Revised 19 Apr 2023

U.S. Census Bureau
Statistical Quality Standards

The leading source of quality data about the nation's people and economy

U.S. CENSUS BUREAU

APPROVAL FOR STATISTICAL QUALITY STANDARDS

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Revision Log

21 Feb 2023

1. Approvals - Updated to reflect current staff.
2. A2-3.1.1 - Removed sub-requirement #3 about using bold font for outdoor viewing on mobile surveys and updated the reference citation to stay consistent with the final publication.
3. E3-1 - Separated labeling requirements. Kept DMS requirements in E3-1.1 and moved DRB requirements into E3-1.2.
4. F1-8 - Removed “that might be serious” for identifying suspected quality issues to avoid confusion in reporting and underscore the note that the Associate Director will determine if it is serious enough to bring to the Deputy Director.
5. App F1 – Clarified instructions. Defect ID represents a unique Information Product.

19 Apr 2023

1. Consolidated E3-1.1 and E3-1.2 into a single E3-1 requirement and added recommended citations to use when referencing the DMS and DRB numbers.

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Preface

1. Introduction

Purpose

This document specifies the statistical quality standards for the U.S. Census Bureau. As the largest statistical agency of the federal government, the Census Bureau strives to serve as the leading source of quality data about the nation's people and economy. The Census Bureau has developed these standards to promote quality in its information products and the processes that generate them. These standards provide a means to ensure consistency in the processes of all the Census Bureau's program areas, from planning through dissemination. By following these standards, the Census Bureau's employees and contractors will ensure the utility, objectivity, and integrity of the statistical information provided by the Census Bureau to Congress, to federal policy makers, to sponsors, and to the public.

Background

In 2002, the United States Office of Management and Budget (OMB) issued Information Quality Guidelines[1] directing all federal agencies to develop their own information quality guidelines. In October 2002, the Census Bureau issued its information quality guidelines.[2] These guidelines established a standard of quality for the Census Bureau and incorporated the information quality guidelines of the OMB and the Department of Commerce, the Census Bureau's parent agency.

Following the OMB's information quality guidelines, the Census Bureau defines information quality as an encompassing term comprising utility, objectivity, and integrity. Our definition of information quality is the foundation for these standards.

Utility refers to the usefulness of the information for its intended users. We assess the usefulness of our information products from the perspective of policy makers, subject matter users, researchers, and the public. We achieve utility by continual assessment of customers' information needs, anticipation of emerging requirements, and development of new products and services.

- The statistical quality standards related to utility include: Planning a Data Program (A1), Developing Data Collection Instruments and Supporting Materials (A2), Developing and Implementing a Sample Design (A3), Acquiring and Using Administrative Data (B2), Reviewing Information Products (E3), Releasing Information Products (F1), and Documentation to Support Transparency in Information Products (F2).

  Objectivity focuses on whether information is accurate, reliable, and unbiased, and is presented in an accurate, clear, complete, and unbiased manner. Objectivity involves both the content of the information and the presentation of the information. It requires complete, accurate, and easily understood documentation of the sources of the information, with a description of the sources of errors that may affect the quality of the data, when appropriate.

- The statistical quality standards related to objectivity include: Developing Data Collection Instruments and Supporting Materials (A2), Developing and Implementing a Sample Design (A3), Establishing and Implementing Data Collection Methods (B1), Acquiring and Using Administrative Data (B2), Capturing Data (C1), Editing and Imputing Data (C2), Coding Data (C3), Linking Data from Multiple Sources (C4), Producing Direct Estimates from Samples (D1), Producing Estimates from Models (D2), Producing Measures and Indicators of Nonsampling Error (D3), Analyzing Data (E1), Reporting Results (E2), Reviewing Information Products (E3), Releasing Information Products (F1), Documentation to Support Transparency in Information Products (F2), Addressing Information Quality Complaints (F3), and Managing Data and Documents (S2).

  Integrity refers to the security of information – protection of the information from unauthorized access or revision, to ensure that the information is not compromised through corruption or falsification. Several federal statutes and Census Bureau policies govern the protection of information, most notably Title 13 and Title 26.

- Protecting Confidentiality (S1) directly addresses issues concerning the integrity of the data. All the statistical quality standards contain requirements for protecting information from unauthorized access or release.

In September 2006, the OMB issued *Standards and Guidelines for Statistical Surveys*[3], also known as Statistical Policy Directive (SPD) 2, which specify requirements for federal statistical agencies to ensure that their information products satisfy the information quality guidelines. The OMB standards are not intended to describe all the efforts that an agency may undertake to ensure the quality of its information. These Census Bureau statistical quality standards provide additional guidance that focuses on the Census Bureau's statistical programs and activities and that addresses the Census Bureau's unique methodological and operational issues.

In January 2019, the Foundations of Evidence-based Policymaking Act of 2018[4] was signed into law. Title III, the Confidential Information Protection and Statistical Efficiency Act (CIPSEA) of 2018, promoted SPD 1 to statute[5]. The updated CIPSEA provided statutory definitions of statistical and nonstatistical uses. Sec. 3563 defined statistical agencies' responsibilities as:

"(1) In general.--Each statistical agency or unit shall--
(A) produce and disseminate relevant and timely statistical information;
(B) conduct credible and accurate statistical activities;
(C) conduct objective statistical activities; and
(D) protect the trust of information providers by ensuring the confidentiality and exclusive statistical use of their responses.

(2) Policies, best practices, and procedures. Each statistical agency or unit shall adopt policies, best practices, and appropriate procedures to implement the responsibilities described in paragraph (1)."

The elevation of SPD 1 to statute accompanied an enhanced charge to statistical agencies to modernize their quality standards; specifically, to introduce guidelines that clearly distinguish research-based, experimental, and core statistical information products. More importantly, the statute explicitly charges the agency with adopting "best practices." The increasing use of blended-source products coupled with the increased demand for granularity and timeliness present the opportunity to use these Quality Standards to describe the Census Bureau's methods for information products that go well beyond the probability sample surveys that were the core of SPD 2.

To that end, these standards now define research-based, experimental and core statistical information products. They provide graduated standards that facilitate development of new information products and clarify the conditions under which the Census Bureau publishes and documents such products. The standards now allow for publication of experimental information products for which some of the requirements for core statistical products are intentionally suspended or delayed. Furthermore, the standards now provide a framework for continued publication of information products that were initially released experimentally when their limitations and sources of uncertainty are properly documented and controlled even if the products never reach the expectations for core statistical products.

2. Scope

The Census Bureau's statistical quality standards apply to all information products released by the Census Bureau and the activities that generate those products, including products released to the public, sponsors, joint partners, or other customers. All Census Bureau employees and Special Sworn Status individuals must comply with these standards; this includes contractors and other individuals who receive Census Bureau funding to develop and release Census Bureau information products.

The Census Bureau often conducts data collections and performs associated work for sponsoring agencies on a reimbursable basis. The work performed by the Census Bureau under such contracts is in the scope of these statistical quality standards, whether performed under Title 13, Title 15, Title 26, or another authorization. If a sponsor's requirements or funding constraints result in noncompliance with these standards, the Census Bureau's manager for the program must obtain a waiver, except where noted in the standards.

For the purposes of these standards, information products include any statistical product produced either by Census Bureau staff or using Census Bureau data. Census Bureau information products are broadly segmented into core, experimental, and research-based statistical products.

Exclusions to the Scope

None of the following exclusions apply to Statistical Quality Standard S1, *Protecting Confidentiality*, or the requirements for protecting confidentiality in the individual standards.

These standards do not apply to:

- Information products intended for internal Census Bureau use that are not intended for public dissemination.
- Information products delivered to agencies within the Department of Commerce for their internal use.
- Internal procedural or policy manuals prepared for the management of the Census Bureau and the Department of Commerce that are not intended for public dissemination.
- Information products that result from the Census Bureau's administrative or management processes.
- Information products released in response to a Freedom of Information Act request.
- Documents intended only for communications between agencies, within agencies, or with individuals outside the Census Bureau if the documents contain no data and do not discuss analyses or methodological information.
- Informal communications between Census Bureau employees and colleagues in other organizations that do not disseminate Census Bureau data or results based on Census Bureau data.
- Information products delivered to sponsors or oversight agencies, including the Congress, relating to the management of Census Bureau programs.
- Information products authored by external researchers at the Federal Statistical Research Data Centers.
- Information products that use Census Bureau data and are authored by Special Sworn Status individuals employed by other federal agencies or organizations for their agencies (e.g., SSA, GAO, and CBO).
- Information products generated by other agencies or organizations to which the Census Bureau has given only technical assistance or training. However, Census Bureau staff providing such assistance should consider these standards as guidelines.
- Information products developed from surveys intended to measure Census Bureau customers' or users' satisfaction with Census Bureau products or to measure Census Bureau employees' job satisfaction. However, any public release of results of such surveys must explain that they do not meet the Census Bureau's statistical quality standards because the respondents are self-selected and may not be representative of all customers, all users, or all employees.
- Communications released via social media. Social media must not be used to disseminate data or statistical analyses not previously cleared for external release. Such communications must follow the Census Bureau's *Policies and Procedures Governing the Use of Social Media*.[6]

The scope statements of the individual standards provide additional information to clarify the scope and to list exclusions specific to each standard.

3. Responsibilities

All Census Bureau employees and Special Sworn Status individuals are responsible for following the Census Bureau's statistical quality standards in their work to develop, deliver, and release information products.

Responsibilities of the Program Areas and the Supporting Directorates and Divisions

Divisions and offices within the Economic Programs, Demographic Programs, and Decennial Census plan, process, analyze, and disseminate data. The Census Bureau's Research and Methodology Directorate supports all other directorates in areas of statistical and methodological research and development. The Field Operations Directorate and the Office of the Chief Information Officer collect, transmit, and process data for demographic household surveys, the Decennial Census, the Economic Census and surveys, and the Government Census and surveys. The Census Bureau's other directorates and divisions provide various types of administrative, logistical, and strategic support to the program areas.

The responsibilities of the program areas and the supporting directorates and divisions with respect to these statistical quality standards include:

- Ensuring that the necessary resources are available to comply with the statistical quality standards.
- Implementing and verifying compliance with the statistical quality standards.
- Reporting situations where requirements of the standards might need revision (e.g., a program's processes or products may have changed so that some requirements of the statistical quality standards may also need to be revised).
- Following the procedure to obtain a waiver if unable to comply with one or more of the statistical quality standards.

Guidance on implementing the standards and verifying compliance can be obtained from the program area's M&S Council representative as shown in Table 1.

