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Washington, DC 20233-0001

2020 CENSUS PROGRAM MEMORANDUM SERIES: 2021.17

Date: September 28, 2021

MEMORANDUM FOR: The Record

From: Albert E. Fontenot, Jr. **(Signed September 28, 2021)**
Associate Director, Decennial Census Programs

Subject: Updates to the Evaluations and Experiments Operation

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This memorandum documents changes to the Evaluations and Experiments operation (EAE) since the release of the EAE Detailed Operational Plan on September 23, 2019. The updates for this operation consist of changes to the set of evaluations and experiments to be performed using data collected during the 2020 Census. Since baselining the Detailed Operational Plan (DOP), seven evaluations were added to the program. Because of the impacts of the COVID-19 pandemic, the Evaluating the Effect of the Decennial Census on Self Response to the American Community Survey (ACS) was cancelled.

The updated list of Evaluations and Experiments is shown below. This replaces Table 1 in the Detailed Operational Plan, which begins on page 6.

2020 Census Evaluations	Description
Administrative Record Dual System Estimation	Purpose: To study if dual system estimates could be generated without conducting an independent post-enumeration survey (PES). The census would continue to serve as the first source, but administrative records would serve as the second source, rather than PES results.

2020 Census Evaluations	Description
Analysis of Census Internet Self-Response Paradata by Language	Purpose: To study paradata from the internet self-response instrument to learn about issues associated with language. 2020 Census system/operation interactions include access to paradata and response data from internet self-response instruments from the 2017 Census Test the 2018 End-to-End Census Test and the 2020 Census.
Evaluating Privacy and Confidentiality Concerns of Complete and Partial Respondents	Purpose: To assess respondents' privacy and confidentiality concerns about responding to the census generally, as well as assessing concerns of certain types of respondents with a follow-up questionnaire. Experimental treatments and data collection include a telephone follow-up with self-respondents and in-person follow-up with Nonresponse Followup (NRFU) respondents. 2020 Census systems/operation interactions include access to response data for sample selection.
Group Quarters Advance Contact (GQAC): Refining Classification of College or University Student Housing	Purpose: In the 2020 Census GQAC, enumerators will classify college or university student housing as university owned (GQ type code 501) versus privately owned (GQ Type code 502). This is exploratory research to determine whether the refined classification results in more accurately identifying privately owned college housing for the GQ universe instead of the housing unit universe.

2020 Census Evaluations	Description
Reengineered Address Canvassing	Purpose: To evaluate the redesign of the Address Canvassing operation, including the use of in-office address canvassing and interactive review. Experimental treatments and data collection include use of “salted” and “suppressed” addresses to measure error in field canvassing. 2020 Census systems/operation interactions include the Address Canvassing operation having “salted” and “suppressed” addresses (transparent to enumerators); and system support from the Decennial Information Technology Division and Geography Division.
Research on Hard to Count Populations: Non-English Speakers and Complex Household Residents, including Young Children	Purpose: To conduct both an evaluation and an experimental research project about hard-to-count populations such as non-English speakers and complex household residents. Experimental treatments and data collection include NRFU observations and respondent debriefings and bilingual enumerator training experiment. 2020 Census system/operation interactions include the NRFU operation: observations and doorstep debriefings; special training module for bilingual enumerators and for Learning Management System; and development and deployment of the bilingual training module.
The Undercount of Young Children: A Qualitative Evaluation of Census Materials and Operations	Purpose: To explore reasons for the undercount of young children. Experimental treatments and data collection include focus groups and cognitive interviews.

2020 Census Evaluations	Description
Evaluating the 2020 Census Communications Campaign: Census Mindset Measures Before and After the Campaign	Purpose: To evaluate the 2020 Census Communications Campaign and to measure whether (and how) mindsets may have shifted over the course of the campaign.
2020 Census Quantitative Creative Testing	Purpose: To test whether 2020 Census television and radio advertisements perform better than control ads that do not mention the 2020 Census on factors including message recall, message comprehension, ad likability and enjoyability, behavioral intention to respond to the census, and the Census Bureau's corporate image.
2020 Census Tracking Survey	Purpose: To track U.S. public sentiment concerning matters that may bear upon 2020 Census participation. Data will optimize the Integrated Partnership and Communications Program's campaign during the enumeration and guide planning prior to its launch.
Investigating Digital Advertising and Online Self-Response	Purpose: To calculate the proportion of in-target submissions and evaluate the accuracy of 2020 Census targeted digital advertising.
Matching 2018 Census Barriers, Attitudes, and Behaviors Study (CBAMS) Survey Sample to 2020 Census	Purpose: To evaluate (1) the relationship between intended response behaviors and actual response behaviors as well as (2) the characteristics of nonresponding CBAMS households. This evaluation will also inform the Census Bureau about respondent, household, and environmental (e.g. neighborhood crime rate) factors related to self-administered survey nonresponse.
Comparing 2019 Census Test and 2020 Census Self-Response Rates to Estimate "Decennial Environment"	Purpose: To match 2019 Census Test data to 2020 Census data and compare self-response behavior with and without the decennial environment.

2020 Census Evaluations	Description
Evaluating Large Technology Platforms – Selected Digital Partnerships	Purpose: To measure the impact from a subset of digital activities conducted by 2020 Census national partners across the 22 National Partnership Program (NPP) portfolios representing different sectors and communities during the 2020 Census self-response campaign. It specifically examines digital partnership activities by the technology platforms.

2020 Census Experiments	Description
Extending the Decennial Census Environment to the Mailing Materials	Purpose: To study the ability to increase self-response by tapping into the unique environment surrounding the decennial census through the materials we use to contact households and request self-enumeration. Experimental treatments and data collection includes a panel (households) to receive a wearable nonmonetary insert (sticker) that promotes the 2020 Census; a panel (households) to receive mailing materials that incorporate elements and images developed by the 2020 Census communications campaign; a panel (geographic area) to receive an every door direct mailer sent on Census Day. 2020 Census system/operation interactions include Control and Response Data System (CaRDS) to manage experimental sample cases (flags); Survey Operational Control System (SOCS) to manage experimental workload (e.g., mailout); National Processing Center (NPC) to manage printing, assembly, and/or mailout of experimental packages; and the commercial print vendor to print some experimental materials.

2020 Census Experiments	Description
Optimization of Self-Response in the 2020 Census	Purpose: To understand the net impacts of the Optimizing Self-Response innovation area in the 2020 Census-the-mailing-strategy-and of the overall influence of the internet response option. Experimental treatments and data collections include a panel to receive the 2010 Census mail strategy (2020 Census questionnaire, no internet option); a panel to receive 2020 Census mail strategy, but without mention of the internet response option; a panel to have their mail strategy switched between Internet First and Internet Choice; and a panel to receive NO mail materials (will go into NRFU if no response received). 2020 Census system/operation interactions include Control and Response Data System (CaRDS) to manage experimental sample cases (flags); Survey Operational Control System (SOCS) to manage experimental workload (e.g., mailouts); NPC to manage printing, assembly, and/or mailout of experimental packages; commercial print vendor to print some experimental materials; and for the NRFU Operation, enumerators need to be trained/prepared for questions from respondents who didn't receive any mail materials.
Real-Time 2020 Administrative Record Census Simulation	Purpose: To conduct an administrative record census in real time in 2020 to show how the population statistics compare between an administrative record census and survey-style collection, in the same time frame; and to show how long it takes to execute an administrative record census, including identifying the most time-consuming parts of the process.

The 2020 Census Memorandum Series

The 2020 Census Memorandum Series documents significant decisions, actions, and accomplishments of the 2020 Census Program for the purpose of informing stakeholders, coordinating interdivisional efforts, and documenting important historical changes.

A memorandum generally will be added to this series for any decision or documentation that meets the following criteria:

1. A major program-level decision that will affect the overall design or have significant effect on 2020 Census operations or systems.

2. A major policy decision or change that will affect the overall design or significantly impact 2020 Census operations or systems.

3. A report that documents the research and testing for 2020 Census operations or systems.

Visit 2020 Census on Census.gov to access the Memorandum Series, the 2020 Census Operational Plan, and other information about preparations for the 2020 Census.

2020 Census Detailed Operational Plan for:
30. Evaluations and Experiments Operation (EAE)

A New Design for the 21st Century

Issued: September 23, 2019
Version: 1.0
Prepared by: Decennial Census Management Division

United States™ Census Bureau

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

This EAE Detailed Operational Plan has been reviewed and approved for use.

Electronically Approved	8/23/2019
Randall J. Neugebauer IPT Lead and Branch Chief	Date Signed

Electronically Approved	8/28/2019
Jennifer W. Reichert IPT Program Manager	Date Signed

Electronically Approved	9/19/2019
Jennifer W. Reichert Chief, Decennial Census Management Division	Date Signed

Document Change History

Revision #	Version	Date	Description
1	v0.01b	10/3/2018	Initial Working DRAFT Version from 2020 Census Detailed Operation Plan template. Uses annotated version of EAE BPM version 6.3.
1.1	v0.01g	4/3/2019	Updated Data Collection IOD. Added EAE IDEF0 diagram and Information Exchange (IE) descriptive text. Font to Calibri, style items/typos fixed, acronyms added.
1.2	v0.01g	4/29/2019	Updated Section 3 with EAE BPM diagram text and description. Fixed list indents for level 4 headings. Fixed pagination and updated Table of Contents/List of Figures/List of Tables.
1.3	v0.01h	7/17/2019	Updated Sections 2 and 3 to improve details about the key operational points and steps. Addressed remaining comments from reviewers.
1.3a	v0.03	8/16/19	Updated all Business Process diagrams to latest Version 6.5 – 8/13/19.
1.4	v0.04	8/28/2019	Minor updates made within narrative descriptions, tables, and reference added.
1.5	V1.0	9/23/2019	Final for publication.

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1. Document Purpose

The 2020 Census Detailed Operational Plan for the Evaluations and Experiments (EAE) operation is intended for use by U.S. Census Bureau managers, staff, contractors, and other internal and external stakeholders working on the 2020 Census. The document presents the detailed operational design for the 2020 Census EAE operation and includes a summary of the operational processes involved, their inputs, outputs, controls, and the basic mechanisms employed to conduct the operational work.

Anticipated uses of this document include the following:

- Communication—Documents operational design details for internal and external stakeholders.
- Planning—Documents planning assumptions and key milestones.
- Staffing—Documents staffing needs and strategies.
- Design—Describes operations and flows, which inform design of IT systems, manual processes, and training.
- Development—Identifies business rules and required capabilities to be developed.
- Testing—Provides a basis for developing integrated test plans for IT systems and processes.

This document complements the 2020 Census Operational Plan, which presents 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.

2. Operational Overview

2.1 Operation Purpose

The 2020 Census Evaluations and Experiments (EAE) operation covers operational assessments that document how well the 2020 Census was conducted; evaluations that analyze, interpret, and synthesize the effectiveness of census components and their impact on data quality, coverage, or both; and experiments that identify potential designs for 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 for future decennial censuses. In general, experiments involve response comparisons between test treatments, new or modified methods, or procedures against 2020 Census production methods or procedures.

The EAE operation performs the following functions:

- Assesses the 2020 Census operations through operational assessments and evaluations.
- Formulates a 2020 Census experimental program that will further refine 2030 Census operational design options.
- Captures and manages knowledge stemming from decennial research recommendations and tracks action plans on how they are addressed.
- Contributes to the formulation of the 2030 Census Research and Testing phase objectives.
- Contributes and informs, as appropriate, simulation of the 2030 life cycle budget.
- Produces an independent Demographic Analysis of population and housing unit coverage.

2.2 Background

Evaluations, Experiments, and Operational Assessments Analyses

As part of each decennial census since 1950, the Census Bureau incorporated a testing, evaluation, and experimental program to evaluate the current census and to facilitate planning for the next decennial census—two important activities that strongly support the Census Bureau's strategic plan.

The approach for formulating the research programs has varied. For the Census 2000 Testing, Experimentation, and Evaluation (TXE), a "bottom-up" approach was used whereby solicitation of evaluation and experiment proposals was cast to all decennial stakeholder divisions. Initially, the Census 2000 TXE Program consisted of 158 evaluations and nine experiment projects. At the close of the program on September 30, 2003, 87 evaluation projects and eight experimental projects remained. To mitigate having an overambitious research program, formulation of the 2010 Census Program for Evaluations and Experiments (CPEX) engaged a "top-down" approach, starting with Executive Steering Committee guidance on big picture, critical topics of most interest and value. This guidance informed the authors on the solicitation of evaluation and experiment proposals. The 2010 CPEX consisted of 27 evaluations and six experiments.

There are 49 operational assessments planned as well, designed to document final volumes, rates, and costs for individual operations or processes using data from production files and activities and information collected from debriefings and lessons learned are also included. They are not evaluative in nature.

The research-program formulation approach for the 2020 Census is comparable to that of the 2010 Census. It is a "top-down" approach, but with guidance from external groups and leadership by the Decennial Research Objectives and Methods (DROM) working group (WG), chartered on April 4, 2016. See Section 2.3.1 for more detail on the formulation of the 2020 DROM.

Even though the approach on formulating the research programs has varied over the past few censuses, the ultimate goal and objectives have remained constant. As in the past, the goal of the 2020 Census Program for Evaluations and Experiments (CPEX) is to evaluate 2020 Census and to help guide planning for the 2030 Census.

Innovations for the 2020 Census

For the 2020 CPEX, opportunities to innovate focused primarily on aspects of the planning and scope definition process for the research program.

These opportunities included:

- Maintaining and building on a Knowledge Management system and application for the Decennial Census Programs Directorate. Updating action plans for final 2010 CPEX recommendations and capturing/managing recommendations from the middecade testing.
- Formulating 2020 Census evaluations and experiments that are more formally guided by the decisions on the 2020 Census operational design and the external guidance from 2030 Census visioning experts.

- Formulating fiscal years 2022–2024 research and testing objectives that are more formally guided by 2030 Census planning and objectives.

Demographic Analysis

The U.S. Census Bureau has a long history of using Demographic Analysis (DA) estimates to evaluate the decennial census. The DA method was first developed by Ansley Coale (1955), a demographer at Princeton University, to review the results of the 1950 Census. Following the 1960 Census, demographers at the Census Bureau began using the method to measure coverage in the census. The Census Bureau has used DA to measure coverage in each successive census.

Innovations for the 2020 Census

There are several ways that the 2020 Census DA estimates will be different from those produced for prior census evaluations. First, there is a focus on the race and ethnic detail in the estimates by including more categories and expanding the number of birth cohorts for some existing race and ethnic categories. In addition, better measures of uncertainty for the estimates are being developed. Finally, several series of estimates are being developed that will provide additional information about the coverage of Hispanics and the coverage of young children.

Mirroring what occurred for the 2010 Census, official release of Demographic Analysis estimates will occur in early December 2020, in advance of the delivery of census counts to the President at the end of that month.

The Creation of Population and Housing Unit Demographic Benchmark Estimates

As needed throughout the decade, the Population Estimates Program produces post-census population and housing unit estimates. These estimates use the most recent census as the base population and measure demographic change during the decade. These are the data used for the Demographic Benchmark Analysis. These benchmarks are not a part of the Demographic Analysis program.

Innovations for the 2020 Census

Population Division (POP) uses a rigorous process whereby innovations for the upcoming vintage are developed, simulated, and approved by the Population Estimates Change Control Board.

2.3 Design Overview

The sections below present the high-level design for the Evaluations and Experiments operation (EAE). Please refer to the 2020 Census Operational Plan for a complete inventory of design decisions for all 2020 Census operations.

2.3.1 High-Level Operational Design

The design of the EAE operation for the 2020 Census includes four major operational activity areas:

- Evaluations, Experiments, and Operational Assessments Analyses - The formulation, coordination, and management of 2020 Census evaluations, experiments, and operational assessments.
- Demographic Analysis (DA) - The planning and research to derive the final component methods for the official release Demographic Analysis estimates.
- Population and Housing Unit Demographic Benchmarks – The creation of population and housing unit demographic benchmark estimates.
- EAE Operation Closeout.

Each of these major activity areas is summarized below. Together, these activities represent the complete set of work that needs to be performed to conduct this operation.

Evaluations, Assessments, and Experiments Research Analyses

Formulation

The Decennial Research Objectives and Methods (DROM) WG was chartered to provide guidance and recommendations on the formulation of a program for 2020 Census evaluations and experiments and to advise on the scope and purpose of assessments across the 35 operations. The mission of the DROM WG is to be accountable and responsible for deriving relevant decennial research objectives, advising on appropriate, sound methods, and ensuring the issuance of meaningful and accurate reports for the 2020 Census. The DROM WG also oversees the timely availability of research results from the 2020 Census, which managers will use to derive initial objectives for early 2030 Census research and testing plans. The DROM WG governs all 2020 Census research, whereby all study plans and reports require the approval of members. Governance responsibilities began with results from the 2015 census tests and study plans for the 2016 Census Test.

To envision a 2030 environment and the implications on census enumeration methods, the Census Bureau received external consultations from the JASON group[1], Sante Fe Institute, Brookings Institute, and The MITRE Corporation. The Census Bureau received insight on census-

[1] Through an Interagency Agreement with the Department of Defense (DOD), the U.S. Census Bureau contracted for a cooperative effort between DOD and a select group of private sector individuals. JASON representatives span academia, senior scientists, engineers, and technical experts. (The name JASON is not an acronym.)

taking given the potential societal, behavioral, and technological norms in the year 2030. From these consultations, the DROM WG derived four 2030 Census guiding principles for authors to use in developing 2020 Census evaluation and experiment proposals. The DROM also used the principles in scoring the proposals received. The four guiding principles of the 2030 Census are that it is person-based; it is electronic only; it is 100 percent records-based; and it fulfills the Census Bureau's constitutional mandate.

The DROM WG also considered the four major innovation areas of the 2020 Census in assessing the research proposals. The four major innovation areas are: Reengineered Address Canvassing, Optimizing Self-Response, Utilizing Administrative Records and Third Party Data, and Reengineered Field Operations.

All of the innovation areas involved operational designs to reduce the cost of fieldwork. Given the significance of the innovation areas for the 2020 Census the DROM WG considered evaluations, experiments, and assessments to measure the effectiveness of the operational designs.

