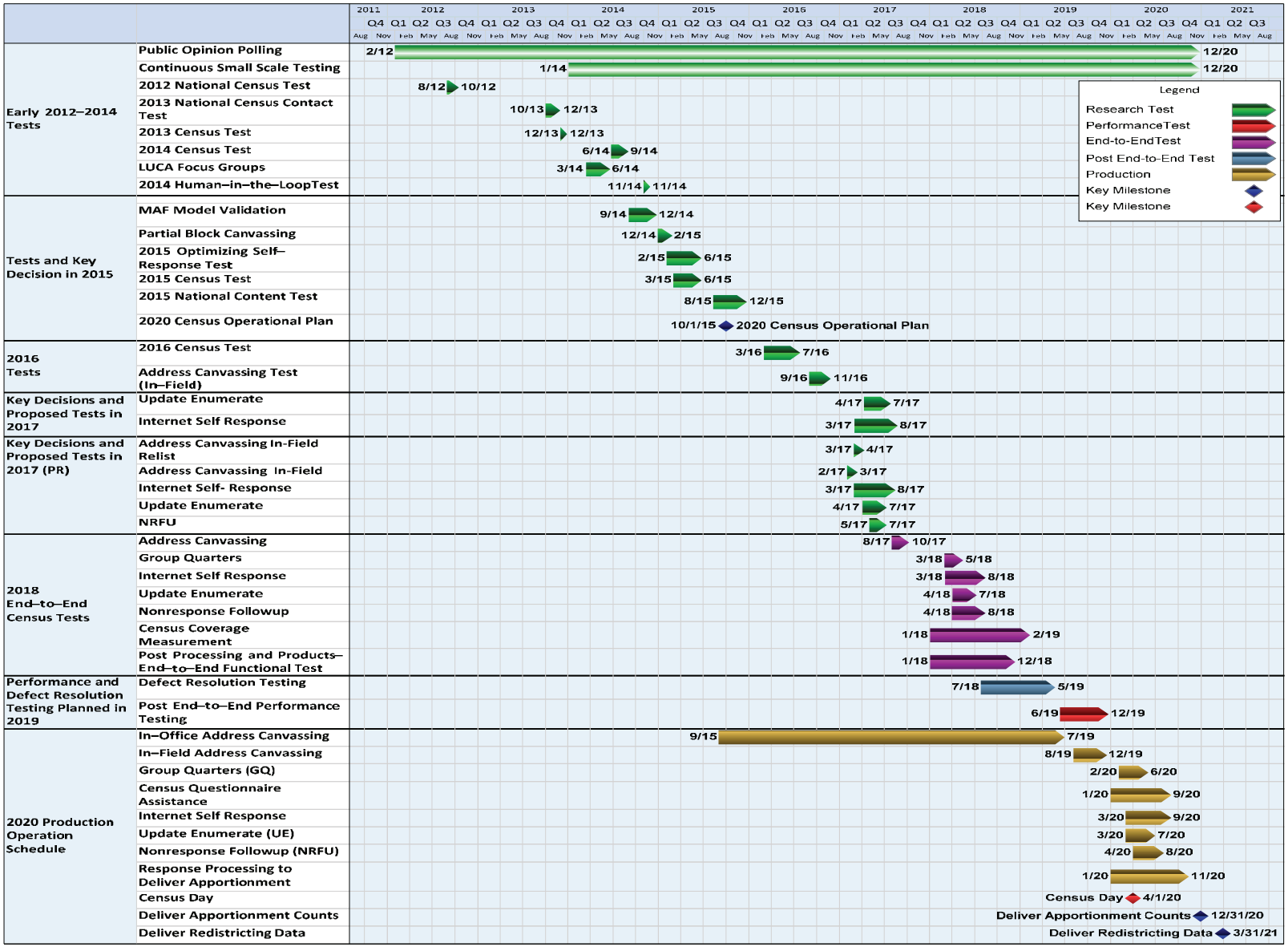

Figure 26: High-Level Integrated Schedule

5. The 2020 Census Operations

This section of the document provides the current state of the operational design. An overview of the 34 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 1.1 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]
- **Opportunities to Innovate:** Major planned innovations for this operation.
- **Description of Operation:** A basic description of the operation.
- **Research Completed:** Research completed through the Research and Testing phase of the 2020 Census Program (2012–2015) 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 proposed design (or alternative designs) for this operation.
- **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 or to be completed.

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

5.1 OPERATIONS OVERVIEW

Figure 27 illustrates all 34 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. The maturity of the operational design for the 34 operations also varies based on the amount of planning conducted to date.

Detailed Operational Plans (DOPs) will be produced for most of the 34 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.

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 28. Major interactions and flows are shown via 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.

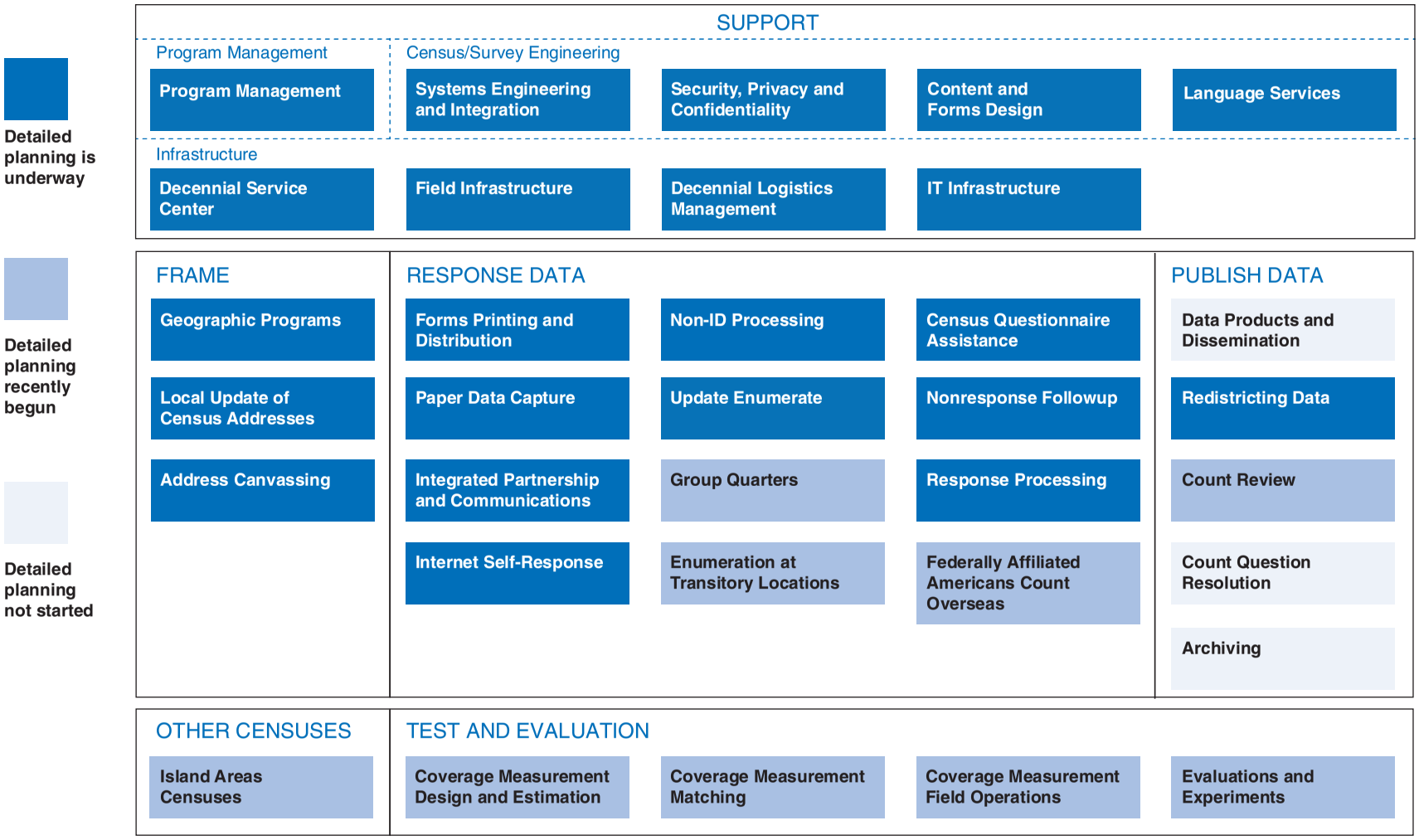

Figure 27: Operational Overview by Work Breakdown Schedule

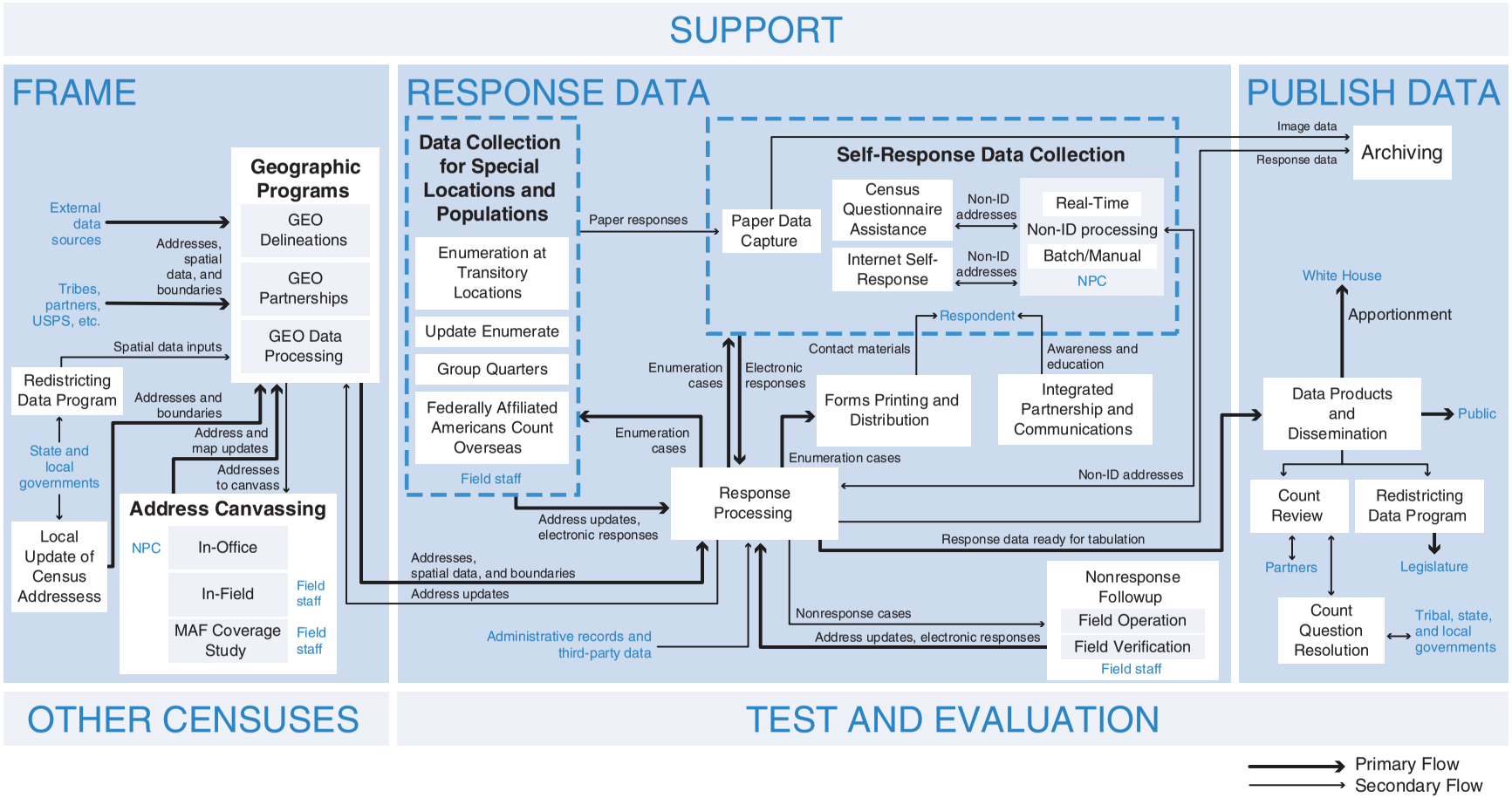

Figure 28: High-Level Integration of Operations

5.1.1 Frame

As shown in Figure 28 from the previous page, the basic flow of information begins in the frame area with the **Geographic Programs** operation that receives addresses, spatial data, and boundary information from tribal, federal, state, and local governments. An additional method for updating the frame is the review of the address and boundary information through the **Local Update of Census Addresses (LUCA)** program. Updates through Geographic Programs and LUCA typically include adding missing living quarters, deleting erroneous living quarters, and modifying or correcting existing records. The most current address list is provided to the **Address Canvassing** operation, where staff make updates to the list via in-office and in-field procedures. These updates are processed on an ongoing basis throughout the decade. Once the frame updates are complete, the initial universe of living quarters is used for enumeration operations in the *Response Data* area.

The Geographic Programs operation allocates the universe of addresses into different methods and modes for the following operations conducted for special locations and populations:

- **Enumeration at Transitory Locations (ETL):** Enumerate individuals in occupied units at transitory locations, such as recreational vehicle parks, campgrounds, tent cities, racetracks, circuses, carnivals, marinas, hotels, and motels, who do not have a usual home elsewhere.
- **Update Enumerate (UE):** Update the address and feature data and enumerate housing units in certain designated geographic areas with special enumeration needs (e.g., areas that do not have city-style addresses and areas with unique challenges associated with accessibility). (This operation crosses Frame and Response Data Collection in the graphic and in the WBS).
- **Group Quarters (GQ):** Enumerate people living or staying in group quarters, people experiencing homelessness, and people receiving service at service-based locations.
- **Federally Affiliated Americans Count Overseas:** Obtain counts by home state of U.S. military and federal civilian employees stationed or deployed overseas and their dependents living with them. All responses from these operations are collected electronically. Some of these operations (e.g., UE or ETL) may find addresses that were not in the initial universe.

Address updates collected during these operations are sent back to the **Geographic Programs** operation for processing.

5.1.2 Response Data

A key goal for the 2020 Census is to optimize self-response. **Integrated Partnership and Communications** and **Forms Printing and Distribution** create awareness for and send contact materials to the respondents, directing them to the online questionnaire or to a paper questionnaire. During **Internet Self-Response**, some respondents will not have a Census ID; the Census Bureau will do real-time (during the interview) processing to identify the correct block for the respondent's address using methods in the **Non-ID Processing** operation. The respondents who do not respond on the Internet will be given the opportunity to respond via **Paper Data Capture (PDC)**. Some respondents will call with questions, and the Census Bureau will offer to collect their response via the telephone through the **Census Questionnaire Assistance** operation. All the responses from each of the Response Data Collection operations, including those operations conducted for special locations and populations, will go to the **Response Processing** operation, which manages the status of cases across the universe. Addresses for which the Census Bureau did not receive a 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, proxy responses, or imputation). Any new addresses identified during NRFU are sent to the **Geographic Programs** operation for processing.

5.1.3 Publish Data

The **Response Processing** operation delivers the edited data to the **Data Products and Dissemination** operation to prepare the final 2020 Census data products. This operation delivers:

- Apportionment counts to the White House and statistical data to the public.

- State counts to the **Redistricting Data Program** for dissemination to the state legislatures so state governments can define the geographic boundaries for Congressional and legislative districts.
- Final counts to the **Count Review** operation for Federal-State Cooperative Population Estimates (FSCPE) members to ensure the accuracy of the 2020 Census.
- Final counts to the **Count Question Resolution** operations so challenges to Census Counts can be resolved.
- Every questionnaire to the **Archiving** operation for public release 72 years after the census.

This description of all 34 operations and the basic integration only depicts high-level data flow and interaction. The detailed Business Process Models (BPM) found in the DOPs for each operation show how information flows within operations.

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 1.1 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 regards to roles and responsibilities between the Census Bureau, contractors, and stakeholder groups.
- Set a clear and publicly announced goal to reduce the inflation-adjusted per housing unit cost relative to 2010 Census totals.

Opportunities to Innovate

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 prior 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:

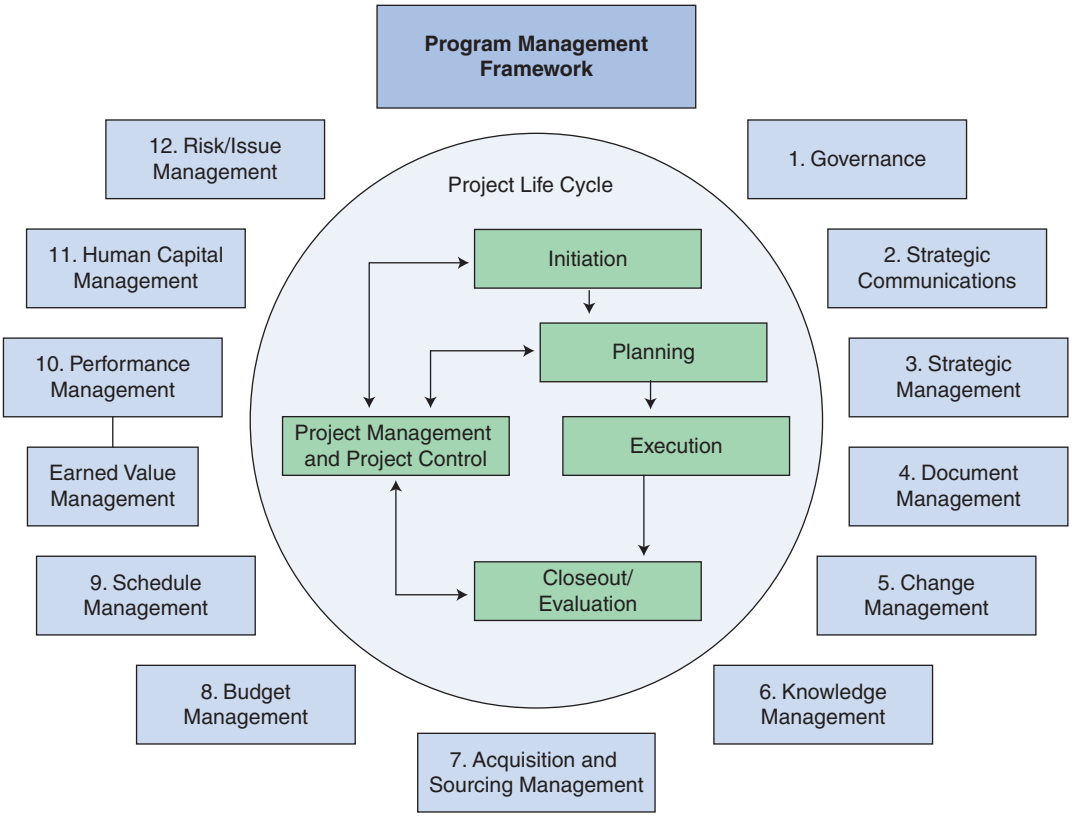

Figure 29: Program Management Framework

- 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 29.