Table 1 – M&S Council Representatives

Directorate	**M&S Council Representative**
Research & Methodology (Also represents all other directorates not listed)	Associate Director Assistant Director Chief, Center for Statistical Research & Methodology Chief, Center for Behavioral Science Methods Chief, Center for Economic Studies & Chief Economist
Decennial Census	Chief, Decennial Statistical Studies Division Chief, Geography Division
Demographic Programs	Associate Director or Chief Demographer Chief, Demographic Statistical Methods Division
Economic Programs	Chief, Economic Statistical Methods Division
Office of the Chief Information Officer	Chief Technology Officer
Field Operations	Chief, Office of Survey and Census Analytics
Office of the Chief Administrative Officer	Chief, Human Resources Division

Responsibilities of the Methodology and Standards Council

The Census Bureau's M&S Council consists of representatives from division and office chiefs of the statistical and related methodology groups in the various program areas as designated in its charter from the Census Bureau Operating Committee. The M&S Council advises the Census Bureau's Associate Directors on policy and issues affecting research and methodology for Census Bureau programs. The M&S Council also ensures the use of sound statistical methods and practices and facilitates communication and coordination of statistical methodology and research throughout the Census Bureau and the broader statistical community.

The responsibilities of the M&S Council with respect to the statistical quality standards include:

- Promoting awareness of and compliance with the Census Bureau's statistical quality standards.
- Reviewing waiver requests and forwarding their recommendation for approval or denial of the waiver to the appropriate Associate Director.
- Conducting periodic reviews and evaluations of the standards to study how well the standards are working and to identify difficulties in implementation.
- Maintaining an archive of evaluation findings, waiver requests, and suggestions for improvement to inform future revisions of the Census Bureau's statistical quality standards.
- Updating the standards as needed.

The responsibilities of the individual M&S Council members for their directorates (See Table 1.) include:

- Providing guidance on interpreting the standards to the programs in their directorates and to directorates that participate in conducting and implementing their programs (e.g., the Field Operations Directorate).
- Providing assistance in implementing and verifying compliance with the standards to the programs in their directorates and to directorates that participate in conducting and implementing their programs (e.g., the Field Operations Directorate).

4. Interpreting and Using the Standards

The complete set of statistical quality standards includes process standards (designated with "A" through "F") and supporting standards (designated with "S"). The process standards are organized according to the different processes associated with developing and releasing information products. The organizational framework for these process standards is:

A. Planning and Development
B. Collecting and Acquiring Data
C. Capture and Processing Data
D. Producing Estimates and Measures
E. Analyzing Data and Reporting Results
F. Releasing Information

The supporting standards address issues that cut across all the process standards. The two supporting standards are S1, *Protecting Confidentiality*, and S2, *Managing Data and Documents*.

The standards are written at a broad level of detail to apply to all the Census Bureau's programs and products. They describe *what* is required and do not delineate procedures for *how* to satisfy the requirements. Each standard has a list of key terms that are used in the standard. These terms are defined in the glossary to provide clarification on their use in relation to these standards.

To help managers interpret the requirements of the standards, examples are often provided. These examples are intended to aid the program manager in understanding the requirements and to provide guidance on the types of actions that may be useful in satisfying the requirements. It is important to note that the examples listed under a requirement are not all-inclusive, nor will every example apply to every program or product. Finally, there may be more than one acceptable way to comply with a requirement. That is, several equally acceptable actions might be performed to comply with a requirement, rather than only one unique set of actions.

Program managers are expected to carry out all actions needed to comply with a requirement. The expectation is that program managers will balance the importance and scope of the information product with the constraints of budget, schedule, and resources when determining how to comply with the requirements. Program managers must use their judgment to determine which actions must be performed for their program to comply with a requirement. Typically, the compliance burden is expected to be minimal for research-based products, moderate for experimental products, and more comprehensive for core statistical products. Program managers should leverage the use of systems with demonstrated compliance in the development of new products.

If the program manager believes it is not feasible to comply with a requirement, the program manager must request a waiver. For information products designated as experimental, in lieu of requesting a waiver, the program manager shall instead document the requirements which may not be met in the proposal for the experimental product (See Sub-Requirement A1-7.1). The *Waiver Procedure* provides a standard mechanism to exempt a program from compliance with a statistical quality standard when such an exemption is warranted. The Waiver Procedure also promotes proper management and control in implementing the standards. Finally, the Waiver Procedure ensures that appropriate documentation of exceptions to the standards is generated and maintained to inform future revisions of the statistical quality standards.

5. History of the Development of the Standards

The Census Bureau has a long history of delivering high quality data about the nation's people and economy. *Technical Paper 32*, *Standards for Discussion and Presentation of Errors in Data*[7], originally issued in March 1974 and revised in September 1975, is an example of the Census Bureau's commitment to promote transparency in the quality of the information and data products it delivers to the public and to its sponsors.

Over the years, the Census Bureau has developed additional guidance regarding the quality of its products and in 1998 began to formalize its efforts to ensure quality in its products and processes. The Census Bureau began this more formal approach by instituting a quality program based on a foundation of quality principles, standards, and guidelines. The paper, *Quality Program at the U.S. Census Bureau*[8], describes the beginnings of the Census Bureau's Quality Program.

In 2001, the Census Bureau issued the first of eleven new statistical quality standards. Several of these standards updated the content of *Technical Paper 32*. Over the next four years, ten more standards were developed.

In 2005, after conducting a benchmarking study of the standards of other statistical organizations, the M&S Council initiated a more coordinated approach for developing a comprehensive set of statistical quality standards. While the existing standards were a good start, the new goal was to reflect all the requirements of the OMB's *Standards and Guidelines for Statistical Surveys*[9] (also known as SPD 2) in the context of the Census Bureau's programs, products, and processes.

The new approach to developing statistical quality standards relied on five key components: 1) a dedicated staff to develop the standards, rather than ad hoc teams; 2) contractor assistance; 3) multiple reviews of draft standards to obtain feedback from the program areas; 4) focus groups to obtain more thoughtful and attentive input from the program areas; and 5) a documented, consistent development process.

The Census Bureau began developing these standards in May 2006. The process was completed in May 2010, when the Census Bureau issued the first release of these statistical quality standards.

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[1] United States Office of Management and Budget, *Guidelines for Ensuring and Maximizing the Quality, Objectivity, Utility, and Integrity of Information Disseminated by Federal Agencies*, Federal Register, Washington D.C., February 22, 2002, 67 FR 8452-8460, https://www.federalregister.gov/documents/2002/02/22/R2-59/guidelines-for-ensuring-and-maximizing-the-quality-objectivity-utility-and-integrity-of-information, Accessed on 27 October 2020.

[2] Methodology and Standards Council, *U.S. Census Bureau Section 515 Information Quality Guidelines*, U.S. Census Bureau, Washington D.C., 2002 https://www.census.gov/about/policies/quality/guidelines.html Accessed on 27 October 2020.

[3] United States Office of Management and Budget, *Standards and Guidelines for Statistical Surveys*, U.S. National Archives and Records Administration, Washington D.C., 2006, https://georgewbush-whitehouse.archives.gov/omb/inforeg/statpolicy/standards_stat_surveys.pdf Accessed on 27 October 2020.

[4] Rep Ryan, Paul D, *H.R.4174 - Foundations for Evidence-Based Policymaking Act of 2018*, United States Congress, Washington D.C., 2018. https://www.congress.gov/bill/115th-congress/house-bill/4174/text Accessed on 24 March 2022.

[5] 44 U.S.C.A. § 3563. https://uscode.house.gov/view.xhtml?req=granuleid:USC-prelim-title44-section3563&num=0&edition=prelim Accessed on 3 March 2022

[6] Office of Digital Engagement, *Policy on the Approval and Use of Social Media and Web 2.0 (SM/W2.0)*, U.S. Department of Commerce, Washington D.C., 2016. https://www.commerce.gov/sites/default/files/media/files/2017/2016-social-media-policy-wac-final.docx Accessed on November 10, 2020

[7] Gonzalez, Maria E., Jack L. Ogus, Gary Shapiro, and Benjamin J. Tepping. *Standards for Discussion and Presentation of Errors in Survey and Census Data*. Journal of the American Statistical Association September 1975 70, no. 351: 5-23. http://www.jstor.org/stable/2286149, Accessed May 19, 2020.
[8] Landman, Cheryl, Donnalley, G., and Clark, C., *Quality Program at the U.S. Census Bureau,* Proceedings of the International Conference on Quality in Official Statistics, Stockholm, 2001.
[9] United States Office of Management and Budget , *Standards and Guidelines for Statistical Surveys*, U.S. National Archives and Records Administration, Washington D.C., 2006, https://georgewbush-whitehouse.archives.gov/omb/inforeg/statpolicy/standards_stat_surveys.pdf Accessed on 27 October 2020.

PLANNING AND DEVELOPMENT
Statistical Quality Standard
A1 - Planning a Data Program

Purpose: The purpose of this standard is to ensure that plans are developed when initiating a new or revised data program.

Scope: The Census Bureau's statistical quality standards apply to all information products released by the Census Bureau and the activities that generate those products, including products released to the public, sponsors, joint partners, or other customers. All Census Bureau employees and Special Sworn Status individuals must comply with these standards; this includes contractors and other individuals that receive Census Bureau funding to develop and release Census Bureau information products.

This standard applies to planning data programs (e.g., surveys, censuses, and administrative data programs) that will release information products to the public, to sponsors, or to other customers.

Exclusions:
The global exclusions to the standards are listed in the Preface. No additional exclusions apply to this standard.

Note: Specific planning requirements for each stage of the data program are addressed in other statistical quality standards. For example, Statistical Quality Standard E1, *Analyzing Data*, includes requirements for planning data analyses.

Key Terms: Administrative records, bridge study, business identifiable information, census, data collection, data program, information products, microdata, personally identifiable information, reimbursable project, response rate, sample design, sample survey, stakeholder, target population, third-party data and users.

Requirement A1-1: The provisions of federal laws[1] (e.g., Title 13, Title 15, and Title 26) and Census Bureau policies and procedures[2] on privacy and confidentiality (e.g., Data Stewardship policies) must be followed in planning and designing any programs that will collect personally identifiable information or business identifiable information. (See Statistical Quality Standard S1, *Protecting Confidentiality*.)

Requirement A1-2: An overall program plan must be developed that includes the following:

1. A justification for the program, including:
   a. A description of the program goals and objectives.
   b. A list of potential users.
   c. When and how frequently users need the data.
   d. A description of stakeholder requirements and expectations.
   e. A description of the intended information products (e.g., tabulations, confidential microdata, or public-use files).
   f. A description of revisions to an ongoing program, including:
      1) Changes to key estimates, methods, or procedures.

2) The usefulness of the revisions for conducting analyses and for informing policymakers and stakeholders.
3) Planned studies to measure the effects of the changes to key estimates and time series (e.g., overlap samples or bridge studies).

g. For sample survey and census programs (i.e., programs that do not rely solely on administrative data), a description of the steps taken to prevent unnecessary duplication with other sources of information, including a list of related (current and past) federal and non-federal studies, surveys, and reports that were reviewed.