Table 1 shows the baselined scope of the 2020 Census Program for Evaluations and Experiments (2020 CPEX). The 2020 CPEX includes seven evaluations and three experiments.

Table 1: CPEX Evaluations and Experiments

2020 Census Evaluations	Description
Administrative Record Dual System Estimation	Purpose: To study if dual system estimates could be generated without conducting an independent post-enumeration survey (PES). The census would continue to serve as the first source, but administrative records would serve as the second source, rather than PES results.
Analysis of Census Internet Self-Response Paradata by Language	Purpose: To study paradata from the internet self-response instrument to learn about issues associated with language. 2020 Census system/operation interactions include access to paradata and response data from internet self-response instruments from the 2017 Census Test the 2018 Census End-to-End Test and the 2020 Census.

2020 Census Evaluations	Description
Evaluating Privacy and Confidentiality Concerns of Complete and Partial Respondents	Purpose: To assess respondents' privacy and confidentiality concerns about responding to the census generally, as well as assessing concerns of certain types of respondents with a follow-up questionnaire. Experimental treatments and data collection include a telephone follow-up with self-respondents and in-person follow-up with Nonresponse Followup (NRFU) respondents. 2020 Census systems/0peration interactions includes access to response data for sample selection.
Group Quarters Advance Contact (GQAC): Refining Classification of College or University Student Housing	Purpose: In the 2020 Census GQAC, enumerators will classify college or university student housing as university owned (501) versus privately owned (502). This is exploratory research to determine whether the refined classification results in more accurately identifying privately owned college housing for the GQ universe instead of the HU universe.
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2020 Census Evaluations	Description
Research on Hard to Count Populations: Non-English Speakers and Complex Household Residents, including Young Children	Purpose: To conduct both an evaluation and an experimental research project about hard-to-count populations such as non-English speakers and complex household residents. Experimental treatments and data collection include NRFU observations and respondent debriefings and bilingual enumerator training experiment. 2020 Census system/operation interactions include the NRFU operation: observations and doorstep debriefings; special training module for bilingual enumerators and for LMS; and development and deployment of the bilingual training module.
The Undercount of Young Children: A Qualitative Evaluation of Census Materials and Operations	Purpose: To explore reasons for the undercount of young children. Experimental treatments and data collection include focus groups and cognitive interviews.

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Extending the Census Environment to the Mailing Materials	Purpose: To study the ability to increase self-response by tapping into the unique environment surrounding the decennial census through the materials we use to contact households and request self-enumeration. Experimental treatments and data collection includes a panel (households) to receive a wearable nonmonetary insert (sticker) that promotes the 2020 Census; a panel (households) to receive mailing materials that incorporate elements and images developed by the 2020 Census communications campaign; a panel (geographic area) to receive an every door direct mailer sent on Census Day. 2020 Census system/operation interactions include Control and Response Data System (CaRDS) to manage experimental sample cases (flags); Survey Operational Control System (SOCS) to manage experimental workload (e.g., mailout); National Processing Center (NPC) to manage printing, assembly, and/or mailout of experimental packages; and the commercial print vendor to print some experimental materials.
Optimization of Self-Response in the 2020 Census	Purpose: To understand the net impacts of the Optimizing Self-Response innovation area in the 2020 Census-the mailing strategy-and of the overall influence of the internet response option. Experimental treatments and data collections include a panel to receive the 2010 Census mail strategy (2020 Census questionnaire, no internet option); a panel to receive 2020 Census mail strategy, but without mention of the internet response option; a panel to have their mail strategy switched between Internet First and Internet Choice; and a panel to receive NO mail materials (will go into NRFU if no response received). 2020 Census system/operation interactions include Control and Response Data System (CaRDS) to manage experimental

2020 Census Experiments	Description
	sample cases (flags); Survey Operational Control System (SOCS) to manage experimental workload (e.g., mailouts); NPC to manage printing, assembly, and/or mailout of experimental packages; commercial print vendor to print some experimental materials; and for the NRFU Operation, enumerators need to be trained/prepared for questions from respondents who didn't receive any mail materials.
Real-Time 2020 Administrative Record Census Simulation	Purpose: To conduct an administrative record census in real time in 2020 to show how the population statistics compare between an administrative record census and survey-style collection, in the same time frame; and to show how long it takes to execute an administrative record census and including identifying the most time-consuming parts of the process.

The 2020 CPEX includes studies on two of the four 2020 Census innovation areas: reengineered address canvassing and optimizing self-response. For Utilizing Administrative Records and Third Party Data Records and Reengineered Field Operations innovation areas, the resulting improvements for the 2020 Census will be examined among the slate of operational assessments.

Operational assessments are designed to document final volumes, rates, and costs for individual operations or processes using data from production files and activities and information collected from debriefings and lessons learned. They do not include evaluative analyses. Operational assessments report out on planned versus actual variances as they relate to budget, schedule, and workloads (production and training). Depending on the operation, the assessment may include frequency distributions and standard demographic or address tables.

Table 2 shows an inventory of the 2020 Census operational assessments. Forty-nine operational assessments are planned. This compares to 66 in the 2010 CPEX. All 2020 Census operations, except for Data Products and Dissemination, Systems Engineering and Integration, and IT Infrastructure, have at least one operational assessment planned. Some operational components have individual operational assessments. In addition, for the Program Management

operation a "quality assessment" will be produced for each business process in lieu of an operational assessment. The Decennial Program Management Office coordinates and manages the quality assessments.

Table 2: 2020 Census Operational Assessments

2020 Census Operational Assessments
Archiving Operational Assessment
Census Questionnaire Assistance Operational Assessment
Content and Forms Design Operational Assessment
Coverage Improvement Operational Assessment
Count Question Resolution Operational Assessment
Decennial Logistics Management - Logistics Management Support Operational Assessment
Decennial Logistics Management - Space Acquisition and Lease Management Operational Assessment
Decennial Service Center Operational Assessment
Demographic Analysis Operational Assessment
Enumeration at Transitory Locations Advance Contact Operational Assessment
Enumeration at Transitory Locations Operational Assessment
Evaluations and Experiments Operational Assessment
Federally Affiliated Count Overseas Operational Assessment
Field Infrastructure – Field Office Administration and Payroll Operational Assessment
Field Infrastructure – Recruiting, Onboarding, and Training Operational Assessment
Forms Printing and Distribution Operational Assessment
Geographic Partnership Programs Operational Assessment
Group Quarters Advance Contact Assessment Report
Group Quarters Enumeration and Military Enumerations Assessment
In-Field Address Canvassing Operational Assessment
In-Office Address Canvassing Operational Assessment
Integrated Partnership and Communications Operational Assessment

Integrated Partnership and Communications Contract Assessment
Internet Self-Response Operational Assessment (Internet & Mail Contact)
Island Areas Censuses Operational Assessment
Item Nonresponse Response Rates Assessment Study
Language Services Operational Assessment
Maritime Vessel Enumeration Report
New Construction Operational Assessment
Non-ID Operational Assessment
Nonresponse Followup Operational Assessment
Paper Data Capture Operational Assessment
Post-Enumeration Survey Sampling and Estimation Operational Assessment
Post-Enumeration Survey Field Operations Initial Listing and Initial Housing Unit Followup Operational Assessment
Post-Enumeration Survey Field Operations Person Interview & Person Followup Operational Assessment
Post-Enumeration Survey Field Operations Final Housing Unit Followup Operational Assessment
Post-Enumeration Survey Matching Initial Housing Unit Matching Operational Assessment
Post-Enumeration Survey Matching Person Matching Operational Assessment
Post-Enumeration Survey Matching Final Housing Unit Matching Operational Assessment
Redistricting Data Program Operational Assessment
Research to Support the Integrated Partnership and Communications Program
Response Processing Operational Assessment
Response Rates Assessment Study
Self-Response Quality Assurance Operational Assessment
Service-Based Enumeration Assessment Report
Systems and Applications in the 2020 Census (Security, Privacy, and Confidentiality)
Update Enumerate Operational Assessment
Update Leave Operational Assessment

Coordination and Management

The Evaluations and Experiments Integrated Project Team (EAE IPT) provides coordination and management for the implementation of evaluations, experiments, and operational assessments. This includes:

- Managing the research program scope, schedule, budget, and risks.
- Coordinating functions on integrating CPEX interfaces with operations and systems in the production 2020 Integrated Master Schedule, and on defining CPEX capability requirements.
- Supporting logistics for the DROM WG and the governance of 2020 CPEX and operational assessments.
- Developing and maintaining the study plan, report, and briefing templates, content guidelines, workflows, and the standard schedule activities/durations.
- Conducting Quality Process Reviews of study plans and reports, ensuring compliance and consistency across all products.
- Maintaining current artifacts on the EAE IPT Resource SharePoint site.
- Capturing and managing final report recommendations in the Census Knowledge Management database.
- Facilitating the release of final study plans and reports in the 2020 Census internal memo series.

Demographic Analysis (DA)

DA is one of two programs that the Census Bureau uses to estimate coverage in the decennial census. The DA program produces national-level estimates of the U.S. population by age, sex, race, and Hispanic origin and compares the estimates to the census counts to evaluate the quality of the census. The DA estimates are developed using historical vital statistics, estimates of international migration, and other data sources that are essentially independent of the census being evaluated. The other method for measuring coverage is Dual-System Estimation using a post-enumeration survey.

The DA method starts with birth cohorts and accounts for change to those cohorts because of mortality, immigration, or emigration. Births are the largest component of the DA estimates. Deaths are another important component. The birth and death data come from current and historical vital records from the National Center for Health Statistics (NCHS). International migration is the movement of people across a national border and is measured as flows into a country (immigration), out of a country (emigration), or the combination of the two (net migration). The immigration and emigration components are developed using administrative data from the Department of Homeland Security, survey and census data, and other sources. DA estimates five components of international migration including foreign-born immigration, foreign-

born emigration, net native-born migration, net migration from Puerto Rico, and the population born abroad of U.S. citizen parents.

In addition, the DA estimates are used as inputs for the Post-Enumeration Survey (PES), which is the other method used by the Census Bureau to measure coverage. PES uses the dual-system estimation method to measure coverage by matching the results of a post-enumeration survey to the census counts. Sex ratios from the DA estimates are used to adjust for correlation bias between the survey and census. Correlation bias occurs because the same subpopulations that are hard-to-count in the census are also hard-to-survey in the PES.

The DA program's fundamental goal is to produce estimates that are representative of the U.S. population. These estimates should leverage demographic methods and administrative data to produce accurate measures of net coverage error in the 2020 Census. DA estimates will demonstrate demographic reasonableness in their patterns of cohort aging and sex ratios within age, sex, and race groups. They will incorporate methods to account for uncertainty. The DA program will produce these estimates on schedule and within budget while managing risks throughout the process.

Population and Housing Unit Demographic Benchmarks

The Population Estimates Program (PEP) produces annual population estimates for the United States, states, counties, cities, and places. These estimates are produced by using the most recent census as a base population and accounting for changes in births, deaths, and migration to that base. PEP also produces annual housing unit estimates for the nation, states, and counties. The housing unit estimates are also based on the prior census and account for change in new construction, demolitions, and conversions to and from nonresidential to residential use. The official population estimates are used as controls for demographic surveys, to allocate federal funds, planning, demographic research, and other purposes. The PEP also has an extensive process for reviewing the housing unit and population estimates. It involves looking at the internal consistency of the data, comparing the data to prior years of estimates, and receiving input from our state partners. This process determines if the estimates meet the quality standards necessary to be released to the public.

EAE Operation Closeout

Closeout activities include:

- The release of all final study plans and reports in the 2020 Census Memo Series and the delivery to the Archiving operation.
- The capture of final report recommendations in the Census Knowledge Management database.

- The delivery of recommendations for designs of 2030 Census life-cycle research and testing plans.
- The public release of Demographic Analysis estimates in December 2020.
- The delivery of Demographic Analysis sex ratio data to the Post-Enumeration Survey operations.
- The delivery of demographic population and housing benchmarks in support of the 2020 Census.

The full hierarchy of activities for the EAE operation is provided in Appendix C in the form of an Activity Tree. In the Activity Tree, each major operational activity area listed above is numbered and then decomposed into a numbered set of subactivities, some of which are further decomposed into more detailed numbered subactivities or steps.

For a full description of the operational subactivities that comprise the EAE operation, see the Detailed Process Description discussions in Section 3 below.

2.3.2 EAE Operational Context

The EAE operational activities described above are conducted within the context of other 2020 Census operations and other programs or data sources that are external to the 2020 Census Program. One way to depict an operational context is by using a "Context Diagram," which shows the boundary of the operational process, the operational activities it contains, and the information exchanged with its neighbor operations (or other entities) as well as the resources (mechanisms) needed to conduct the operational work.

Figure 1 is a top-level context diagram for the EAE operation represented as an Integrated Definition, Level 0 (IDEF0) model. An IDEF0 model of a process (or operation) shows the Inputs, Controls, Outputs, and Mechanisms of the process. These IDEF0 model elements are summarized below and described further in the sections that follow.

The yellow box in the center of the IDEF0 model lists the major operational activity areas for the operation, numbered as given in the EAE operation Activity Tree in Appendix C. Specific Information Exchanges (IE) are shown in different colored boxes to represent the Inputs (green boxes on left side), Outputs (orange boxes on right side), Controls (purple boxes on top), and Mechanisms (blue boxes on the bottom). Boxes to the left of the Inputs indicate the *Provider* of the inputs to the operation (typically another 2020 Census operation or an external source). The Provider of the Controls is noted in the box itself. Boxes to the right of the Outputs indicate the *Receiver* of the outputs (typically another 2020 Census operation or external entity). Each Information Exchange has a name and a unique number for identification purposes.

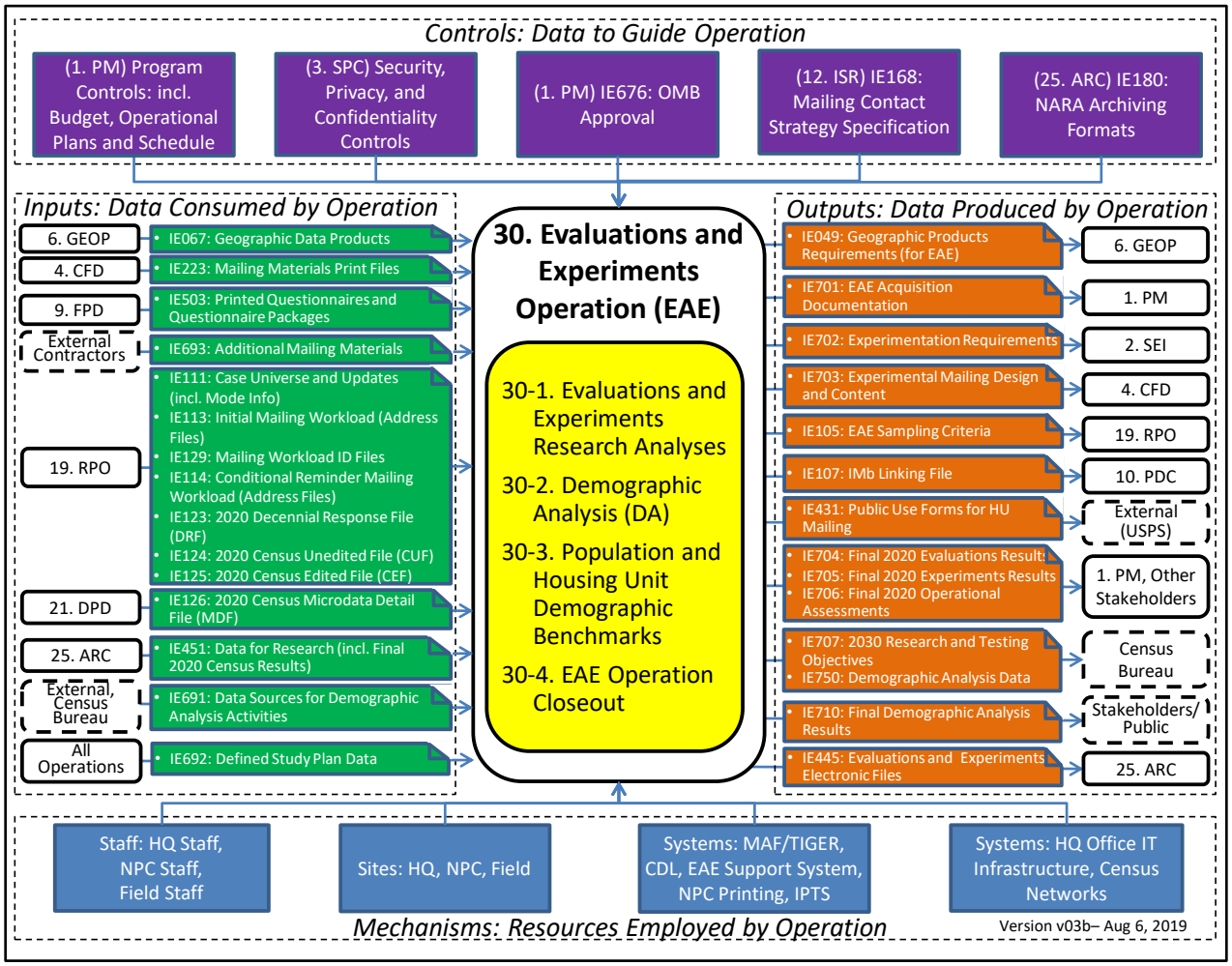

Figure 1: Evaluations and Experiments Operation (EAE) Context Diagram

For detailed descriptions of the Inputs, Controls, Outputs, and Mechanisms used by the EAE operation, see the sections that follow.

2.3.2.1 EAE Operational Inputs

Inputs are the data that are consumed by the operation. The inputs define the amount of operational work that needs to be performed.

Table 3 lists the inputs to the EAE operation.