General activities are required to manage multiple, ongoing, interdependent projects in order 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 principals 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 between activities, and determine activity resource requirements and duration.
10. **Performance Management:** Practices used to monitor the progress of the 2020 Census in order 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. 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 will continue to be used for the remaining 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 risk at the Portfolio Management Governing Board-level and project-level risks at the project team level.
- ✓ 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, including 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.

Design Issues to Be Resolved

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

Question	Expected Date
Defining the role and processes for using SharePoint in performance management.	August 2017
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.

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 skillsets. **IF** the dedicated resources are not available and funded to implement program management, **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 projects may lack sufficient scope, schedule, budget controls, and risk management, increasing the likelihood of negative impacts to cost and schedule.

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 Address Canvassing 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: SEI; Security, Privacy, and Confidentiality; Content and Forms Design; and Language Services. Each is described below.

5.3.1 Systems Engineering and Integration

Detailed Planning Status:	**Underway**

Purpose

The Systems Engineering and Integration operation (SEI) manages the delivery of a system of systems that meets 2020 Census Program business and capability requirements.

Changes Made Since Version 1.1 Operational Plan Release: Updated schedule and nomenclature to align with the Integration and Implementation Plan (IIP). Also, updated schedule to reflect year and month. The 2020 SEI Program adheres to cost processes of the 2020 Census Program; therefore, specific references to cost and budget were removed. "Work Completed" was updated to reflect current status of major efforts. Updated risks to be consistent with Program-Level Risk Register.

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.

Opportunities to Innovate

Opportunities to innovate include the following:

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

Description of Operation

The scope of the SEI operation includes managing the delivery of a 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 utilize 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 and avoiding an "over the fence" approach to requirements engineering.
- 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 develops the 2020 Census Solution Architecture and Systems and Interface Inventories. 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 (ATP) 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 Oversight

During solution development, the requirements, architecture, and low-level technical design are used to develop the end-product System of Systems and required interfaces. As part of Technical Integration and Solution Development Oversight, 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 within the structure of the solution architecture.
- 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 individual 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 to include: Cross Program and Project Integration, Data Quality, and System Performance.
- 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 activities. As part of the Deployment and O&M activities, the SEI operation will perform the following activities:

- 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 deployed and ready to support all operational activities.

Work Completed

The following work has been completed for this operation:

- Business process models and business and capability requirements are baselined for all applicable business operations.
- 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 are baselined.
- The IIP was the developed, and several key IIP Reviews were held, including:
  - Systems Requirements Reviews (SRR) for the 2017 Census and Puerto Rico Census Tests and initial SRR for the 2018 End-to-End Census Test.
  - Critical Design Reviews for the Address Canvassing Test and 2017 Census and Puerto Rico Census Tests.
  - Test Readiness Reviews for 2016 Census Test and Address Canvassing releases.
  - Production Readiness Reviews for the 2016 Census Test releases.
- The eSDLC Phase Gate Review process is being used.

Decisions Made

The following decisions have been made for this operation:

- ✓ Key IT Directorate roles, such as the 2020 Census Chief Architect, Chief Systems Engineer, and the Chief IT Security Engineer, will be funded by and matrixed to the 2020 Census Program.
- ✓ The 2020 Census Program will leverage the enterprise infrastructure and enterprise solutions as appropriate.

Design Issues to Be Resolved

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

Question	Expected Date
What tools and test materials are required to support the integrated tests (Performance Test Services, Representative Test Data, etc.)?	April 2017
What is the sourcing approach for each capability supporting the 2020 Census?	June 2017

Cost and Quality

Given the complexity of the 2020 Census, SEI activities have a critical impact on its success. 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.

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).
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 Puerto Rico Census Test and 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.
November 2016	Complete TRRs for 2017 Puerto Rico Census Test and 2017 Census Test.
January 2017	Complete PRRs and deployment of systems supporting 2017 Puerto Rico Census Test and 2017 Census Test address canvassing, recruiting, training, and self-response releases. Complete PRRs and deployment of systems supporting 2017 Census Test recruiting, training and self-response releases.
April 2017	Complete PRR and deployment of systems supporting 2017 Puerto Rico Census Test and 2017 Census Test field enumeration release.
June 2017	Conduct SRR and CDR for 2020 Census and establish Baseline 4 of PLBR, CAP and Solution Architecture. Complete TRRs and deployment of systems supporting the first four 2018 End-to-End Census Test releases.

Milestones—Con.

Date	Activity
October 2017	Complete PRRs and deployment of systems supporting first four releases of the 2018 End-to-End Census Test. Conduct TRRs for systems supporting self-response and field enumeration releases of the 2018 End-to-End Census Test.
January 2018	Complete PRRs and deployment of systems supporting self-response and field enumeration releases of the 2018 End-to-End Census Test.
April 2018	Complete TRR for tabulation/dissemination release of 2018 End-to-End Census Test.
October 2018	Complete PRR and deployment of systems supporting tabulation/dissemination for the 2018 End-to-End Census Test. Conduct TRR for 2020 Census
March 2019	Complete PRR and deployment of systems supporting the 2020 Census. Conduct Final Performance Testing.
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**

Purpose

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

- Appropriate systems and data security.
- Respondent and employee privacy and confidentiality.

Changes Made Since Version 1.1 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.

Opportunities to Innovate

Opportunities to innovate 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, 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.
- Data Stewardship Policies: Ensure that the 2020 Census complies with the Census Bureau's Data Stewardship polices including:
  - Control of Personally Identifiable Information (DS-007).
  - Record Linkage (DS-014).
  - Respondent Identification (DS-016).
  - Privacy Impact Assessments (DS-019).
  - Data Breaches (DS-022).
- 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 prior to testing and a full security assessment prior to obtaining an Authority to Operate.
- Ensure Appropriate Suitability Screening Processes are in place.

Privacy and Confidentiality

- 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.
- 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 that all people handling or reviewing Title 13 and Title 26 materials are Special Sworn Status certified.
- Ensure Personally Identifiable Information Incident Handling process is operational.

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.
- ✓ In Decision Memo #1 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

The risk listed below is specific to this operation.

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.

[4] Both MDM and MAM fall under the umbrella term of Enterprise Mobility Management (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.

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.

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, brochures, envelopes, flashcards, and field materials.
- Ensure consistency across data collection modes and operations, including (but not limited to) questionnaire content, help text, mailing materials, and field materials.
- Provide the optimal design and content of the questionnaires to encourage high response rates.

Changes Made Since Version 1.1 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:

- Develop an enterprise repository that includes questionnaire content and design elements for

questionnaires and associated nonquestionnaire materials.

- 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.

Opportunities to Innovate

Opportunities to innovate include the following:

- Utilize a central, electronic repository of 2020 Census content (questionnaire and associated nonquestionnaire materials).
- 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 will ensure 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, paper, CQA (the telephone), and NRFU (in-person interview). This is a significant departure from the 2010 Census, which primarily relied on paper for data collection.

The goal is to finalize the content of the questionnaire and associated nonquestionnaire materials for the 2020 Census so that the 2020 Census topics can be submitted to Congress by April 2017, with the final questionnaire wording submitted by April 2018.

Specific activities of the CFD operation include the following:

- Developing instrument specifications for all data collection modes: Internet, CQA, Paper, and NRFU
- Pretesting questionnaire content (e.g., cognitive testing, focus groups) prior to making final decisions on questionnaire topics and wording.
- Finalizing content development and design of questionnaires across all modes: Internet, CQA, Paper, and NRFU.
- Finalizing content development and design of associated nonquestionnaire materials deployed during enumeration including letters, postcards, envelopes, inserts, 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 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, NRFU).
    - 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.
  - Developed content specifications for Internet and NRFU data collection instruments.
  - Developed bilingual paper questionnaires and associated nonquestionnaire materials in English/Spanish, English/Chinese, and English/Korean.

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).

Design Issues to Be Resolved

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

Question	Expected Date
What is the 2020 Census Paper Capture workload, questionnaire size and shape?	October 2016
What are the final content topics for the 2020 Census?	December 2016
What is the paper questionnaire layout for respondents living in residences other than households (e.g. group quarters and transitory locations)?	September 2017
What is the final questionnaire wording for the 2020 Census?	December 2017
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 (under review).

Risks

The risks listed below are specific to this operation:

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.

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 increased number of pages in the paper questionnaire will increase the postage cost (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 1.1 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.

Opportunities to Innovate

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 of Limited English Proficiency. 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 socio/psycholinguistic approaches to provide language operations and assistance and to identify, create, and refine non-English materials for Limited English Proficiency 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 mailing strategies 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 multi-language

public use forms increases participation by non-English speakers.

- Providing language assistance 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 Flashcard to include Chinese-spoken dialects.
- Language Needs Assessment:
  - Assessed current language needs using American Community Survey (ACS) data.
    - Findings: Informed non-English support for 2015 and 2016 Census Tests, 2015 National Content Test, and 2017 Census Test.
- Research on Translation Technology:
  - Conducted research on translation machines (e.g., Google Translate).
    - 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, NRFU).
    - Findings: Informed final instrument layout and navigation for the 2014, 2015, and 2016 Census Tests and the 2015 National Content Test.
  - Conducted usability testing of Chinese and Korean automated data collection instruments (Internet, NRFU).
    - 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, and 2016 Census Tests and the 2015 National Content Test.
- Field Testing of Non-English Instruments and Materials—2016 Census Test:
  - Conducted testing of data collection instruments (Internet, CQA, paper, NRFU) and mailing/field materials in Spanish, Chinese, and Korean.
    - Findings: Forthcoming.

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 released in January 2016. Supported languages will be revised on an ongoing 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

The risks listed below are specific to this operation:

The Internet data collection instrument is currently available in four languages. **IF** the Internet data collection instrument is not developed for additional languages, **THEN** there will not be Internet self-response options outside the four languages.

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	Deploy Internet instrument in additional non-English languages for the 2018 End-to-End Census Test. Languages include Vietnamese, Russian, Arabic, and Tagalog.
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, LUCA, and Address Canvassing. Each is described below.

5.4.1 Geographic Programs

Detailed Planning Status:	**Underway** **DOP 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 1.1 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:

- Consider consolidation of field operations, and Type of Enumeration Area (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).

Opportunities to Innovate

Opportunities to innovate 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 Basic Collection Units (BCUs) to:
  - Eliminate operation specific Assignment Area delineations.
  - Incorporate data and information not previously used in delineation such as predominant housing unit characteristics (e.g., single unit, group quarters, 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 30:

- 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

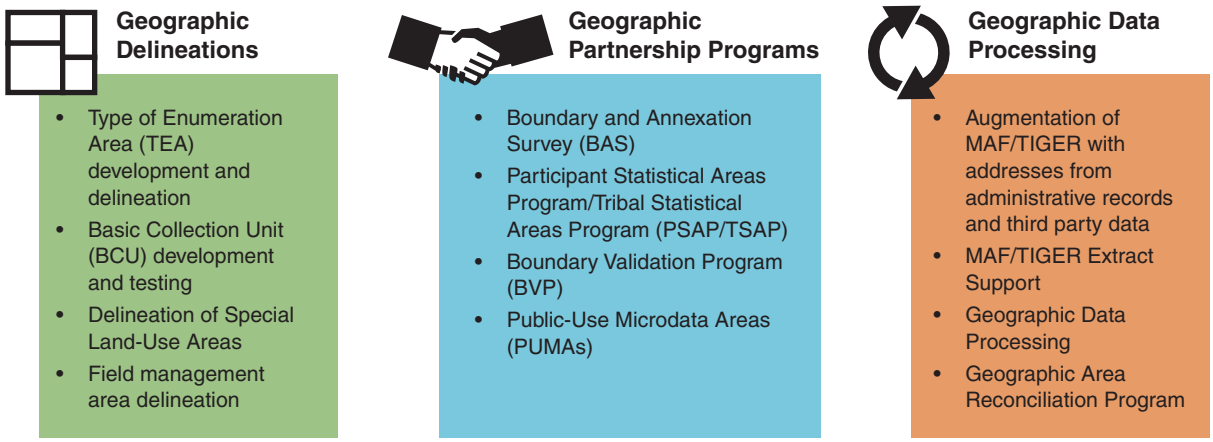

Figure 30: Summary of Geographic Programs Components

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:

- **Type of Enumeration Area:** In an effort to ensure the most cost effective and efficient process to enumerate households, every block 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.
- **Basic Collection Unit (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, group quarter 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 boundaries.

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] program), 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
- School Districts
- Traffic Analysis Zones
- 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 housing units. The 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.
- **Participant Statistical Areas Program/ Tribal Statistical Areas Program:** 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:** The intent of the Boundary Validation Program 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:

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

- **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 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 for providing geocoding services and geospatial data products.
- **Geographic Area Reconciliation Program** 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.

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 administrative records from local governments are a valuable source of address and spatial information.
- 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 will be used beginning in the 2016 Address Canvassing Test.
- ✓ Special Land Use Areas and public lands will be used in the delineation of collection geographies.
- ✓ The Statistical Areas Program (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.
  - Traffic Analysis Zones.
  - Urban Areas as defined by the 2020 Census Urban Area Delineation Program.
- ✓ The following are the Type of Enumeration Areas (TEA) required for the 2020 Census.
  - TEA 1 = Self Response
  - TEA 2 = UE
  - TEA 4 = Remote Alaska
  - TEA 5 = Military
  - TEA 6 = Island Areas

Geographic Partnership Programs:

- ✓ The geographic programs conducted in the 2010 Census will occur in the 2020 Census (the approach for adding new construction is yet to be determined).
- ✓ The GUPS will support:

- All geographic partnership programs (i.e., BAS, PSAP/TSAP, Boundary Validation Program, and Public Use Microdata Areas).
- Redistricting Data Program
- Local Update of Census Addresses
- Count Question Resolution

✓ Partnership programs will offer limited paper materials.

✓ Data received from partnership programs will be processed from a central location.

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 what 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

Using attribution in BCUs increases their benefits and usefulness. **IF** attribution related to address coverage risk, optimal contact and enumeration strategy, and production rate and workload cannot be applied to the Basic Collection Unit, **THEN** the ability for Basic Collection Unit to act as a planning tool and to be dynamically assigned in the field is limited.

The GUPS contract states there will be a Web-based and stand-alone version of GUPS. **IF** a Web-based version of GUPS is not developed, **THEN** it will significantly add to the resources required to update partnership programs for the 2020 Census.

Milestones

Date	Activity
	Geographic Delineation Programs
April 2014	Initiate Development of Tabulation Block Criteria.
March 2016	Initiate Conducting Initial Basic Collection Unit (BCU) Delineation.
June 2016	Initiate Conducting Initial Type of Enumeration Area (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 Participant Statistical Areas Program (PSAP) Delineation.
August 2019	Complete 2019 BAS.
February 2020	Complete Participant Statistical Areas Program Verification.
August 2020	Complete 2020 BAS.
August 2022	Complete Boundary Validation Program (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 Geographic Area Reconciliation Program.
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:	**Underway** **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 1.1 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 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 housing units), lower-level governments (such as minor civil divisions and places).

- Explain the definition and use of addresses and housing units 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.

Opportunities to Innovate

Considering recommendations from the 2010 Census and the 2020 Census Research and Testing Phase, and the design of a reengineered 2020 Census, opportunities to innovate 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 via a clerical review, automated address matching, and Address Canvassing.
- Census Bureau provides feedback to the governmental entities.
- Governmental entities can appeal the Address Canvassing 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 Address Canvassing.
    - 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 R&D 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 United States 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 Address Canvassing.
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 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 Census 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 Address Canvassing.

- ✓ 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 during In-Office Address Canvassing, with minimal validation occurring early in the In-Field Address Canvassing operation.
- ✓ The Census Bureau will provide an option for partners to access registration materials online and return them via email. We will accept scanned signatures, 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.

Design Issues to Be Resolved

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

Question	Expected Date
To what extent can administrative records and third-party data be used to validate addresses submitted by LUCA participants?	June 2017
Will there be a separate New Construction Program or will the GSS-I Program continue to collect new construction addresses for the 2020 Census?	June 2017
What is the 2020 Census LUCA Appeals process?	October 2018

Cost and Quality

Investment in LUCA 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:

- ↑ 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

To protect Title 13 data on computer-readable materials, all local government LUCA liaisons and LUCA reviewers are required to sign a Confidentiality Agreement and abide by the Census Bureau's security guidelines. However, lessons learned from previous censuses show that not all stakeholders reviewing the Title 13 materials possess the skills necessary to meet IT requirements. **IF** participants are required to take additional efforts to meet the Census Bureau's IT Title 13 requirements, **THEN** there needs to be adequate support in a help desk environment for responding to IT Title 13 issues.

The Census Bureau needs to work with the Office of Management and Budget to determine the requirements for the LUCA Appeals Office. **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 Address Canvassing.
June 2019	Complete Address Canvassing 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 living quarter.

Changes Made Since Version 1.1 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:

- Continuously update the maps and address lists throughout the decade, supplementing these activities with Address Canvassing at the end of the decade.
- Allow more time in the schedule to fully develop and test the listing instrument.
- Improve the Address Canvassing training to emphasize working from the ground to the Handheld Computer.

Opportunities to Innovate

Opportunities to innovate include the following:

- One hundred percent Address Canvassing conducted In-Office.
- Target 25 percent of living quarters for In-Field Address Canvassing.
- Use of automation and data (imagery, administrative records, and third-party data) for In-Office Address Canvassing.
- Ongoing 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 living quarter in the United States to conduct the census. During Address Canvassing, the Census Bureau verifies that its master address list and maps are accurate so the tabulation for all housing units (HUs) and Group Quarters (GQs) 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 Address Canvassing 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. 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., UE). Detects and identifies change from high quality administrative and third-party data sources to reduce the In-Field Address Canvassing workload. Determines the In-Field Address Canvassing universe.
  - In-Office Address Canvassing assesses the extent to which the number of addresses—both HUs and GQs—in the census address list is consistent with the number of addresses visible in current imagery.
  - 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.
- 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 living quarter (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: An ongoing 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 implement the reengineered Address Canvassing (In-Field and In-Office).
- February 2015: Completed the 2015 Address Validation Test, which consists of the MAF Model Validation Test and the Partial Block Canvassing 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.

Decisions Made

The following decisions have been made for this operation:

- ✓ The ADC operation consists of:
  - In-Office Address Canvassing.
  - In-Field Address Canvassing.
  - Quality Assurance.
  - MAF Coverage Study.
- ✓ Administrative records and third-party data sources will be used to validate addresses within each block.
- ✓ GQ will be identified and classified during Address Canvassing.
- ✓ Geographic areas (e.g., living quarters and feature) which are included in downstream operations will no longer have to be canvassed in the field (e.g., UE and Remote Alaska).
- ✓ At most 25 percent of the living quarters will be canvassed in the field.
- ✓ Production Address Canvassing will begin September 2015.
- ✓ Address Canvassing provides training for both production and quality assurance processes for in-office work.
- ✓ Address Canvassing relies on automated training for production and quality assurance processes for in-field work.
- ✓ Address Canvassing updates the Census Bureau's address list using a dependent canvass (from ground to list).
- ✓ Address Canvassing validates and collects coordinates for every structure with a living quarter.
- ✓ The MAF Coverage Study will be conducted throughout the decade.
- ✓ In-Office Address Canvassing creates the universe for In-Field Address Canvassing.
- ✓ In-Office Address Canvassing will review public lands.
- ✓ Geographic areas designated for In-Office Address Canvassing can move to the In-Field Address Canvassing universe and vice versa.
- ✓ In-Field Address Canvassing can identify additional in-field work.
- ✓ Statistical modeling will not be used in Address Canvassing.
- ✓ Imagery will be available on the Listing and Mapping Instrument to use during In-Field Address Canvassing.