Notes:
(1) The Office of Management and Budget's (OMB) *Guidance on Agency Survey and Statistical Information Collections*[3] provides information on preparing OMB clearance packages for surveys used for general purpose statistics or as part of program evaluations or research studies.
(2) The OMB's *Standards for Maintaining, Collecting, and Presenting Federal Data on Race and Ethnicity*[4,5,6] provides standards for programs collecting data on race and ethnicity.
(3) The OMB's *Standards for Defining Metropolitan and Micropolitan Statistical Areas*[7, 8, 9] provides standards for collecting, tabulating, and publishing statistics for geographic areas.
(4) When designing or improving data collection systems, the information product owner should actively solicit comment from potential downstream users about their needs. The information product owner should describe potential uses in their Information Collection Request submitted to OMB.

2. An initial schedule that identifies key milestones for the complete program cycle from planning to data release.

Generally, the program cycle includes the following stages:
- Planning a data program (Statistical Quality Standard A1).
- Developing the data collection instrument and sample design (Statistical Quality Standards A2 and A3).
- Establishing and implementing data collection methods and acquiring administrative data (Statistical Quality Standards B1 and B2).
- Capturing and processing data (Statistical Quality Standards C1, C2, C3, and C4).
- Producing estimates and quality measures (Statistical Quality Standards D1, D2, and D3).
- Analyzing data and reporting results (Statistical Quality Standards E1 and E2).
- Reviewing information products (Statistical Quality Standard E3).
- Releasing information products (Statistical Quality Standards F1 and F2).

Note: Managers responsible for each stage of the program generally are expected to prepare milestone schedules for their stages. The overall program manager can use these individual schedules to prepare the overall milestone schedule.

3. An initial, overall cost estimate that identifies the resources needed and itemizes the costs to carry out the program.

   Note: Managers responsible for each stage of the program generally are expected to prepare cost estimates for their stages. The overall program manager can use these estimates to prepare the overall cost estimate.

4. A description of deliverables to be received as the result of any contracts originated by the Census Bureau, including any documentation to be provided by contractors.

   Examples of such deliverables include:
   - Computer software or hardware.
   - Data files.
   - Advertising or outreach services and materials.
   - Specifications for software or hardware.
   - Quality control or quality assurance procedures, criteria, and results.

Sub-Requirement A1-2.1: When the sponsor of a reimbursable project requests the Census Bureau to carry out activities that do not comply with our Statistical Quality Standards or deliver products that do not conform with the standards, the program manager must:

1. Obtain a waiver to carry out the noncompliant activities or to deliver the nonconforming products before agreeing to conduct the project. (See the *Waiver Procedure* for the procedures on obtaining a waiver.)
2. Obtain from the sponsor a copy of the clearance package[10] approved by the OMB, including any associated terms of clearance.
3. Deliver to the sponsor written documentation that describes the following for each area of noncompliance:
   a. The details regarding the noncompliance issue.
   b. The consequences of performing the noncompliant work.
   c. The actions recommended by the Census Bureau that would result in compliance.

Requirement A1-3: For sample survey and census programs**,** a preliminary survey design must be developed that describes the:

1. Target population and sampling frame.
2. Sample design.
3. Key data items and key estimates.
4. Response rate goals.
5. Data collection methods.
6. Analysis methods.

Sub-Requirement A1-3.1: For surveys employing adaptive survey design, a plan for data collection must be developed, incorporating the following elements:

1. The cost and data quality goals for data collection, resulting from discussions with the survey sponsor.
2. The data on the sampling frame, or auxiliary data linked to the frame that will be used to monitor sample quality during collection.

3. The paradata (e.g., cost, contact experience) that will be used to monitor the expenditure of resources and the response propensity of open cases.
4. The indicators of sample quality that will be monitored (e.g., achieved sample representativeness, response rate)
5. The key survey estimates that will be monitored during data collection.
6. A description of models, incorporating frame data and paradata, which will be employed to assess response propensity and achieved sample quality.
7. A description of data collection methods that will be employed and prospective modifications to them during the field period, in response to observations of the costs incurred, the achieved sample quality, the stability of key survey estimates and the response propensity of open cases.
8. The process for ensuring that planned interventions are executed faithfully (e.g., checks on programming, training and monitoring of Field Representatives).
9. A protocol for monitoring and modifying data collection methods, including a tentative schedule and criteria for deciding on possible modifications to the methods (including stopping rules).
10. The documentation process that will render the adaptive procedures transparent for stakeholders, data users and the public.
11. For revisions to an existing survey data collection program, the anticipated usefulness of the revisions for the survey data quality and cost containment.
12. For revisions to an existing survey data collection program, the research that will be undertaken to measure the effects of adaptive procedures on costs, sample quality and key survey estimates (e.g., field experiments comparing adaptive and current data collection procedures, bridge studies).

Requirement A1-4: For administrative data projects, a preliminary study design must be developed that describes the:

1. Target population.
2. Coverage of the target population by the administrative data.
3. Key data items and key estimates.
4. Methods of integrating data sources, if more than one is used.
5. Analysis methods.

Note: See the Administrative Data Acquisition, Access, and Use Policy (DS 001A) and the Handbook for Administrative Data Projects (DS 001B) for complete information on planning a project that uses administrative data. DS 001A defines "administrative data" to include microdata records from governmental and commercial entities.

Requirement A1-5: Any contract or statement of work originated by the Census Bureau for deliverables that will be used in information products released by the Census Bureau must include provisions that the contractor complies with the Census Bureau's statistical quality standards.

Requirement A1-6: Quality control checks must be performed to ensure the accuracy and completeness of the program plans, including all schedules, cost estimates, agreements (e.g.,

memoranda of understanding, statements of work, and contracts), survey designs, and study designs.

Requirement A1-7: The M&S Council will review proposals for experimental statistical products and their transition to core statistical products. The M&S Council may offer concurrence and/or additional advice on development of the experimental statistical products but the ultimate authority lies with Associate Director proposing the experimental statistical products.

Sub-Requirement A1-7.1: Proposals for experimental statistical products shall document the relevant supporting research and describe the processes involved in the development of the statistics. Proposals shall also include a statement of limitations and uncertainty. Any anticipated noncompliance with the quality standards shall be noted and include a description of any quality concerns that may arise. The proposal shall be included with the documentation made available to the public and updated for revisions noting the revision date and scope of revisions.

Sub-Requirement A1-7.2: A program manager wishing to transition an experimental statistical product to a core statistical product shall:

1) Ensure the program is well established. At minimum the program shall have
   a) Documented workflows,
   b) Established production schedules,
   c) Identified staff to support the information product,
   d) Provide evidence of an established audience (e.g., Web traffic statistics, User Feedback),
   e) Provide outward-facing, comprehensive documentation on methodologies used to develop the product. Such evidence could include externally peer-reviewed scientific papers as defined in Data Stewardship Policy 27 or internally reviewed papers that meet standard E3-2.1.
   f) Provide summary quality measure that convey the coverage rates, imputation rates, and precision of the estimates, as applicable.
2) Request a waiver (as needed) for any quality requirements that are not met. This will ensure that a mitigation and corrective action plan is in place.
3) Notify the M&S Council.

Requirement A1-8: Documentation needed to replicate and evaluate the data program must be produced. The documentation must be retained, consistent with applicable policies and data-use agreements, and must be made available to Census Bureau employees who need it to carry out their work. (See Statistical Quality Standard S2, *Managing Data and Documents*.)

Examples of documentation include:

- Program plans, including cost estimates and schedules, after all revisions.
- Survey designs.
- Study designs.
- Decision memoranda.

Notes:

(1) The documentation must be released on request to external users unless the information is subject to legal protections or administrative restrictions that would preclude its release. (See Data Stewardship Policy DS007, *Information Security Management Program*.[11])

(2) Statistical Quality Standard F2, *Documentation to Support Transparency in Information Products*, contains specific requirements about documentation that must be readily accessible to the public to ensure transparency of information products released by the Census Bureau.

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[1] United States Government, *Code of Federal Regulations*, Federal Register, Washington D.C., Updated Annually, https://www.govinfo.gov/app/collection/cfr Accessed on 27 October 2020.

[2] Data Stewardship Executive Policy Committee, *Data Stewardship Policies*, U.S. Census Bureau, Washington D.C. October 2020 https://www.census.gov/about/policies/privacy/data_stewardship/dsep_committee.html Accessed on 2 March 2022

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[11] Data Stewardship Executive Policy Committee. *DS007: Safeguarding and Managing Information*. U.S. Census Bureau, Washington, D.C.. May 28, 2013. https://www.census.gov/about/policies/privacy/data_stewardship/dsep_committee.html Accessed on 2 March 2022

Planning And Development
Statistical Quality Standard
A2 - Developing Data Collection Instruments and Supporting Materials

Purpose: The purpose of this standard is to ensure that data collection instruments and supporting materials are designed to promote the collection of high-quality data from respondents.

Scope: The Census Bureau's statistical quality standards apply to all information products released by the Census Bureau and the activities that generate those products, including products released to the public, sponsors, joint partners, or other customers. All Census Bureau employees and Special Sworn Status individuals must comply with these standards; this includes contractors and other individuals that receive Census Bureau funding to develop and release Census Bureau information products.

This standard applies to the development or redesign of data collection instruments and supporting materials. The types of data collection instruments and supporting materials covered by this standard include:

- Paper and electronic instruments (e.g., CATI, CAPI, Web, and touch tone data entry).
- Self-administered and interviewer-administered instruments.
- Instruments administered by telephone or in person.
- Respondent letters, aids, and instructions.
- Mapping and listing instruments used for operations, such as address canvassing, group quarters frame development, and the Local Update of Census Addresses (LUCA).

Exclusions:
In addition to the global exclusions listed in the Preface, this standard does not apply to:

- Data collection instruments and supporting materials where the Census Bureau does not have control over the content or format, such as the paper and electronic instruments used for collecting import and export merchandise trade data.

Key Terms: Behavior coding, CAPI, CATI, cognitive interviews, data collection instrument, field test, focus group, graphical user interface (GUI), imputation, integration testing, methodological expert review, nonresponse, pretesting, questionnaire, record linkage, respondent burden, respondent debriefing, split panel test, and usability testing.

Requirement A2-1: Throughout all processes associated with data collection, unauthorized release of protected information or administratively restricted information must be prevented by following federal laws[1] (e.g., Title 13, Title 15, and Title 26), Census Bureau policies[2] (e.g., Data Stewardship policies), and additional provisions governing the use of the data (e.g., as may be specified in a memorandum of understanding or data-use agreement). (See Statistical Quality Standard S1, *Protecting Confidentiality*.)

Requirement A2-2: A plan must be produced that addresses:

1. Program requirements for the data collection instrument and the graphical user interface (GUI), if applicable (e.g., data collection mode, content, constraints, and legal requirements).
2. Supporting materials needed for the data collection (e.g., brochures, flashcards, and advance letters).
3. Pretesting of the data collection instrument and supporting materials.
4. Verification and testing to ensure the proper functioning of the data collection instrument and supporting materials.