Table 3: EAE Operational Inputs

Provider	Information Exchange	Description
6. Geographic Programs operation (GEOP)	IE067: Geographic Data Products	The geographic products that will be needed to conduct the specific 2020 Census operations work. Includes MAF/TIGER[2] extracts that provide address and geographic reference information to be used by EAE.
4. Content and Forms Design operation (CFD)	IE223: Mailing Materials Print Files	Print files for the questionnaire and nonquestionnaire paper mailing materials supporting enumeration activities. Print files for questionnaire materials are for reference purposes. Print files for nonquestionnaire materials will be used by the National Processing Center (NPC) to print these materials.
9. Forms Printing and Distribution operation (FPD)	IE503: Printed Questionnaires and Questionnaire Packages	Printed materials needed in support of EAE data collection operational activities, e.g., standard questionnaires and associated materials that are printed by FPD print contractors and shipped to NPC for use in EAE mailing packages.
External Contractors	IE693: Additional Mailing Materials	Various materials for inclusion in experimental mailing packages. May include promotional items such as magnets, pens, etc.
19. Response Processing Operation (RPO)	IE111: Case Universe and Updates (incl. Mode Info)	The set of response data collection cases designated to receive experimental treatment.

[2] Master Address File/Topologically Integrated Geographic Encoding and Referencing System

Provider	Information Exchange	Description
19. Response Processing Operation (RPO)	IE113: Initial Mailing Workload (Address Files)	The set of addresses that are to be mailed 2020 Census materials before the start of data collection. This includes all addresses in the Self-Response Type of Enumeration Area (TEA) and all mailable addresses in the Update Leave (UL) TEA. The workload includes the timing, sequence, and type of paper material (letter, questionnaire, language, etc.) to be included in the mailing for each address.
19. Response Processing Operation (RPO)	IE129: Mailing Workload ID Files	The mailable items for the Self-Response and UL TEAs will contain case IDs (Census IDs or Document IDs) that the respondent can use for internet or telephone self-response. RPO provides these IDs to FPD and EAE for use in printing these items.
19. Response Processing Operation (RPO)	IE114: Conditional Reminder Mailing Workload (Address Files)	The set of nonresponding addresses in the Self-Response and UL TEAs that are to be mailed reminders and other materials during data collection. The workload includes the timing, sequence, and type of paper material (letter, questionnaire, language, etc.) to be included in the mailing for each address. Conditional Reminder Mailings include Self-Response Reminder Workload for Self-Response (SR) and UL TEAs, AdRec (Administrative Records) Occupied Removals, and AdRec Vacant/Delete Removals.

Provider	Information Exchange	Description
19. Response Processing Operation (RPO)	IE123: 2020 Decennial Response File (DRF)	The computer file containing all 2020 Census responses for the final enumeration universe after additional data processing, Group Quarters (GQ) matching and unduplication, and application of Primary Selection Algorithm. Used for analysis purposes.
19. Response Processing Operation (RPO)	IE124: 2020 Census Unedited File (CUF)	All person and household records for the 50 states, D.C., and Puerto Rico, including GQ records with person records for the 2020 Census. The CUF is the baseline file for the total count of people and the total count of housing units. Used for analysis purposes.
19. Response Processing Operation (RPO)	IE125: 2020 Census Edited File (CEF)	All person and household records for the 50 states, D.C., and Puerto Rico, including GQ records with person records for the 2020 Census. The CEF is the results file for the consistency edits, imputation, and allocation of characteristics for all people (in housing units and GQs) and housing unit characteristics. Used for analysis purposes.
21. Data Products and Dissemination operation (DPD)	IE126: 2020 Census Microdata Detail File (MDF)	The input files for tabulation (50 states, D.C., and Puerto Rico), which have been processed through consistency edits and disclosure avoidance modeling to protect privacy and confidentiality. Used for analysis purposes.
25. Archiving operation (ARC)	IE451: Data for Research (incl. Final 2020 Census Results)	Data used for research to support planning that is performed by EAE for the future censuses.

Provider	Information Exchange	Description
External, Census Bureau	IE691: Data Sources for Demographic Analysis Activities	Data from various external demographic sources used for demographic analysis, including: • Birth records from the National Center for Health Statistics (NCHS) • Death records from NCHS • IRS Individual Master File from the Internal Revenue Service • Medicare Enrollment Database Full File from the Center for Medicare and Medicaid Services • Legal Permanent Resident file from the Department of Homeland Security • Armed Forces Population data from the Defense Manpower Data Center.
All Operations	IE692: Defined Study Plan Data	Formally baselined study plans provided by all 2020 Census operations.

2.3.2.2 EAE Operational Controls

Controls are the data that guide the behavior of the operation. They are not consumed by the operation, but rather they provide guidance, models, limits, criteria, cutoff dates, or other information that controls the way in which the operational work is performed.

Table 4 lists the controls for the EAE operation.

Table 4: EAE Operational Controls

Provider	Information Exchange	Description
1. Program Management operation (PM)	Program Controls	Program control information including: • Budget. • Operational Plans and Schedule.

Provider	Information Exchange	Description
3. Security, Privacy, and Confidentiality operation (SPC)	Security, Privacy, and Confidentiality Controls	Laws, policies, regulations, and guidelines related to physical security, IT security, data security, and privacy and confidentiality impacts, analyses, and processes. These include but are not limited to Title 13, Title 26, and other laws and policies related to protection of personally identifiable information.
1. Program Management operation (PM)	IE676: OMB Approval	To avoid overburdening the public with federally sponsored data collections, the Paperwork Reduction Act (PRA) of 1995 requires that U.S. federal government agencies obtain Office of Management and Budget (OMB) approval before requesting or collecting most types of information from the public. OMB approval must be obtained before collecting federally sponsored data, whether the request is delivered in person, on the phone, or online.

Provider	Information Exchange	Description
12. Internet Self Response operation (ISR)	IE168: Mailing Contact Strategy Specification	Business rules that define the sequence and timing of materials to be mailed to housing units inviting and reminding people to respond. The contact strategy rules are designed to encourage self-response through the internet. These rules also apply to additional mailings sent to nonresponding housing units. During pre-data collection, these rules are used by RPO to create the initial mailing workload for Self-Response TEA. During data collection, these rules are used by RPO to create the conditional mailing workload for Self-Response and UL TEAs based on response and housing unit status.
25. Archiving operation (ARC)	IE180: National Archives and Records Administration Archiving Formats	Acceptable archiving formats to assist in determining how to prepare response records for archiving based on NARA and Census requirements.

2.3.2.3 EAE Operational Outputs

Outputs are the data produced by the operation. The outputs constitute the results of operational work that has been performed. Outputs produced may be used as inputs or controls to other operations.

Table 5 lists the outputs from the EAE operation.

Table 5: EAE Operational Outputs

Consumer	Information Exchange	Description
6. Geographic Programs operation (GEOP)	IE049: Geographic Data Products Requirements (for EAE)	Requirements for the Geographic Products that will be needed to conduct the specific EAE operational work. Includes requirements for the selection of addresses for Address Canvassing experiments.
1. Program Management operation (PM)	IE701: EAE Acquisition Documentation	Documentation to support EAE acquisitions. Some experiments require contractor support for qualitative testing and external consultations.
2. Systems Engineering and Integration operation (SEI)	IE702: Experimentation Requirements	Includes capability requirements to support experiments and evaluations.
4. Content and Forms Design operation (CFD)	IE703: Experimental Mailing Design and Content	Includes requirements for custom questionnaires and other materials supporting mailing and enumeration activities. Some of the resulting questionnaire forms and mailing materials print files will be provided to the Forms Printing and Distribution operation (FPD) for printing.
19. Response Processing Operation (RPO)	IE105: EAE Sampling Criteria	Criteria to be used for allocating data collection cases within the 2020 Census universe based on Census Experimental Program requirements. EAE designs and performs experiments and evaluations during the 2020 Census as the first step in planning for the 2030 Census. A sample of living quarters will be selected for each of the experiments and evaluations as needed.

Consumer	Information Exchange	Description
10. Paper Data Capture operation (PDC)	IE107: IMb Linking File	Results of the bulk mail contract arrangements with the United States Postal Service (USPS) used to deliver mailing items. Each mailing item (package, letter, or postcard) will have an Intelligent Mail barcode (IMb®) for postal tracing. IPTS[3] will need to know the IMb code and corresponding Census ID (or Document ID) that is associated with each item that is mailed out or returned by respondents to PDC. This information will used by PDC and RPO to update case status and will also be used to identify USPS Undeliverable as Addressed mailing items.
External (USPS)	IE431: Public Use Forms for HU Mailing	Paper forms to support the 2020 Census housing unit (HU) mailing strategy and enumeration of population including internet invitation letters, reminder cards or letters or both, questionnaire mailing packages, and materials for other special operations.
1. Program Management operation (PM), Other Stakeholders	IE704: Final 2020 Evaluations Results	Results of the 2020 Census evaluations used to analyze, interpret, and synthesize the effectiveness and efficiencies of census components and their impact on data quality and coverage using data collected from census operations, processes, systems, and auxiliary data collections. Additionally, these results prepare the Census Bureau in designing, developing, implementing, and executing 2030 Census research and testing.

[3] Intelligent Mail barcode® Postal Tracking System

Consumer	Information Exchange	Description
1. Program Management operation (PM), Other Stakeholders	IE705: Final 2020 Experiments Results	Results of the 2020 Census experiments that provide quantitative or qualitative results for tests of unique treatments that occur during a decennial census. Since they occur in an environment of optimal census awareness, results simulate more closely what experimental treatments would yield in a full production application. Additionally, these results prepare the Census Bureau in designing, developing, implementing, and executing 2030 Census research and testing.
1. Program Management operation (PM), Other Stakeholders	IE706: Final 2020 Operational Assessments	All 35 operations will produce 2020 Census operational assessments to document how the operation performed against expectations. These operational assessments analyze all aspects of the operation and include lessons learned for operations improvement before the 2030 Census.
Census Bureau	IE707: 2030 Research and Testing Objectives	Objectives align with 2030 Census Research Guiding Principles and build on what is learned from 2020 Census evaluations, experiments, and operational assessments.

Consumer	Information Exchange	Description
Census Bureau (incl. Post-Enumeration Survey operations (PES))	IE750: Demographic Analysis Data	Demographic analysis data including: • Demographic Analysis (DA) sex ratios for the black / nonblack population for all ages. These data will be used by the PES for correlation bias adjustment. • A memorandum about net coverage error using the 2020 Census and DA/PES Estimates. • Data extracts from the postcensal population and housing unit estimates, as needed for 2020 Census operations.
Stakeholders/Public	IE710: Final Demographic Analysis Results	Final Demographic Analysis results including: • Data tables with results from the 2020 DA and 2020 Census, published on the DA website. • Methodology statement for the 2020 DA estimates. • Working papers about 2020 DA methodology and results.
25. Archiving operation (ARC)	IE445: Evaluations and Experiments Electronic Files	Includes relevant details about the evaluations and experimental activities to support planning for future censuses. This includes evaluation and experiment data sets.

2.3.2.4 EAE Operational Mechanisms

Mechanisms are the resources (people, places, and things) that are used to perform the operational processes. They include staff resources, infrastructure sites, systems, and other technology infrastructure.

Staff Resources

Table 6 identifies the staff resources employed for the EAE operation.

Table 6: Staff Resources Used Within EAE Operational Activities

Staff Resources	Description/Role
Headquarters (HQ) Staff	HQ staff to perform the core of the EAE operation.
National Processing Center (NPC) Staff	EAE utilizes NPC to assemble and mail the experimental packages to the selected housing units. NPC works at EAE's direction to receive materials from the Forms Printing and Distribution operation (FPD) and external contractors, print mailing labels, update the Response Processing Operation (RPO) through IPTS with appropriate mailing barcodes, assemble the experimental mailing packages, and mail the materials to the selected housing units. NPC may also conduct telephone survey support for evaluation purposes.
Field Staff	Field staff including field representatives and managers to provide field survey support for evaluation purposes.

Infrastructure Sites

Table 7 identifies the infrastructure sites employed for the EAE operation.

Table 7: Infrastructure Sites for EAE Operational Activities

Infrastructure Site	**Description/Role**
Headquarters (HQ)	Headquarters (HQ) is a location where EAE management activities are performed. This location is in Suitland, Maryland.
National Processing Center (NPC)	NPC site to print materials and assemble experimental mailing packages for delivery to selected housing units.
Field	Field locations to support field surveys for evaluation purposes. During the 2020 Census, field operations are conducted out of six regional census centers and 248 area census offices.

Systems and Other Technology Infrastructure

Table 8 identifies the systems employed for the EAE operation.

Table 8: Systems Used Within EAE Operational Activities

System	Description
Master Address File/Topologically Integrated Geographic Encoding and Referencing (MAF/TIGER)	A Census Bureau system that provides address and spatial data products for participants and a mechanism for applying updates made by participants.
Census Data Lake (CDL)	The Census Data Lake serves as the repository for paradata and response data. It is built on a distributed, scalable platform to support data ingest, storage, provide data access to reporting and analytics applications.
EAE Support System	A notional Census Bureau system that provides support capabilities that satisfy the automated functions needed to conduct EAE.
NPC Printing	The NPC system that is used to print and assemble mailing materials needed for EAE.
Intelligent Mail Barcode Postal Tracking System (IPTS)	IPTS is a Census Bureau system housed at NPC and used to ingest data from the USPS Intelligent Mail barcode® Tracing Service. The system generates records for each mail piece when it is processed through an automated sort. These events can be correlated to an expected delivery date of outbound mail or business reply mail entering or making its way to a data capture facility.

Other technology infrastructure employed for the EAE operation includes:

- HQ Office Information Technology (IT) Infrastructure.
- Census Networks.

2.4 EAE Data Flow and Operational Influences

Figure 2 is an Integrated Operations Diagram (IOD) that describes the design concepts for the response data collection operations for the 2020 Census (stateside and Puerto Rico). This diagram assumes that the frame has been developed and address canvassing operations are complete. The diagram shows the Response Processing Operation (RPO) as the hub of data collection and RPO's interactions with all the other 2020 Census operations that have a role in data collection. The discussion below walks the reader through the diagram, using the circled numbers to help the reader follow the flow.

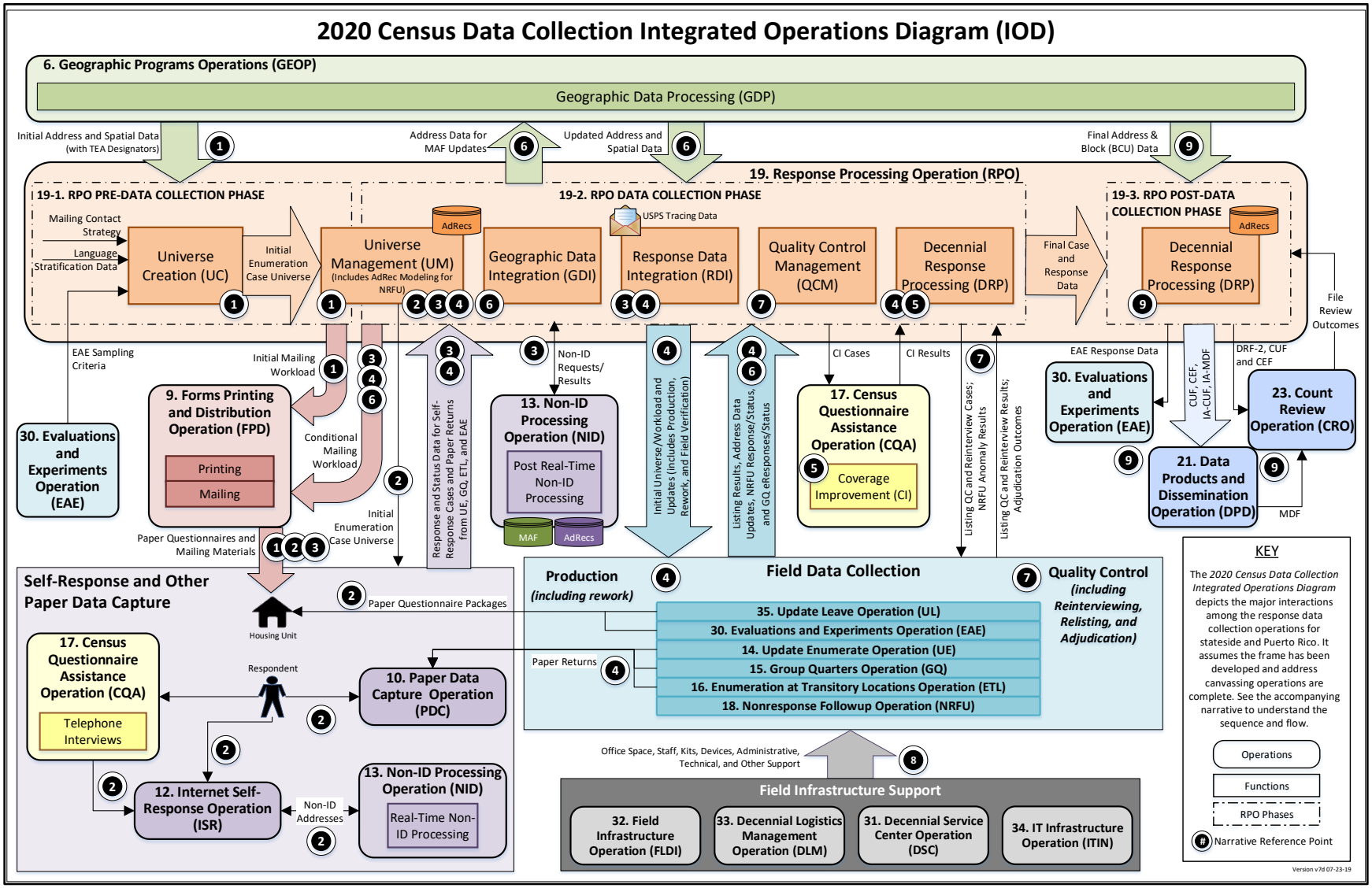

Figure 2: 2020 Census Data Collection - Integrated Operations Diagram (IOD)

Pre-Data Collection

1 Before the start of data collection, the Geographic Data Processing (GDP) component of the Geographic Programs operation (GEOP) sends initial Address and Spatial Data, including the Type of Enumeration Area (TEA) designations, to RPO so it can create the Initial Enumeration Case Universe. RPO also receives the mailing contact strategy (i.e., strategy for self-response stratification) so it can identify which housing units receive which kinds of mailings, language stratification information so it knows which language to use, and experimentation stratification data so it knows which housing units are to be included in what types of experiments. The creation of the Initial Enumeration Case Universe and application of the stratification data are done as part of the RPO Universe Creation function.