- ✓ Address Canvassing will validate LUCA submissions.
- ✓ Validation of LUCA submissions will occur primarily during In-Office Address Canvassing, with minimal validation occurring early in the In-Field Address Canvassing operation.
- ✓ The Census Bureau will do a full block canvassing in the 2020 Census.
- ✓ Address Canvassing 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 pages 24-26 of the 2020 DOP for the Address Canvassing Operation for details on the process.
- ✓ Coordinates captured for features and living quarters will be collected using available technology. Metadata will be collected and provided for use in improving the spatial accuracy if deemed necessary.
- ✓ Spatially accurate feature data will not be captured in the Field. Field staff will identify where features are missing and report that back to HQ for processing. HQ has access to satellite imagery and other source material which will allow for an accurate insertion into the TIGER database. This decision is based on expert opinion and experience.

Design Issues to Be Resolved

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

Question	Expected Date
How will Quality Assurance be handled?	January 2017
What are the business processes for handling Transitory Locations during Address Canvassing?	January 2017
Will the Census Bureau be able to meet the 25 percent In-Field Address Canvassing goal without sacrificing quality?	January 2017

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 and the resolution of ungeocoded responses.

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

- 🡹 Continuous in-field improvement process to:
  - Test in-field methodologies.
  - Verify in-office methodologies.
  - Update MAF with results.
- 🡹 Use of additional sources of administrative records and third-party data to validate the frame.
- 🡻 Missed changes in 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 local governments 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 stakeholder acceptance for the proposed Address Canvassing methodology, **THEN** the workload for In-Field Address Canvassing may increase dramatically.

The LUCA operation provides addresses to the Address Canvassing workload that need to be validated. The redesigned LUCA operation is intended to resolve more addresses and lessen the potential for increased In-Field Address Canvassing work. **IF** LUCA provides addresses to In-Office Address Canvassing that are unresolvable at a higher than expected rate, **THEN** there will be an increased workload for In-Field Address Canvassing.

Milestones

Date	Activity
August 2015	Release Address Validation Test Results.
September 2015	Begin 2020 Census Address Canvassing (In-Office).
December 2015	Release ADC DOP.
April 2016	Begin MAF Coverage Study (In-Field).
October 2016	Begin Address Canvassing Test (In-Field).
February 2017	Begin In-Field Address Canvassing for 2017 Puerto Rico Census Test.
August 2017	Begin In-Field Address Canvassing for 2018 End-to-End Census Test.
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 12 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 Location
9. Census Questionnaire Assistance
10. Nonresponse Followup
11. Response Processing
12. Federally Affiliated Americans Count Overseas

5.5.1 Forms Printing and Distribution

Detailed Planning Status:	**Underway**

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 or Field Infrastructure operations.

Changes Made Since Version 1.1 Operational Plan Release: Questionnaire mailing will now include all nonresponding households in the mail universe.

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.
- Identify an owner for every field on the questionnaires.

Opportunities to Innovate

Opportunities to innovate 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 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 Language Services 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 some portion of the population and to non-responding households in the mail universe.

- Printing and mailing will be contracted through the Government Publishing Office.
- 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 non-responding 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 decisions have been made 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 can be used on a nationwide scale in lieu of check-in.

Decisions Made

The following decisions have been made for this operation:

✓ Paper questionnaires, in at least English and 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, and questionnaires will be contracted out through Government Publishing Office.

✓ USPS barcodes will be used for various postal services, such as tracing and identification of vacant or other undeliverable addresses.

Design Issues to Be Resolved

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

Question	Expected Date
What is the process for addressing "on demand" questionnaires?"	June 2017
What other census operations have paper printing requirements (e.g., UE, Puerto Rico and Island Areas Censuses, GQ enumeration)?	October 2017

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:

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

Risks

The printing products and address files needed to support the 2020 Census need to be finalized in time so that subsequent planning and development for the printing operation can take place. **IF** printing products and address files are not finalized on schedule, **THEN** the printing operation will be unable to plan print contracts and production in the most fiscally responsible way, resulting in extra mailing costs and schedule delays.

The final design for the 2020 Census paper questionnaire needs to be within the established USPS thresholds in order to take advantage of mailing discounts. **IF** the final 2020 Census questionnaire design pushes the weight, size, or shape of a mailing piece over established USPS thresholds, **THEN** the Census Bureau will be unable to maximize use of USPS mailing discounts, adding extra mailing costs.

[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.

Milestones

Date	Activity
October 2016	Receive final contact strategies from the Internet Self-Response operation. Receive design concepts for questionnaires and other mailing materials from the CFD operation. Define the printing and mailing workload estimates.
March 2017	Release the FPD DOP.
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**

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.
- Optical Mark Recognition.
- Key From Image.
- Editing and checkout.

Changes Made Since Version 1.1 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 paper data capture workload.
- Use postal tracing to monitor large-scale inbound and outbound mailings.
- Barcode serialization is an essential automated quality component to data capture operations.

Opportunities to Innovate

Opportunities to innovate include the following:

- Reduction in PDC operations and associated infrastructure due to Internet Self-Response and automated field operations.
- Use of in-house systems Integrated Capture and Data Entry (iCADE) for paper data capture.
- USPS tracing data used to identify questionnaires prior to arrival at the processing center. This information will be used to reduce follow-up workloads.

Description of Operation

The PDC operation is responsible for the capture and conversion of data from paper questionnaires. Paper forms delivered by the USPS are processed by the National Processing Center (NPC). Questionnaires go through several steps as shown in Figure 31. Note that questionnaire images are archived. The paper questionnaires themselves are stored until verification that data are received by Headquarters and then they are destroyed per security regulations.

The PDC operation is driven largely by the timing of the questionnaire mail out, 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 Archiving 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

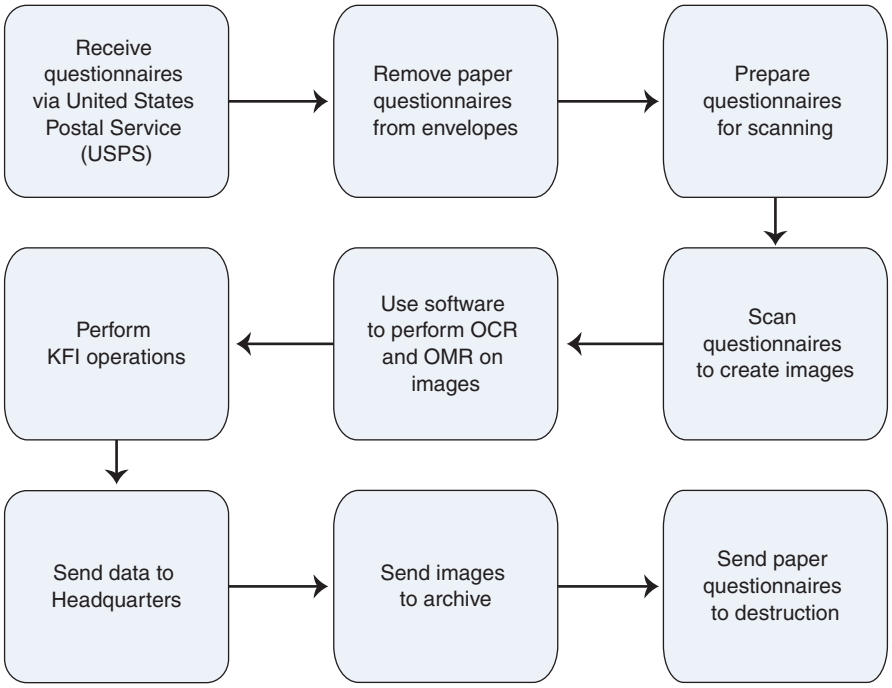

Figure 31: Paper Data Capture Flow

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 move on to the checkout operation. Forms await confirmation that the data have been received at Headquarters (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). Once all data have been received at Headquarters, 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.
- 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 a cost-effective and accurate alternative to a check-in operation for the 2020 Census.

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 questionnaires are booklets that require separation.
- ✓ USPS tracing data will be used to identify questionnaires prior to arrival (no laser sorter check-in operation).
- ✓ All questionnaires will be scanned by iCADE (no key from paper).
- ✓ The 2010 Census target quality levels will be used for OMR (99 percent), OCR (97 percent) and KFI (99 percent).
- ✓ There will be two paper data capture centers.

Design Issues to Be Resolved

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

Question	Expected Date
Which operations will use paper questionnaires as a contingency in the event that the Internet Self-Response, NRFU and other operations cannot be executed as planned?	October 2016
What other operations have paper data capture requirements (e.g., UE, Puerto Rico, and GQ)?	October 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 paper data capture.
- 🡻 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 UE 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 paper data capture.

Risks

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

The size of the final 2020 Census questionnaire affects the cost of processing paper forms as it determines the number of form faces that must be managed. **IF** the final 2020 Census questionnaires is in a booklet format, **THEN** additional equipment and storage space may be needed to accommodate the format, adding time, cost, and complexity to the paper data capture process.

The Census Bureau is considering significant innovations to conduct the 2020 Census. These innovations (e.g., enterprise IT solutions, data collection via 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 paper data capture NRFU plan. Develop paper data capture contingency planning guidance.
December 2016	Release the PDC DOP.
October 2017	Design other operations that may require paper data capture.
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 1.1 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.

Opportunities to Innovate

Opportunities to innovate include the following:

- Microtargeted messages and placement for digital advertising, especially for hard-to-count populations.
- Advertising and partnership campaign adjusted based on respondent performance.
- Texting and emailing to motivate self-response.
- 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 will be engaged to support the 2020 Census Program from recruitment through data dissemination. At a minimum, the Program will offer the following components:

- Partnership, including both regional and national efforts.
- Advertising, using print, radio, digital, television, and out-of-home.
- Social media, to include blogs, Facebook, Twitter, and etc.
- Statistics in Schools.
- Rapid Response.
- Earned media.
- Thank you campaign.
- Public relations.

Together these eight major 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:

- Promote "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.
- Measured 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.
  - Findings: 2015 Optimizing Self-Response Test Report due December 2016.
- The 2015 Census Test of Digital Advertising and Other Communications
  - Measured 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.
  - Simulated 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.
    - Findings: 2015 Census Test of Advertising and Partnerships Report due December 2016.

Decisions Made

The following decisions have been made for this operation:

- ✓ The 2020 Census will use partnerships to communicate the importance of the 2020 Census to the U.S. population and encourage self-response.
- ✓ The 2020 Census will use digital advertising and social media targeting.
- ✓ The 2020 Census will use texting and emailing to motivate self-response.
- ✓ 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.

✓ IPC Internet kiosks will be made available in public spaces for respondents to complete their Census questionnaire online.

Design Issues to Be Resolved

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

Question	Expected Date
What are the components and materials required for implementing the Integrated Partnership and Communication (IPC) operation?	March 2017
What is the approach for audience and market segmentation models?	April 2017
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?	April 2017
When and how will the CQA as a response mode be communicated to the public?	April 2017

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.

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.

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.
May 2017	Release the Integrated Partnership and Communication Plan.
June 2017	Start the 2020 Census Partnership program.

5.5.4 Internet Self-Response

Detailed Planning Status:	**Underway**

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 1.1 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 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.

Opportunities to Innovate

Opportunities to innovate include the following:

- Internet Data Capture:
  - Real-time edits.
  - Ability to capture unlimited household size entries.
  - Multiaccess methods across different technologies (e.g., computers, smart phones, tablets).
  - Online questionnaires available in multiple languages.
- Mail contact strategy tailored to demographic or geographic area, designed to encourage Internet self-response and tied to the messaging from the Integrated Partnership and Communication 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 47 percent of U.S. households in mailout areas 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 such as the paper methods used in the past.

Planning and development activities to support self-response have focused on two primary areas: optimizing the respondent experience and maximizing data quality. Each is discussed below.

Ensuring a positive experience for users is one way to facilitate high rates of Internet self-response. The overall experience includes factors such as usability, convenience, speed, and the general "look and feel" of a Web site. To meet this broad range of expectations, respondents will be offered multiple avenues to complete their census online. The questionnaire Web site will be optimized for use on mobile devices. This provides a higher level of convenience as well as ensures the broadest access possible to those without traditional Internet service.

Internet questionnaire screens must be easy to complete and responses must be processed quickly to eliminate wait time between screens. Additionally, all systems developed to support Internet Self-Response must have the capacity to handle the anticipated response loads and provide security protections for Title 13 data.

The option to respond online must be available to those without personal Internet access. Through the Census Bureau's planned partnership and other community-level efforts, free-standing or mobile devices will be available for use by the public, and assistance will be provided to those who cannot complete the form themselves. Additional information on the Census Bureau's IPC Campaign is described in section 5.5.3.

Similarly, language needs must be addressed. The Census questionnaire will be available for Internet completion in English, Spanish and other languages as determined by the prevalence of the need. Additional information on the Language Services program is described in section 5.3.4.

Internet Self-Response should also lead to improvement in overall data quality. The Internet self-response application will include preprogrammed edit checks to identify user error prior to submission. Real-time or post hoc respondent validation checks are also possible with Internet respondents.

To further improve data quality, assistance will be available to respondents who are having difficulty completing their 2020 Census online through CQA agents who will facilitate successful submissions of questionnaires and reduce the number of incoming telephone calls for assistance. Additional guidance will be available in static form on the Census Bureau or 2020 Census Web site, including step-by-step guides and Frequently Asked Questions for completing the Census.

Contact Strategies

All attempts by the Census Bureau to make direct contact with individual households 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.

Each type or mode of contact may be used for multiple purposes: advance notification of upcoming contact, invitation to participate in the 2020 Census, reminder prompting to nonresponders, or to complete the questionnaire in an alternative mode.

Prior to the 2010 Census, research yielded distinct attitudinal segments or messaging mindsets. Research was also conducted and continues to be refined with cluster analysis of mail return rates from the 2010 Census and the ACS with demographic, housing, and economic variables to understand and plan for response propensities. 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 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 push" 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 hard-copy questionnaire. All correspondence will contain a telephone number for respondents to call to complete the questionnaire over the telephone.

This approach, however, may not be appropriate for all respondent types, and the Census Bureau is actively working to understand the optimal contact strategies for different segments of the population; the Census Bureau is exploring variations on the timing, mode, and frequency of contacts on response. Research is underway to understand whether these nontraditional methods of contact are acceptable and produce the intended results.

Research Completed

The following research has been completed for this operation:

- ACS Internet Self-Response 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 push).
    - 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 Test offered an Internet response option, including real-time non-ID 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 housing units 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 housing units 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 (whether 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.

Decisions Made

The following decisions have been made for this operation:

Internet Self-Response:

- ✓ An Internet self-response 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 Internet questionnaires in a small number of languages other than English and Spanish, including those requiring non-Roman characters. 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 Internet Self-Response.

Contact Strategy:

- ✓ An advance letter will not be used; the first letter will be an Internet push letter inviting response to the Census to most of the housing units. We will provide a paper questionnaire (including bilingual forms) 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 of all of the following: postcard mailings, letter mailings, emails, text messages, prerecorded telephone messages, questionnaire mailings, and in-person visits by an enumerator.
- ✓ Respondents more likely to respond online will receive the "Push" 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 Non-Response Followup (NRFU) begins. Respondents least likely to respond online (as determined by modeling response likelihood, using ACS data in the planning database tool and FCC Internet connectivity data), will receive the "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 that 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.
- ✓ Housing units from whom an Internet questionnaire is not received will be mailed a paper questionnaire.

Design Issues to Be Resolved

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

Question	Expected Date
What is the printing and mailing workload as part of the Optimizing Self-Response contact strategy and NRFU Operation?	October 2016
In what languages will Internet self-response be available?	September 2017
What type of Internet form design will facilitate high quality self-response data collection in GQ?	October 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 via paper questionnaire
- 🡻 Increased self-response, which will decrease the NRFU workload.

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.
- 🡹 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.
September 2016	Release the IIP.
December 2016	Release the ISR DOP.
March 2017	Begin the 2017 Census Test.
March 2020	Begin 2020 Census Internet Self-Response data collection.
September 2020	End 2020 Census Internet Self-Response 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 non-ID respondent addresses to the Census living quarters address inventory.
- Accurately assigning nonmatching addresses to census blocks.
- Conducting validation of all non-ID responses.

Changes Made Since Version 1.1 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:

- The automated and manual non-ID 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 Non-ID Process.
- The delivery of addresses from non-ID processing that require independent verification should occur on a flow basis during self-response and NRFU rather than at the end of these operations.

Opportunities to Innovate

Opportunities to innovate include the following:

- Public can respond 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 validate non-ID responses.
- Use of administrative records and third-party data to validate and 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 identification code (non-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 get the ID and confirm the geographic information with the respondent. The address collection interface facilitates obtaining complete and accurate data from a non-ID response.

Key capabilities of non-ID 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.
- Respondent address geocoding real time via a map interface.
- Response validation; both during the response, as well as via back-end processing.
- For non-ID cases not matched in real time, use of administrative records and third-party data to supplement respondent-provided address data,

followed by an additional address matching attempt.

- Manual matching and geocoding when automated Non-ID 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 non-ID addresses to allow for a match to the MAF/TIGER System.
- 2014 Census Test on NID.
  - Findings:
    - The address collection interface in the Internet instrument yielded a much greater proportion of higher quality address data from non-ID 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 non-ID responses. Therefore, the use of administrative records and third-party data matching should follow an initial matching attempt using the MAF/TIGER System.
- 2015 Optimizing Self-Response Test
  - Findings:
    - When a non-ID respondent address matches to 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 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 non-ID cases compared to the Census living quarters address inventory during automated processing.

Decisions Made

The following decisions have been made for this operation:

- ✓ The 2020 Census will offer a non-ID option for self-response and telephone agent-assisted response.
- ✓ The 2020 Census Internet self-response instrument and the CQA interviewer instrument will utilize capabilities and requirements for the address collection interface as specified for non-ID responses, as used in the 2014 and 2015 Census Tests.
- ✓ The non-ID 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.
- ✓ Non-ID respondents can help confirm the location of their living quarters descriptive information (i.e., cross streets) provided to the NID operation. This method, which has been tested during the 2015 and 2016 Census Tests, will enable the Census Bureau to associate the respondents address with the correct block for tabulation purposes.