Notes:

(1) Statistical Quality Standard A1, *Planning a Data Program*, addresses overall planning requirements, including the development of schedules and costs.

(2) See the *Guidelines for Designing Questionnaires for Administration in Different Modes*[3] and the *Economic Directorate Guidelines on Questionnaire Design*[4] for guidance on designing data collection instruments.

(3) Data Stewardship Policy DS016, *Respondent Identification Policy*[5], contains policy requirements for data collection operations involving households where respondents in households provide information.

Requirement A2-3: Data collection instruments and supporting materials must be developed and tested in a manner that balances (within the constraints of budget, resources, and time) data quality and respondent burden. This requirement applies to instruments employed by Field Representatives to record their contact attempts with respondents, their observations of sample housing units and their activities undertaken in making contacts and observations (e.g., time, mileage).

Sub-Requirement A2-3.1: Specifications for data collection instruments and supporting materials, based on program requirements, must be developed and implemented.

Examples of topics that specifications might address include:

- Requirements for programming the instrument to work efficiently. For example:
  - Built-in edits or range checks for electronic data collection instruments (e.g., edits for numeric data that must be within a pre-specified range).
  - Compliance with the CATI/CAPI Screen Standards for GUI (Windows-based) Instruments and Function Key Standards for GUI Instruments. (See the Technologies Management Office's Authoring Standards *Blaise Standards for Windows Surveys*[6] [7] [8] [9] [10]).
  - Input and output files for data collection instruments.
- Segmented boxes for paper data collection instruments to facilitate scanning.
- Paper size, color, thickness, and formatting to ensure compatibility with data capture and processing systems for paper data collection instruments.
- Frequently Asked Questions about the data collection.
- Supporting materials, such as Help materials and instructions.

Note: The Census Bureau Guideline *Presentation of Data Edits to Respondents in Electronic Self-Administered Surveys*[11] presents recommendations for designing editing functionality, presentation, and wording in both demographic and economic self-administered electronic surveys.

Sub-Requirement A2-3.1.1: The design for mobile survey instruments shall:

1. Size a touch button at least 6 mm in width or diameter
2 Use a font of at least 2-mm x-height for text display
3. Maintain luminance ratio between text and background being at least 4.5:1
4. Avoid placing red and green colors next to each other

Note: Additional design guidance for mobile survey instruments is provided in *Standards and Guidelines for Mobile Survey Instrument Design 1st Ed* [12]

Sub-Requirement A2-3.2: Data collection instruments and supporting materials must clearly state the following required notifications to respondents:

1. The reasons for collecting the information.
2. A statement on how the data will be used.
3. An indication of whether responses are mandatory (citing authority) or voluntary.
4. A statement on the nature and extent of confidentiality protection to be provided, citing authority.
5. An estimate of the average respondent burden associated with providing the information.
6. A statement requesting that the public direct comments concerning the burden estimate and suggestions for reducing this burden to the appropriate Census Bureau contact.
7. The OMB control number and expiration date for the data collection.
8. A statement that the Census Bureau may not conduct, and a person is not required to respond to, a data collection request unless it displays a currently valid OMB control number.

Sub-Requirement A2-3.3: Data collection instruments and supporting materials must be pretested with respondents to identify problems (e.g., problems related to content, order/context effects, skip instructions, formatting, navigation, and edits) and then refined, prior to implementation, based on the pretesting results. Statistical products may propose and use (validated or proven) data-driven tools in lieu of or in addition to conventional content and cognitive pre-testing. As part of the transition to a core product, the validity of the data-driven tool should be documented.

Note: On rare occasions, cost or schedule constraints may make it infeasible to perform complete pretesting. In such cases, subject matter and cognitive experts must discuss the need for and feasibility of pretesting. The program manager must document any decisions regarding such pretesting, including the reasons for the decision. If no acceptable options for pretesting can be identified, the program manager must apply for a waiver. (See the *Waiver Procedure* for the procedures on obtaining a waiver.)

1. Pretesting must be performed when:
   a. A new data collection instrument is developed.

b. Questions are revised because the data are shown to be of poor quality (e.g., unit or item response rates are unacceptably low, measures of reliability or validity are unacceptably low, or benchmarking reveals unacceptable differences from accepted estimates of similar characteristics).
c. Review by cognitive experts reveals that adding pretested questions to an existing instrument may cause potential context effects.
d. An existing data collection instrument has substantive modifications (e.g., existing questions are revised, or new questions added).

Note: Pretesting is not required for questions that performed adequately in another survey. If this option is exercised, the program area must document the decision for the record—identifying the source survey and testing used in the source program. This documentation must be maintained in the same manner as for other standards.

2. Pretesting must involve respondents or data providers who are in scope for the data collection. It must verify that the questions:
   a. Can be understood and answered by potential respondents.
   b. Can be administered properly by interviewers (if interviewer-administered).
   c. Are not unduly sensitive and do not cause undue burden.

   Examples of issues to verify during pretesting:
   - The sequence of questions and skip patterns is logical and easy-to-follow.
   - The wording is concise, clear, and unambiguous.
   - Fonts (style and size), colors, and other visual design elements promote readability and comprehension.

3. One or more of the following pretesting methods must be used:
   a. Cognitive interviews.
   b. Focus groups, but only if the focus group completes a self-administered instrument and discusses it afterwards.
   c. Usability techniques, but only if they are focused on the respondent's understanding of the questionnaire.
   d. Behavior coding of respondent/interviewer interactions.
   e. Respondent debriefings in conjunction with a field test or actual data collection.
   f. Split panel tests.

   Notes:
   (1) Multiple pretesting methods should be used as budget, resources, and time permits to provide a thorough evaluation of the data collection instrument and to document that the data collection instrument works as expected. In addition, other techniques used in combination with the pretesting methods listed above may be useful in developing data collection instruments. (See Appendix A2, *Questionnaire Testing and Evaluation Methods for Censuses and Surveys*, for descriptions of the various pretesting methods available.)

4. If budget, resource, or time constraints make requirement A2-3.3 #3 impossible, alternative evidence (expert review, web probing) may be used, provided questionnaire

design experts agree that these evaluations provide adequate evidence of meeting the standard and the results are documented in a written report. If the questionnaire design experts do not agree the requirement is satisfied, then the owner of the information product will need to develop a plan to evaluate measurement quality and if for core statistics will need to request a waiver or if for experimental statistics will need to update their notice to the public.

5. When surveys or censuses are administered using multiple modes and meaningful changes to questions are made to accommodate the mode differences, all versions must be pretested.

   Meaningful changes to questions to accommodate mode differences include changes to the presentation of the question or response format to reflect mode-specific functional constraints or advantages. In these cases, the proposed wording of each version must be pretested to ensure consistent interpretation of the intent of the question across modes, despite structural format or presentation differences. As long as the proposed wording of each version is pretested, testing of the mode (e.g., paper versus electronic) is not required, although it may be advisable.

6. Data collection instruments in any languages other than English must be pretested in the languages that will be used to collect data during production. Pretesting supporting materials in these languages is not required but is recommended.

   Note: The Census Bureau Guideline *Language Translation of Data Collection Instruments and Supporting Materials*[13] provides guidance on translating data collection instruments and supporting materials from English to another language.

Sub-Requirement A2-3.4: Data collection instruments and supporting materials must be verified and tested to ensure that they function as intended.

Examples of verification and testing activities include:

- Verifying that the data collection instrument's specifications and supporting materials reflect the sponsor's requirements (e.g., conducting walk-throughs to verify the appropriateness of specifications).
- Verifying that the data collection instrument and supporting materials meet all specifications (e.g., verifying correctness of skip patterns, wording, instrument fills, and instrument edits).
- Conducting integration testing using mock input files with realistic scenarios to test all parts of the data collection instrument together (e.g., front, middle, and back modules).
- Conducting usability testing to discover and eliminate barriers that keep respondents from completing the data collection instrument accurately and efficiently.
- Conducting output tests to compare the output of the data collection instrument under development with that of its predecessor (if the data collection has been done with a similar instrument in the past).
- Verifying that user interfaces work according to specifications.

- Verifying that user interfaces for electronic forms adhere to IT Standard 15.0.2, *Web Development Requirements and Guidelines*[14], and any other guidance applicable to the program.
- Verifying that Web-based data collection instruments comply with requirements of Section 508 of the U.S. Rehabilitation Act.[15]
- Verifying that paper data collection instruments are compatible with the program's data capture and processing systems.

Note: The Census Bureau Guideline *Computer Assisted Personal Interviewing*[16] reflects recommended practices for ensuring the quality of CAPI.

Requirement A2-4: Documentation needed to replicate and evaluate the development of data collection instruments and supporting materials must be produced. The documentation must be retained, consistent with applicable policies and data-use agreements, and must be made available to Census Bureau employees who need it to carry out their work. (See Statistical Quality Standard S2, *Managing Data and Documents*.)

Examples of documentation include:
- Plans for the development and testing of the data collection instrument and supporting materials.
- Specifications for the data collection instruments and supporting materials.
- Results of questionnaire development research (e.g., pretesting results, expert review reports, and site visit reports).
- Input files used to test the final production instrument and reports of testing results.
- Computer source code for the production data collection instrument along with information on the version of software used to develop the instrument.
- Quality measures and evaluation results. (See Statistical Quality Standard D3, *Producing Measures and Indicators of Nonsampling Error*.)

Notes:
(1) The documentation must be released on request to external users, unless the information is subject to legal protections or administrative restrictions that would preclude its release. (See Data Stewardship Policy DS007, *Information Security Management Program*.[17])
(2) Statistical Quality Standard F2, *Documentation to Support Transparency in Information Products*, contains specific requirements about documentation that must be readily accessible to the public to ensure transparency of information products released by the Census Bureau.

[1] United States Government, *Code of Federal Regulations*, Federal Register, Washington D.C., Updated Annually, https://www.govinfo.gov/app/collection/cfr Accessed on 27 October 2020.
[2] Data Stewardship Executive Policy Committee, *Data Stewardship Policies*, U.S. Census Bureau, Washington D.C., October 2020. https://www.census.gov/about/policies/privacy/data_stewardship/dsep_committee.html Accessed on 2 March 2022

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[12] Lin Wang, Christopher Antoun, Brian Falcone, Shelley Feuer, Ivonne Figueroa, Elizabeth Nichols, Erica Olmsted-Hawala, Alda Rivas, *Proposed Standards and Guidelines for Mobile Survey Instrument Design*, U.S. Census Bureau. Research and Methodology Directorate, Center for Behavioral Science Methods Research Report Series (Survey Methodology #2022-02). Washington D.C., June 14, 2022. https://www.census.gov/library/working-papers/2022/adrm/rsm2022-02.html Accessed on 16 June 2022
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Planning And Development
Statistical Quality Standard [1,2]
App A2 - Questionnaire Testing & Evaluation Methods for Censuses & Surveys

Pretesting is critical to the identification of problems for both respondents and interviewers about question content, order/context effects, skip instructions, and formatting. Problems with question content, for example, include confusion over the meaning of the question as well as misinterpretation of individual terms or concepts. Problems with skip instructions may result in missing data and frustration by interviewers and/or respondents. Formatting concerns are relevant to self-administered questionnaires and may lead to respondent confusion and a loss of information.