Based on the stratifications, the RPO Universe Management function creates the initial mailing workload and sends it to the Forms Printing and Distribution operation (FPD), which prints and then mails the appropriate materials to mailable housing units for the Self-Response (SR) TEA. The first two of the five potential mailings for the SR TEA are sent unconditionally to all housing units in this TEA. These mailings are sent in English or English and Spanish based on the language stratification data and may include letters or—based on the self-response stratification—letters and questionnaires.

During Data Collection

2 Once the RPO Universe Creation work is complete, the Initial Enumeration Case Universe is managed by the RPO Universe Management function, which tracks changes to the enumeration universe for future mailings and for the data collection operations.

People living in housing units are encouraged to self-respond through a partnership and communications campaign (not shown on this diagram), through mailings sent by FPD, and through paper questionnaires left at housing units as part of the Update Leave (UL) operation.

To make it easy for people to respond and to reduce the paper workload, the Census Bureau is using an *Internet First* strategy for most housing units. This strategy involves households not receiving paper questionnaires in the first mailings, but rather they receive letters only with instructions on how to self-respond online. If these *Internet First* households do not respond, they will receive a paper questionnaire in the fourth mailing. The remaining households will fall into the *Internet Choice* strategy and will receive paper questionnaire in the initial mailing. All respondents can go to the internet and enter their response using the internet instrument as part of the Internet Self-Response operation (ISR). The internet option offers additional

flexibility and allows people to respond in multiple languages. If a respondent calls the Census Questionnaire Assistance operation (CQA), a customer service representative may offer to collect the respondent's information by telephone. The information collected from these telephone interviews is entered by a customer service representative using an ISR instrument similar to the public-facing instrument used by respondents.

Respondents can also mail their paper questionnaire forms. These forms are received by the Paper Data Capture operation (PDC), which uses scanning and imaging technology to capture the information from these forms.

ISR receives the Initial Enumeration Case Universe from the RPO Universe Management function and uses the Enumeration Case Universe to link responses provided through the internet instrument to the appropriate case. If respondents do not have their unique Census ID available, they are still able to complete the census questionnaire as a Non-ID response using the ISR instrument. The Non-ID Processing operation (NID) first attempts to match the address entered by the respondent or customer service representative to a known census address in real-time. For addresses that do not match, the response is still collected and is subject to later Non-ID Processing.

Response and status data collected through the various self-response data collection operations are sent (in digital format) to RPO's Response Data Integration function. Any responses collected through PDC or ISR that are submitted in languages other than English or Spanish are translated by staff at the Tucson call center on behalf of these operations before being sent to RPO. RPO's Universe Management function uses the response status data to determine the appropriate actions for the case.

During the self-response data collection time-period, reminder mailings are sent to housing units in the SR TEA. The first reminder is sent to all housing units in the SR TEA using the initial mailing workload as discussed above. Subsequent reminders are conditional and are only sent to those housing units that have not yet responded. The RPO Universe Management function sends a Conditional Mailing Workload to the FPD operation for these nonresponding units. FPD also receives from the RPO Universe Management function a list of mailable housing units in the UL TEA and mails two reminders to these housing units.

Any remaining Non-ID cases are sent by RPO to NID for post real-time Non-ID processing, which attempts to match addresses provided by respondents to known addresses in the Master Address File (MAF) using automated and clerical procedures. As needed, administrative records (AdRecs) are used to supplement the matching process. Most of these Non-ID cases will be

from internet responses that could not be matched during real-time Non-ID processing. In addition, post data capture Non-ID processing will be required for paper forms for which the Census ID could not be read during data capture. The results of post real-time Non-ID matching are sent back to RPO. Based on predefined business rules, some of the responses that are not able to be matched through NID are sent to the field for verification as part of the Nonresponse Followup (NRFU) operation.

The discussion above covers self-responses for people living in housing units. Special operations also exist to collect data from people living in other types of living quarters or for whom self-response is not a viable option:

- The Group Quarters operation (GQ) enumerates people living in group quarters (e.g., dormitories, correctional facilities, and nursing/skilled-nursing facilities) as well as people experiencing homelessness and receiving services at service-based locations such as soup kitchens. GQ also enumerates people living on maritime and military vessels and living in group quarters on military bases and other military installations using specialized procedures.
- The Enumeration at Transitory Locations operation (ETL) enumerates people who are living in special locations such as recreational vehicle parks, campgrounds, racetracks, circuses, carnivals, marinas, hotels, and motels and who do not have a Usual Home Elsewhere.
- The Update Enumerate operation (UE) lists and enumerates housing units in areas that pose unique challenges to the standard self-response data collection operations. These housing units are in the UE and Remote Alaska TEAs, which cover remote areas of the country and other small selected areas.

NRFU is another special operation whose primary purposes are to determine the housing unit status of addresses in the SR and UL TEAs for which a self-response was not received and to enumerate households that are believed to be occupied. As mentioned in number 3 above, NRFU also performs a field verification activity to verify selected addresses for Non-ID self-responses that could not be matched to known addresses through NID processing.

Based on the universe case type (derived from TEA and living quarter type), RPO sends the Initial Enumeration Case Universe/Workload to the GQ, ETL, and UE operations. GQ uses this universe to perform an advance contact activity to collect general information and determine the preferred method of enumeration. ETL also performs an advance contact activity to schedule appointments for enumerating its universe of cases.

NRFU does not require advance contact activities. For NRFU, the RPO Universe Management function creates an Initial Case Universe/Workload comprising all housing units in the SR and UL TEAs for which a self-response was not received. The NRFU contact strategy is dependent on the results of an AdRec modeling activity. Four possible status outcomes result from this modeling for a given address:

- AdRec Vacant: No one lives there.
- AdRec Delete: There is no housing unit at that address.
- AdRec Occupied: There is a high probability that someone lives there and that the Census Bureau has high-quality data about that housing unit and the people residing within the household.
- AdRec No Determination: Administrative data are not sufficient to help determine the housing unit status, and a full contact strategy is required.

An initial attempt to enumerate is made for all addresses in the NRFU workload. NRFU sends to RPO information regarding the success of this and any subsequent enumeration attempts as part of the response status data.

AdRec Vacant and AdRec Delete housing units also receive an additional mailing from FPD. The RPO Universe Management function provides this AdRec mailing workload to FPD (as another type of Conditional Mailing).

RPO removes from the follow-up workload any AdRec Occupied cases that cannot be successfully resolved during the first attempt and triggers one final mailing (from FPD) to these addresses to encourage these households to self-respond. RPO also removes AdRec Vacant and AdRec Delete cases that cannot be successfully resolved during this first attempt, provided that those cases do not appear occupied and that information from the United States Postal Service (USPS) about the additional mailing indicates that the unit is either vacant or non-existent. For all other cases, NRFU continues to attempt to enumerate the housing unit until the attempt is successful or the maximum number of attempts has been reached. Additional attempts are made for selected units during the NRFU Closeout phase.

Self-responses can continue to arrive at any time during NRFU. Accordingly, RPO flags housing units in the follow-up workload for which RPO has received a self-response or tracing information from the USPS that indicates that a return is on its way to one of the paper data capture facilities. NRFU is notified about these flagged households as soon as the information is available so that it can remove the housing units from the daily workload, if possible. Any self-responses that are flagged but later found by RPO to have insufficient enumeration data are added back to the NRFU workload for continued enumeration attempts. The RPO Universe

Management function tracks this information and uses it to determine what to include in the next day's follow-up workload. Housing units that have been successfully enumerated are not included in subsequent follow-up workloads.

For NRFU, data are collected by electronic devices. The electronic data are sent to the RPO Response Data Integration function, which subsequently provides this information to the Decennial Response Processing function for further processing. Paper questionnaires are used to enumerate residents at living quarters during UE and at housing units during ETL. These paper questionnaires are checked in at area census offices (ACOs) and then sent to the paper data capture facilities, where they are scanned and imaged by PDC. PDC sends the captured data and case status information to RPO in digital format.

GQ is primarily a paper operation. Group quarter responses collected on paper questionnaires are checked-in at the ACOs and sent to PDC for scanning and imaging before being transmitted to RPO. Case status updates are sent to RPO as part of the check-in process. GQ data provided in electronic files (eResponses) require additional processing to prepare the data before they are electronically transmitted to RPO. GQ data collected on paper rosters are entered by ACO clerks into the same file format that is used for eResponses. These response data are then sent electronically to RPO.

As part of the Evaluations and Experiments operation (EAE), the Census Bureau may test different questionnaire content and data collection methodologies during the 2020 Census to help evaluate content and modes for the 2020 Census and inform design changes for the 2030 Census. Addresses that are selected to be part of these experiments are identified in the initial universe (see number 1 above). For those addresses, the EAE operation sends households questionnaires with various experimental items, packaging, etc. to assess the impact made on the response or lack thereof. Respondents receiving EAE questionnaires and notices will respond via ISR, CQA, PDC, or NRFU.

5 RPO's Decennial Response Processing function performs quality assurance activities as well as coding and other preparation steps on incoming self-response data.

The RPO Universe Management function also supports a Coverage Improvement (CI) activity, the goal of which is to ensure a high-quality census by conducting telephone follow-up for households where there could be coverage issues on submitted responses. CI is a follow-up activity and is therefore considered a component of NRFU, however, the CI telephone interviews are performed by CQA. CQA receives from the RPO Universe Management function a

set of cases with potential coverage issues and provides the results of these cases back to RPO's Response Data Integration function.

As noted above, universe and address updates occur during field operations. Census Bureau field staff may uncover changes to addresses as they perform their daily assignments in any field operation. For example, a UL or UE lister may add an address or find an error in the address or geographic data based on the listing activities, or a NRFU enumerator or a UL lister may go to an address and find an additional unit such as a garage apartment located on the premises. All listing results and other address changes are sent to the RPO Geographic Data Integration function, which passes the information on to the GDP function in GEOP.

Changes to the address list may also come from other sources such as appeals from the Local Update of Census Addresses (LUCA) operation, the review of addresses performed by the Count Review operation (CRO), and updated files from the postal service. The GDP function within GEOP updates the address data and sends these to RPO's Universe Management Function, which provides these cases to the appropriate operation. Depending on the timing, living quarter type, and TEA designation, RPO may initiate one or more mailings to these new addresses through FPD to encourage self-response.

All field operations (GQ, UL, ETL, UE, and NRFU) include quality control (QC) functions. For GQ, the field operational control system creates a sample of the field enumeration cases for QC by ACO staff, who conduct telephone reinterviews for this sample set of cases to confirm that a GQ enumerator visited the site and that the total population count is correct.

For UL, the Sampling, Matching, Review, and Coding System (SMaRCS) selects a sample set of basic collection units (BCUs) for relisting. The QC Listing Results are sent back to the RPO Quality Control Management function for further processing. RPO does not send any changes resulting from UL listing to GEOP until the lister has passed the QC check. Further, if the QC activities result in a hard fail, BCUs already worked may require relisting. RPO includes this rework in subsequent UL production workloads.

QC methods for ETL and UE are performed primarily in the field, tailored to meet the circumstances of these unique paper-based operations.

NRFU includes multiple methods for ensuring high-quality data collection. Several of these are integrated into the staff management activities. In addition, samples of NRFU cases are selected for reinterview (RI), a process whereby some of the response data are collected again and compared with the original collected data. SMaRCS creates the RI workload and sends it to the

NRFU operation. The RI cases are handled by NRFU field staff. The RI results are sent to SMaRCS, which performs an automated comparison of the RI data against the original data. Anomalies are sent to the National Processing Center, where clerks use SMaRCS to conduct additional research to determine if the data collected are accurate and the enumerators are following proper procedures. In some cases, the matching and adjudication results require that prior cases performed by the enumerator at fault be reworked. RPO puts these cases back into the NRFU workload as appropriate.

8 NRFU, UE, UL, ETL, and parts of the GQ operation are performed in the field. Several operations provide the support for these field data collection activities. The Field Infrastructure operation recruits, hires, onboards, and trains the staff needed to conduct these operations and also operates the field offices during production. The Decennial Logistics Management operation (DLM) provides the space and logistics support (e.g., supplies and kits) for the offices and the field staff. The Decennial Service Center operation provides technical support for field and field office staff. Finally, the IT Infrastructure operation provides the hardware and software used by the field staff and field offices.

Post-Data Collection

9 Once data collection is complete, additional processing occurs to prepare the counts for use in apportionment and the data used by the Data Products and Dissemination (DPD) operation to create data products for redistricting and other purposes. The RPO Decennial Response Processing function handles this post-data collection processing, which includes multiple activities:

- Supplementing response data with administrative records for those cases that had been identified as AdRec Occupied but for which a NRFU attempt was unsuccessful and no subsequent self-response was received.
- Determining the final enumeration universe by reconciling or applying final address and block data from the GDP component of GEOP.
- Determining the returns of record for situations where multiple responses have been received for the same housing unit.
- Performing count and status imputations.
- Performing consistency editing and characteristic allocation supplemented with administrative records data.

- Applying tabulation geography.
- Performing disclosure avoidance (Note: This is done by RPO for Island Areas Censuses data only. Disclosure avoidance for stateside/PR data is handled by DPD).

Similar processing occurs for responses from group quarters. Responses collected through the EAE operation may require slightly different activities.

Through these processing activities, the RPO Decennial Response Processing function creates multiple files for stateside/PR response data, including the Decennial Response File (DRF), the Census Unedited File (CUF), and the Census Edited File (CEF). RPO also creates an Island Areas CUF (IA-CUF), Island Areas CEF (IA-CEF), and Island Areas Microdata Detail Files (IA-MDF) for the Island Areas Censuses response data. Each of these files is reviewed within the Census Bureau before the data are sent to the next stage of processing. Some of these reviews are done as part of the CRO. The CUF, the CEF, the IA-CUF, and the IA-MDF are sent to DPD via the Census Data Lake (CDL). DPD uses these files as inputs for data products creation and also creates the Stateside/PR MDFs using the CEF as input. RPO also sends data collected as part of EAE back to the EAE operation for further analysis.

3. Evaluations and Experiments (EAE) Detailed Process Description

Figure 3 is a top-level Business Process Model (BPM) showing the Level 1 activity areas within the EAE operation. BPMs for the 2020 Census follow industry-standard Business Process Model and Notation (BPMN). An explanation of how to read the BPMN notations and a full-sized copy of all of the BPMN diagrams for this operation are provided under separate cover.

This top-level BPM serves as the Context Model for the EAE operation. A BPMN Context Model displays the high-level activities within the operation and relationships between them, whereas the IDEF0 Context Diagram shown earlier depicts the boundaries of the operation or activity and the interfaces between the operation or activity and other operations and activities with which it is associated.

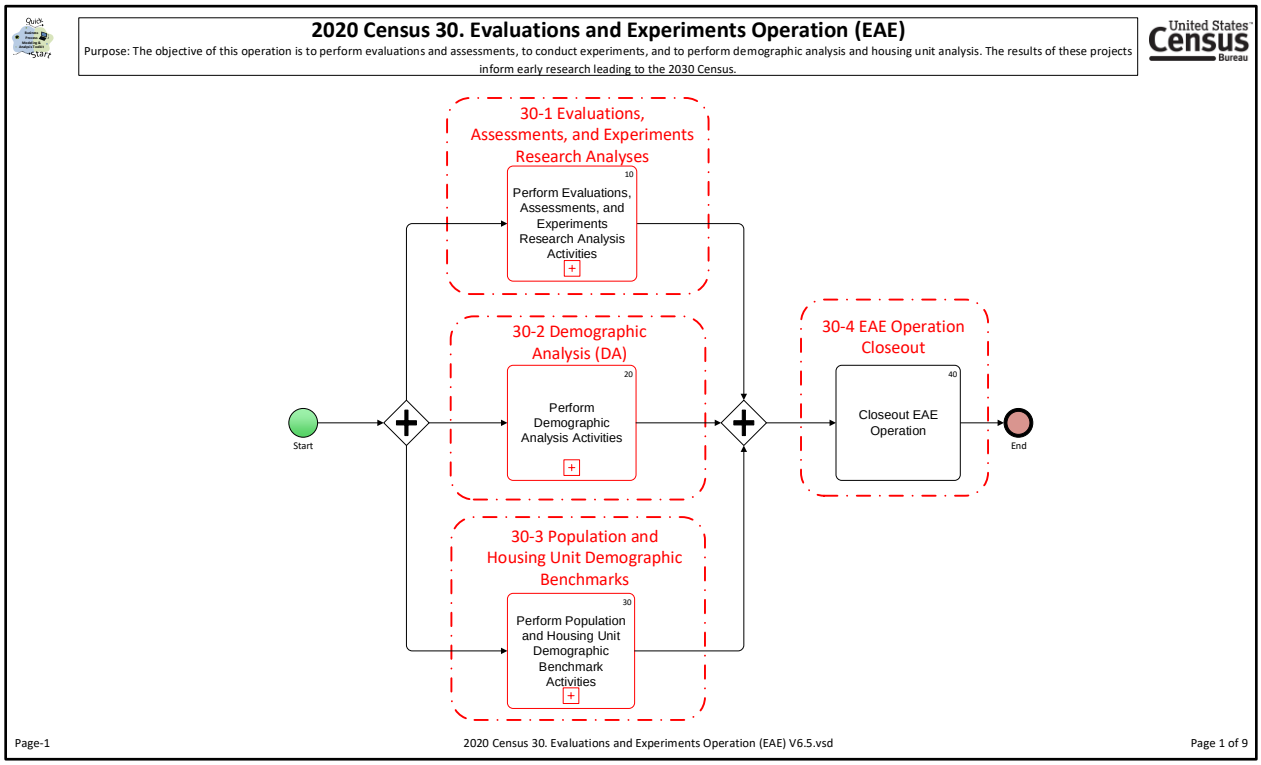

Figure 3: EAE Operation Context Model

The 2020 Census Program for Evaluations and Experiments (CPEX) was designed to document and evaluate the 2020 Census programs and operations, as well as test new methods that were suggested from previous evaluation work. Results from the 2020 CPEX will serve as the background or basis from which the 2030 Census is designed, tested, and implemented.

The EAE operation is subdivided into the following Activity Areas:

- Evaluations, Assessments, and Experiments Research Analyses [EAE 30-1].
- Demographic Analysis (DA) [EAE 30-2].
- Population and Housing Unit Demographic Benchmarks [EAE 30-3].
- EAE Operation Closeout [EAE 30-4].