Design Issues to Be Resolved

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

Question	Expected Date
How will administrative records and third-party data be used to improve matching in Non-ID Processing?	September 2017
At what proportion did office resolution confirm the existence and location of nonmatching addresses?	September 2017
What will be the estimated workload of post-capture Non-ID Processing?	September 2017
What methodology will be used to conduct Non-ID response validation?	September 2018
If the proportion of Non-ID 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 Non-ID 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 Non-ID Processing is to provide respondents the opportunity during the response to resolve non-ID cases that are not matched or not geocoded or both. Any non-ID 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 housing unit if the non-ID case can be fully resolved during the response. **IF** the IT infrastructure is not adequately scaled to support real-time Non-ID Processing, **THEN** fewer addresses from non-ID 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 non-ID response via the Internet instrument could potentially lead to an increase in fraudulent responses, as well as new methods of committing fraud. A final solution that will implement identity validation during self-response has not been determined. **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 Internet self-response, including non-ID Internet self-response, 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	Deliver real-time processing in the cloud, manual matching and geocoding at the NPC, and utilize multiple respondent validation methods for the 2016 Census Test.
September 2016	Release the NID DOP.
April 2017	Deliver all components for the 2017 Census Test, and include functionality for Puerto Rico addresses.
April 2018	Conduct the 2018 End-To-End Census Test.
April–July 2020	Conduct the 2020 Census Non-ID Processing.
August 2021	Complete the 2020 Census Non-ID Assessment Report.

5.5.6 Update Enumerate

Detailed Planning Status:	**Underway**

Purpose

The Update Enumerate (UE) operation is designated to occur in geographic areas where the Census Bureau has identified unique challenges. UE combines listing methodologies with enumeration methodologies. 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 living quarter.
- Enumerating respondents at housing units within the UE geographic areas for which a 2020 Census response was not received.

UE 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 natural disasters.
- Have high concentrations of seasonally vacant housing.
- Have unique challenges associated with accessibility.

Changes Made Since Version 1.1 Operational Plan Release:

The components and the business process model for the UE Operation are defined and are presented in the Description of Operations section: UE Production, UE Followup, UE Listing Quality Control, and UE Reinterview.

Lessons Learned

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

- Determine ways to closely track the fieldwork during the Update and Leave field operation in order to monitor any falsification or procedural issues that may arise during production.

Opportunities to Innovate

Opportunities to innovate include the following:

- Combine enumeration methodologies from the 2010 Update Leave, Remote Update/Enumerate, and UE Operations.
- Use a single device for both listing and enumeration.
- Use a reengineered field management structure and approach to managing fieldwork, including a new field office structure and new staff positions.
- Link the Notice of Visit form to the address with a unique ID that the respondent can use to self-respond and that will link the enumeration data to the updated address data collected in the field.
- Reuse processes and procedures from In-Field Address Canvassing and NRFU to the extent feasible.
- Encourage those housing units in a UE area with a mailable address toward self-response before the operation begins to reduce the enumeration workload for UE.

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

- UE utilizes a reengineered field management structure.
- UE utilizes integrated automated listing and enumeration tools and systems to facilitate data collection.
- UE collects coordinates (latitude and longitude) for each structure with a living quarter.
- UE utilizes automated systems and logistics to monitor cost and progress.
- UE areas will not have an In-Field Address Canvassing.
- The Notice of Visit form will provide both the 2020 Census Uniform Resource Locator (URL) and the phone number for CQA.
- UE will employ real-time or near-real time data processing.
- UE will be able to assign a final housing unit status of vacant.

Description of Operation

The UE operation is comprised of the following components: UE Production, UE Followup, UE Listing Quality Control (QC), and UE Reinterview. In addition to the field operation, the current plans for the UE operation include mailing out an invitation package to housing units with a mailable address to generate self-response before the operation begins. If a household self-responds, the UE enumerator will not enumerate at that house while listing the geographic area. This is a cost savings to UE since the enumerator will not have to spend time collecting the enumeration at self-responding households.

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 Address Canvassing, enumerators classify each living quarter (LQ) as a housing unit (HU), a Group Quarter (GQ), a Transitory Location (TL), or as nonresidential. If the LQ is not classified as a HU, it is either reassigned into the appropriate enumeration operation or removed from the list for enumeration. At each housing unit that has not yet responded, 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 the questionnaire on the mobile device, which securely collects and transmits respondent data. If no one is home at a nonresponding housing unit, the enumerator will leave a Notice of Visit inviting a respondent for each household to go online with an ID to complete the 2020 Census Questionnaire. The Notice of Visit will also include the phone number for CQA if the respondent has any questions or would prefer to provide a response on the phone.

UE Followup

The UE operation will have a UE Followup component for those households that were not enumerated on the first visit and that have not responded via the Internet or CQA. UE Followup will use the same contact strategies, business rules, and enumeration application as NRFU.

UE Listing Quality Control

The UE operation will use the same methodology for the Listing Quality Control that the Address Canvassing Operation uses. The QC enumerator 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 the QC enumerator begins a full canvass of the production enumerator's work.

Research being done on alternate QC designs for Address Canvassing also applies to the listing portion of UE. Alternatives include using external sources to confirm data collected in the field and collecting and analyzing paradata to help develop models, which can focus the QC sample on known problem areas.

UE Reinterview

A sample of cases enumerated via UE or UE Followup 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.

The UE operation will take full advantage of all of the innovations associated with the reengineered field operations, including the use of a handheld device to collect the data, automated training, automated administrative processes, the operational control system, and streamlined staffing structures.

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 UE Operation. Those cases will be flagged and enumerated via the GQ Operation.
- ✓ Transitory Locations will not be enumerated during the UE Operation. Those cases will be

flagged and enumerated via the Enumeration at Transitory Location Operation.

- ✓ When the enumerator adds a new address, the system will create an ID in real-time. This will be tested in the 2017 Census Test.
- ✓ The UE Operation will attempt to contact respondents via mail. This will be tested in the 2017 Census Test.
- ✓ The UE Operation will use the same Notice of Visit contact as the NRFU Operation.
- ✓ The UE Operation will use the same business rules implemented for the Address Canvassing Operation. For example, UE will add, delete, verify, move, etc.
- ✓ UE enumerators will leave a Notice of Visit form. The Notice of Visit form does not ask the household to update their address online. If the respondent goes online to respond, he or she will follow the business process established for Self Response which allows the respondent to provide their address. This address may be updated from what the Census Bureau has on record.
- ✓ 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 the same business rules established for NRFU.
- ✓ UE enumerators will conduct all follow up enumeration; follow up enumeration will not be the responsibility of the NRFU Operation. Neither the UE Operation nor the NRFU Operation will make outbound phone calls.

Design Issues to Be Resolved

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

Question	Expected Date
Are there any geographic areas where a paper questionnaire should be left in lieu of the notice of visit form (i.e. Puerto Rico)?	January 2017
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 will Remote Alaska be handled?	December 2017
How are Census IDs from the address list associated with or linked to the notice of visit forms?	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

By this point in the decade, planning for all major 2020 Census operations should be underway. Budget reductions in FY 2013 through FY 2016 delayed planning for UE. **IF** planning efforts are not initiated at the start of FY 2017, **THEN** there may not be sufficient time to implement innovations related to the UE operation.

Limited resources are in place to design and develop the necessary systems and instrument(s) to conduct both production and Quality Control (QC) listing in the field for UE. **IF** priorities are not set appropriately for QC design and development, **THEN** a statistically sound QC program may not be implemented and an outgoing level of quality for data cannot be ensured for UE.

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.

Milestones

Date	Activity
April 2016	Begin detailed planning of UE.
March 2017	Send Self-Response Mail Packages in UE Areas for the 2017 Census Test.
March 2017	Send Self-Response Mail Packages in UE Areas for the 2017 Puerto Rico Census Test.
March 2017	Release the UE DOP.
April 2017	Begin UE for 2017 Census Test.
April 2017	Begin UE for 2017 Puerto Rico Census Test.
March 2018	Send Self-Response Mail Packages in UE Areas for the 2018 End-to-End Census Test.
April 2018	Begin UE for the 2018 End-to-End Census Test.
January 2020	Begin UE for the 2020 Census in Remote Alaska.
March 2020	Send Self-Response Mail Packages in UE Areas for 2020 Census.
April 2020	Begin UE for 2020 Census.
July 2020	End UE for 2020 Census.

5.5.7 Group Quarters

Detailed Planning Status:	**Recently Begun**

Purpose

The 2020 Census Group Quarters (GQ) Operation will:

- Enumerate people living or staying in group quarters.
- 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 1.1. 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 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 usual home elsewhere on all census data collection instruments, the Individual Census Report, and Shipboard Census Report.
- Conduct outreach to professional organizations such as education, health care, and tribal organizations as part of the 2020 Census GQ planning.

Opportunities to Innovate

Opportunities to innovate include the following:

- Use of an integrated approach, including administrative records and third-party data and Address Canvassing (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 living quarters.
- Staff could train in multiple operations for increased efficiency.
- Use of both in-office and in-field methods for enumeration.

Description of Operation

Before the enumeration at group quarters can occur, the Census Bureau must validate the GQ frame. This validation activity is part of the 2020 Census Address Canvassing operation.

The 2020 Census GQ operation consists of these components:

- **GQ Advance Contact (known as GQ Advance Visit in the 2010 Census):** For the 2020 Census, this will primarily be an in-office function (although some in-field work may be required in limited areas), which includes:
  - Verifying the group quarters' 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 group quarters 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.
- **In-Office Advance Contact** will be performed by leveraging available Census Bureau systems to communicate with the GQ point of contact to gather required information for GQ enumeration.
- **GQ Enumeration:** This includes enumeration of all group quarters through in-field visits or administrative records data.

The Residence Rule and Residence Situations for the 2020 Census will determine what is considered a group quarters. 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 living quarters that are owned or managed by an entity or organization providing housing or services for the residents (e.g., college residence halls, residential treatment centers, 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 Administrative Records (eADRec) enumeration:

      Electronic Administrative Records (eADRec) involves the electronic transfer of client-level data from systems maintained by group quarters administrators that will be transferred to a standardized Census Bureau system that will accept electronically transmitted data in multiple formats.
  - In-Field GQ Enumeration modes include:
    - In-Person interview using the automated mobile device.
    - Self-Enumeration—In the 2010 Census, this method was 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.
    - Drop Off/Pick up paper questionnaires.
    - Pick up paper administrative records and transcribe data into the automated mobile device.
- **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 automated mobile device.
    - Pick-up Paper administrative records 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 group quarters 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).
- **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 United States 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 2016.
- 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.

Decisions Made

The following decisions have been made for this operation:

- ✓ The GQ frame development and validation will be integrated with the Address Canvassing operation.
- ✓ The GQ operation will allow an individual to self-respond and self-identify the group quarters type for the facility in which he or she resides.
- ✓ An electronic data exchange of group quarters and client-level administrative records or third-party data will be part of the GQ methodology.
- ✓ The Census Bureau will design a standardized system that will accept electronically transmitted administrative records or third-party data in multiple formats.
- ✓ During field enumeration operations, newly identified group quarters will be validated and enumerated using a combination of in-office and in-field methodologies.
- ✓ Current goals for various types of group quarters include the following:
  - Enumerate 75 to 80 percent of people residing in group quarters through in-office methodologies (i.e., electronic transfer of administrative records or third-party data and Internet self-response) and the remainder in the field.
  - Enumerate military group quarters using administrative records and third-party data.
- ✓ Administrative records will be pursued for transitory shelters. All other service based locations; such as soup kitchens and mobile food vans, will be done without administrative records.

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 varying computing capabilities and multiple formats for administrative records and third-party data can be integrated into a standardized Census Bureau system for processing?	August 2018
What is the optimal linkage methodology to ensure self-response data are linked to the correct group quarters?	December 2018
How much in-field GQ Enumeration will be required?	December 2018
How will quality assurance be handled?	December 2018
How will field reengineering concepts be used for integrating group quarters with multiple housing unit 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 third-party data reduces transcription errors.
- ↑ Administrative records and third-party data may provide more comprehensive demographic information.
- ↓ Administrative records and third-party data may provide less current data than data received through in-field Enumeration.

Risks

The enterprise data collection device for listing and enumerating housing units should also be capable of listing and enumerating group quarters. **IF** the enterprise data collection device does not have integrated housing unit and group quarters functionality, **THEN** field staff may have to visit certain group quarters more than once.

The person record of the group quarters must link to the address of the group quarters. **IF** each person record cannot be linked to the group quarters at the same address, **THEN** the count of people residing at each group quarters would not be accurate.

The GQ operation is not in scope for the 2017 Census test or the 2017 Puerto Rico Census Test. **IF** the first opportunity to test the GQ operation (systems, processes, procedures, and staffing) is in the 2018 End-to-End Census Test, **THEN** there may not be an opportunity to include any changes or improvements for the GQ operation in the 2020 Census.

Milestones

Date	Activity
December 2015	Conduct Electronic Transfer Capability Survey—Stateside.
June 2015	Conduct Electronic Transfer Capability Survey—Puerto Rico.
February 2017	Conduct the 2017 Census Test (Conduct GQ Advance Contact).
April 2017	Conduct the 2017 Electronic Administrative Records Data Transfer Census Test—Puerto Rico.
June 2017	Release the GQ DOP.
February 2018	Conduct the 2018 End-to-End Census Test.
February 2020	Conduct GQ Advance Contact.
March 2020	Conduct Service-Based Enumeration.
April 2020	Conduct GQ Enumeration.

5.5.8 Enumeration at Transitory Locations

Detailed Planning Status:	**Recently Begun**

Detailed planning for this operation has recently begun. The narrative that follows represents the Census Bureau's early planning efforts on

the operational design for the 2020 Census Enumeration at Transitory Locations operation.

Purpose

The Enumeration at Transitory Locations (ETL) operation enumerates individuals in occupied units at transitory locations who do not have a Usual Home Elsewhere. Transitory locations include recreational vehicle parks, campgrounds, racetracks, circuses, carnivals, marinas, hotels, and motels.

Changes Made Since Version 1.1. 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:

- 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 transitory locations, as well as procedures on how to list transitory units appropriately in operations that feed the ETL universe.
- Conduct intercensal testing of the ETL population.

Opportunities to Innovate

Opportunities to innovate 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 transitory locations who do not have a Usual Home Elsewhere.

The ETL operation will:

- Use automation 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 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.

Assumptions Made

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

- The 2020 Census ETL operation will include a Quality Assurance function.
- The 2020 Census ETL operation will utilize automated tools and systems to facilitate the enumeration of transitory locations.
- The 2020 Census ETL operation will leverage the approaches to field office structure and management of field assignments resulting from the Field Reengineering efforts.
- The 2020 Census ETL operation will use adaptive design (routing and dynamic case management) to allocate resources efficiently.

Although no specific decisions for the design of the 2020 Census ETL Program have been made, the operational design of the ETL operation is dependent on understanding the operational design and timing for other operations, such as ADC, GQ, UE, LUCA, and Field Infrastructure (e.g., the number of field offices, staffing structures).

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 transitory locations who do not have a usual home elsewhere. The ETL operation is designed to enumerate eligible populations that inhabit transitory locations such as Recreational Vehicle (RV) parks, campgrounds, hotels, motels

(including those at military sites), marinas, racetracks, circuses, and carnivals.

✓ We will follow an approach similar to the approaches used in NRFU, UE, etc. which will involve a comprehensive approach to quality. All cases will be subject to edits within the automated data collection application, will be subject to various checks within the Operational Control System, and, as needed, the chance at being selected for a "reinterview" involving telephone re-contact followed by in-person recontact for those cases not successfully reached by phone, etc.

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 Non-ID 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

The risks below are specific to this operation:

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 Address Canvassing 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 living quarters covered by the ETL operation, **THEN** some living quarters may not get enumerated by the ETL operation and the people living at those transitory locations may not get included in the final 2020 Census population count.

Milestones

Date	Activity
October 2015	Initiate the 2020 Census ETL Integrated Product 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 two 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 Interactive Voice Response (IVR).

- Tier 2: Provide real-time assistance over the telephone or other electronic channels (Web chat and email) via CQA agents.
- Provide an option for respondents to complete a Census interview over the telephone.

Changes Made Since Version 1.1 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:

- 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.

Opportunities to Innovate

Opportunities to innovate include the following:

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

Description of Operation

The main objectives of CQA are to assist Internet and paper self-respondents by answering questions coming from telephone, Web chat, and email. CQA will provide support for:

- 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 limit the need for additional agents.
- Respondent questions on the Internet via real-time Web chat functionality.
- Callers (inbound) to complete the 2020 Census questionnaire over the telephone (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.
- Outbound telephone calls made by agents to respondents for NRFU quality assurance component.
- Outbound telephone calls made by agents to respondents for UE quality assurance component.

Scope and Timing of 2020 Census CQA includes:

- Multichannel contact center with a central command functionality.
  - Voice channel (telephone via IVR and agents).
  - Nonvoice channels (Web chat and email).
- 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.
- Utilization of an IVR system.
- 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), Web chat, and email—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 will specify small business goals within the Request for Proposal 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 2010 Census, the ACS, the 2014 Census Test, and the 2015 Optimizing Self-Response 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 Request for Proposal 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 or both.
- ✓ The 2020 Census CQA will utilize and integrate nonvoice channels, such as Web chat, email, and texting to support in-bound questions.
- ✓ The Request for Proposal 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 not mail paper questionnaires to people who call to request them, but they will refer people to materials on the Web site or collect the interview.
- ✓ 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 text, email text, or Web chat.
- ✓ CQA will not accept emails with PDF attachments, 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. (NRFU quality assurance component is still under consideration.)
- ✓ 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 on line.
- ✓ The Request for Proposal (RFP) included preliminary service level and quality standards.
- ✓ The language requirements were specified in the RFP.
- ✓ The Census CQA will not utilize an IVR as a data collection mode to complete questionnaire items.
- ✓ The CQA will include a Quality Outbound 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 is handling centralized outbound calling for NRFU and UE quality assurance component.

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.
- ↓ Decreased NRFU workload.
- ↓ Reduced quantities of paper questionnaires.

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.

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.

In order to participate in the 2017 Census Test and 2017 Puerto Rico Census Test, the systems involved need to be approved by security oversight and receive certification. The contractors working on the CQA operation cannot be brought on board until the approval has been given. **IF** approval and certification from security oversight is not received or takes longer than anticipated for multiple IT systems, **THEN** the contractor may miss the opportunity to participate in the 2017 Census Test and 2017 Puerto Rico Census Test.

The staff working on the CQA operation must undergo a security background check before they can be brought on board. **IF** the Census Bureau is unable to process a large number of contact center agents and support staff through security background checks in a short time frame for CQA, **THEN** the contractor may not be appropriately staffed to handle the anticipated workload.

Milestones

Program milestone dates for 2020 Census CQA will be determined after contract award. For acquisition purposes, the major milestone dates are:

Date	Activity
January 2016	Release Request for Proposal for 2020 CQA acquisition.
July 2016	Award contract for 2020 CQA.
September 2016	Release the CQA DOP.
April 2017	Participate in 2017 Census Test.
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**

Purpose

The Nonresponse Followup (NRFU) Operation serves two purposes:

- Determines housing unit status for nonresponding addresses that do not self-respond to the 2020 Census.
- Enumerates households that are determined to have a housing unit status of occupied.

Changes Made Since Version 1.1 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:

- 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 housing units from administrative records or third-party data.
- Avoid having to add late-planned operations and procedures.