"Pretesting" is a broad term that applies to many different methods or combinations of methods that can be used to test and evaluate questionnaires. These methods are valuable for identifying problems with draft questionnaires, but they have different strengths and weaknesses, and may be most useful at different stages of questionnaire/instrument development. Typically, using several pretesting methods is more effective in identifying problem questions and suggesting solutions than using just a single method. This appendix briefly describes the different types of pretesting methods, their strengths and weaknesses, and situations where they are most beneficial.

The enumeration and description of potential pretesting and evaluation methods in this appendix is meant to cover all the available techniques; however, some techniques do not satisfy the pretesting requirement of Statistical Quality Standard A2: *Developing Data Collection Instruments and Supporting Materials*. Other methods satisfy the requirement only under special circumstances. The pretesting requirement of Standard A2 identifies the methods that must be used to pretest census and survey questions.

Although the pretesting requirement of Standard A2 must be satisfied, the appropriateness of the methods and the resources available to implement them should be considered in determining which pretesting methods to use.

Pretesting and evaluation techniques fall into two major categories – pre-field and field techniques. Generally, pre-field techniques are used during the preliminary stages of questionnaire development.

Pre-field techniques that satisfy the pretesting requirement include:

- Cognitive interviews.

Pre-field techniques that may conditionally satisfy the pretesting requirement include:

- Respondent focus groups. (Only if the focus group completes and discusses a self-administered questionnaire.)
- Usability techniques. (Only if it is focused on respondent understanding of a self-administered or interviewer-administered questionnaire.)

Pre-field techniques that **do not** satisfy the pretesting requirement include:

- Exploratory or feasibility visits to companies or establishment sites.

- Methodological expert reviews.

Field techniques are used to evaluate questionnaires tested under field conditions, either in conjunction with a field test or during production data collection. Using field techniques during production data collection would be appropriate only for ongoing or recurring surveys.
Field techniques that satisfy the pretesting requirement include:

- Behavior coding of interviewer-respondent interactions.
- Respondent debriefings.
- Split panel tests.

Field techniques that **do not** satisfy the pretesting requirement include:

- Interviewer debriefings.
- Analysts' feedback.
- Analysis of item nonresponse rates, imputation rates, edit failures, or response distributions.
- Web probing.

PRE-FIELD TECHNIQUES

Respondent Focus Groups are used early in the questionnaire development cycle and can be used in a variety of ways to assess the question-answering process. Generally, the focus group technique does **not** satisfy the pretesting requirement, because it does not expose respondents to a questionnaire.

The only use of focus groups that satisfies the pretesting requirement is to have the group complete a self-administered questionnaire, followed by a discussion of the experience. This provides information about the appearance and formatting of the questionnaire and reveals possible content problems.

Focus groups can be used before questionnaire construction begins to gather information about a topic, such as:

- How potential respondents structure their thoughts about a topic.
- How respondents understand general concepts or specific terminology.
- Respondents' opinions about the sensitivity or difficulty of the questions.
- How much burden is associated with gathering the information necessary to answer a question.

Focus groups can also be used to identify variations in language, terminology, or the interpretation of questions and response options. Used in this way, they may provide quicker access to a larger number of people than is possible with cognitive interviews. One of the main advantages of focus groups is the opportunity to observe an increased amount of interaction on a topic in a short time. The group interaction is of central importance – it can result in information and insights that may be less accessible in other settings. However, precisely because of this group interaction, the focus group does not permit a good test of an individual's response process when alone. Moreover, in focus groups the researcher does not have as much control over the process as with cognitive interviews or interviewer-administered questionnaires. One or two

people in the group may dominate the discussion and restrict the input from other group members.

Exploratory or Feasibility Studies are another common method for evaluating survey content relative to concepts. Economic survey practitioners typically call these studies *company or site visits* because they carry out the studies at the site of the business or institution. Because these visits are conducted before the questionnaire has been developed, they do **not** satisfy the pretesting requirement.

Because economic surveys rely heavily on business or institutional records, the primary goal of these site visits is to determine the availability of the desired data in records, their periodicity, and the definition of the concept as used in company records. Other goals include assessment of response burden and quality and the identification of the appropriate respondent.

The design of these company or site visits tends to vary a great deal. Because they are exploratory in nature, the activity may continue until the economic survey or program staff sufficiently understands the respondents' views of the concepts, resources permitting of course. Purposive or convenience samples are selected that target key data providers. Sample sizes are small, perhaps as few as five and rarely more than thirty. Typically, several members of the survey or program staff, who may or may not include questionnaire design experts, conduct meetings with multiple company employees involved in government reporting. Information gained during these visits helps determine whether the survey concepts are measurable, what the specific questions should be, how to organize or structure the questions related to the concept of interest, and to whom the form should be sent.

Exploratory or feasibility studies may be multi-purpose. In addition to exploring data availability for the concept of interest, survey or program staff may also set up reporting arrangements and review operating units to ensure correct coverage. A common by-product of these visits is to solidify relationships between the companies and the survey or program staff.

Cognitive Interviews are used in the later part of the questionnaire development cycle, after a questionnaire has been constructed based on information from focus groups, site visits, or other sources. They consist of one-on-one interviews using a draft questionnaire in which respondents describe their thoughts while answering the survey questions. Cognitive interviews provide an important means of learning about respondents' problems with the questionnaire directly from them. Because this technique tests the questionnaire with potential respondents, it satisfies the pretesting requirement.

In addition, small numbers of interviews can yield information about major problems if respondents repeatedly identify the same questions and concepts as sources of confusion. Because sample sizes are small, iterative pretesting of an instrument is often possible. After one round of interviews is complete, researchers can diagnose problems, revise question wording to solve the problems, and conduct additional interviews to see if the new questions are successful.

Cognitive interviews may or may not be conducted in a laboratory setting. The advantage of the laboratory is that it offers a controlled environment for conducting the interview and provides the

opportunity for video as well as audio recording. However, laboratory interviews may be impractical or unsuitable. Virtual cognitive interviews (i.e., conducted via telephone or audio/video software) can be useful if travel is difficult for the interviewer and/or respondent. Additionally, economic surveys rarely conduct cognitive interviews in a laboratory setting. Rather, cognitive testing of economic surveys is usually conducted on-site at the offices or location of the business or institutional respondent. One reason for this approach is to enable business or institutional respondents to have access to records. Another is business respondents' reluctance to meet outside their workplaces for these interviews. In many economic surveys, which tend to be relatively lengthy and require labor-intensive data retrieval from records, testing may be limited to a subset of questions or sections rather than the entire questionnaire. Thus, researchers must be careful to set the proper context for the target questions.

Respondents are often asked to *think aloud* while answering survey questions. *Probing questions* are used when the researcher wants to have the respondent focus on aspects of the question-response task. For example, the interviewer may ask how respondents chose among response choices, how they interpreted reference periods, or what a term meant. *Paraphrasing* (asking the respondents to repeat the question in their own words) permits the researcher to learn whether the respondent understands the question and interprets it in the manner intended, and it may reveal better wordings for questions.

Probing questions can be administered either concurrently or retrospectively – that is, either during or after the completion of the questionnaire. As the Census Bureau conducts them, cognitive interviews typically incorporate follow-up questions by the researcher in addition to the respondent's statement of his or her thoughts.

In surveys of businesses or institutions, in which data retrieval often involves business records, probing and paraphrasing techniques are often augmented by questions asking respondents to describe those records and their contents or to show the records to the researcher. Since data retrieval tends to be a labor-intensive process for business respondents, frequently requiring the use of multiple sources or consultation with colleagues, it is often unrealistic for researchers to observe the process during a cognitive interview. Instead, *hypothetical probes* are often used to identify the sources of data, discover respondents' knowledge of and access to records, recreate likely steps taken to retrieve data from records or to request information from colleagues, and suggest possible estimation strategies.

Usability Techniques are used to aid development of automated questionnaires. Objectives are to discover and eliminate barriers that keep respondents from completing an automated questionnaire accurately and efficiently with minimal burden. Usability tests that are focused on respondent understanding of the questionnaire satisfy the pretesting requirement. Usability tests that are focused on the interviewers' ability to administer the instrument do not satisfy the pretesting requirement; however, they are recommended for interviewer-administered electronic questionnaires.

Aspects that deserve attention during usability testing include the language, fonts, icons, layout, organization, and interaction features, such as data entry, error recovery, and navigation. Typically, the focus is on instrument performance in addition to how respondents interpret

survey questions. Problems identified during testing can then be eliminated before the instrument is finalized.

As with paper questionnaires, different usability techniques are available depending upon the stage of development. One common technique is called the *usability test*. These tests are similar to cognitive interviews – that is, one-on-one interviews that elicit information about the respondents thought process. Respondents are given a *task*, such as "Complete the questionnaire," or smaller subtasks, such as "Send your data to the Census Bureau." The *think aloud*, *probing*, and *paraphrasing* techniques are all used as respondents complete their assigned tasks. Early in the design phase, usability testing with respondents can be done using *low fidelity questionnaire prototypes* (i.e., mocked-up paper screens). As the design progresses, versions of the automated questionnaire can be tested to choose or evaluate basic navigation features, error correction strategies, etc.

Disability accommodation testing is a form of usability testing which evaluates the ability of a disabled user to access the questionnaire through different assistive technologies, such as a screen reader. *Expert reviews* (see below) are also part of the repertoire of usability techniques.

Research has shown that as few as three participants can uncover half of the major usability problems; four to five participants can uncover 80 percent of the problems; and ten participants can uncover 90 percent of the problems.[3]

Finally, in a *heuristic review*, an expert compares the electronic survey instrument with usability principles that should be followed by all user interfaces.[4]

Methodological Expert Reviews, conducted by survey methodologists or questionnaire-design experts, evaluate any difficulties potential interviewers and respondents may have with the questionnaire. Seasoned survey researchers who have extensive exposure to either the theoretical or practical aspects of questionnaire design use their expertise to achieve this goal. Because respondents do not provide direct input in these reviews, in general they do **not** satisfy the pretesting requirement. Usually, these reviews are conducted early in the questionnaire development process and in concert with other pretest methods.

Expert reviews may be used instead of respondent-based pretesting only as a last resort, when extreme time constraints prevent the use of other pretesting methods. In such instances, survey methodology experts must conduct the reviews and document the results in a written report. The decision to use expert reviews rather than respondent-based pretesting must be made by subject-matter areas in consultation with the methodological research areas in the Center for Behavioral Science Methods.