The business processes for each of these Level 1 activity areas are discussed along with their inputs and outputs in the following subsections.

3.1 Evaluations, Assessments, and Experiments Research Analyses [EAE 30-1]

Figure 4 shows the BPM for the Evaluations, Assessments, and Experiments Research Analyses [EAE 30-1] activity area (area within the gray rounded rectangle) within the overall context of the EAE operation.

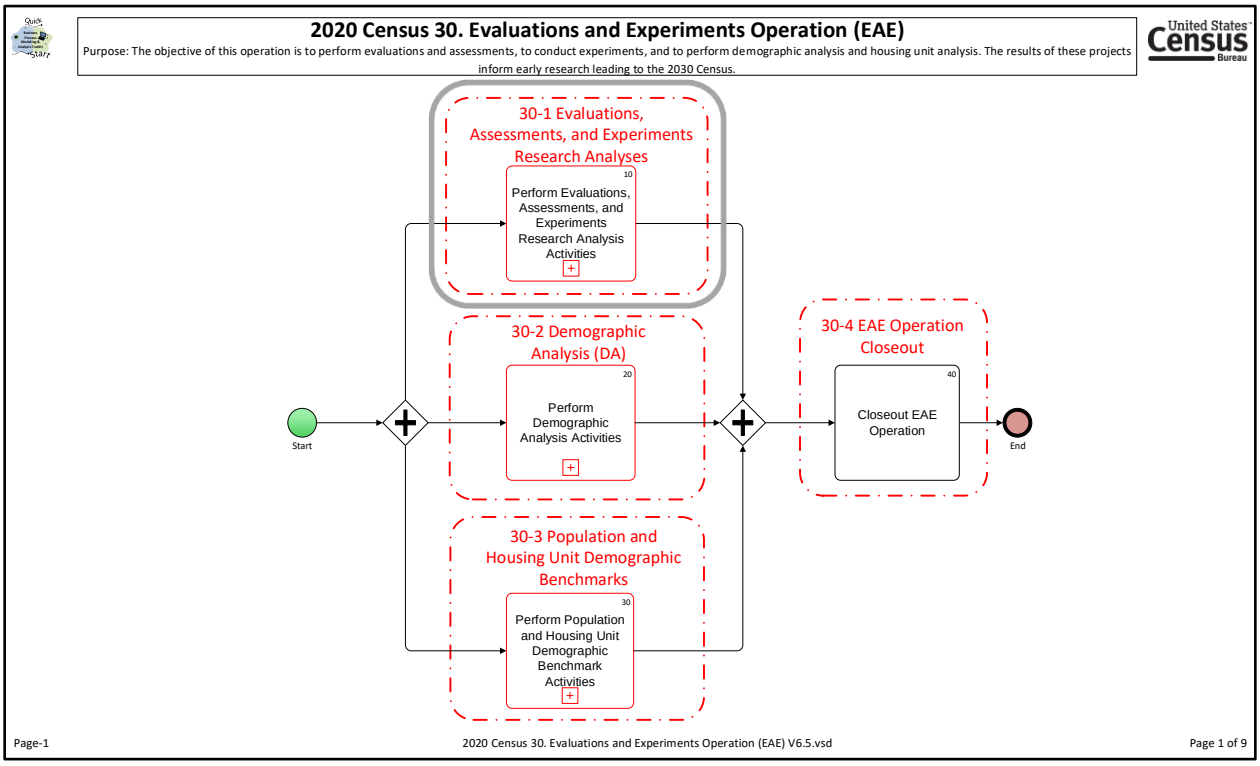

Figure 4: Evaluations, Assessments, and Experiments Research Analyses [EAE 30-1] Activity

This activity area develops the foundation for the 2020 CPEX and the governance methodology and workflow that will be used.

The Evaluations, Assessments, and Experiments Research Analyses activity area is subdivided into the following operational subactivities:

- Evaluations, Assessments, and Experiments Research Analyses [EAE 30-1].
  - Perform Planning and Proposal Preparation [30-1.1].
  - Baseline and Approve Study Plans [30-1.2].
  - Enable EAE Project Execution [30-1.3].
  - Conduct EAE Research [30-1.4].
  - Coordinate 2030 R&T Planning [30-1.5].
  - Finalize and Capture Results [30-1.6].

A detailed view of the constituent activities that make up the "Evaluations, Assessments, and Experiments Research Analyses" operational activity is given in Figure 5 below.

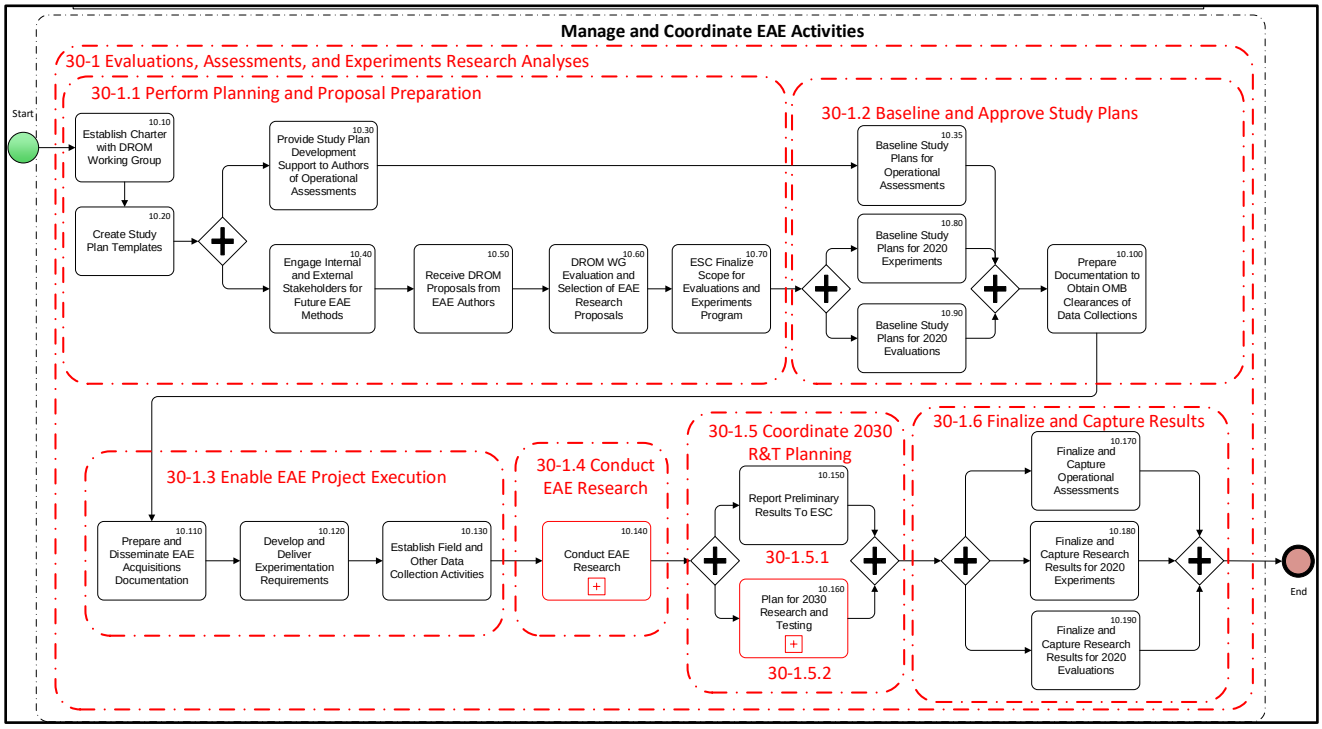

Figure 5: Evaluations, Assessments, and Experiments Research Analyses Constituent Activities

- Establish charter with DROM WG [10.10].
- Create Study Plan Templates [10.20].
- Engage Internal and External Stakeholders for Future EAE Methods [10.30].
- Receive Study Plans from Operations [10.40].
- Receive and Analyze EAE Study Assessments [10.45].

- DROM WG Evaluation and Selection of EAE Research Proposals [10.50].
- ESC Finalize Scope for Evaluations and Experiments Program [10.60].
- Baseline Study Plans for 2020 Experiments [10.80].
- Baseline Study Plans for 2020 Evaluations [10.90].
- Prepare Documentation to Obtain OMB Clearances of Data Collections [10.100].
- Prepare and Disseminate EAE Acquisitions Documentation [10.110].
- Develop and Deliver Experimentation Requirements. [10.120].
- Establish Field and Other Data Collection Activities [10.130].
- Conduct EAE Research [10.140].
- Report Preliminary Results to ESC [10.150].
- Plan for 2030 Research and Testing [10.160].
- Finalize and Capture Operational Assessments [10.165].
- Finalize and Capture Research Results for 2020 Experiments [10.170].
- Finalize and Capture Research Results for 2020 Evaluations [10.180].

Subsequent sections describe the "Evaluations, Assessments, and Experiments Research Analyses" operational subactivities in detail.

3.1.1 Perform Planning and Proposal Preparation [EAE 30-1.1]

A detailed view of the constituent activities that make up the "Perform Planning and Proposal Preparation" operational subactivity is given in Figure 6 below.

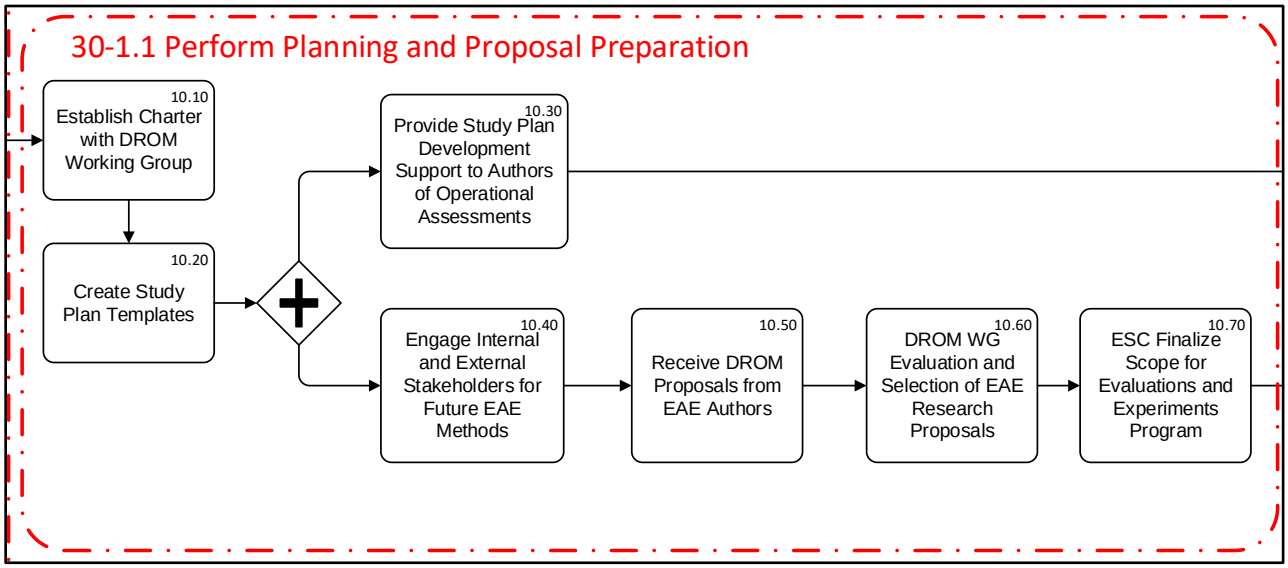

Figure 6: Perform Planning and Proposal Preparation

- Perform Planning and Proposal Preparation [301-1.1]
    - Establish charter with DROM WG [10.10].
    - Create Study Plan Templates [10.20].
    - Engage Internal and External Stakeholders for Future EAE Methods [10.30].
    - Receive Study Plans from Operations [10.40].
    - DROM WG Evaluation and selection of EAE Research Proposals [10.50].
    - ESC Finalize Scope for Evaluations and Experiments Program [10.60].

This subactivity illustrates a timeframe for formulating the 2020 CPEX and DROM's involvement in the review and vetting of research and testing (R&T) and operational assessment study plans and reports. The charter establishing the DROM WG was approved and released in the 2020 Census Internal Memorandum Series in the spring of 2016. The chiefs of the Decennial Census Management Division (DCMD) and the Decennial Statistical Studies Division are co-executive sponsors of the DROM WG, which has broad collaboration with the Research and Methodology Directorate and involvement by the Demographic Programs and Field Operations directorates. See section 2.3.1. for details on the formulation steps.

The EAE IPT created study plan and report templates, standard schedule activities, and workflows. Once approved by DROM, they were tools for authors.

As detailed in section 2.3.1, the Census Bureau engaged with external institutions, such as the JASON, to help guide formulation of the 2020 CPEX. DROM provided authors with guiding principles for deriving research proposals, which also served as a basis for DROM's evaluation of them. After review, vetting, and approval of the proposals, the DROM recommended specific 2020 Census evaluations and experiments to the Executive Steering Committee (ESC) in May 2018. The ESC approved and baselined the scope of the 2020 CPEX.

For development of operational assessment study plans, a subset of DROM members hold workshops with IPTs and authors to provide guidance. Members advise on appropriate operational background, the pertinent assessment questions, and the methods for addressing them. The workshops are held in advance of full DROM member review and voting on whether the study plan can proceed to 2020 Census memo clearance.

3.1.2 Baseline and Approve Study Plans [EAE 30-1.2]

A detailed view of the constituent activities that make up the "Baseline and Approve Study Plans" operational subactivity is given in Figure 7 below.

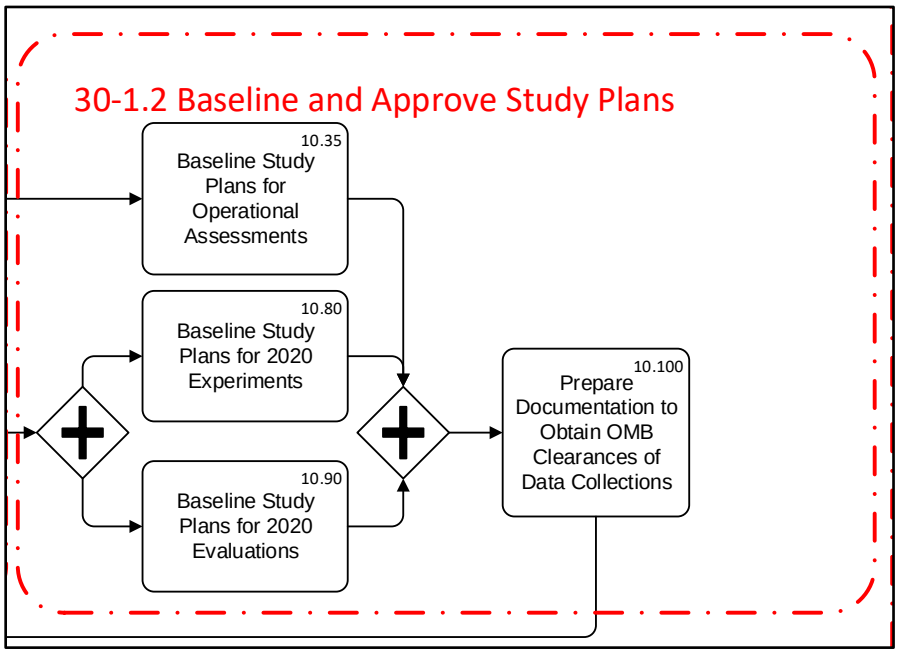

Figure 7: Baseline and Approve Study Plans

- Baseline and Approve Study Plans [30-1.2].
  - Baseline Study Plans for 2020 Experiments [10.80].
  - Baseline Study Plans for 2020 Evaluations [10.90].
  - Prepare Documentation to Obtain OMB Clearances of Data Collections [10.100].

Once the DROM WG approves evaluation, experiment, and operational assessment study plans, they undergo clearance steps for release in the 2020 Census Internal Memorandum Series. Once released, the study plans are baselined. For evaluations and experiments that have unique [to production] data collection activities, the OMB must approve and provide approval. Study plans provide the necessary information on sample sizes, stratification, methods, alternative content with public facing documents and instruments, and power analysis to prepare the evaluations and experiments OMB clearance requests.

3.1.3 Enable EAE Project Execution [EAE 30-1.3]

A detailed view of the constituent activities that make up the "Enable EAE Project Execution" operational subactivity is given in Figure 8 below.

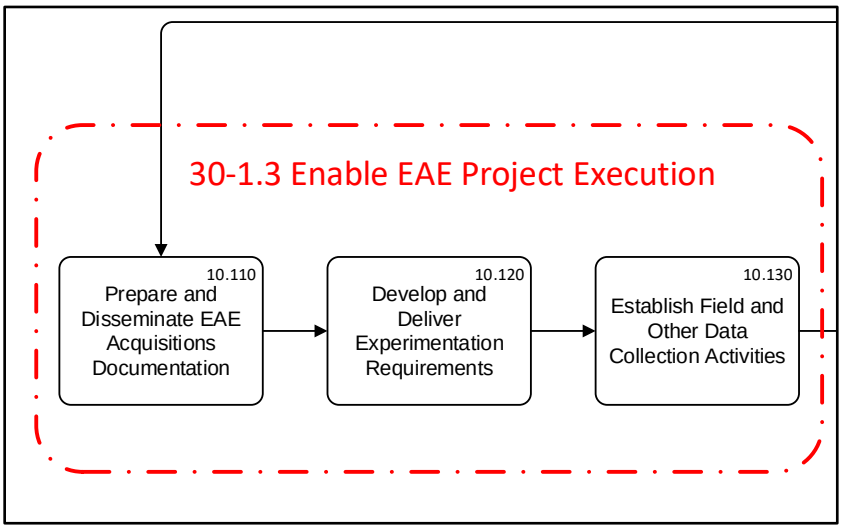

Figure 8: Enable EAE Project Execution

- Enable EAE Project Execution [30-1.3].
  - Prepare and Disseminate EAE Acquisitions Documentation [10.110].
  - Develop and Deliver Experimentation Requirements. [10.120].
  - Establish Field and Other Data Collection Activities [10.130].