Opportunities to Innovate

Opportunities to innovate include the following:

- Use of administrative records and third-party data to remove vacant housing units from the NRFU workload.
- Use of administrative records and third-party data to remove occupied housing units from the NRFU workload.
- Use of a manager interview for multi-unit dwellings to determine vacancy status of units prior to the first NRFU visit.
- Use of a 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.
- Use of Device-as-a-Service as an alternative to traditional procurement methods for smartphone and tablet devices used in the operation.
- Reengineered quality assurance approach.

Description of Operation

For the 2020 Census, the NRFU operation will be dramatically 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.
- Use of adaptive design methodologies.
- Automation to facilitate data collection.

After giving the population an opportunity to self-respond to the 2020 Census, addresses for which the Census Bureau did not receive a self-response will form the initial universe of addresses for the NRFU operation. Prior to any fieldwork, vacant addresses will be removed from the NRFU workload using administrative records. Undeliverable-As-Addressed information from the USPS will provide the primary administrative records source for the identification of vacant units.

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 Non-ID Processing operation that require a field visit for final resolution.

After an initial attempt to contact nonresponding housing units, the NRFU workload will be further reduced through the removal of cases where administrative records and third-party data are available and usable to enumerate the occupied housing units. The NRFU operational design will use administrative records and third-party data to enumerate occupied housing units where it makes sense and is feasible. Examples of sources of administrative records and third-party data used to enumerate occupied housing units 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 either vacant or occupied will receive a final mailing that encourages occupants to self-respond to

the 2020 Census. After each phase of the administrative records modeling, those addresses that are determined to be vacant will immediately be mailed a final letter encouraging self-response; for those addresses that are determined to be occupied and are incomplete after one personal visit attempt, a final letter encouraging self-response will be mailed within seven days.

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:
  - Optimization of daily enumerator assignments.
  - Near real-time operations information for decision making.
  - Enhanced operational control system.
  - Payroll submission and approval processing.
  - Training of enumerators and managers.

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 housing unit, and when occupied, enumerate the housing unit. Enumerators will use an automated data collection application on a handheld device to record the Census Day housing unit status and to enumerate occupied housing units. 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.

Unlike the 2010 Census, the 2020 Census NRFU operation will use an adaptive design methodology, which includes a variable contact strategy, decisions about when proxy responses are acceptable, and stopping rules to control the number of attempts made for each address. The number of contacts may vary by geographic area. Fewer attempts will be made in some geographic areas, whereas more attempts will be made in others with the goal of achieving a consistent response rate across all geographic areas (and within geographic areas for key demographic characteristics).

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 as a multi-unit manager visit. In this interview, the enumerator will ask the building manager to identify which units were occupied, vacant, or not a housing unit on Census Day. Units identified as vacant or not a housing unit will be enumerated as such, reducing the number of enumerator visits and respondent burden.

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:

- Use of real-time paradata and editing capabilities will increase accuracy and quality check data.
- Use of a Best Time to Contact model in assigning work will increase the likelihood of finding respondents at home.
- Capabilities available through an enhanced operational control system with real-time supervisory alerts will 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. The details of this component are in development and could include a combination of approaches such as use of paradata and fieldwork.

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 housing units. 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.
    - Smart phones 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 housing units. 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 housing units and enumerated occupied housing units 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 our first opportunity to operationally test our new 'manager visit' procedures for enumeration of multiunit structures. We also tested 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 us to continue our evaluation of the use of administrative records modeling 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:
  - Recruiting, onboarding, and training.
  - Time and attendance and payroll.
  - Case load management.
  - Data collection.

- 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 housing units, as appropriate.
- ✓ A contact attempt will be made prior to using administrative records or third-party data for enumeration of occupied units.
- ✓ A final letter, 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.
- ✓ 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:
  - Internal Revenue Service Individual Tax Returns.
  - Internal Revenue Service Information Returns.
  - Center for Medicare and Medicaid Statistics Medicare Enrollment Database.
  - Indian Health Service Patient Database.
  - Social Security Number Identification File.
  - USPS DSF.
  - USPS Undeliverable-As-Addressed Information.
  - Targus Federal Consumer File.
  - 2010 Census Data.
  - 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
- ✓ Statistical modeling will be used for determination of housing unit status
- ✓ Decentralized telephone contacts for the purposes of making and keeping appointments will be incorporated into the NRFU contract strategy. Decentralized telephone contacts will not be incorporated as an initial contract strategy
- ✓ Fieldworkers will enumerate adds found during NRFU. The Census Bureau will not utilize real-time Non ID processing for this process
- ✓ Administrative Records and Third-party data will be stored and accessed through a repository known as PEARSIS. CAES will access data in PEARSIS to support administrative records modeling for the NRFU operation. The DRPS 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.

Design Issues to Be Resolved

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

Question	Expected Date
To what extent can the Census Bureau minimize the error associated with use of administrative records and third-party data for the removal of vacants and occupied housing units?	September 2016 *
When are proxy responses used in the NRFU operation?	September 2016
What is the final field management staffing structure (including staffing ratios) for the NRFU operation?	September 2016
What is the final approach for the use of variable contact strategies and stopping rules to balance the goal of reducing the number of attempts against having consistent response rates across demographic groups and geographic areas?	September 2016
What does the reengineered NRFU operation require from Paper Data Capture? Will there be priority capture requirements for NRFU? Is the universe cut schedule different?	October 2016

Design Issues to Be Resolved—Con.

Question	Expected Date
How will any field verification of unmatched but geocoded Non-ID response be integrated into the NRFU operation?	September 2017
Given potential for infusing quality throughout the NRFU systems and procedures, what is the operational design for the NRFU quality assurance component?	September 2017
To what extent and how will vacant addresses and addresses found to not exist, discovered during the In-Field NRFU, be verified?	September 2017
To what extent and how can a last-resort data collection be implemented within the controlled environment that exists with the reengineered workload optimization and management capabilities?	September 2017
What are the business rules for optimizing case assignments?	September 2017
Given other aspects of the 2020 Census operational design, what is the operational timing for the 2020 Census NRFU operation?	September 2017
What are the sources that contribute to the NRFU universe (e.g., LUCA Appeals, late DSF adds, non-responding UE addresses, etc.)?	September 2017
What are the best enumerator performance indicators?	September 2017
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

* The 2020 Census Operational Plan is current as of August 31, 2016.

Cost and Quality

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 living quarters 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 housing units.
  - Removing self-responses on a near-real-time basis.
  - Interviewing managers of multi-unit 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 housing units from the NRFU workload may impact housing unit 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

The risks listed below are specific to this operation:

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.
December 2016	Release the NRFU DOP.
May 2017	Begin NRFU for 2017 Puerto Rico Census Test.
April 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**

Purpose

The Response Processing Operation (RPO) supports the three major components of the 2020 Census: predata 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 living quarters.
- 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 post data collection processing actions in preparation for producing the final 2020 Census results.
- Check for invalid or potential fraudulent returns.

Changes Made Since Version 1.1 Operational Plan Release:

Scope of the operation now includes translation of non-English/Spanish response data and fraud detection.

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.

Opportunities to Innovate

Opportunities to innovate 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 data capture.
  - 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

Predata Collection Activities

During predata collection activities, the Response Processing operation applies criteria to create the initial 2020 Census enumeration universe, which includes address and geographic attributes for all known living quarters within the boundaries of the United States including Puerto Rico. The initial enumeration universe is used to support early census operations, such as assigning and managing specific contact strategies for each living quarter based on defined criteria.

Data Collection Activities

For data collection activities, the Response Processing operation starts with receiving and managing updates to the initial 2020 Census universe. These updates come from various address frame update operations including Address Canvassing, LUCA, and some Geographic Programs activities. The results from the address updates establish a revised 2020 Census enumeration universe. The Response Processing operation 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 without Census IDs are sent to the Non-ID Processing operation for matching and geocoding. All cases are returned to the Response Processing operation and those that were successfully resolved are removed from further enumeration follow-up.

For nonresponding cases, the Response Processing operation 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 prior to 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 response processing operation provides response collection support to UE operations, GQ operations, 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., hand-written race and ethnicity responses provided when respondents do not select an option from the questionnaire) are coded for tabulation purposes. Coding is conducted by both automated and computer-assisted manual processes. In addition, checks are run to detect potentially fraudulent returns. Response Processing 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 between household population counts and person data. 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 count review operation. 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, and produce a Microdata Detail File for delivery to the Data Products and Dissemination operation and then used 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 Archiving operation to the National Archives and Records Administration (NARA) for the Title 13 prescribed 72-year secured storage.

Figure 32 summarizes the RPO by component.

Predata Collection Activities	Data Collection Activities	Postdata 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 work-loads to data collection modes based on modeling results or specification criteria • Record response data and enumeration case status • Translate non-English and non-Spanish responses • Deliver response data to Postdata Collection Activities	• Apply data codes to write-in responses to facilitate data tabulation • Identifying potential fraudulent returns • 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 32: Response Processing Operation

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 Optimizing Self-Response Test and the 2015 Census Test included processing of non-ID 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 solutions (Control and Response Data System and Multimode Operational Control System) for universe creation, data collection control and management, and 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 field 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 Non-ID responses through the asynchronous Non-ID 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 field 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 field 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 field 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 adjusted 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 non-enterprise 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 Response Processing operation 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 Response Processing.
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.
March 2017	Release the 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 Americans Count Overseas

Detailed Planning Status:	**Recently Begun**

Detailed planning for this operation has recently begun. The narrative that follows represents the Census Bureau's early planning efforts on the operational design for the Federally Affiliated Americans Count Overseas.

Purpose

The Federally Affiliated Americans Count Overseas (FAA) 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 1.1 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:

- 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.

Opportunities to Innovate

Create 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.

The FAA operation performs the following activities:

- Compile address list of federal agencies with personnel overseas.
- Prepare letters and data collection materials.
- Request the name of a contact person for each agency.
- Obtain agencies' overseas counts by state.
- Submit final counts in the apportionment counts.

Assumptions Made

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

- Continuously engage and communicate the Census Bureau's methodology and procedures with the Defense Manpower Data Center.
- Establish an online site for communicating with participating federal agencies and for collecting responses on a form that can be completed electronically.
- Use data from the Department of Defense Personnel System to enumerate the military and their dependents and Department of Defense federal civilian employees overseas in the following order: Home of Record, Legal Residence, and Last Duty Station.
- Use the Defense Enrollment Eligibility Reporting System as an additional source of data to enumerate the military and their dependents and Department of Defense federal civilian employees overseas.

Early Findings:

- 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

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 other data sources are available for tabulating the overseas counts?	September 2017
How will the Census Bureau use electronic transmissions to obtain the data?	September 2017

Cost and Quality

Investment in Federally Affiliated Americans Count Overseas is projected to have minimal influence on the overall cost and quality of the 2020 Census.

Risks

The Federally Affiliated Americans Count Overseas operation plans to use an external-facing portal as an automated collection system for the 2020 Census overseas count. **IF** the external-facing portal does not meet the Census Bureau's IT security requirements and cannot be used for the automated collection system, **THEN** collection methods used for the 2010 Census may have to be reused for the 2020 Census overseas count.

The Federally Affiliated Americans Count Overseas operation plans to use an external-facing portal as an automated collection system for the 2020 Census overseas count. **IF** there is a cybersecurity incident with the external-facing portal, **THEN** the information collected for the Federally Affiliated Americans Count Overseas 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 Americans living overseas.
March 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 FAA 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.

5.6 PUBLISH DATA

Response Processing delivers the edited data to the **Data Products and Dissemination** operation to prepare the final 2020 Census data products. This operation delivers:

- Input to the **Count Review** operation to ensure the counts appear correct.
- Apportionment counts to the President of the United States.
- State counts to the **Redistricting Data Program** for dissemination to the state legislatures so state governments can define the geographic boundaries for Congressional and legislative districts.
- Final counts to the **Count Question Resolution** operation so challenges to Census Counts can be resolved.
- All response data to the **Archiving** operation for public release 72 years after the census.

5.6.1 Data Products and Dissemination

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.

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 1.1 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.

Opportunities to Innovate

Opportunities to innovate 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 takes the processed response data, tabulates, goes through the necessary Disclosure Avoidance procedures, and prepares it for delivery to the President, the states, and the public.

A set of enterprise-level systems will provide access to data via an interactive Web site, allowing users to access prepackaged data products, application programming interfaces, and metadata documentation. These include:

- CEDSCI dissemination platform.
- Tabulation System.
- Customer Experience Management System.

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 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 Application Programming Interfaces.
  - Generate data products (Apportionment and Redistricting) and associated data documentation.

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
Which system will provide the 2020 Census Tabulation solution?	September 2016*
What will be the mix or array of standardized data products?	March 2017
How will the Census Bureau develop the 2020 Census data user interface through CEDSCI?	April 2019

* The 2020 Census Operational Plan is current as of August 31, 2016.

Cost and Quality

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

Risks

The scope of CEDSCI includes providing tabulation services for the 2020 Census Program starting in 2018. **IF** the 2020 Census is depending on CEDSCI to provide tabulation services prior to 2018, **THEN** the scope of CEDSCI will be larger than what is feasible to accomplish.

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.
June 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 application programming interfaces.
April 2023	Release final data products.

5.6.2 Redistricting Data Program

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

Purpose

The purpose of the 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 1.1 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:

- 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.

Opportunities to Innovate

Opportunities to innovate 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 Boundary and Annexation Survey (BAS) component to capture and improve underlying geography.
- Processing at Headquarters and the NPC to provide states with consistent guidance, to enhance coordination between BAS and RDP, and to reduce burden on the Geographic Area Reconciliation Program.
- State legislative district updates captured at time of collection of Congressional district updates reducing 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 that is 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 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.
- ✓ Group Quarter (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.
- ✓ The Block, Block Group, and Tract crosswalk files can be released prior to the April 1st, 2021 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?	June 2017
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 2020 (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:

- ↑ Consistent messaging and guidance to participants.
- ↑ Consistent processing of incoming files.
- ↑ Improvement of incoming file quality due to expanded participation timeline.
- ↑ Improvement in underlying geography through iterated update cycles—update, apply, view, refine, update.

Risks

The GUPS is a critical tool in ensuring that all states can participate in the program regardless of their ownership of Geographic Information System software. **IF** the GUPS module being developed for each phase of RDP is not ready for use by the start date of the respective phase, **THEN** participants will have unequal opportunities for participation, violating the principles of P.L. 94-171.

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 prototype product and delivers that product within the same time constraints. This prototype and process is used to validate both the product creation, product delivery, and the product suitability. **IF** the systems for producing products from the 2018 End-to-End Census Test are not ready, **THEN** a P.L. 94-171 prototype product will not be generated within the timeframe required (before April 1, 2019) and stakeholders will not be able review and provide feedback as to the acceptability of the product in meeting the Census Bureau's legal mandate.

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 2019	Deliver P.L. 94-171 Prototype Products.
November 2020–March 2021	Conduct Phase 3: Data Delivery for the 2020 Census RDP.
April 1st 2021	Deliver the P.L. 94-171 data (legal deadline).

5.6.3 Count Review

Detailed Planning Status:	**Recently Begun**

Detailed planning for this operation has recently begun. The narrative that follows represents the Census Bureau's early planning efforts on the operational design for the 2020 Census Count Review operation.

Purpose

The Count Review (CRO) operation enhances the accuracy of the 2020 Census through remediating potential gaps in coverage by:

- Implementing an efficient and equitable process to identify missing housing units.
- Identifying and correcting missing or geographically misallocated large group quarters and their population.
- Positioning remaining count issues for a smooth transition to the CQR operation.

Changes Made Since Version 1.1 Operational Plan Release: The changes shown below represent a maturing of the potential design of the 2020 Census Count Review operation. While most decisions necessary to solidify the design remain to be made, a narrowing of the options has occurred.

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 E911 system, tax assessor records, and other federal agencies to develop a common format and address updating protocol.
- Have both group quarters and housing unit address information available during the review.

Opportunities to Innovate

In the 2010 Census, the Count Review operational design was developed such that the outputs were not easily integrated with other components of the operational design. With the 2020 Census, there is an opportunity to fully integrate the operational design of Count Review with the overall 2020 Census design.

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 with the Federal State Cooperative for Population Estimates (FSCPE) Network. Under the joint-partnership authority, an FSCPE and 2020 Census Working Group was established to explore opportunities to leverage the knowledge and experience of the FSCPE network to the benefit of the 2020 Census Program. This is particularly the case with the CRO, but also carries to other aspects of the 2020 Census operational design as well. Membership of the working group includes representatives from the FSCPE Steering Committee, as well as Census Bureau subject matter experts.

The CRO consists of the following:

- A partnership with the FSCPE members for a housing unit count review. The Housing Unit (HU) Count review 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 Count Review, members of FSCPE from all 50 states, the District of Columbia, and Puerto Rico will be invited to participate in the HU Count Review operation.

  The FSCPE participants will obtain address and coordinate data from various sources, with the historically most common sources being tax assessor records and Emergency Services (E911) data. State participants will be required to provide their HU addresses and 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, and are the correct length and type.

  The application available to the FSCPE reviewers will provide information showing the differences between tallies of the Census Bureau and FSCPE HUs in a given county, tract, or block. The prescribed review process will focus the reviewers

on the geographies where the FSCPE counts showed more HUs than the Census Bureau did.

- A partnership with the FSCPE members for a GQ count review focusing on large GQs (missing and misallocated). The GQ review identifies GQs missing from the 2020 Census. A secondary goal will be to identify GQs in the 2020 Census that were misallocated to the wrong census block. FSCPE representatives will be asked to focus first on finding GQs missing from the 2020 Census. The Census Bureau's GQ count data will come from a file of the GQ records enumerated in the 2020 Census available at the time of the review.

  Similar to the 2010 Census, the GQ types in-scope for the review are expected to include nursing homes, college housing, military barracks, adult correctional facilities, and workers' dormitories 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 GQs. Juvenile institutional facilities, medical institutional facilities, and all other non-institutional facilities will likely be out of scope for the review. An 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 GQs 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 of the following for systematic or large anomalies in population and housing units:
  - Census Unedited File.
  - Census Edited File.
  - Microdata Detail File.

  (Note: This review is conducted at the Census Bureau by staff in the Population Division. It is separate and in addition to a robust review led by the Decennial Statistical Studies Division.)

The design and schedule for the Count Review Program will consider the necessary inputs and outputs to ensure a smooth transition to downstream operations, such as the CQR operation.

Research (Planning)

The 2020 CRO will implement similar designs and methodologies to those used in the 2010 Census. While enhancements will be pursued, the planning and design of the 2020 Census Count Review is about the operational implementation rather than research into new or different methodologies. There are decisions needed to solidify the operational design for the Count Review, but these do not fall in a research category.

Assumptions Made

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

- The CRO will leverage the knowledge and experience of the FSCPE network.
- The CRO will leverage existing software and systems to accomplish its goals and objectives.
- The FSCPE and Census Bureau staff will review population, housing unit, and group quarters counts.