The cognitive appraisal coding system[5] is a tool providing a systematic approach to the methodological expert review process. Like methodological expert reviews, results are used to identify questions that have potential for reporting errors. This tool is particularly effective when used by questionnaire design experts who understand the link between the cognitive response process and measurement results. However, novice staff or subject-area staff also can use this tool as a guide in their reviews of questionnaires.

Methodological expert reviews also can be conducted as part of a usability evaluation. Typically, this review is performed with an automated version of the questionnaire, although it need not be fully functional. Experts evaluate the questionnaire for consistency and application of user-centered principles of user-control, error prevention and recovery, and ease of navigation, training, and recall.

FIELD TECHNIQUES

Field techniques may be used with pretests or pilot tests of questionnaires or instruments and survey processes. They may also be employed in ongoing periodic (or recurring) surveys. The value of testing draft questionnaires with potential survey respondents cannot be overstated, even if it simply involves observation and evaluation by questionnaire developers. However, the following pretesting methods can be used to maximize the benefits of field testing.

Behavior Coding of Respondent/Interviewer Interactions involves systematic coding of the interaction between interviewers and respondents from live or taped field or telephone interviews to collect quantitative information. Using this pretesting method satisfies the pretesting requirement.

The focus here is on specific aspects of how the interviewer asks the question and how the respondent reacts. When used for questionnaire assessment, the behaviors that are coded focus on behaviors that indicate problems with the question, the response categories, or the respondent's ability to form an adequate response. For example, if a respondent asks for clarification after hearing the question, it is likely that some aspect of the question caused confusion. Likewise, if a respondent interrupts the question before the interviewer finishes reading it, then the respondent misses' information that might be important to giving a correct answer. For interviewer-administered economic surveys, the coding scheme may need to be modified from traditional household applications, because interviewers for establishment surveys tend to be allowed greater flexibility.

In contrast to the pre-field techniques described earlier, the use of behavior coding requires a sample size sufficient to address analytic requirements. For example, if the questionnaire contains many skip patterns, it is necessary to select a large enough sample to permit observation of various paths through the questionnaire. In addition, the determination of sample sizes for behavior coding should consider the relevant population groups for which separate analysis is desired.

Because behavior coding evaluates all questions on the questionnaire, it promotes systematic detection of questions that elicit large numbers of behaviors that reflect problems. However, it is not usually designed to identify the source of the problems. It also may not be able to distinguish which of several similar versions of a question is better.

Finally, behavior coding does not always provide an accurate diagnosis of problems. It can only detect problems that are manifest in interviewer or respondent behavior. Some important problems, such as respondent misinterpretations, may remain hidden because both respondents

and interviewers tend to be unaware of them. Behavior coding is not well-suited for identifying such problems.

Respondent Debriefing uses a structured questionnaire after data are collected to elicit information about respondents' interpretations of survey questions. Use of this method satisfies the pretesting requirement.

The debriefing may be conducted by incorporating structured follow-up questions at the end of a field test interview or by re-contacting respondents after they return a completed self-administered questionnaire. In economic surveys, respondent debriefings sometimes are called "response analysis surveys" ("RAS") or "content evaluations." Respondent debriefings usually are interviewer-administered but may be self-administered. Some Census Bureau economic surveys have conducted respondent debriefings by formulating them as self-administered questionnaires and enclosing them with survey forms during pilot tests or production data collections.

Sample sizes and designs for respondent debriefings vary. Sample sizes may be as small as 20 or as large as several hundred. Designs may be either random or purposive, such as conducting debriefings with respondents who exhibited higher error rates or errors on critical items. Since the debriefing instrument is structured, empirical summaries of results may be generated.

When used for testing purposes, the primary objective of respondent debriefing is to determine whether the respondents understand the concepts and questions in the same way that the survey designers intend. Sufficient information is obtained to evaluate the extent to which reported data are consistent with survey definitions. For instance, respondents may be asked whether they included or excluded items in their answers, per definitions. In economic surveys, the debriefings may ask about the use of records or estimation strategies. In addition, respondent debriefings can be useful in determining the reason for respondent misunderstandings. Sometimes results of respondent debriefings show that a question is superfluous and can be eliminated from the final questionnaire. Conversely, it may be discovered that additional questions need to be included in the final questionnaire to better operationalize the concept of interest. Finally, the data may show that the intended meaning of certain concepts or questions is not clear or able to be understood.

A critical requirement to obtain a successful respondent debriefing is that question designers and researchers have a clear idea of potential problems so that good debriefing questions can be developed. Ideas about potential problems can come from pre-field techniques (e.g., cognitive interviews conducted prior to the field test), from analysis of data from a previous survey, from careful review of questionnaires, or from observation of earlier interviews.

Respondent debriefings may be able to supplement the information obtained from behavior coding. As noted above, behavior coding demonstrates the existence of problems but does not always identify the source of the problem. When designed properly, the results of respondent debriefings can provide information about the sources of problems. Respondent debriefings also may reveal problems not evident from the response behavior.

Interviewer Debriefing has traditionally been the primary method used to evaluate field or pilot tests of interviewer-administered surveys. It also may be used following production data collection prior to redesigning an ongoing periodic or recurring survey. Interviewer debriefing consists of holding group discussions or administering structured questionnaires with the interviewers to obtain their views of questionnaire problems. The objective is to use the interviewers' direct contact with respondents to enrich the questionnaire designer's understanding of questionnaire problems. Although it is a useful evaluation component, it is not sufficient as an evaluation method and does **not** satisfy the pretesting requirement.

Interviewers may not always be accurate reporters of certain types of questionnaire problems for several reasons. When interviewers report a problem, it is not always clear if the issue caused trouble for one respondent or for many. Interviewers' reports of problem questions may reflect their own preference regarding a question, rather than respondent confusion. Finally, experienced interviewers sometimes change the wording of problem questions as a matter of course to make them work and may not even realize they have done so.

Interviewer debriefings can be conducted in several different ways: in a group setting, through rating forms, or through standardized questionnaires. *Group setting debriefings* are the most common method. They essentially involve conducting a focus group with the field test interviewers to learn about their experiences in administering the questionnaire. *Rating forms* obtain more quantitative information by asking interviewers to rate each question in the pretest questionnaire on selected characteristics of interest to the researchers (e.g., whether the interviewer had trouble reading the question as written, whether the respondent understood the words or ideas in the question). *Standardized interviewer debriefing questionnaires* collect information about the interviewers' perceptions of a problem, the prevalence of a problem, the reasons for a problem, and proposed solutions to a problem. Interviewer debriefings also can ask about the magnitude of specific kinds of problems, to test the interviewers' knowledge of subject-matter concepts.

Analysts' Feedback is a method of learning about problems with a questionnaire specific to the economic area. At the Census Bureau, most economic surveys are self-administered; so survey or program staff analysts in the individual subject areas, rather than interviewers, often have contact with respondents. While collecting feedback from analysts is a useful evaluation component, it does **not** satisfy the pretesting requirement.

Feedback from analysts about their interactions with respondents may serve as an informal evaluation of the questionnaire and the data collected. These interactions include "Help Desk" phone inquiries from respondents and follow-up phone calls to respondents by analysts investigating suspicious data flagged by edit failures. Analyst feedback is more useful when analysts systematically record comments from respondents in a log. The log enables qualitative evaluation of the relative severity of questionnaire problems, because strictly anecdotal feedback sometimes may be overstated.

Another way to obtain analyst feedback is for questionnaire design experts to conduct focus groups with the analysts who review data and resolve edit failures. These focus groups can identify questions that may need to be redesigned or evaluated by other methods. Regardless of

how respondent feedback is captured, analysts should provide feedback early in the questionnaire development cycle of recurring surveys to identify problematic questions.

Split Panel Tests are controlled experimental tests of questionnaire variants or data collection modes to determine which one is "better" or to measure differences between them. Split panel testing satisfies the pretesting requirement.

Split panel experiments may be conducted within a field or pilot test or embedded within production data collection for an ongoing periodic or recurring survey. For pretesting draft versions of a questionnaire, the search for the "better" questionnaire requires that an a priori standard be determined by which the different versions can be judged. Split panel tests can incorporate a single question, a set of questions, or an entire questionnaire.

It is important to select adequate sample sizes when designing a split panel test so that differences of substantive interest can be measured. In addition, these tests must use randomized assignment within replicate sample designs so that differences can be attributed to the question or questionnaire and not to the effects of incomparable samples.

Another use of the split panel test is to calibrate the effect of changing questions. They are extremely valuable in the redesign and testing of surveys for which the comparability of the data collected over time is an issue. They provide an important measure of the extent to which different results following a major survey redesign are due to methodological changes, such as the survey instrument or interview mode, rather than changes over time in the subject-matter of interest. Split panel testing is recommended for data with important policy implications.

Comparing response distributions in split panel tests produces measures of differences but does not necessarily reveal whether one version of a question produces a better understanding of what is being asked than another. Other question evaluation methods, such as respondent debriefings, interviewer debriefings, and behavior coding, are useful to evaluate and interpret the differences observed in split panel tests.

Analysis of Item Nonresponse Rates, Imputation Rates, Edit Failures, or Response Distributions from the collected data can provide useful information about how well the questionnaire works. Use of this method in combination with a field test does **not** satisfy the pretesting requirement.

In household surveys, examination of item nonresponse rates can be informative in two ways. First, "don't know" rates can determine the extent to which a task is too difficult for respondents. Second, refusal rates can determine the extent to which respondents find certain questions or versions of a question to be more sensitive than others.

In economic surveys, item nonresponse may be interpreted to have various meanings, depending on the context of the survey. In some institutional surveys (e.g., hospitals, prisons, schools) where data are abstracted from individual person-level records, high item nonresponse is considered to indicate data not routinely available in those records. Item nonresponse may be more difficult to detect in other economic surveys where questions may be left blank because

they are not applicable to the responding business or the response value may be zero. In these cases, the data may not be considered missing at all.

Response distributions are the frequencies with which respondents provided answers during data collection. Evaluation of the response distributions for survey items can determine whether variation exists among the responses given by respondents or if different question wordings or question sequencings produce different response patterns. This type of analysis is most useful when pretesting either more than one version of a questionnaire or a single questionnaire for which some known distribution of characteristics exists for comparative purposes.

The quality of collected data also may be evaluated by comparing, reconciling, or benchmarking to data from other sources. This is especially true for economic data, but benchmarking data are also available for some household surveys.

Web Probing is an emerging asynchronous pretesting method that involves embedding cognitive interview-style probes into a self-administered web questionnaire. Probes can be open-ended or closed-ended, and web probing can be used either as a pre-field or field technique.

Unlike traditional cognitive interviews, web probing does not use interviewers. An advantage of this is that responses from large numbers of respondents can be collected inexpensively in a short period of time. However, there are also several disadvantages to consider. Web probing is highly dependent on careful selection of probes since they cannot be adjusted on the fly as they can be in a cognitive interview. If pre-written probes are not successful in eliciting the desired type of feedback, results may be of limited utility. Respondent fatigue is another risk, particularly with open-ended probes. Without an interviewer to motivate them, respondents may give short or one-word answers in response to questions. This method does not meet the pretesting standard because of these limitations.