  Contract vehicles support the conduct of evaluations and experiments, as well as for any qualitative and quantitative pretesting of instruments, content, and translations, and the purchase of administrative records and third-party data. Evaluations and experiments, in varying degrees, intervene with some 2020 Census operations and systems requiring the derivation of requirements and the acceptance by the solution providers. EAE interventions with field data-collection activities, including enumerator training, require coordination with the appropriate field operations (e.g., Address Canvassing or Nonresponse Followup). The EAE interfaces also require integration in the 2020 Census Integrated Master Schedule.

3.1.4 Conduct EAE Research [EAE 30-1.4]

The "Conduct EAE Research" subactivity is represented by a single process in Figure 5 above. A detailed view of the constituent activities that make up the operational subactivity is given in Figure 9 below.

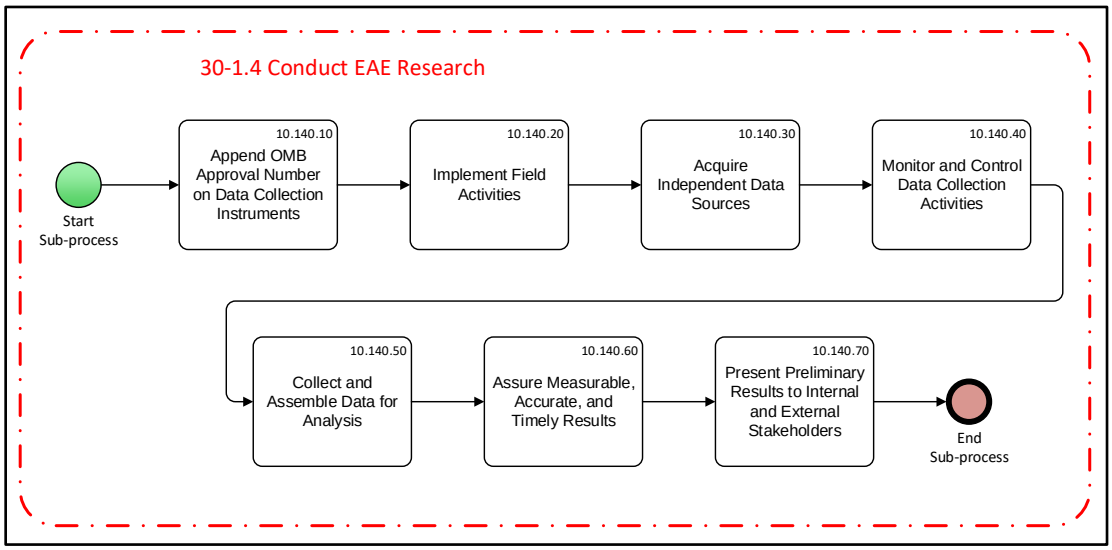

Figure 9: Conduct EAE Research

- Conduct EAE Research [10.140].
  - Append OMB Approved Numbers on Data Collection Instruments.
  - Implement Field Activities.
  - Acquire Independent Sources.
  - Monitor and Control Data Collection Activities.
  - Collect and Assemble Data for Analysis.
  - Assure Measurable, Accurate, and Timely Results.
  - Present Preliminary Results to Internal and External Stakeholders.

Before EAE unique data collections commences, the EAE Integrated Project Team (IPT) ensures the appropriate OMB clearance number accurately shows on unique public use forms and instruments. The 2020 CPEX authors work with operations and systems to implement activities and monitor data collection activities involving self-response and field operations. Authors establish the agreement necessary to obtain pertinent production data, paradata, and data unique to the evaluation or experiment. Authors, with DROM guidance, produce accurate and data-substantiated results. As requested, authors provide preliminary results to the ESC, advisory groups, and oversight bodies.

3.1.5 Coordinate 2030 R&T Planning [EAE 30-1.5]

The Coordinate 2030 Research &Testing (R&T) Planning activity area is subdivided into the following operational subactivities:

- Coordinate 2030 R&T Planning [EAE 30-1.5].

- Report Preliminary Results to ESC [30-1.5.1].
- Plan for 2030 Research and Testing [30-1.5.2].

A detailed view of the constituent activities that make up the "Coordinate 2030 R&T Planning" operational activity is given in Figure 10 below.

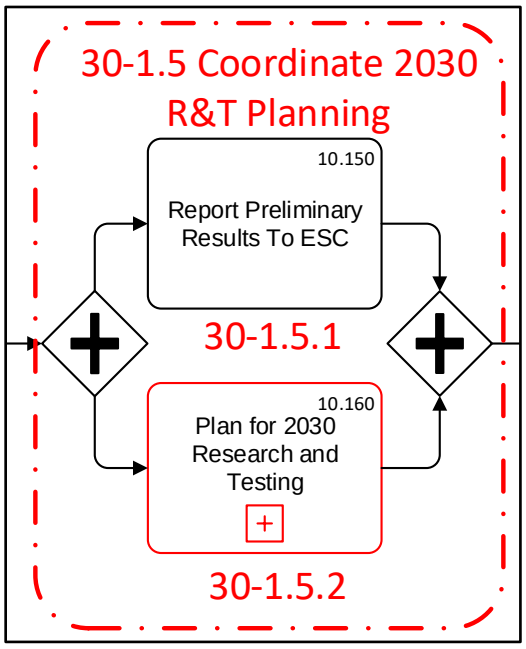

Figure 10: Coordinate 2030 R&T Planning

The results and lessons learned from the 2020 Experiments, Evaluations, and Operational Assessments will inform the planning process for 2030. Recommendations and lessons learned will be captured in the Census Knowledge Management Database. The 2020 CPEX results provide recommendations for both new, innovative methods and enhancements to existing methods. Those recommendations serve as critical inputs into middecade research and testing.

3.1.5.1 Subsequent sections describe the "Coordinate 2030 R&T Planning" operational subactivities in detail. Report Preliminary Results to ESC [30-1.5.1]

The "Report Preliminary Results to ESC" subactivity is represented by a single process in Figure 10 above.

If final results from evaluations, experiments, and operational assessments are unavailable in time for early middecade planning, preliminary results will be provided to ESC for 2030 planning purposes or on an as-requested basis. Preliminary results reflect

completion of analysis, but not the subsequent report development and vetting by the DROM WG.

3.1.5.2 Plan for 2030 Research and Testing [30-1.5.2]

The "Plan for 2030 Research and Testing" subactivity is represented by a single process in Figure 10 above. A detailed view of the constituent activities that make up this operational subactivity is given in Figure 11 below.

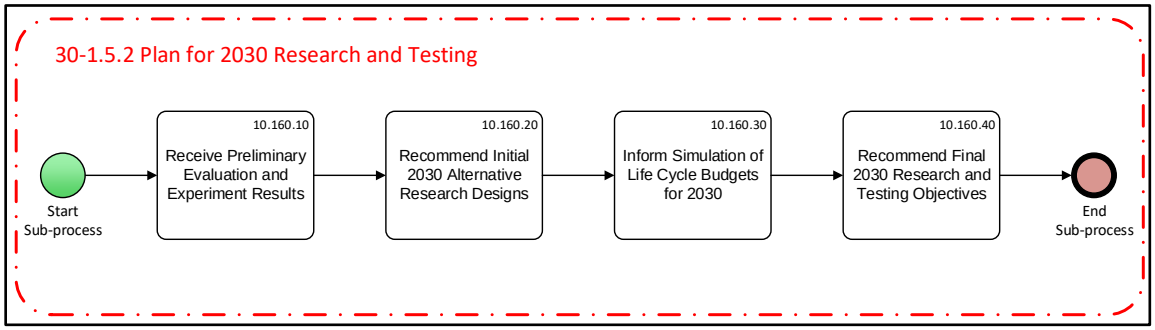

Figure 11: Plan for 2030 Research and Testing

- Plan for 2030 Research and Testing [30-1.5.2]
  - Receive Preliminary Evaluation and Experiment Results [10.160.30].
  - Recommend Initial 2030 Alternative Research Designs [10.160.10].
  - Inform Simulation of Life Cycle Budget for 2030 [10.160.20].
  - Recommend Final 2030 Research and Testing Objectives [10.160.40].

  Available final recommendations from evaluations, experiments, and operational assessments along with preliminary results will inform early 2030 alternative research designs. The DROM WG will recommend objectives for the final 2030 R&T design. As appropriate and if pertinent to the simulation of the life cycle budget, results will inform that planning.

3.1.6 Finalize and Capture Results [EAE 30-1.6]

A detailed view of the constituent activities that make up the "Finalize and Capture Results" operational subactivity is given in Figure 12 below.

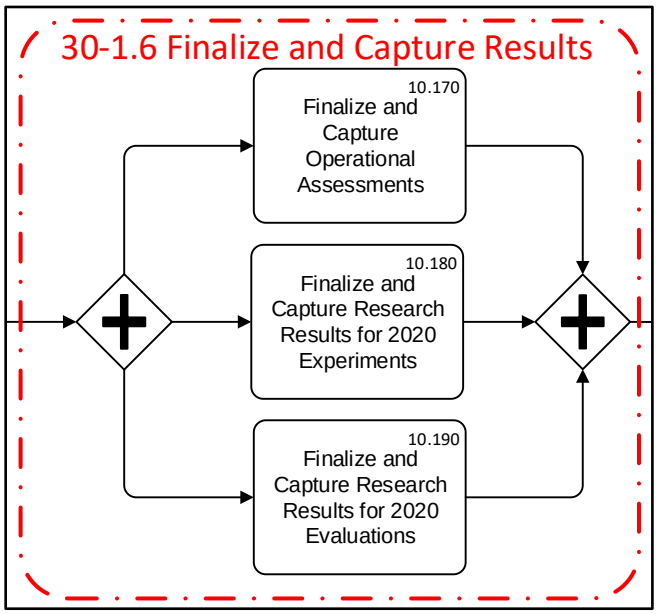

Figure 12: Finalize and Capture Results

- Finalize and Capture Results [30-1.6].
  - Finalize and Capture Operational Assessments [10.165].
  - Finalize and Capture Research Results for 2020 Experiments [10.170].
  - Finalize and Capture Research results for 2020 Evaluations [10.180].

Once the DROM WG approves evaluation, experiment, and operational assessment reports, they undergo clearance steps for release in the 2020 Census Internal Memorandum Series. Recommendations in the final reports are captured in the Census Knowledge Management database and assigned to program managers, who derive action plans on how the recommendations will be addressed in early 2030 R&T efforts. Upon requests from external stakeholders or interested parties the Census Bureau for reports included in the CPEX program, they will need to first be cleared through the disclosure review process for public release.

3.2 Demographic Analysis (DA) [EAE 30-2]

Figure 13 shows the BPM for the Demographic Analysis (DA) [EAE 30-2] activity area (area within the gray rounded rectangle) within the overall context of the EAE operation.

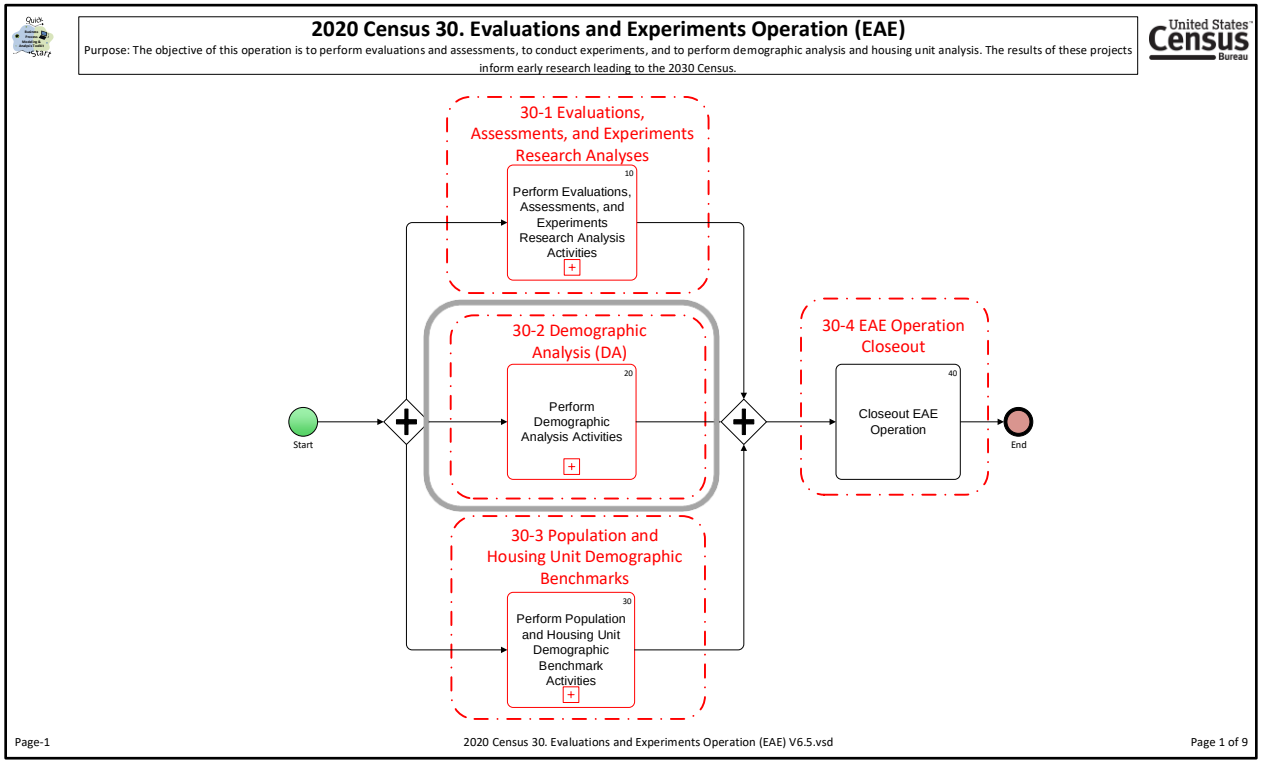

Figure 13: Demographic Analysis (DA) [EAE 30-2] Activity

The Demographic Analysis activity area is subdivided into the following operational subactivities:

- Demographic Analysis (DA) [EAE 30-2].
  - Obtain Data Sources for DA [30-2.1].
  - Define and Test DA Methodology [30-2.2].
  - Create DA Estimates [30-2.3].
  - Make DA Results Available to the Public [30-2.4].
  - Conduct Post Decennial Release Analysis [30-2.5].

The DA estimates are developed using historical vital statistics, estimates of international migration, and other data sources that are essentially independent of the census being

evaluated. The 2020 DA estimates will include data from 1935 to 2020. The historical files are kept and maintained by the Population Estimates Program (PEP). PEP also has arrangements with other federal agencies to get current data that are used to produce the annual population estimates and will be used for the 2020 DA. The Center for Economic Studies receives data from National Center of Health Statistics, the Social Security Administration, and the Office of Immigration Statistics, which are then delivered to the POP. The DA methodology starts with births, deaths, and net migration. The results will be released at a press conference and technical workshop in December 2020, several weeks before the 2020 Census counts are to be released. The estimates of net coverage error will be developed and released after the 2020 Census counts are released during the post-decennial analysis phase of the 2020 DA.

A detailed view of the constituent activities that make up the Demographic Analysis operational activity is given in Figure 14 below.

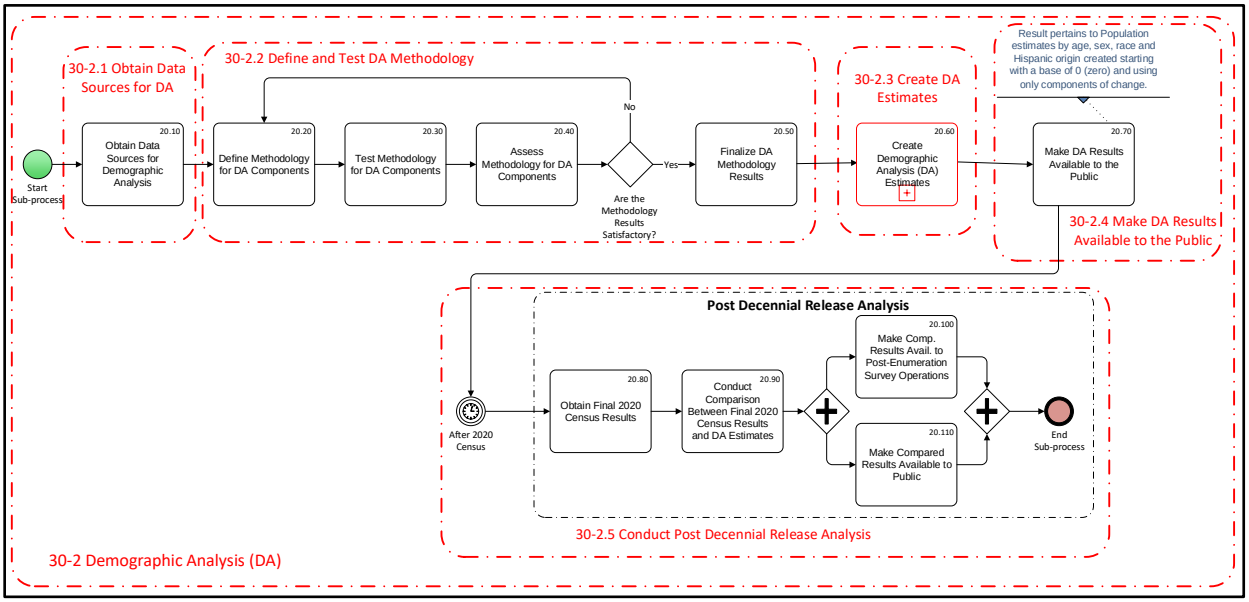

Figure 14: Demographic Analysis Constituent Activities

- Obtain Data Sources for Demographic Analysis [20.10].
- Define Methodology for DA Components [20.20].
- Test Methodology for DA Components [20.30].
- Assess Methodology for DA Components [20.40].
- Finalize DA Methodology Results [20.50].
- Create DA Estimates [20.60].