Decisions Made

The following decisions have been made for this operation:

✓ Similar to the approach used in the 2010 Census Count Review operation, there will be two distinct opportunities for FSCPE knowledge and experience to remediate potential gaps in coverage associated with missing housing units and missing or misallocated group quarters. FSCPE representatives will leverage information from their respective states along with data and software provided by the Census Bureau to identify clusters of missing housing units (timing: post in-field Address Canvassing and before enumeration time frame) and missing or misallocated GQs in the late summer of 2020.

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 Count Review Program?	September 2017
What does success for the 2020 Census Count Review Program look like and how is it measured?	September 2017
What is the appropriate level of geography for conducting housing unit, group quarters, and population count review?	September 2017
What is the timing of the Count Review? Can the Census Bureau conduct the Count Review in time to impact the counts?	September 2017
How can Count Review improve the GQ universe before enumeration?	September 2017
What approach will be used for validating missing housing units provided by FSCPEs? For example, fieldwork? Aerial imagery?	September 2017
What approaches will be used for validating group quarters count discrepancies?	September 2017

Cost and Quality

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

Risks

The risks listed below are specific to this operation:

Successful upstream 2020 Census operations will create a sound and accurate base for the Count Review operation, thereby creating an environment that makes the Count Review workload manageable for the FSCPE members in the limited time allotted. **IF** the upstream operations such as Address Canvassing and GQ enumeration have unexpected results, **THEN** the workload for the FSCPEs may be more than can be managed within the operational timeline.

Meeting the goals of the Count Review operation to remediate potential gaps in coverage is dependent on an active engagement of FSCPE members. **IF** FSCPE participation in the 2020 Census Count Review is low, **THEN** the potential for disparate coverage across the states increases.

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 Housing Unit Count Review.
August 2020	Conduct 2020 Census 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 1.1 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.

Opportunities to Innovate

No specific opportunities to innovate have been identified to date 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 housing unit 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:	**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.

Purpose

The Archiving (ARC) operation performs the following functions:

- Coordinates storage of the materials and data and provides records deemed permanent, 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.

Changes Made Since Version 1.1 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.

Opportunities to Innovate

No specific opportunities to innovate have been identified to date for this operation.

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 electronic images. This operation also provides similar data to support the Census Bureau Age Search Program at NPC.

The ARC operation is responsible for the Census Bureau Record Schedule relating to the 2020 Census. The schedule we establish with NARA is only intended to encompass records used to capture, process, and tabulate respondent data, and records used to collect and update address and map information.

Research Completed

Because detailed planning for this operation has not yet started, research that directly supports this operation has not yet been completed.

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 are the format, media, and timing for the delivery of individual responses to NARA?	July 2018

Cost and Quality

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

Risks

The risk listed below is specific to this operation:

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 PDF template with the response data from the 2020 Census, **THEN** there will be an impact the 2020 Census Architecture design as it relates to data storage and dissemination.

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, so must be archived.
September 2017	Release the ARC DOP.
April 2021	Develop final records schedule with NARA and submit for approval by Archivist.
July 2022	Begin transfer of permanent records to NARA.
January 2023	Complete transfer of all permanent records to NARA. Complete destruction of all temporary records no longer needed by Census Bureau.

5.7 OTHER CENSUSES

Other Censuses comprises all functions associated with the decennial censuses for the Pacific Island Area of American Samoa, the Commonwealth of the Northern Mariana Islands, 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:	**Recently Begun**

Detailed planning for this operation has recently begun. The narrative that follows represents the Census Bureau's early planning efforts on the operational design for the 2020 Island Areas Censuses.

Purpose

The purpose of the Island Areas Censuses operation is to 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.

Changes Made Since Version 1.1 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:

- 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 Island Areas' Censuses data collection operations and data processing needs to be more in-line with stateside operations and data processing.
- The planning phase of the Island Areas' Censuses should involve data processing staff who can help create testing strategies.

Opportunities to Innovate

Use of enterprise solutions optimized for the 2020 Census and the ACS for preparing 2020 Census Island Areas Censuses 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, Commonwealth of the Northern Mariana Islands, 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 Island Area Census Offices.
- Updating the Address List.
- Enumerating residents.
- Follow-up operations.
- Local Count Review.
- Shipping completed Census questionnaires and forms to data processing sites.

Research Completed

Because detailed planning for this operation has recently started, research that directly supports this operation has not yet been completed.

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.
- ✓ Revise MAF/TIGER system with geospatial updates from the 2010 Census data, local data, site visits and satellite imagery.
- ✓ 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 except coverage questions and taking into account Island Area local government concerns where possible.
- ✓ Build and maintain a first-ever MAF for each of the Island Areas for use in the 2020 Census and in subsequent censuses.
- ✓ Use stateside 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 Headquarters (HQ)—one advisor for each of the Pacific Island Areas (American Samoa, Commonwealth of the Northern Mariana Islands (CNMI) and Guam), and two advisors for the U.S. Virgin Islands (one for St. Thomas and St. John, and one for St. Croix).
- ✓ The four Island Areas will use an UE strategy. Field enumerators will conduct door-to-door visits to validate and update the address lists, and to leave paper questionnaires for every living quarters to complete. Later, the enumerators will return to collect the completed questionnaires or to assist the respondents in completing their questionnaires.

Design Issues to Be Resolved

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

Question	Expected Date
What response modes will be used in the Island Areas and what format will they be?	September 2017
Which enterprise systems can be used to support the Island Areas Censuses operation and what modifications are needed to these systems?	September 2017
How will the Island Areas questionnaire differ from the then current ACS form?	December 2017

Cost and Quality Measures

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

Risks

The risk listed below is specific to this operation:

For the 2020 Census, automated systems are being developed for office control functions. **IF** the Island Areas Censuses operation has unique requirements that cannot be allocated to the control systems under development by the end of December 2016, **THEN** a custom control system will have to be developed, which will increase the cost of the 2020 Census for the Island Areas.

Milestones

Date	Activity
September 2013	Establish quarterly contact with Island Areas Censuses government officials.
March 2018	Decide what, if any, stateside systems can be used for the 2020 Island Areas Censuses operations.
March 2018	Obtain Office of Management and Budget clearance for data collection materials.
June 2018	Finalize plans for the Island Areas Censuses operations.
September 2018	Award contracts with the Island Areas Censuses governments.
September 2018	Release the Island Areas Censuses DOP.
June 2019	Open Area Census Offices in American Samoa, the Commonwealth of the Northern Mariana Islands, Guam, and St. Thomas and St. Croix of the U.S. Virgin Islands.
September 2020	Close the Area Census Offices in the Island Areas Censuses and their contracts.
December 2020	Publish the Island Areas Censuses population counts.
September 2023	Complete Island Areas Censuses detail data publications.

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 postenumeration survey, including sampling and estimation.
- **Coverage Measurement Matching (CMM):** Identifies matches and nonmatches between the 2020 Census and the Coverage Measurement Survey for the enumerated housing units and people.
- **Coverage Measurement Field Operations (CMFO):** Collects person and housing unit information (independent from the 2020 Census operations) for the sample of housing units in the Coverage Measurement Survey.
- **Evaluations and Experiments:** 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:	**Recently Begun**

Detailed planning for this operation has recently begun. The narrative that follows represents the Census Bureau's early planning efforts on the operational design for the Coverage Measurement Design Estimation.

Purpose

The Coverage Measurement Design Estimation (CMDE) operation develops the survey design and sample for the postenumeration survey for the 2020 Census. It also produces estimates of census coverage based on a postenumeration survey.

Changes Made Since Version 1.1 Operational Plan Release: Demographic analysis was moved to the Evaluations and Experiments operation.

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 of the Planning Database for designing the Census Coverage Measurement sample.

Opportunities to Innovate

Brainstorming for changes from the 2010 Census design methodology yielded the following list of potential ideas for innovation:

- Reduce the sampling error of coverage estimates by using area level covariates from the Planning Database and the ACS in stratification and estimation.
- Preserve joint distributions for imputed variables by using multivariate methods or sequential regression.
- Improve coverage estimates for young children and babies by using demographic analysis results by age in the correlation bias adjustment.
- Reduce the overall error of coverage estimate by combining direct and synthetic estimates with small area estimation models.
- 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 Coverage Measurement Program will be based on the 2010 Census Coverage Measurement operational design.

The CMDE operation performs the following functions:

- Develop the survey design for the postenumeration survey for the 2020 Census.
- 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 housing units and persons living in housing units for the United States and Puerto Rico, excluding Remote Alaska.

Research Completed

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

Assumptions Made

Based on the 2010 Census design and planning of other operations for the 2020 Census, the following assumptions have been made:

- Use the capture-recapture, dual-system estimation methodology, similar to the 2010 Census Coverage Measurement approach, to measure the 2020 Census coverage.
- Maintain the independence of the Coverage Measurement Survey operations from the 2020 Census operations.

- Automate all Coverage Measurement Survey data collection instruments.
- Take advantage of directorate and enterprise automation processes.
- 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:

- ✓ We will estimate the net coverage error and the components of census coverage for housing units and persons living in housing units. The components of census coverage will include correct enumerations, erroneous enumerations (which include census duplicates), whole-person imputations, and omissions.
- ✓ The Census Bureau is proceeding with systems already under development. However, as a result of budget cuts and being descoped, the effects on estimates will be determined later in the decade as we don't expect a major impact at this point in time.
- ✓ The target release is approximately one year earlier than in the 2010 Census.
- ✓ We will produce estimates for the United States (including Washington, DC) and Puerto Rico, by major demographic subgroups, and by specified census operations. We will produce estimates by states, large counties, and places.
- ✓ We will implement processes and procedures as it was done in the 2010 Census.
- ✓ The first official field test of the 2020 Census CMDE Operation will be conducted as part of the 2018 End-to-End Census Test. Testing of the processes will occur in advance of this test.

Design Issues to Be Resolved

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

Question	Expected Date
What is the optimal sampling plan that balances estimation plans and operational considerations?	September 2016*

* The 2020 Census Operational Plan is current as of August 31, 2016.

Cost and Quality

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

Risks

By this point in the decade, planning for all major 2020 Census operations should be underway. Budget reductions in FY 2013 through FY 2016 delayed planning for this operation. **IF** sufficient resources are not provided in FY 2017 for the 2018 End-to-End Census Test planning, **THEN** all CMDE operations and expected innovations may not be fully implemented for the 2018 End-to-End Census Test.

To make coverage estimates, the Census Bureau needs to match census enumerations to responses from an independent postenumeration survey—the Coverage Measurement Survey. Part of the matching process identifies cases that require interviews, which involves asking about people who were enumerated in the 2020 Census but not in the Coverage Measurement Survey. If the 2020 Census enumerations include administrative records, matchers will need to see the names of the persons enumerated by administrative record data. Furthermore, field representatives will need to say the names of people who were enumerated by administrative records to respondents when asking questions about them. The Census Bureau has concerns that providers of the administrative records or a Federal policy may prevent the use of names from administrative records during the Coverage Measurement Survey data collection and matching operations. **IF** the Census Bureau is prevented from using the names of the persons enumerated by administrative data during the Coverage Measurement Survey data collection and matching operations, **THEN** the Census Bureau will not be able to accurately estimate the coverage of the 2020 Census.

Milestones

Date	Activity
January 2016	Start CMDE.
September 2017	Release the CMDE DOP.
February–April 2019	Select Coverage Measurement Survey Sample BCUs.
August–September 2019	Start 2020 Census CMDE Sample Design.
April 2020	Conduct Small BCUs Subsampling.
May 2020	Identify CMDE Person Interview Sample.
April 2021	Release National Net Person Coverage Error and National Components of Person Coverage Estimates.
July 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:	**Recently Begun**

Detailed planning for this operation has recently begun. The narrative that follows represents the Census Bureau's early planning efforts on the operational design for Coverage Measurement Matching.

Purpose

The Coverage Measurement Matching (CMM) operation identifies matches and nonmatches between the 2020 Census and the Coverage Measurement Survey, for both housing units and people, including computer and clerical components.

Changes Made Since Version 1.1 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:

- Simplify the Coverage Measurement clerical matching tasks.
- Rely more on the automated matching systems than the clerical matchers.
- Move housing unit matching and follow-up operations closer to the listing operation.
- Automate the assignment of status codes and address information where possible.

Opportunities to Innovate

To simplify the Coverage Measurement clerical matching tasks, the Census Bureau will reengineer the business process to improve the efficiency of the analyst and will rely more on automation.

Description of Operation

The CMM operation includes:

- Housing Unit Matching: Links the housing unit addresses in the sample and the initial census addresses in the MAF using automated computer matching and clerical matching techniques.
- Person Matching: Links the persons in the sample and the census using automated computer and clerical matching techniques.
- Final Housing Unit Matching: Links the housing unit 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 persons 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 that are not computer geocoded and assign residence status codes and housing unit status codes. The

clerical matchers receive the actual respondent information from Coverage Measurement Survey 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 Coverage Measurement Survey.

Research Completed

Research was undertaken to determine if the Initial Housing Unit Followup (HUFU) and Final HUFU operations are needed. A decision has been made to conduct Initial HUFU. Research into the Final HUFU operation for the 2020 Census continues.

Decisions Made

The following decisions have been made for this operation:

✓ The first official field test of the 2020 Census CMM Operation will be conducted as part of the 2018 End-to-End Census Test. Testing of the processes will occur in advance of this test.

Design Issues to Be Resolved

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

Question	Expected Date
What computer matching and clerical matching systems will be used for Coverage Measurement?	September 2016*

* The 2020 Census Operational Plan is current as of August 31, 2016.

Cost and Quality

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

Risks

By this point in the decade, planning for all major 2020 Census operations should be underway. Budget reductions in FY 2013 through FY 2016 delayed planning for this operation. **IF** sufficient resources are not provided in FY 2017 for the 2018 End-to-End Census Test planning, **THEN** all CMM operations and expected innovations may not be fully implemented for the 2018 End-to-End Census Test.

Milestones

Date	Activity
September 2017	Release the Coverage Measurement Matching DOP.
April 2020	Conduct Initial Housing Unit Computer Matching.
April–June 2020	Conduct Initial Housing Unit Clerical Matching.
October 2020	Conduct Person Computer Matching.
July 2020–January 2021	Conduct Person Clerical Matching.
November 2020	Conduct Final Housing Unit Computer Processing and Matching.
March–June 2021	Conduct Final Housing Unit Clerical Matching.

5.8.3 Coverage Measurement Field Operations

Detailed Planning Status:	**Recently Begun**

Detailed planning for this operation has recently begun. The narrative that follows represents the Census Bureau's early planning efforts on the operational design for the Coverage Measurement Field Operations.

Purpose

The Coverage Measurement Field Operations (CMFO) collects person and housing unit information (independent from 2020 Census operations) for the sample of Coverage Measurement Survey housing units. Coverage Measurement (CM) collects the same data as the 2020 Census for both housing units and persons. Additional information is collected by CM to help us understand census coverage and to detect erroneous enumerations.

Changes Made Since Version 1.1 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:

- 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.

Opportunities to Innovate

Opportunities to innovate include the following:

- To the extent feasible, the CMFO will leverage the use of automation and the field reengineering concepts under development for In-Field Address Canvassing and NRFU operations.

Description of Operation

This operation collects person and housing unit information for the sample of CM Survey housing units. The 2020 Census CM Program 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 CM Survey field data collection suboperations:

- **Independent Listing:** In this operation, listers walk all areas of the sample BCUs and list all the housing units in the sample area from scratch, that is, without using MAF information. This is an independent listing. Listers knock on all housing units to inquire if there is more than one housing unit at the address (like a basement or garage apartment, and if so, these are listed separately).
- **Initial Housing Unit Follow-Up:** The list of CM housing unit addresses in the sample is matched to the Initial census MAF 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 using the follow-up results of this operation. The results identify the list of housing units in the CM sample to be included in the CM person operations.
- **Person Interview:** Collects person information for the CM Survey sample housing units 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 persons 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. The list of CM housing unit people in the sample is matched to the list of people in the census 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 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 after follow-up clerical matching 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, the updated MAF list of addresses is matched to the CM 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 Final Housing Unit Matching, where clerical matchers try to resolve remaining matching, duplication, and housing unit status issues. The results of Final Housing Unit Matching are then used in the housing unit coverage estimation.

As the Census Bureau designs this operation, it will consider whether any administrative records and third-party data can be used to support person interviews, recognizing that the same administrative records and third-party data sources used during NRFU cannot ensure an independent evaluation in CM.

Research Completed

Research that directly supports this operation has not yet started. However, 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:

- CM housing unit data collection will use the Listing and Mapping Instrument.
- The CM Survey operations will be maintained independently of the 2020 Census.
- All CM Survey data collection will be automated and leverage systems and tools used in other field operations where feasible.
- Directorate and enterprise automation processes will be leveraged whenever possible.

Decisions Made

The following decisions have been made for this operation:

✓ The Coverage Measurement person data collection will use a tablet.

✓ There will be no additional telephone operation prior to the Coverage Measurement Person Interview.

✓ The first official field test of the 2020 Census CMFO will be conducted as part of the 2018 End-to-End Census Test. Testing of the processes will occur in advance of this test.

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

By this point in the decade, planning for all major 2020 Census operations should be underway. Budget reductions in FY 2013 through FY 2016 delayed planning for this operation. **IF** sufficient resources are not provided in FY 2017 for the 2018 End-to-End Census Test planning, **THEN** all Coverage Measurement field operations and expected innovations may not be fully implemented for the 2018 End-to-End Census Test.

Milestones

Date	Activity
September 2017	Release the CMFO DOP.
January–March 2020	Conduct CM Independent Listing and Quality Control.
May 2020	Conduct Initial Housing Follow-Up and Quality Control.
May–September 2020	Conduct CM Person Interview and Quality Control.
October–December 2020	Conduct CM Person Follow-Up and Quality Control.
February–April 2021	Conduct Final Housing Follow-Up and Quality Control.

5.8.4 Evaluations and Experiments

Detailed Planning Status:	**Recently Begun**

Detailed planning for this operation has recently begun. The 2020 Census Evaluations and Experiments 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 formulation process. The initial planning, formation of governing bodies, solicitation of input, and the agreement on scope of the 2020 Census Evaluations and Experiments operation is dependent upon funding.

In addition, the Demographic Analysis program is included under the EAE operation. Demographic Analysis is an independent evaluation of the census that uses demographic techniques and historical vital records on births and deaths and data on international migration to produce national-level estimates of the population. Demographic Analysis is the primary source for administrative records-based estimates of the total population by age, sex, and the Demographic Analysis race categories for comparison with the 2020 Census counts.

Purpose

Evaluations and Experiments (EAE) document 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.
- 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 coverage via Demographic Analysis.

Changes Made Since Version 1.1 Operational Plan Release:

Established the Decennial Research Objectives and Methods (DROM) working group, which serves as an oversight body to review research methodologies, study plans, and analysis results. The group provides support to other 2020 Census teams in the form of validation of the research questions and the methods and data needed to provide sound and defensible answers to the questions. Initiating efforts to formulate the high-level scope of evaluations and experiments for the 2020 Census, the DROM established an Interagency Agreement with the Department of Defense to contract with the JASON Group to support development of a vision for the 2030 Census.