CONCLUSION

At least one of the following techniques must be used to satisfy the pretesting requirement:

- Cognitive interviews.
- Usability techniques focused on the respondent's understanding of the questionnaire.
- Focus groups involving the administration of questionnaires.
- Behavior coding of respondent/interviewer interactions.
- Respondent debriefings in conjunction with a field test or actual data collection.
- Split panel tests.

However, pretesting typically is more effective when multiple methods are used. Additional pretesting techniques should be carefully considered to provide a thorough evaluation and documentation of questionnaire problems and solutions. The relative effectiveness of the various techniques for evaluating survey questions depends on the pretest objectives, sample size, questionnaire design, and mode of data collection. The Census Bureau advocates that both pre-field and field techniques be undertaken, as time and funds permit.

For continuing surveys that have a pre-existing questionnaire, cognitive interviews should be used to provide detailed insights into problems with the questionnaire whenever time permits or when a redesign is undertaken. Cognitive interviews may be more useful than focus groups with a pre-existing questionnaire because they mimic the question-response process. For one-time or new surveys, focus groups are useful tools for learning what respondents think about the concepts, terminology, and sequence of topics prior to drafting the questionnaire. In economic surveys, exploratory/feasibility studies, conducted as company or site visits, also provide information about structuring and wording the questionnaire relative to data available in business/institutional records. Usability techniques are increasingly important as surveys move to automated data collection.

Pre-field methods alone may not be sufficient to test a questionnaire. Some type of testing in the field is encouraged, even if it is evaluated based only on observation by questionnaire developers. More helpful is small-to-medium-scale field or pilot testing with more systematic evaluation techniques. The various methods described in this appendix complement each other in identifying problems, the sources of problems, and potential solutions.

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Planning And Development
Statistical Quality Standard
A3 - Developing and Implementing a Sample Design

Purpose: The purpose of this standard is to ensure that statistically sound frames are designed, and samples are selected to meet the objectives of the survey.

Scope: The Census Bureau's statistical quality standards apply to all information products released by the Census Bureau and the activities that generate those products, including products released to the public, sponsors, joint partners, or other customers. All Census Bureau employees and Special Sworn Status individuals must comply with these standards; this includes contractors and other individuals who receive Census Bureau funding to develop and release Census Bureau information products.

This standard applies to the design and selection of statistically sound samples used to produce estimates or make inferences and covers:

- Frame development for censuses and sample surveys.
- The design and selection of samples or subsamples for surveys.
- The design and selection of samples or subsamples for secondary data analysis, evaluations, or quality assessments.

Exclusions:
In addition to the global exclusions listed in the Preface, this standard does not apply to:

- Qualitative research.
- Samples that will not be used to produce estimates or make inferences (e.g., samples used for operational tests, pilot studies, or quality control).
- Frames and samples provided to the Census Bureau by a sponsor.
- Activities performed to produce sample estimates (e.g., weighting, estimation, and variance estimation). Statistical Quality Standard D1, *Producing Direct Estimates from Samples*, addresses requirements related to producing estimates.

Key Terms: Administrative data, Cluster, coverage, cut-off samples, estimate, estimation, estimation error, frame, housing unit, peer review, precision, primary sampling unit (PSU), probability of selection, probability sampling, record linkage, sample design, sample size, sampling frame, sampling weights, sequential sampling, strata, stratification, systematic sampling, target population, third-party data, unduplication, variance, and weights.

Requirement A3-1: Throughout all processes associated with frame development and sample design, unauthorized release of protected information or administratively restricted information must be prevented by following federal laws[1] (e.g., Title 13, Title 15, and Title 26), Census Bureau policies[2] (e.g., Data Stewardship policies), and additional provisions governing the use of the data (e.g., as may be specified in a memorandum of understanding or data-use agreement). (See Statistical Quality Standard S1, *Protecting Confidentiality*.)

Requirement A3-2: A plan must be developed that addresses:

1. Statistical requirements of the program using the sample (e.g., the target population, the key estimates, the required precision of the estimates, and the expected response rates).
2. Development of the sampling frame.
3. Sampling methodologies that improve efficiency and minimize the costs of data collection (e.g., probability sampling, oversampling, stratification, sorting, unduplication requirements, and cluster sizes).
4. Verification and testing of systems associated with the sampling operations.
5. Monitoring and evaluating the accuracy of the frame and the sample (e.g., the coverage of the target population by the frames, timeliness of the frames, efficiency of stratification, and verification of the sample).

Notes:

(1) The Census Bureau Guideline *Sample Design and Selection*[3] identifies steps to follow and issues to consider when designing and selecting a sample.

(2) Statistical Quality Standard A1, *Planning the Data Program*, addresses overall planning requirements, including the development of schedules and costs.

Requirement A3-3: Sampling frames that meet the data collection objectives must be developed using statistically sound methods. When linking auxiliary data to units on a sampling frame pertinent standards on acquiring and using administrative data (Standard B2) and on record linkage (Standard C4) must be satisfied.

Examples of frame development activities include:

- Describing the target population.
- Constructing the frame using sources that promote accuracy and completeness.
- Combining multiple frames and unduplicating among them or adjusting probabilities of selection to address units appearing in multiple frames.
- Updating frames (e.g., for new construction and establishment "births" and "deaths").
- Identifying limitations of the frame, including timeliness and accuracy of the frame (e.g., misclassification, eligibility, and coverage).

Requirement A3-4: The sample design must be developed to meet the objectives of the survey, using statistically sound methods. The size and design of the sample must reflect the level of detail needed in tabulations and other information products and the precision required of key estimates. Any use of nonprobability sampling methods (e.g., cut-off) must be justified statistically and be able to measure estimation error.

Examples of sample design activities include:

- Setting the requirements and rules for how to define primary sampling units (PSUs), secondary units (e.g., clusters of housing units), and criteria for self-representing PSUs.
- Defining measures of size.
- Determining appropriate sample sizes for population subgroups as needed.
- Defining sampling strata and criteria for clustering.
- Defining the sample size by stratum and the allocation methodology.
- Determining the order of selection and the probabilities of selection.

- Describing the sample selection methods (e.g., systematic sampling, sequential sampling, and probability proportional to size).
- Grouping sample units into representative panels and identifying the duration a unit will remain in sample.
- Determining sample rotation patterns.
- Addressing the issues involved with replacing a current sample design with a new one (e.g., phase-in/phase-out periods, minimizing/maximizing overlap, and accounting for any bias associated with the redesign).
- Developing and maintaining sample design information needed for weighting, estimation, and variance estimation (e.g., probabilities of selection, noninterview adjustment cells, and sample replicates).
- Assessing the potential bias from using the cut-off sampling method.

Requirement A3-5: Sampling frames must be implemented, and samples selected to ensure high quality data.

Sub-Requirement A3-5.1: Specifications and procedures for creating frames and selecting samples, based on the statistical requirements, must be developed and implemented.

Examples of issues that specifications and procedures might address include:
- Stratum definitions, stratification algorithms, and clustering algorithms.
- Addition or deletion of records to update frames.
- Algorithms for creating PSUs.
- Sampling algorithms.
- Unduplication of the sample between surveys or between different waves of the same survey.
- Creation of sample replicates needed for weighting, estimation, and variance estimation.
- Assignment of sampling weights appropriate for the sample design to selected units.

Sub-Requirement A3-5.2: Systems and procedures must be verified and tested to ensure all components function as intended.

Examples of verification and testing activities include:
- Verifying that specifications conform to the technical requirements for the frame and sample design (e.g., using walk-throughs and peer reviews).
- Validating computer code against specifications.
- Performing tests of the individual modules and an integrated test of the full sample selection operation.
- Verifying the accuracy of frame information.
- Verifying the selection of the sample for accuracy (e.g., sample sizes are as expected).

Sub-Requirement A3-5.3: Systems and procedures must be developed and implemented to monitor and evaluate the accuracy of the frame development and sample selection operations and to take corrective action if problems are identified.

Examples of activities to monitor and evaluate the accuracy include:

- Comparing weighted sample counts with frame counts.
- Verifying that sample sizes are within expectations.
- Evaluating the accuracy and coverage of the frames against the target population.
- Evaluating changes in the sample design to understand how the revisions might affect the estimates.

Requirement A3-6: Documentation needed to replicate and evaluate frame development and sample design operations must be produced. The documentation must be retained, consistent with applicable policies and data-use agreements, and must be made available to Census Bureau employees who need it to carry out their work. (See Statistical Quality Standard S2, *Managing Data and Documents*.)

Examples of documentation include:

- Plans, requirements, specifications, and procedures for the systems and processes of frame development and sample selection.
- Sampling design information needed to produce estimates and variance estimates.
- Descriptions of the frame and its coverage.
- Techniques used to evaluate the coverage of the frame and the adequacy of the sample design.
- Quality measures and evaluation results. (See Statistical Quality Standard D3, *Producing Measures and Indicators of Nonsampling Error*.)

Notes:

(1) The documentation must be released on request to external users, unless the information is subject to legal protections or administrative restrictions that would preclude its release. (See Data Stewardship Policy DS007, *Information Security Management Program*.[4])

(2) Statistical Quality Standard F2, *Documentation to Support Transparency in Information Products*, contains specific requirements about documentation that must be readily accessible to the public to ensure transparency of information products released by the Census Bureau.

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[1] United States Government, *Code of Federal Regulations*, Federal Register, Washington D.C., Updated Annually, https://www.govinfo.gov/app/collection/cfr Accessed on 27 October 2020.

[2] Data Stewardship Executive Policy Committee, *Data Stewardship Policies*, U.S. Census Bureau, Washington D.C., October 2020. https://www.census.gov/about/policies/privacy/data_stewardship/dsep_committee.html Accessed on 2 March 2022

[3] Methodology and Standards Council *Census Bureau Guideline: Sample Design and Selection*, U.S. Census Bureau, Washington, D.C., February 13, 2003.

[4] Data Stewardship Executive Policy Committee. *DS007: Safeguarding and Managing Information*. U.S. Census Bureau, Washington, D.C.. May 28, 2013. https://www.census.gov/about/policies/privacy/data_stewardship/dsep_committee.html Accessed on 2 March 2022.

Collecting And Acquiring Data
Statistical Quality Standard
B1 - Establishing and Implementing Data Collection Methods

Purpose: The purpose of this standard is to ensure that methods are established and implemented to promote the collection of high-quality data from respondents.

Scope: The Census Bureau's statistical quality standards apply to all information products released by the Census Bureau and the activities that generate those products, including products released to the public, sponsors, joint partners, or other customers. All Census Bureau employees and Special Sworn Status individuals must comply with these standards; this includes contractors and other individuals who receive Census Bureau funding to develop and release Census Bureau information products.