There are a variety of external sources that DA will use mentioned above. There are several major components to DA including: births, deaths, and net migration. Much of the methodology developed for DA focuses on how to assign race and Hispanic origin to the birth data. Uncertainty in the DA estimates of net coverage error can come from many different sources of error. In the past, the DA program has approached measuring uncertainty in the estimates in various ways. For example, the 1980 DA used different assumptions about the undercount of the undocumented immigrant population in the 1980 Census to develop a range of estimates, since international migration is the largest source of uncertainty in the DA estimates. The 1990 DA used high and low probability multipliers for each component to create an upper and lower bound for the estimates. For the 2020 DA estimates, POP will use a range of estimates—Low, Middle, High—to show uncertainty in the estimates. The range will be produced by varying the assumptions used to develop the inputs on births, deaths, international migration, and estimates of the oldest age population. After methodology results are finalized, DA Estimates will be created.

- Make DA Results Available to the Public [20.70].
- Obtain Final 2020 Census Results [20.80].
- Conduct Comparison Between Final 2020 Census Results and DA Estimates [20.90].
- Make Component Results Available to Post-Enumeration Survey Operation [20.100].
- Make Compared Results Available to Public [20.110].

The DA program will use the 2020 Census counts to estimate net coverage error; therefore, the CEF will be provided once it is available. The DA program will compare the estimates to the census counts and analyze the results. The estimates of net coverage error will be made available to the public in 2021. In addition, the DA program will also deliver estimates to the Post-Enumeration Survey 0perations, which are used as input into their estimation process.

Subsequent sections describe the Demographic Analysis operational subactivities in detail.

3.2.1 Obtain Data Sources for DA [EAE 30-2.1]

The “Obtain Data Sources for DA” subactivity is represented by a single process in Figure 14 above.

- Obtain Data Sources for Demographic Analysis [20.10].

In 2017, the Census Bureau initiated the process to acquire data sources for DA. This is a similar process to that which has been used in the past censuses. Data sources include information on births, deaths, international migration, aging, and race and Hispanic origin.

3.2.2 Define and Test DA Methodology [EAE 30-2.2]

A detailed view of the constituent activities that make up the "Define and Test DA Methodology" operational subactivity is given in Figure 15 below.

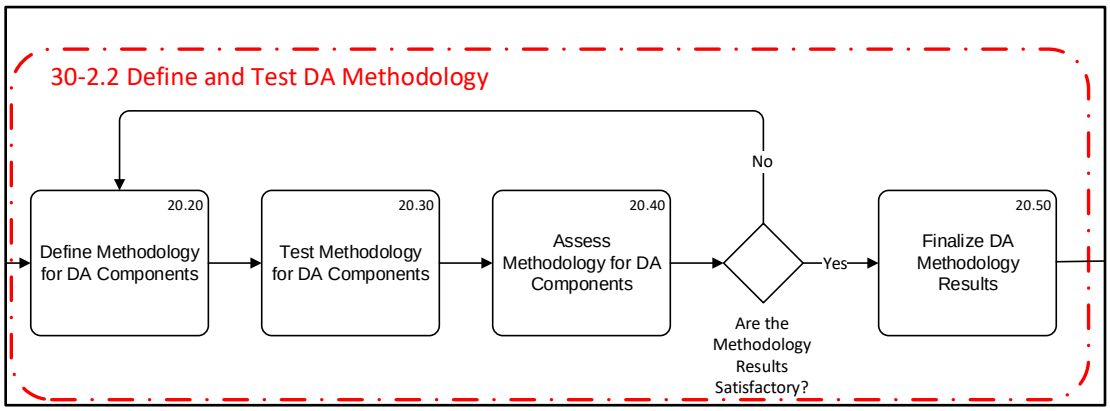

Figure 15: Define and Test DA Methodology

- Define Methodology for DA Components [20.020].
- Test Methodology for DA Components [20.30].
- Assess Methodology for DA Components [20.40].

  Are the Methodology Results Satisfactory: There are several methods that the 2020 DA program will use to evaluate if a methodology result is satisfactory. First, the 2020 DA program will look at how the method impacts the demographic characteristics of the specific component. The DA program will compare characteristics of the component using the old method and new method. Next, the DA program will use the professional judgement of Census Bureau staff and DA external partners to decide if the new method is an improvement.

- Finalize DA Methodology Results [20.50].

Once the methodology for a component has been finalized, POP will write a description of the new methodology for the 2020 DA Methodology document and develop the necessary code to incorporate the new method into their existing production process.

3.2.3 Create DA Estimates [EAE 30-2.3]

The "Create DA Estimates" subactivity is represented by a single process in Figure 14 above. A detailed view of the constituent activities that make up this operational subactivity is given in Figure 16 below.

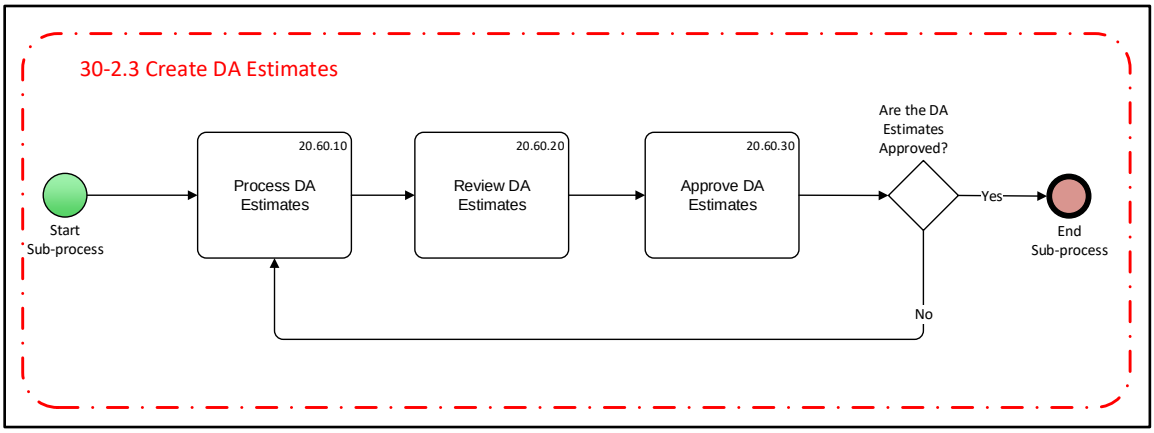

Figure 16: Create DA Estimates

- Process DA Estimates [20.60.10].
- Review DA Estimates [20.60.20].
- Approve DA Estimates [20.60.30].

The 2020 DA program has a team of analysts that will review the data. The analysts will use distributions in demographic characteristics from census, population estimates, and survey data to determine if the DA Estimates are demographically reasonable. The analysts will also analyze the internal consistency of the DA Estimates. This analysis will focus primarily on sex ratios and age cohorts.

3.2.4 Make DA Results Available to the Public [EAE 30-2.4]

The "Make DA Results Available to the Public" subactivity is represented by a single process in Figure 14 above.

- Make Compared Results Available to Public [20.110].

DA results produces national-level population estimates that are used to measure net coverage error in the census. In addition, the sex ratios from the DA estimates are used as inputs for the Census Coverage Measurement (CCM) program. Both the DA and CCM programs are independent of the 2020 Census operations. The results will be made public in 2021.

3.2.5 Conduct Post Decennial Release Analysis [EAE 30-2.5]

A detailed view of the constituent activities that make up the "Conduct Post Decennial Release Analysis" operational subactivity is given in Figure 17 below.

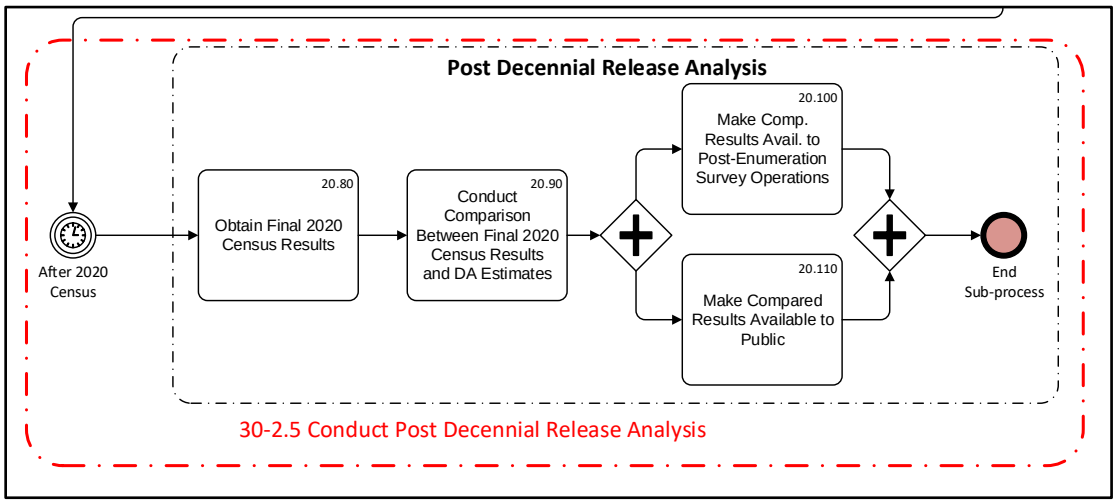

Figure 17: Conduct Post Decennial Release Analysis

- Obtain Final 2020 Census Results [20.80].
- Conduct Comparison Between Final 2020 Census Results and DA Estimates [20.90].
- Make Components Results Available to Post-Enumeration Survey Operations [20.100].
- Make Compared Results Available to Public [20.110].

The DA program will receive the 2020 CEF from the Census Activities and Tabulation Staff (CATS) in the POP. Next, the DA program will produce estimates of net coverage error by comparing the results of the 2020 Census to the DA estimates. The estimates of coverage error will be produced by age, sex, race, and Hispanic origin. The DA program will prepare a report with the estimated net coverage error rates that will be released to the public in 2021.

In addition, the DA program will deliver the estimates of the population on April 1, 2020 to the PES. PES will use the DA estimates as inputs into their estimation process. Specifically, the DA estimates are used to adjust for correlation bias between the post-enumeration survey and the 2020 Census.

3.3 Population and Housing Unit Demographic Benchmarks [EAE 30-3]

Figure 18 shows the BPM for the Population and Housing Unit Demographic Benchmarks [EAE 30-3] activity area (area within the gray rounded rectangle) within the overall context of the EAE operation.

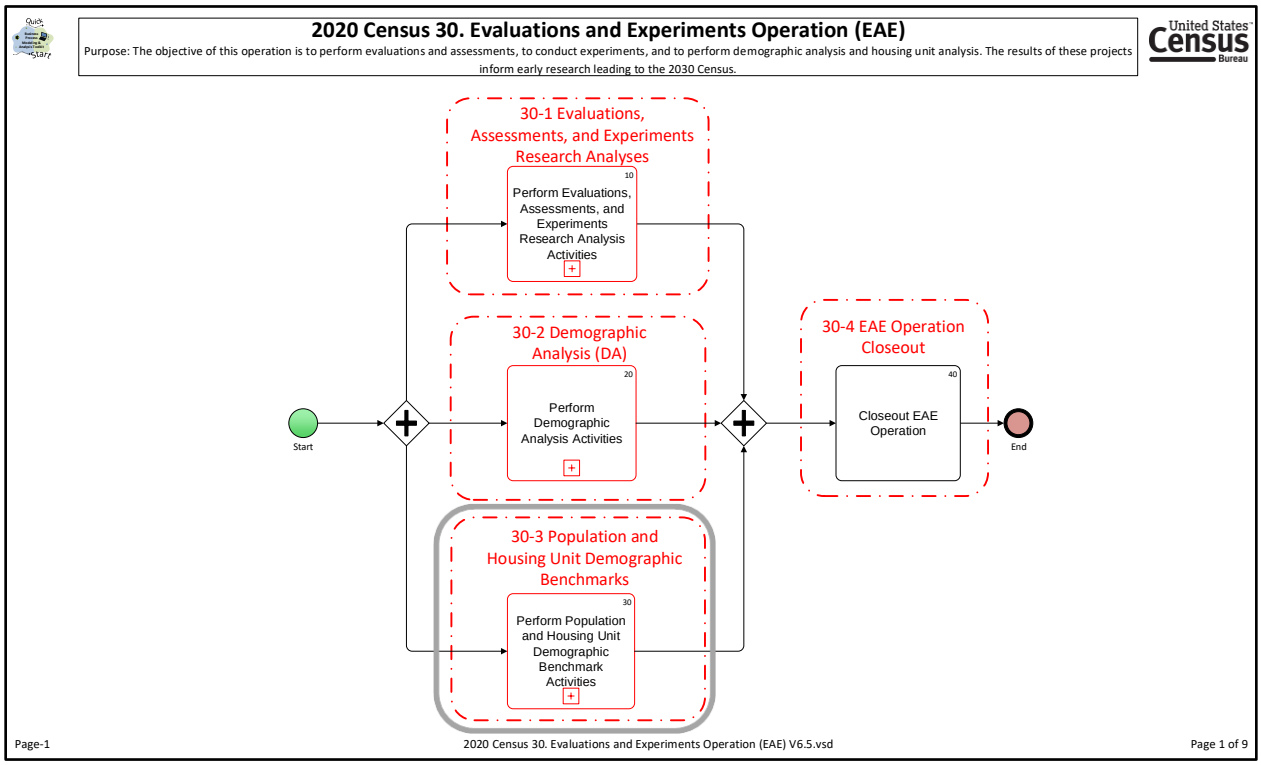

Figure 18: Population and Housing Unit Demographic Benchmarks [EAE 30-3] Activity

The Population and Housing Unit Demographic Benchmarks activity area is subdivided into the following operational subactivities:

- Population and Housing Unit Demographic Benchmarks [EAE 30-3].
  - Receive Data Request from 2020 Census Staff [EAE 30-3.1].
  - Establish Demographic Benchmark Processing Capability [EAE 30-3.2].
  - Create Population and Housing Unit Demographic Benchmark Estimates [EAE 30-3.3].

A detailed view of the constituent activities that make up the "Population and Housing Unit Demographic Benchmarks" operational activity is given in Figure 19 below.

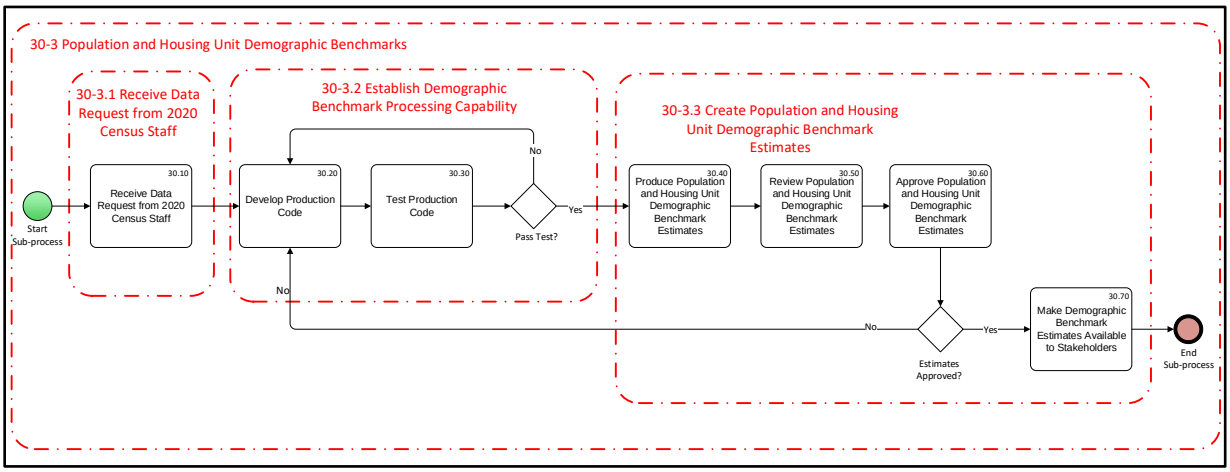

Figure 19: Population and Housing Unit Demographic Benchmarks Constituent Activities

- Receive Data Request from 2020 Census Staff [30.10].
- Develop Production Code [30.20].
- Test Production Code [30.30].
- Produce Population and Housing Unit Demographic Benchmark Estimates [30.40].
- Review Population and Housing Unit Demographic Benchmark Estimates [30.50].
- Approve Population and Housing Unit Demographic Benchmark Estimates [30.60].
- Make Demographic Benchmarks Available to Stakeholders [30.70].

The PEP produces annual estimates of population and housing units for the country, states, counties and sub-county areas. The estimates are based on the most recent census and measure change in the population or housing units using a components of change method. The main inputs for population estimates are births, deaths, and migration. The main inputs for housing units are new construction, conversions (from nonresidential to residential and vice versa), and demolitions. PEP maintains strict procedures for developing production code and testing that code prior to implementing it into production.

After the estimates are produced, there is an extensive process for reviewing the housing unit and population estimates. This process involves looking at the 1) internal consistency of the data, 2) comparing the data to prior years' estimates, and 3) receiving input from state partners. The results of the review are presented to management in the POP who determine if the estimates are approved. PEP releases data to the public at different times during the year.

For the Demographic Benchmark Analysis operation, 2020 Census staff will be able to request estimates of population and housing units to be used by their operation. Staff in PEP will fill

these requests using the master files for the official population and housing unit estimates. The master files contain the final data that have been produced, reviewed, and cleared for dissemination.

Subsequent sections describe the "Population and Housing Unit Demographic Benchmarks" operational subactivities in detail.

3.3.1 Receive Data Request from 2020 Census Staff [EAE 30-3.1]

The "Receive Data Request from 2020 Census Staff" subactivity is represented by a single process in Figure 19 above.

- Receive Data Request from 2020 Census Staff [30.10].

PEP will receive data requests from 2020 Census staff through the process already used by the External Data Request (EDR) team. The EDR team is a group within PEP that works with stakeholders who request special tabulations of estimates of population and housing units. The EDR team has a form that the requesting area will fill out. The forms asks for information about the specific data requested, level of geography, population universe (resident pop, household pop, GQ pop), and demographic detail. The EDR team works with management in the Population Division to determine if the request can be fulfilled in the given timeframe.

3.3.2 Establish Demographic Benchmark Processing Capability [EAE 30-3.2]

A detailed view of the constituent activities that make up the "Establish Demographic Benchmark Processing Capability" operational subactivity is given in Figure 20 below.