Moved the Demographic Analysis program from the CMDE operation to the EAE operation because the design, methods, and long-term research agenda of Demographic Analysis is more fitting with the goals of the EAE operation. Separating Demographic Analysis from the Coverage Measurement operation helps ensure independence of coverage estimations.

EAE will be a supporting operation for the decennial operations in the 2018 End-to-End Census Test. Support will come in the way of standard schedule activities and process flows associated with the development, review, and approval of study plans, operational assessments, and analysis results.

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 Evaluations and Experiments 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.

Opportunities to Innovate

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 Evaluations and Experiments operational process will define the 2020 Census Evaluations and Experiments, 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 2020 Census 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.
- Soliciting ideas and thoughts on the environment in which we might conduct the 2030 Census in order to establish the vision for 2030 and lay the groundwork for our 2030 research agenda. JASON, an autonomous group of academics who have assisted the Federal government for decades in proposing solutions to challenging problems, assists us with this project.

Description of Operation

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.

Development, implementation, program control, closeout, and coordination activities follow formulation of the 2020 Census Evaluations and Experiments operation. Future versions of the operational plan will clearly describe these phases of the operation.

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 Evaluations and Experiments operation.

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
How can vital statistics be better used, or combined with other data sources to improve the Demographic Analysis estimates by age and sex, and to better estimate or expand the race and Hispanic origin categories for which the Demographic Analysis estimates are produced?	September 2016*
What are the strategic principles and high-level research targets for guiding formulation of evaluations and experiments during the 2020 Census?	December 2016
What are the parameters (cost, quality, risks, visibility, etc.) and criteria for selecting and prioritizing evaluation and experimentation proposals?	December 2016

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

* The 2020 Census Operational Plan is current as of August 31, 2016.

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
June 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[2] for 2020 Census Evaluations.
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.
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.

[2] This aligns with when the earliest results will be available for Census operations, such as for the LUCA (LUCA).

5.9 INFRASTRUCTURE

The following four operations support the infrastructure of the 2020 Census:

- **Decennial Service Center:** Supports 2020 Census field operations and handles all service requests initiated by field staff.
- **Field Infrastructure:** Coordinates space acquisition for and lease management of the Regional Census Centers (RCCs) and field offices and provides the administrative infrastructure for data collection operations covering the 50 states, the District of Columbia, and Puerto Rico.
- **Decennial Logistics Management:** Provides logistics management services to include procuring warehouse space, warehousing, inventory management, kit assembly, deployment of materials, and receiving and excessing materials.
- **IT Infrastructure:** Provide the IT Infrastructure to support the 2020 Census, including enterprise systems and applications, 2020 Census-specific applications, field IT infrastructure, 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 and handle all service requests initiated by field staff.

Changes Made Since Version 1.1 Operational Plan Release: There have been no major changes to this operation.

Lessons Learned

Based on lessons learned from the 2014 and 2015 Census Tests, the following recommendations are made:

- Having the Service Center open during annual Census tests provides insight into potential issues which may arise during full 2020 Census operations.
- Having Service Center staff involved in User Acceptance Tests helps them gain a better understanding of possible issues which may occur in the field.
- Fund support staff from the beginning of testing through 2020 Census production; otherwise, there is no knowledge transfer from one test to the next. DSC is only funded on a year-to-year basis so all contractors are dismissed at the end of the contract. Training of Service Center staff 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.

Opportunities to Innovate

Opportunities to innovate include the following:

- Centralized service center system to provide a call management system, incident, and service management system supporting decentralized Service Center technicians (e.g., technicians based in Area Census Offices answering any call to the DSC).
- Online service center technician training. Provide online training for service center technicians as opposed to classroom training. Online training is more accessible than classroom training.
- Cloud technology for call management and incident management. Cloud technology will support the centralized service center system.

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 field staff during the 2020 Census. These services include the following:

- Password resets for all 2020 Census applications including LUCA.[7]
- Resolution of software and hardware issues from field offices and field staff, such as those experienced by users of the Decennial Applicant Payroll and Personnel System and mobile devices.
- Security incident management, such as petty theft, injuries, and stolen equipment.

[7] DSC is providing only password resets for LUCA; no further DSC support is anticipated for LUCA.

- Communications to and from field offices to address such things as outages or software releases.

Major functions of the DSC include the following:

- Provide three major functions supporting 2020 Census Field Operations:
  - Receive requests for service.
  - Respond to requests for service.
  - Report on requests for service.
- Provide Tier-1 support during the 2020 Census Tests.
  - Tier-1 support will consist of resolving simple issues from the field in a specified period of time, such as password resets.
- Provide Tier-1 and Tier-2 support during the 2020 Census field operations.
  - In addition to the Tier-1 support described above, Tier-2 support will consist of more complex issues requiring troubleshooting by specially trained staff with expertise in 2020 Census applications, such as the Operational Control System, the Enumeration Instrument, and the Listing and Mapping instrument.
- Provide and Implement service-level agreements with Tier-3 support based on current operational standards of practice.
- Serve in a coordination and communication role in the event that a field office executes a Continuity of Operations Plan.
- Archive electronic records generated by the DSC in accordance with Census Bureau archiving policies.

Work Completed

The following research has been completed for this operation:

- Tested DSC use as part of the 2014 and 2015 Census Tests.
  - Findings:
    - Changes to PIN and password configurations for enumerators have reduced the number of calls expected for password resets.
    - As the fingerprint vendor, USPS needs to be prepared to cover the expected call volume.[8]
    - 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 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, we 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 Decennial Service Center (DSC) will be through online submission and telephone.

[8] DSC is not planning to support this function for the 2020 Census.

Design Issues to Be Resolved

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

Question	Expected Date
What new contracts will need to be awarded for the 2020 Census?	January 2017
What is the optimal service center staffing structure for the 2020 Census? Centralized or decentralized? Optimal staff ratios? Type of technical support needed in local field offices? Impact on services rendered of the number of field offices that are deployed, and number of field staff hired? Impact on services rendered of using wireless connectivity in the field offices?	January 2017

Cost and Quality

Investment in DSC is projected to have minimal influence on the overall cost of the 2020 Census (under review).

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 risks listed below are specific to this operation:

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.
June 2017	Release the DSC DOP.
September 2017	Start support the 2018 End-to-End Census Test. Award the 2020 Census DSC contract.
December 2017	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:

- Coordinates space acquisition for, and lease management of, the RCC and Area Census Offices.
- 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.
  - Materials supply.
  - Printing and plotting.

Changes Made Since Version 1.1 Operational Plan Release: There is a change to the decision about the location of the 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. This change is reflected in the Decisions Made section.

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.
- Opening some field offices earlier than the others allowed for a "test" run of implementation in the space acquisition effort and improved the process for opening the remaining (majority) of offices.
- Streamline and automate the job application process to replace the paper-based recruitment and testing process.

Opportunities to Innovate

Opportunities to innovate include the following:

- Streamline field management structure using automation and technology to manage the NRFU caseload.
- Automate 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.

Description of Operation

Field Infrastructure includes:

- Space acquisition or leasing, provisioning (specifications, schemas, designs, etc.), building-out, and supplying the RCC and field offices that will open to support field operations.
- 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 to 18 hours.
    - Deployment of online videos to provide targeted training to enumerators quickly and efficiently.
    - Identified topics requiring additional training in future tests.
  - 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:

- ✓ 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 Regional Census Center (RCC) to support and manage Census Coverage Measurement Operations.
- ✓ The preliminary Regional Census Center (RCC) staffing model is as follows:
  - General Management: one Regional Director and one Deputy Regional Director.
  - Data Collection: two Assistant Regional Census Managers and one Regional Manager for Operations, who oversees five Census Operations Managers located in different field offices.

- Administrative Functions: one Assistant Regional Census Manager, one Recruiting Coordinator, two Administrative Coordinators, one Space, Leasing, and Supplies Coordinator, and one Lead Technical Support Coordinator (under review).
- Geography Partnership and Quality: one Assistant Regional Census Manager, one Regional Manager for Quality Assurance (QA), two Partnership Coordinators, and one Geographic Coordinator.

✓ The 2020 Census field office infrastructure will include up to 250 field offices, a small subset of which will open a few months early to support early census operations, including In-Field Address Canvassing.

✓ The preliminary field office staff model is as follows:

- General Management: one Census Operations Manager (reporting to the Regional Manager for Operations at the Regional Census Center (RCC)), one Manager for Support Operations and one Manager for Field Operations.
- Data Collection: multiple Field Managers for Operations, Local Supervisors for Operations, Trainers, and Enumerators; specific numbers based on workload; supervisory ratios to be determined.

✓ In-Field Address Canvassing will be managed out of the field offices.

✓ 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.

✓ As part of the solution, the USPS will assist with onboarding processing for field staff.

Design Issues to Be Resolved

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

Question	Expected Date
What is the approach for the recruiting and onboarding process?	January 2017
Where will the field offices be located?	January 2017

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.

↑ 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** there is significant risk of not being able to effectively or efficiently manage the associated field workload, which could have an impact on cost and data quality.

The number of offices and 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 number of offices and staffing levels may need to increase.

Milestones

Date	Activity
March 2016	Finalize RCC space requirements. Finalize number of field offices.
January 2017	Finalize locations of field offices.
June 2017	Release the FLDI DOP.
December 2017	Finalize field office space requirements.
December 2017	Begin opening RCCs.
January 2019	Begin opening field offices.
December 2020	Complete closing of all field offices.
June 2021	Complete closing of all RCCs.

5.9.3 Decennial Logistics Management

Detailed Planning Status:	**Underway**

Purpose

The Decennial Logistics Management (DLM) will provide logistics management services including procuring warehouse space, warehousing, inventory management, kit assembly, deployment of materials, and receiving and excessing materials.

Changes Made Since Version 1.1 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:

- 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.

Opportunities to Innovate

Opportunities to innovate 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 RCC and field offices.
- Policy and procedure to require full material and supply inventory accounting throughout the Census using Enterprise Resource Planning system.

Description of Operation

The DLM operation for the 2020 Census consists of:

- Setting up a warehouse and office to support RCC and field office deployments.
- Recruiting, hiring, and training human resources to support NPC logistics operations.
- Providing the means to provision RCC, field offices, and field staff with supplies.
- Providing the RCC and field offices with operating materials, supplies, and equipment.
- Providing other support functions (e.g., printing, shipping, kitting, non-IT equipment).

Work Completed

The following research has been completed for this operation:

- Study of current literature regarding Third-Party Logistics Organizations.
  - Findings: Given deadlines imposed by Third-Party Logistics Organizations, this approach is not consistent with the iterative development of 2020 Census requirements.
- Study of current literature on other logistics support models that may fit the characteristics of the 2020 Census:
  - Findings:

- 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.

Design Issues to Be Resolved

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

Question	Expected Date
What are the preliminary plans for quantities of Operating Materials and Supplies required to support operations?	October 2016

Cost and Quality

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

↓ Online, real-time inventory transaction updates.

- º Better, more up-to-date information for decision-making regarding on-going procurement activities.

↓ Material requirements planning and resource requirements planning.

- º 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.

- º Reduces the reliance on spreadsheet management by providing automated planning and scheduling capabilities and has minimal influence on the overall cost and 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.

Milestones

Date	Activity
April 2016	Initiate search and build out activities for Logistics Space.
March 2017	Initiate Equipment Leases for Logistics Functions.
June 2017	Release the DLM DOP.
October 2017	Occupy Logistics Space: installations complete and ready to operate.
May 2021	Close down Logistics Operations.

5.9.4 IT Infrastructure

Detailed Planning Status:	**Underway**

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 paper data capture center).
- Mobile computing.
- Cloud computing.

Changes Made Since Version 1.1 Operational Plan Release: Updated risks are consistent with the Program-Level risk register, and updated "Work Completed" is based on current status. Greater detail on cloud computing items has been provided, and the types of systems supported within the Decennial-specific applications scope has been broadened.

Lessons Learned

Based on lessons learned from the 2010 Census, as well as the 2014 and 2015 Census Tests, 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.
- IT Infrastructure Readiness preparation and assessment process for the 2015 Census Test was instrumental and should continually be used to improve remaining tests for the 2020 Census.
- Improvements are needed in assessing and approving requested changes to business and technical requirements.

Opportunities to Innovate

Opportunities to Innovate 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 IIP.
- Use of workload demand models to size IT solutions appropriately.
- Scalable solutions.
- Agile development of applications (all systems supporting the 2020 Census).
- 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.
- 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:

- Recruiting, hiring, and on-boarding tools (including training).
- Personnel and payroll applications.
- Real-Time Non-ID Processing (RTNP) system.
- Data Editing, Imputation, and Estimation systems.
- Evaluation systems.
- Administrative Records 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.
- Teardown 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:

- Decennial Service Center.
- National Processing Center.
- Regional Census Centers.
- Area Census Offices (ACO).
- Data Capture Centers.
- Partnerships, if needed.
- Mobile offices and vehicles, if needed.
- Offices for outlying areas (Island Areas).
- Regional technicians.

Mobile Computing: The Census Bureau will leverage technology innovations such as Mobile Application Management (MAM) and Mobile Device Management (MDM) programs and secure applications provided via 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 Test, and 2016 Census Test.
- Established the Headquarters IT infrastructure to support the 2014 Census Test, 2014 SIMEX, 2015 Census Tests and 2016 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.
  - Real-Time Non-ID Processing.

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.
- ✓ 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 Atri Kalluri, the Decennial IT Division Chief, at the July 22, 2016 2020 Census Program Management Review.
- ✓ Bring Your Own Device (BYOD) will not be used moving forward, but lessons learned will inform how we structure and use the Decennial Device as a Service (dDaaS) program. The dDaaS approach will be used to provide mobile devices, accessories, cellular connectivity, and device provisioning for each 2020 operation beginning with the 2018 End-to-End Census Test through 2020 Coverage measurement.
- ✓ 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. The security approach will be to encrypt data at rest and in transit via 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 (keyboards, monitors as examples) 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)?	May 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 IT infrastructure 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 IT Infrastructure Solution Requirements.
December 2016	Award Contract for Field IT Infrastructure. Finalize Field Office IT Infrastructure Design.
March 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 Internet Self-Response 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. Re-baseline and deliver demand models based on 2016 Census Test results.
December 2016 (estimated)	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.

Figure 33 shows the current risk matrix for all risks in the 2020 Census Program Risk Register, as of August 31, 2016.

From the 2020 Census Risk Register, 12 key program-level 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. Mitigation strategies are to be considered ongoing activities, except where indicated as complete. For information about all the program-level risks, the full program risk register is available upon request.

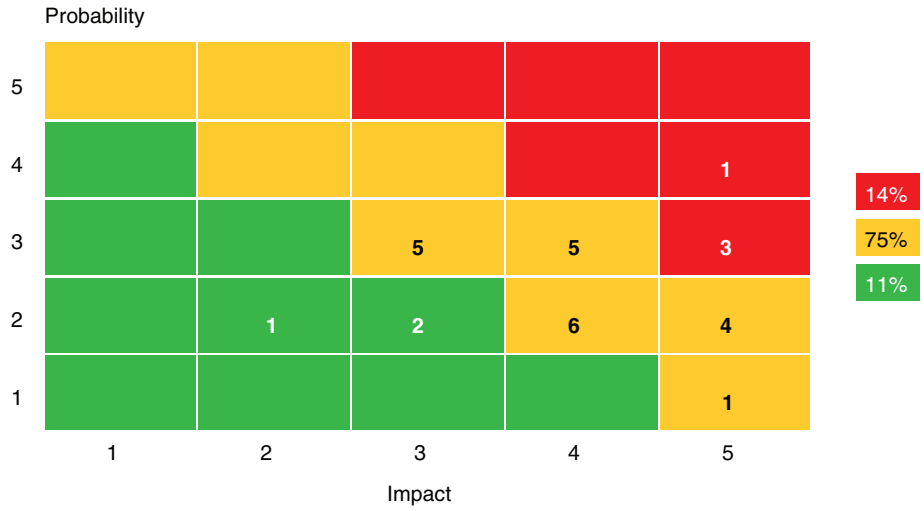

Figure 33: 2020 Census Program-Level Risk Matrix

6.1 FUNDING REQUESTS NOT REALIZED

To execute a 2020 Census that reduces cost while maintaining quality, 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 ability to implement the critical systems and operations supporting the 2020 Census will be adversely affected.

Probability 4 (Likely)	Impact 5 (Major impact)	Exposure level **HIGH**

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.

6.2 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) and the enumeration of nonresponding housing units. Administrative records will also be used to update the Master Address File, predict the best times to contact nonresponding households, and verify respondent- and enumerator-provided information.

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.

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.

6.3 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.

6.4 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.

6.5 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. (Complete)
- 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. (Complete)
- Prepare for rapid response to implement change based on the results of the change control process.

6.6 DATA QUALITY

The planned innovations for the design of the 2020 Census aspire to save significant taxpayer dollars

by making data collection and field operations more efficient.

IF the innovations implemented to meet the 2020 Census cost goals result in unanticipated negative impacts to data quality, **THEN** additional unplanned efforts may be necessary in order to increase the quality of the census data.

Probability 3 (Moderately likely)	Impact 4 (Substantial impact)	Exposure level **MEDIUM**

Mitigation Strategies include the following:

- Perform cost and quality trade off analysis on data collected during field tests.
- Review results of cost and quality trade off analysis, and determine the most cost-effective methods, if any, for increasing quality without sacrificing cost savings.
- Determine level of quality expected by major stakeholders.
- Determine what additional effort would be needed to increase the quality of census data.

6.7 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.
- Assess impacts of any changes to the 2020 Census design based on feedback from internal and external stakeholders and update plans accordingly.
- 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. (Complete)
- Prepare for rapid response to address potential changes and make decisions based on the results of the change control process.

6.8 REENGINEERING ADDRESS CANVASSING OPERATION

For the 2010 Census, a near 100-percent Address Canvassing operation in the field was used to update and validate a complete and accurate inventory of addresses, which forms the basis for the census enumeration. For the 2020 Census, a variety of in-office techniques are being tested for use in updating and validating the completeness of the address inventory. These in-office techniques are expected to reduce the areas that require fieldwork while achieving an equal or greater result, thereby reducing costs and improving quality for the overall 2020 Census Program.

IF the established threshold of addresses to update and validate through in-office techniques is not achieved with the expected level of quality and cost, THEN the 2020 Census Program objectives may not be met.

Probability 2 (Not likely)	Impact 5 (Major impact)	Exposure level **MEDIUM**

Mitigation Strategies include the following:

- Establish the objectives for In-Office Address Canvassing through the development of the 2020 Census Operational Plan. (Complete)
- Baseline the techniques for In-Office Address Canvassing through the development of the Detailed Operational Plan for Address Canvassing. (Complete)

- Evaluate In-Office Address Canvassing techniques and results.
- Update, as necessary, the In-Office Address Canvassing techniques from lessons learned, recommendations, and results from various data collection exercises.

Changes Made Since Version 1.1 Operational Plan Release:

- Probability rating was lowered from 3 to 2 (therefore, the exposure level changed from High to Medium) because recent analysis, as documented in the Detailed Operational Plan for the Address Canvassing Operation, of the quality and coverage of the MAF has led 2020 Census managers to believe the 25 percent In-Field Canvassing workload can be met.

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. Administrative records will also be used to update the Master Address File, predict the best times to contact nonresponding households, and verify respondent- and enumerator-provided information. 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 conflicts with planned 2020 Census operations, **THEN** the Census Bureau may not be able to fully meet the strategic goal of containing the overall cost of the 2020 Census.

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 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. (Complete)
- Dedicate funds to incorporate innovations into the design.
- Bring new technological innovations to Portfolio Management Governance Board (PMGB).
- Reach out to data-collection institutions for knowledge sharing.

Changes Made Since Version 1.1 Operational Plan Release:

- Probability rating was lowered from 3 to 2 (therefore, the exposure level changed from High to Medium) because it is believed the design for the 2018 End-to-End Census Test will be technologically sound and there are unlikely to be many technological innovations that will surface between the 2018 End-to-End Census Test and Census Day in 2020. It is not likely any technological innovation will be approved for production in that timeframe.

6.12 POLICY IMPACTS

The Census Bureau is introducing significant innovations to conduct the 2020 Census. Some of these innovations may be contingent upon interpretation of current policies or the development of new policies where gaps exist.

IF policies prevent the 2020 Census Program from implementing the proposed innovations, **THEN** the 2020 Census Program may not be able to meet the strategic goals and objectives of the program.

Probability 2 (Not likely)	Impact 3 (Moderate impact)	Exposure level **LOW**

Mitigation Strategies include the following:

- Actively engage key internal and external stakeholders to build support for the use of new or modified activities and operations for enumeration in the 2020 Census.
- Determine if current or new policies, both internal and external, will affect the implementation of the proposed innovations.

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, Utilizing Administrative Records and Third-Party Data, and Reengineering Field Operations. The analysis focuses 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
  - Local Update of Census Addresses (LUCA)
  - Geographic Programs
- Quality Impacts for Optimizing Self-Response
  - Paper Data Capture
  - Internet Self-Response
  - Non-ID Processing
  - Census Questionnaire Assistance (CQA)
- Quality Impacts of Utilizing Administrative Records and Third-Party Data
  - Update Enumerate (UE)
  - Nonresponse Followup (NRFU)
- Quality Impacts of Reengineering Field Operations
  - UE
  - Group Quarters (GQ)
  - NRFU

This release expands prior analysis in version 1.1 of the 2020 Census Operational Plan by including analysis of 2015 and 2016 Census Test data, integrating LUCA, identifying expanded metrics for housing and people, quantifying downstream impacts and integration across operations, and analyzing six additional operations.

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 completed 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 prior to 2020.

This quality analysis leverages data from the 2010 Census Coverage Measurement (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 is 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.

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 to 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.); and
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.

It is important to realize that the current analysis relies on scores of input parameters, many of them derived from expert judgment. As the decade progresses, data from additional tests, research, and analyses may become available and in some cases provide for more accurate parameters. Thus, the projections and estimates that are currently being reviewed and analyzed are only preliminary and will change.

These analyses are potentially valuable in several ways. 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 impacts of decisions on LUCA to later operations like paper self-response via 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 our parameters for self-response 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 percent of addresses visited in the In-Field Address Canvassing 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 2010 Census Coverage Measurement Survey (CCM).[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 identify 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.

Additionally, the Census Bureau's Population Division (POP) produces estimates of expected HUs and population for 2020. POP updates these projections on a regular basis and includes both stateside and Puerto Rico components. The current 2020 estimates are 142,359,000 HUs and 334,503,000 people. The quality analysis presented here uses these POP

[12] The scope of the 2010 CCM survey excluded people living in group quarters and in Remote Alaska.

estimates as an estimate of truth. A full description of POP methodology is available.[13]

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 2, which are UE areas; and TEAs 3+, which are the rest of the country[14].

The six parameters for Paper self-response include:

1. Percent of Paper questionnaires completed in TEA 1;
2. Percent of Paper questionnaires completed in TEA 2 mailable areas;
3. Percent of Paper questionnaires completed in TEA 2 non-mailable areas and post-visit;
4. Percent of Paper questionnaires with erroneous people (called erroneous enumerations);
5. Percent of Paper questionnaires with omitted people (called omissions); and
6. Percent of Paper questionnaires with missing Race or Hispanic origin.

Focusing on the first parameter, percent 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; and
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 replicatable in any census test or survey. The middle value estimate of this parameter was applied to the total TEA 1 universe (133.5 million). The other parameters for TEA 2 were applied to the TEA 2 universe (12.4 million) and then the estimates were added together to get approximately 17,900,000. This total, 17.9 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 for quality, 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**—these are addresses expected on the ground that are missing from our frame (missed adds include addresses that are on the frame but lack a geocode[15]); and
3. **Missed deletes**—these are addresses on our frame that are not actually valid living quarters on the ground.

[13] For information on POP methodology, see Methodology, Assumptions, and Inputs for the 2014 National Projections, December 2014, at <www.census.gov/population/projections/files/methodology/methodstatement14.pdf>.

[14] TEAs 3+ are not included in this analysis and they make up 0.2 percent of the addresses in the country.

[15] A geocoded address is one that has a block code. This code is critical for 2020 Census because we must count people and living quarters in a block.

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 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	10
MAF Coverage Study	5
In-Office Address Canvassing	22
LUCA	10
In-Field Address Canvassing	5
Geographic programs	8
Total	**57**

To simplify the analysis, the starting point is the beginning of Fiscal Year 2016 (FY16), 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 In-Office Address Canvassing, the Master Address File (MAF) Coverage Study, the LUCA program, and In-Field Address Canvassing. The critical point is January 1, 2020, when the enumeration frame is defined and created for census enumeration operations, such as, Self-Response, UE, 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 October 1, 2015. Based on analysis of the MAF and using results of the Address Validation Test that occurred in 2015, the ten parameters for estimating the initial state of the MAF are listed in Table 9.

Table 9: Summary of Quality Parameters Collected for Initial Frame

Parameter	Source
Number of addresses on the frame (US and Puerto Rico)—3 parameters	ACS 2016 extracts of total addresses and ungeocoded addresses
Estimated number of actual addresses	POP's estimate
Percent of growth missing from the frame	From Analysis of the Address Validation Test (AVT) and expert judgment
Percent of the growth that is ungeocoded	Estimated based on AVT and additional sources
Percent of growth that is overcoverage (missed deletes)	Estimated based on AVT and expert judgment
Errors already on the frame—Percent of missed adds in frame	Estimated based on AVT and expert judgment
Errors already on the frame—Percent of missed deletes in frame	Estimated based on AVT and expert judgment
Addresses geocoded annually	Estimated based on past production rates and expected funding in the future

These ten parameters, once integrated, represent the state of the frame in 2016 prior to any Address Canvassing work, including the In-Office Address Canvassing and the MAF Coverage Study, which both started in full production in FY16.

The number of addresses on the frame for FY17 is projected by taking the estimate for FY16, adding an estimate of the missed adds that will be resolved during FY16, and subtracting an estimate of the missed deletes that will be resolved in FY16. 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. Projections of these numbers for FY18, FY19, and FY20 are made analogously.

For this analysis, estimates of the numbers of missed adds are separated into two categories: addresses missing from the MAF, and addresses on the MAF that are ungeocoded. Some operations will resolve both types. On the other hand, a planned geocoding operation to be started in the middle of 2017 will address only ungeocoded addresses. The office work involved in the LUCA operation will 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: In-Office Address Canvassing (IOAC), In-Field Address Canvassing (IFAC), and the MAF Coverage Study (MCS). Both the IOAC operation and the MCS began in full production in FY16 and continue throughout the decade. 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. ABR updates the block and adds and deletes addresses in the active blocks. Table 10 describes the five key parameters, out of the 27 total collected, for IOAC and MCS conducted in 2016 through 2019, prior to 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
Percent of blocks identified as Passive during Interactive Review	Based on observed IR work that occurred in 2016
Percent of missed adds in Passive blocks	Address Validation Test results and expert judgment
Percent of missed deletes in Passive blocks	Address Validation Test results and expert judgment
Percent of missed adds captured in Active blocks	Address Validation Test results and expert judgment
Percent of missed deletes captured in Active blocks	Address Validation Test results and expert judgment

Recognizing that the frame is the single largest contributor to overall quality, the parameters in Table 10 show the most critical contributors to quality in the entire 2020 Census design. IOAC corrects 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 include 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 (GSS), 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.

As the Census Bureau operationalizes the IOAC processes and measures the results of the work through the MCS in 2017, the input parameters for IOAC based on these measures should improve and support better estimates of the three key aggregates.

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 have 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 Bureau as not valid. The 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 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.

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 housing units (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 In-Office Address Canvassing, 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 In-Field Address Canvassing (IFAC) operation will occur in 2019 for no more than 25 percent of the HUs, the key IFAC parameter. This operation incorporates fieldwork identified through the results of In-Office Address Canvassing 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, 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.

Because the volume of addresses sent to In-Field Address Canvassing is a major cost driver, that parameter is included.

Active Block Resolution (ABR) is a new operation that began during FY16. Very little data are available to understand the quality of this process. Two parameters for ABR contributed to our alternatives analysis.

During In-Office Address Canvassing the Census Bureau categorizes blocks to be “Passive,” or stable, which means based on aerial imagery and other data sources we do not believe this block requires any additional effort, and there appear to be no inventory changes. Once again, this process is new and Census Bureau experts have minimal data to estimate the quality of this process. Two key parameters measure quality for Passive blocks.

For the ABR and Passive Blocks the Census Bureau expects to have much-improved data coming from the MCS by September 2017. Once MCS results analysis is done, more reliable estimates of quality for ABR and IOAC process will be incorporated into these parameters and the model generally.

Analysis of alternatives for the cost and quality tradeoffs began in late summer 2016. The Census

Bureau is conducting a detailed analysis of alternatives in FY17, as resources permit.

Geographic Programs

After the frame definition is complete, the Geographic Programs operation prepares the frame for Enumeration. These parameters from the Geographic Programs operation subdivide the universe that goes to Enumeration and defines enumeration methods for the specific addresses. Based on the newly updated results of Type of Enumeration Area (TEA) delineation produced in July 2016, 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, all of the addresses in TEA 3 or higher (including TEAs 4, 5, and 6) are not 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**	**146,200,000**
Percent of all addresses in TEA 1 (self-response)	91.31	133,500,000
Percent of TEA 1 addresses that are mailable	91.25	121,800,000
Percent of all addresses in TEA 2 (update enumerate)	8.49	12,400,000
Percent of TEA 2 addresses that are mailable	29.17	3,600,000
Percent of all addresses in TEA 3+ BCUs (all other)[1]	0.20	300,000

[1] Measurement of the quality of these addresses will occur in FY17 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, 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; and
7. Imputed[16] Race or Hispanic origin.

The results for enumeration are summarized by these seven measures for this quality analysis.

The detailed parameters collected from subject matter experts to define the enumeration, including Optimizing Self-Response, Using Administrative Records, and Reengineering Field Operations, are summarized in Table 12.

[16] 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.

Table 12: Summary of Quality Parameters Collected for Enumeration

Operation	Number of parameters collected for quality analysis
Paper[1]	6
Internet Self-Response (ID only)	6
Non-ID Processing (sources are Internet and telephone)	8
Telephone (ID only)	7
Nonresponse Followup (administrative records)	8
Nonresponse Followup (Non Ad Rec)	14
Update Enumerate	20
Group Quarters	5
Total	**74**

[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 Optimizing Self-Response, specifically.

Paper Enumeration

The Census Bureau estimates the percent of the Self-Response universe that complete their questionnaires on paper and send them back and the percent of the mailable portion of the UE geography for which households complete their questionnaires on paper. The third component of paper comes from the UE universe that either responds via Non-ID or mails back questionnaires that are left during the first visit in UE. Based on the parameters for this mode, the Census Bureau estimated the total number of completed questionnaires expected via Paper in the 2020 Census.

Internet Enumeration (ID only)

The quality parameters collected for Internet were similar to paper. The Census Bureau estimates the percent of the Self-Response universe that complete their questionnaires on the Internet and the percent of the mailable portion of the UE geography that complete their questionnaires on the Internet. The third component of the Internet comes from the UE universe that completes a questionnaire in the Internet based on materials left during the first visit in UE. 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 Telephone or Census Questionnaire Assistance (CQA) quality parameters for SMEs paralleled the Internet parameters. The Census Bureau estimated the percent of the Self-Response universe that complete their questionnaires using the CQA telephone option. The Census Bureau also estimated the percent of the mailable portion of the UE geography that complete their questionnaires over the telephone. The third component of the telephone comes from the UE universe that completes a questionnaire by calling in based on materials left during the first visit in UE. 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 estimated the percent of the enumeration universe that will complete their questionnaires using the Non-ID process from either Internet or CQA. This includes portions from both Self-Response and Update Enumerate geographies. 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 Non-ID operation will add new addresses that the Census Bureau does not have on the initial enumeration frame, which is different than self-response options applied in the 2010 Census. These estimates for real adds via 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	**17,900,000**	**58,400,000**	**7,000,000**	**400,000**	**6,900,000**
Occupied	17,900,000	58,400,000	7,000,000	400,000	6,900,000
Vacant	N/A	N/A	N/A	N/A	N/A
Delete.	N/A	N/A	N/A	N/A	N/A
Adds.	N/A	N/A	90,000[1]	10,000[1]	N/A
Unresolved.	N/A	N/A	N/A	N/A	N/A

[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 housing unit 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 subject matter experts 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. Percent of the universe removed for Occupied;
   - NRFU universe
   - UE Universe
2. Percent of the NRFU universe deemed to be vacant through the use of administrative records; and
3. Percent of the NRFU Universe deemed to be vacant through the use of a delete.

Although the delete percent 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 Group Quarters will use administrative records, the analysis team plans to add analysis of GQ administrative records usage in FY17.

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 2016 test models
Number of missed people (omissions)	2010 Census simulation using the 2016 test models
Number of people with imputed race or Hispanic origin	2010 Census simulation using the 2016 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 universe and were therefore applied across both NRFU (TEA 1) and UE (TEA 2) evenly. Future analysis may break this error down by TEA to improve these methods.

7.4 REENGINEERING FIELD OPERATIONS

Nonresponse Followup

The Nonresponse Followup field operation is the most costly operation. After the Census Bureau removes the addresses via administrative records and adds the 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 via 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 Enumerate

The Update Enumerate (UE) operation is more complicated and has a sizable effect of the overall quality of the 2020 Census design. Based on the current, untested methodology, the Census Bureau expects six sources of response data for UE geography.

1. **Self-response with an ID that occurs prior to the first visit** for the 29 percent of this TEA that is mailable. This universe will not be included in this section because it has already been included in the Paper, Internet, and CQA sections.
2. **Self-response that comes from Non-ID direct mailing prior to the first visit** for the 71 percent of this TEA that is not mailable. This includes Internet and CQA, already included in prior sections as well.
3. **Enumeration at the door** during the first visit when updates are made to the address frame, including identification of vacant and deleted HUs.
4. **Self-response that occurs after the first visit** based on the materials like paper questionnaires or ID'ed cards left during the first visit. This is included in the self-response for Internet and telephone in prior tables.
5. **Application of using administrative records and third-party data** to remove occupied HUs from the UE universe. This universe is included in the administrative records tables presented.
6. **Nonresponse** where all addresses end up, if not in the first five categories.

The quality parameters for the UE operation are less mature because the team started in FY15.

Table 17: Summary of Key Quality Parameters Collected for 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

Group Quarters

Group Quarters (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 FY16 in an effort to include all significant methods of enumeration. Minor adjustments for person-level error occurred for group quarters.

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. Life-Cycle Cost Estimate

The 2020 Census Life-Cycle Cost Estimate is pending clearance. This section will be populated at a later date.

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9. Approval Signature

Lisa M. Blumerman (signed) *September 30, 2016*

Lisa M. Blumerman Date

Associate Director for Decennial Census Programs

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10. Document Logs

10.1 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

10.2 REVIEW AND APPROVALS

This 2020 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	9/16/2016
2020 Census Operational Plan Team Leadership Group:		
Lisa M. Blumerman	Associate Director for Decennial Census Programs	9/16/2016
Shirin A. Ahmed	Assistant Director for Decennial Census Programs	9/16/2016
Deborah M. Stempowski	Chief, Decennial Census Management Division	9/16/2016
Patrick J. Cantwell	Chief, Decennial Statistical Studies Division	9/16/2016
Deirdre D. Bishop	Chief, Geography Division	9/16/2016
Phani-Kumar A. Kalluri	Chief, Decennial IT Division	9/16/2016
	2020 Census Portfolio Management Governance Board	9/16/2016
	2020 Census Executive Steering Committee	9/16/2016

10.3 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 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.

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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
ARC	Archiving
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
CM	Coverage Measurement
CMDE	Coverage Measurement Design and Estimation
CMFO	Coverage Measurement Field Operations
CMM	Coverage Measurement Matching
COMPASS	Census Operations Mobile Platform for Adaptive Services and Solutions
CQA	Census Questionnaire Assistance
CQR	Count Question Resolution
CRO	Count Review Operation
dDaaS	decennial Device as a Service
DLM	Decennial Logistics Management
DOP	Detailed Operational Plan
DPD	Data Products and Dissemination
DSC	Decennial Service Center
EAE	Evaluations and Experiments
eSDLC	Enterprise Systems Development Life Cycle
ETL	Enumeration at Transitory Locations
FAA	Federally Affiliated Americans Count Overseas
FLDI	Field Infrastructure
FPD	Forms Printing and Distribution
FSCPE	Federal-State Cooperative Population Estimate
GAO	Government Accountability Office
GEOP	Geographic Programs

Acronym	Definition
GQ	Group Quarters
GSS-I	Geographic Support System Initiative
GUPS	Geographic Update Partnership Software
HU	Housing Unit
HUFU	Housing Unit Followup
iCADE	Integrated Capture and Data Entry
IFAC	In-Field Address Canvassing
IOAC	In-Office Address Canvassing
IPC	Integrated Partnership and Communications
ISP	Internet Self Response
IT	Information Technology
ITIN	IT Infrastructure
IR	Interactive Review
IVR	Interactive Voice Response
LNG	Languages Services
LUCA	Local Update of Census Addresses
MAF	Master Address File
MAM	Mobile Application Manager
MCS	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
NPC	National Processing Center
NRFU	Nonresponse Followup
O&M	Operations and Maintenance
PBC	Partial Block Canvassing
PDC	Paper Data Capture
PL	Public Law
PLBR	Project-Level Business Requirements
PM	Project Management
PSAP	Participant Statistical Areas Program
QC	Quality Control
RCC	Regional Census Center
RDP	Redistricting Data Program
RFP	Request for Proposal
RPO	Response Processing Operation

Acronym	Definition
SEI	Systems Engineering and Integration
SIMEX	Simulation Experiment
SPC	Security, Privacy, and Confidentiality
TEA	Type of Enumeration Area
TIGER	Topologically Integrated Geographic Encoding and Referencing System
TSAP	Tribal Statistical Areas Program
UE	Update Enumerate
URL	Uniform Resource Locator
USPS	United States Postal Service
WBS	Work Breakdown Structure