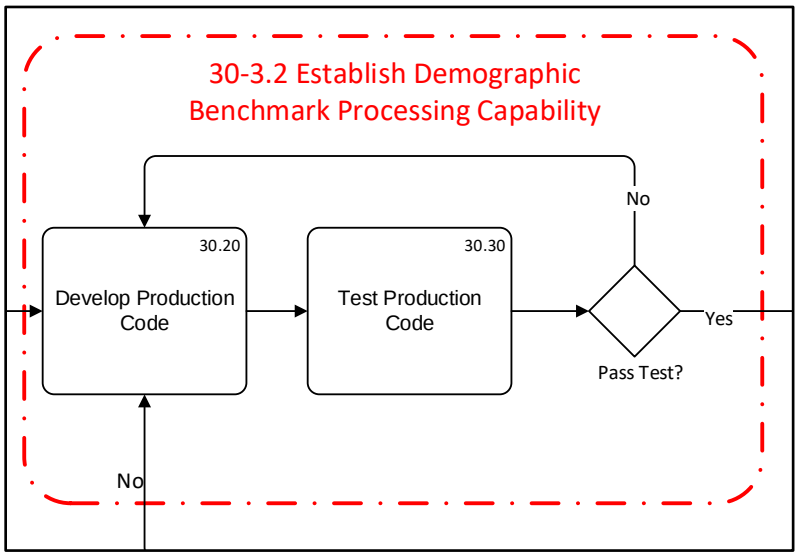

Figure 20: Establish Demographic Benchmark Processing Capability

- Develop Production Code [30.20].
- Test Production Code [30.30].

  Pass Test: The Population Estimates Program has a defined process for producing, reviewing, and releasing annual estimates of housing and population.

The production code that PEP uses to produce the official estimates is under change control and cannot be altered without approval from the PEP Change Control Board (CCB). The CCB is made up of managers and senior analysts in the Estimates and Projections Area of the POP. Once the CCB has given approval to make improvements to the method, new code is developed and tested. A review of the new output is conducted to determine if the method change had the desired effect. This review involves time series analysis and comparisons to estimates developed using the prior method. The CCB gives final approval on whether the new method is used to produce the population estimates.

3.3.3 Create Population and Housing Unit Demographic Benchmark Estimates [EAE 30-3.3]

A detailed view of the constituent activities that make up the "Create Population and Housing Unit Demographic Benchmark Estimates" operational subactivity is given in Figure 21 below.

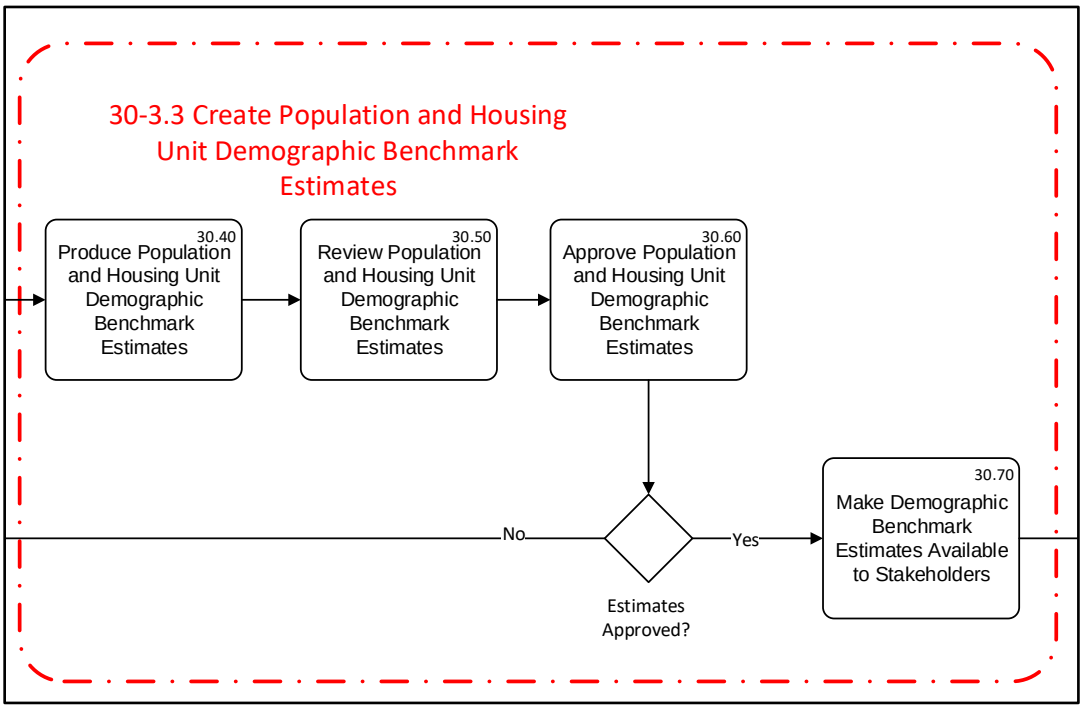

Figure 21: Create Population and Housing Unit Demographic Benchmark Estimates

- Produce Population and Housing Unit Demographic Benchmark Estimates [30.40].
- Review Population and Housing Unit Demographic Benchmark Estimates [30.50].
- Approve Population and Housing Unit Demographic Benchmark Estimates [30.60].
- Make Demographic Benchmark Estimates Available to Stakeholders [30.70].

The EDR team within PEP fulfills requests from stakeholders for population and housing unit estimates. This team receives and processes the request, extracts the data from existing master files, reviews the data extract, and delivers it to the stakeholder. The EDR team fulfills requests from stakeholders both within and outside the Census Bureau (e.g. other federal agencies, state and local governments, universities).

3.4 EAE Operation Closeout [EAE 30-4]

Figure 22 shows the BPM for the EAE Operation Closeout [EAE 30-4] activity area (area within the gray rounded rectangle) within the overall context of the EAE operation.

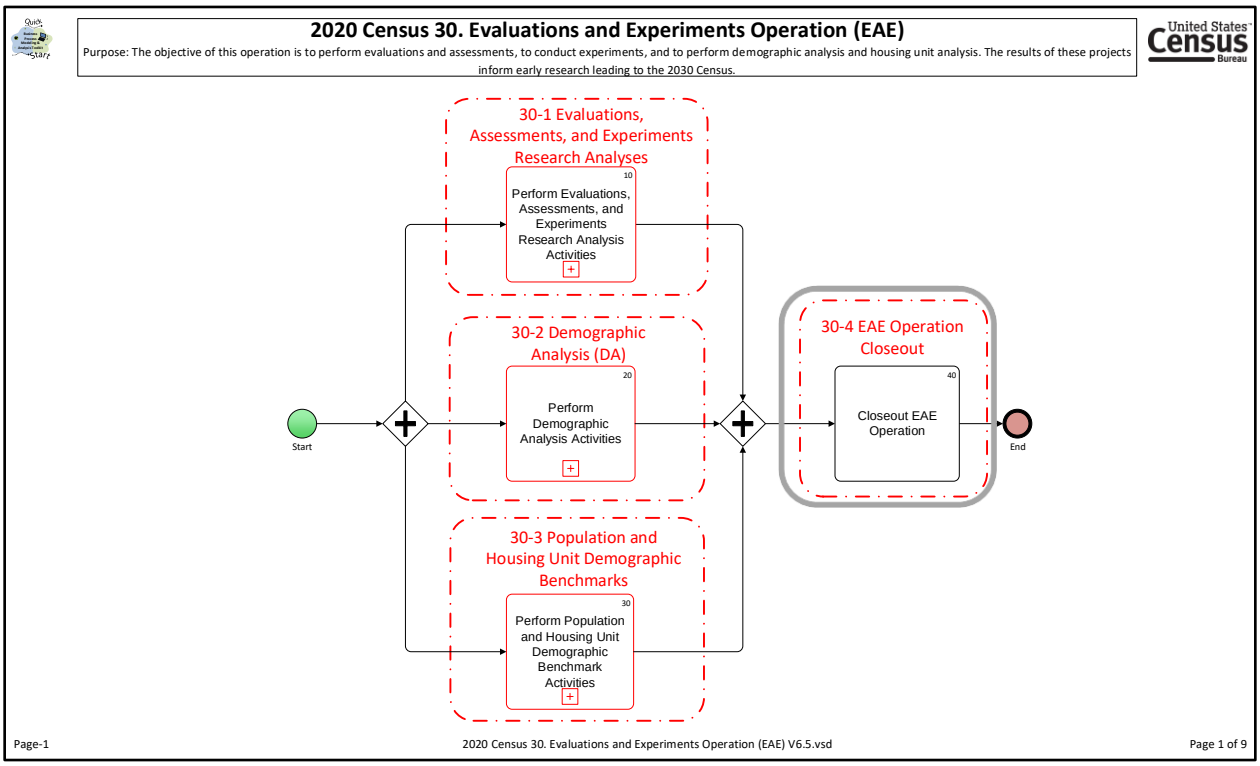

Figure 22: EAE Operation Closeout [EAE 30-4] Activity

The "EAE Operation Closeout" subactivity is represented by a single process in Figure 22 above. Closeout activities include:

- The release of all final study plans and reports in the 2020 Census Memo Series and the delivery to the Archiving operation.
- The capture of final report recommendations in the Census Knowledge Management database.
- The delivery of recommendations for designs of 2030 Census life cycle research and testing plans.
- The public release of Demographic Analysis estimates.
- The delivery of Demographic Analysis sex ratio data to the Post-Enumeration Survey operations.
- The delivery of demographic population and housing benchmarks in support of the 2020 Census.

4. Cost Factors

The investment in EAE is projected to have minimal influence on the 2020 Census overall costs and quality. While the EAE operation is not a major cost driver for the 2020 Census, the following mechanisms from the IDEF0 Context Diagram represent the resources used to support this operation and comprise part of the 2020 Census cost elements:

Staff

- Headquarters (HQ) Staff.
- National Processing Center (NPC) Staff.
- Field Staff.

Sites

- Headquarters (HQ).
- National Processing Center (NPC).
- Field.

Systems

- Master Address File/Topologically Integrated Geographic Encoding and Referencing (MAF/TIGER).
- Census Data Lake (CDL).
- EAE Support System.
- NPC Printing.
- Intelligent Mail barcode (IMb®) Postal Tracking System (IPTS).

Other

- HQ Office Information Technology (IT) Infrastructure.
- Census Networks.

5. Measures of Success

For the 2020 Census operations, the corresponding Measures of Success will be documented in the operational assessment study plans and final reports. The operational assessment study plan documents the criteria that will be used to define successful completion of the operation. The operational assessment report will provide results on whether the criteria were met.

In general, operational assessments report on planned to actual variances in budget, schedules, and production and training workloads. The corresponding Measures of Success (as documented in the operational assessment study plan) include variances that exceed established thresholds. See *Preparing for the 2020 Census Operational Assessment Study Plan* for the potential scope of assessment.

Types of success measures include:

- **Process Measures** that indicate how well the process works, typically including measures related to completion dates, rates, and productivity rates.
- **Cost Measures** that drive the cost of the operation and comparisons of actual costs to planned budgets. Costs can include workload as well as different types of resource costs.
- **Measures of the Quality** of the results of the operation, typically including things such as rework rates, error rates, and coverage rates.

See the corresponding operational assessment study plan and report for the Evaluations and Experiments (EAE) for details on the measures of success.

Appendix A – Acronyms and Terminology

Table 9 lists the acronyms and abbreviations used within this detailed operational plan document. Table 10 lists a Glossary of Terms used within this detailed operational plan document.

Table 9: Acronyms and Abbreviations List

Acronym	Meaning
ACO	Area Census Office
AdRec	Administrative Record
ARC	Archiving operation
BCU	Basic Collection Unit
BPM	Business Process Model
BPMN	Business Process Modeling and Notation
CaRDS	Control and Response Data System
CATS	Census Activities and Tabulation Staff
CCB	Change Control Board
CCM	Census Coverage Measurement
CDL	Census Data Lake
CEF	Census Edited File
CFD	Content and Forms Design operation
CI	Coverage Improvement
CPEX	Census Program for Evaluations and Experiments
CQA	Census Questionnaire Assistance operation
CRO	Count Review Operation

Acronym	Meaning
CUF	Census Unedited File
DA	Demographic Analysis
DCMD	Decennial Census Management Division
DITD	Decennial Information Technology Division
DLM	Decennial Logistics Management operation
DMDC	Defense Manpower Data Center
DPD	Data Products and Dissemination operation
DRF	Decennial Response File
DROM	Decennial Research Objectives and Methods [WG]
EAE	Evaluations and Experiments operation
EDR	External Data Request
ESC	Executive Steering Committee
ETL	Enumeration at Transitory Locations operation
FPD	Forms Printing and Distribution operation
GDP	Geographic Data Processing
GEOP	Geographic Programs operation
GQ	Group Quarters; Group Quarters operation
GQAC	Group Quarters Advance Contact
HQ	Headquarters
HU	Housing Unit
IA	Island Areas

Acronym	Meaning
IA-CUF	Island Area Census Unedited File
IA-MDF	Island Area Census Master Delivery File
ID	Identifier
IDEF0	Integrated Definition Level 0
IE	Information Exchange
IMb	Intelligent Mail barcode®
IOD	Integrated Operations Diagram
IPT	Integrated Project Team
IPTS	Intelligent Mail barcode® Postal Tracking System
IRS	Internal Revenue Service
ISR	Internet Self-Response operation
IT	Information Technology
LMS	Learning Management System
LUCA	Local Update of Census Addresses operation
MAF/TIGER	Master Address File /Topologically Integrated Geographic Encoding and Referencing
MDF	Microdata Detail File
NARA	National Archives and Records Administration
NCHS	National Center for Health Statistics
NID	Non-ID Processing operation
Non-ID	Non-Identifier
NPC	National Processing Center

Acronym	Meaning
NRFU	Nonresponse Followup operation
OMB	Office of Management and Budget
PDC	Paper Data Capture operation
PEP	Population Estimates Program
PES	Post-Enumeration Survey; Post-Enumeration Survey operations
PM	Program Management operation
POP	Population Division
PR	Puerto Rico
PRA	Paperwork Reduction Act
QC	Quality Control
R&T	research and testing
RI	reinterview
RPO	Response Processing Operation
SEI	Systems Engineering and Integration operation
SPC	Security, Privacy, and Confidentiality operation
SOCS	Survey Operational Control System
SR	Self-Response
SSA	Social Security Administration
TEA	Type of Enumeration Area
TXE	Testing, Experimentation, and Evaluation
UAA	Undeliverable as Addressed

Acronym	Meaning
UE	Update Enumerate operation
UL	Update Leave operation
USPS	United States Postal Service
WG	Working Group

Table 10: Glossary of Terms

Term	Meaning
Evaluations	Evaluations analyze, interpret, and synthesize the effectiveness and efficiencies of census components and their impact on data quality and coverage using data collected from census operations, processes, systems, and auxiliary data collections.
Experiments	Experiments provide quantitative or qualitative results for tests that occur during a decennial census. Since they occur in an environment of optimal census awareness, results simulate more closely to what experimental treatments would yield in a full production application. Experiments inform planning of future decennial censuses, so 2020 Census experiments will focus on planning toward a 2030 Census.
Operational Assessments	Operational assessments document final volumes, rates, and costs for individual operations or processes using data from production files and activities and information collected from debriefings and lessons learned. They do not include analysis. Operational assessments report out on planned versus actual variances as it relates to budget, schedule, and workloads (production and training). Depending on the operation, they may include frequency distributions and standard demographic or address tables.
Research and Testing (R&T) Studies	Evaluative or experimental studies that explore alternative census design concepts to inform the culminating 2020 Census design. Studies were produced from annual census tests starting in 2012.

Appendix B – References

Appendix B lists the documents or other resources used during the development of this detailed operational plan document.

U.S. Census Bureau, "*2020 Census Operational Plan*," Version 4.0, February 1, 2019.

U.S. Census Bureau, "*2020 Census Decennial Research Objectives and Methods (DROM) Working Group,"* Version 1.5, May 5, 2017 (internal charter document)

Internal Working Draft Templates and Guidelines:

U.S. Census Bureau, Preparing for the 2020 Census Operational Assessments Study Plan

U.S. Census Bureau, 2020 Census Study Plan Template Eval. Exp. or R and T Study (internal document)

U.S Census Bureau, 2020 Research Results Template_EXTERNAL (internal document)

U.S. Census Bureau, 2020 Research Results Template_INTERNAL (internal document)

U.S. Census Bureau, 2020 Census Operational Assessment Study Plan Template (internal document)

Internal Working Draft Workflows:

U.S. Census Bureau, Governance Workflows for Operational Assessments To-Be_with Pre-Report (internal document)

U.S. Census Bureau, Governance Workflows for Evaluations and Experiments To-Be_with Pre-Report (internal document)

Appendix C – Activity Tree for Evaluations and Experiments (EAE)

This appendix presents the Activity Tree for the Evaluations and Experiments operation (EAE). An Activity Tree uses an outline structure to reflect the decomposition of the major operational activities in the operation. Each activity is numbered according to its position in the outline. For example, for the current operation numbered "30," the first activity would be numbered 30-1. Subactivities under this activity would be numbered sequentially, starting again with the number one. For example, the first subactivity under the first activity would be numbered 30-1.1 the second subactivity as 30-1.2. The second activity would be numbered 30-2, and so on.

EAE Activity Tree:

- 30-1 Evaluations, Assessments, and Experiments Research Analyses
    - 30-1.1 Perform Planning and Proposal Preparation
    - 30-1.2 Baseline and Approve Study Plans
    - 30-1.3 Enable EAE Project Execution
    - 30-1.4 Conduct EAE Research
    - 30-1.5 Coordinate 2030 R&T Planning
        - 30-1.5.1 Report Preliminary Results to ESC
        - 30-1.5.2 Plan for 2030 Research and Testing
    - 30-1.6 Finalize and Capture Results
- 30-2 Demographic Analysis (DA)
    - 30-2.1 Obtain Data Sources for DA
    - 30-2.2 Define and Test DA Methodology
    - 30-2.3 Create DA Estimates
    - 30-2.4 Make DA Results Available to the Public
    - 30-2.5 Conduct Post Decennial Release Analysis
- 30-3 Population and Housing Unit Demographic Benchmarks
    - 30-3.1 Receive Data Request from 2020 Census Staff
    - 30-3.2 Establish Demographic Benchmark Processing Capability
    - 30-3.3 Create Population and Housing Unit Demographic Benchmark Estimates
- 30-4 EAE Operation Closeout