This standard applies to establishing and implementing data collection methods for data programs that obtain information directly from respondents, including reimbursable surveys and surveys in which interviewers collect information from establishments.

Exclusions:
In addition to the global exclusions listed in the Preface, this standard does not apply to:
- Administrative data acquired under agreements with other organizations and not collected by interviewers.

Key Terms: Administrative data, CAPI, CATI, coverage, data collection, dress rehearsal, fax imaging, field test, load testing, mail-out/mail-back, measurement error, nonresponse bias, nonresponse follow-up, reinterview, response error, response rate, supplemental reinterview, systems test, and touch-tone data entry (TDE).

Requirement B1-1: Throughout all processes associated with data collection, unauthorized release of protected information or administratively restricted information must be prevented by following federal laws[1] (e.g., Title 13, Title15, and Title 26), Census Bureau policies[2] (e.g., Data Stewardship policies), and additional provisions governing the use of the data (e.g., as may be specified in a memorandum of understanding or data-use agreement). (See Statistical Quality Standard S1, *Protecting Confidentiality*.)

Requirement B1-2: A plan must be developed that addresses:
1. Data collection methods (e.g., interview mode, use of incentives, and reference periods), systems, and procedures. In adaptive survey design collections, the plan must additionally include methods for tracking sample quality and costs incurred and methods employed to target open cases for contact effort.
2. Definitions for what constitutes an interview or response (i.e., a complete interview, a sufficient partial interview, or an insufficient partial interview).
3. Verification and testing of the data collection methods, systems, and procedures. (Statistical Quality Standard A2, *Developing Data Collection Instruments and Supporting Materials*, addresses questionnaire content pretesting and instrument testing.)
4. Training for staff involved in the data collection effort.

5. Monitoring and evaluating the quality of the data collection operations. In adaptive survey collections, monitoring includes estimates of achieved sample quality, response propensity for open cases and costs.

Note: Statistical Quality Standard A1, *Planning a Data Program*, addresses overall planning requirements, including estimates of schedule and costs.

Requirement B1-3: Data collection methods must be designed and implemented in a manner that balances (within the constraints of budget, resources, and time) data quality and measurement error with respondent burden.

Sub-Requirement B1-3.1: Systems and procedures must be developed to implement the data collection.

Examples of data collection activities for which systems and procedures should be developed include:

- Listing possible sampling units.
- Producing electronic (Internet/CAPI/CATI) or paper questionnaires and related materials (e.g., printing and assembling mail-out packages). (Statistical Quality Standard A2, *Developing Data Collection Instruments and Supporting Materials*, addresses the design of questionnaires and materials.)
- Providing OMB-required notifications to respondents.
- Providing telephone questionnaire assistance for mail-out/mail-back data collection.
- Transmitting information (by mail, electronically, the Internet, TDE, fax imaging, or other method) between respondents or interviewers and the Census Bureau.
- Formatting CAPI/CATI output files to be compatible with processing systems.
- Conducting interviews.
- Conducting nonresponse follow-up operations.

In addition to the items listed above, examples of data collection activities in adaptive survey collections for which systems and procedures should be developed include:

- Systems for moving cases among different collection effort statuses (e.g., across modes, “high, medium, low or on-hold” status).
- Systems for integrating data on contact efforts expended and characteristics of interviewed and open cases in order to create models of response propensity and sample representativeness.
- Systems for tracking sample quality, stability of key estimates and costs incurred, permitting judgments on stopping data collection.

Sub-Requirement B1-3.2: Data collection systems and methods must be verified and tested to ensure that all components function as intended.

Examples of verification and testing activities include:

- Verifying that the specifications and procedures reflect the requirements of the program.
- Verifying that the materials used for data collection operations meet specifications (e.g., ensure that forms are printed properly).

- Verifying the physical assembly of mailing packages (e.g., ensure that mailing pieces fit properly in the envelopes).
- Testing the electronic data management systems (e.g., the systems used to manage cases and data between headquarters and the interviewers and between headquarters and the data processing systems) for accuracy, capacity (e.g., load testing), and reliability.
- Conducting a system test to verify the functioning of the data collection instrument in combination with the data management systems.
- Conducting a field test to test systems and methods under realistic conditions (e.g., the dress rehearsal for the decennial census).
- Conducting tests to ensure that systems for adaptive survey collections perform as expected.

Sub-Requirement B1-3.3: Training for field and headquarters staff involved in the data collection effort (as identified during planning) must be developed and provided.

Examples of training topics include:

- Relevant Census Bureau policies (e.g., Data Stewardship Policy DS016, *Respondent Identification Policy*[3]).
- The goals and objectives of the data collection.
- Survey-specific concepts and definitions.
- The uses of the data.
- Techniques for obtaining respondent cooperation.
- Follow-up skills.

Sub-Requirement B1-3.4: Systems and procedures must be developed and implemented to monitor and evaluate the data collection activities and to take corrective actions if problems are identified. (This could be standard issues with field data collection or could be major problems or unexpected events).

Examples of monitoring and evaluating activities include:

- Tracking unit response rates, progress in completing interviews, and costs of the data collection, and taking corrective action when goals are not met.
- Tracking returned cases to ensure all cases are accounted for and investigating to locate missing cases.
- Verifying that interviewers follow interviewing procedures and do not falsify data (e.g., by conducting field observations, conducting reinterviews, or monitoring telephone center interviewers) and, if necessary, taking appropriate corrective action (e.g., retraining, reassigning, or dismissing interviewers).
- Collecting, tracking, and analyzing interviewer performance statistics (e.g., refusals, completed interviews, refusal conversions, login hours, and completed interviews per login hour), and providing feedback or other corrective action when necessary.
- Verifying that analyst follow data collection review procedures and providing feedback when necessary.
- Reviewing response data for accuracy and completeness and taking appropriate corrective action when necessary to improve accuracy or completeness.

- Reviewing response data for unexpected results and unusual patterns (e.g., a pattern of an unusually high number of vacant households) and taking corrective action when needed (e.g., providing feedback, retraining interviewers, or conducting supplemental reinterviews).
- Being prepared for major disruptions in data collection activities.
- Conducting evaluation studies (e.g., nonresponse bias analysis, coverage evaluation study, and response error reinterview study).

Requirement B1-4: Documentation needed to replicate and evaluate the data collection methods must be produced. The documentation must be retained, consistent with applicable policies and data-use agreements, and must be made available to Census Bureau employees who need it to carry out their work. (See Statistical Quality Standard S2, *Managing Data and Documents*.)

Examples of documentation include:

- Plans, requirements, specifications, and procedures for the data collection.
- Test designs and results.
- Instructions to respondents and interviewers about the data collection instrument.
- Quality measures and evaluation results. (See Statistical Quality Standard D3, *Producing Measures and Indicators of Nonsampling Error*.)

Notes:

(1) The documentation must be released on request to external users, unless the information is subject to legal protections or administrative restrictions that would preclude its release. (See Data Stewardship Policy DS007, *Information Security Management Program*.[4])

(2) Statistical Quality Standard F2, *Documentation to Support Transparency in Information Products*, contains specific requirements about documentation that must be readily accessible to the public to ensure transparency of information products released by the Census Bureau.

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[1] United States Government, *Code of Federal Regulations*, Federal Register, Washington D.C., Updated Annually, https://www.govinfo.gov/app/collection/cfr Accessed on 27 October 2020.

[2] Data Stewardship Executive Policy Committee, *Data Stewardship Policies*, U.S. Census Bureau, Washington D.C., October 2020. https://www.census.gov/about/policies/privacy/data_stewardship/dsep_committee.html Accessed on 2 March 2022

[3] Data Stewardship Executive Policy Committee *DS-016: Policy on Respondent Identification and Sensitive Topics in Dependent Interviewing*, U.S. Census Bureau, Washington, D.C.. December 15, 2014. https://www.census.gov/about/policies/privacy/data_stewardship/dsep_committee.html Accessed on 2 March 2022

[4] Data Stewardship Executive Policy Committee. *DS007: Safeguarding and Managing Information*. U.S. Census Bureau, Washington, D.C., May 28, 2013. https://www.census.gov/about/policies/privacy/data_stewardship/dsep_committee.html Accessed on 2 March 2022.

Collecting And Acquiring Data
Statistical Quality Standard
B2 - Acquiring and Using Administrative Data

Purpose: The purpose of this standard is to ensure the quality of information products derived from administrative data acquired from non-Census Bureau organizations.

Scope: The Census Bureau's statistical quality standards apply to all information products released by the Census Bureau and the activities that generate those products, including products released to the public, sponsors, joint partners, or other customers. All Census Bureau employees and Special Sworn Status individuals must comply with these standards; this includes contractors and other individuals who receive Census Bureau funding to develop and release Census Bureau information products.

This standard applies to the acquisition and use of administrative data (e.g., demographic, business, and geographic administrative records and data from non-Census Bureau organizations.)

Exclusions:
The global exclusions to the standards are listed in the Preface. No additional exclusions apply to this standard.

Key Terms: Administrative data, Administrative records, data-use agreement, record linkage, and third-party data.

Requirement B2-1: Throughout all processes associated with acquiring, using, and disposing of administrative data, the provisions of federal laws[1] (e.g., Title 13, Title 15, and Title 26), data-use agreements, and Census Bureau policies and procedures on privacy and confidentiality[2] (e.g., Data Stewardship policies) must be followed to protect administrative data from unauthorized release. (See Statistical Quality Standard S1, *Protecting Confidentiality*.)

Note: For detailed procedures on acquiring, using, and disposing of administrative data, see the Administrative Data Acquisition, Access, and Use Policy[3] and the corresponding Handbook for admistrative data projects[4].

Requirement B2-2: A study plan must be developed to evaluate the integrity and reliability of the data provider, verification and evaluation of the quality of the acquired data, in addition to the requirements of the Administrative Data Acquisition, Access, and Use Policy and the Handbook for admistrative data projects.

Note: Statistical Quality Standard A1, *Planning a Data Program*, addresses the overall planning requirements for a data program, including estimates of schedule and costs.

Requirement B2-3: Acquired data must be reviewed to ensure that they meet the requirements specified in the data-use agreement and in the technical documentation provided by the source agency.

Examples of review activities include:
- Verifying that the data are readable and match the record layout.
- Verifying that the number of records is consistent with counts provided by the source agency.
- Comparing distributions of variables with historical averages or expected values.
- Reviewing address lists for extraneous characters and to ensure that the format of incoming information is consistent with information contained within Census Bureau databases.

Sub-Requirement B2-3.1: The quality of the acquired data must be evaluated.

Examples of evaluation activities include:
- Calculating the missing data rates within the records.
- Calculating coverage rates.
- Evaluating the accuracy of the records (e.g., values of variables are within acceptable ranges).

Sub-Requirement B2-3.2: If the data do not meet the requirements, timely feedback on the problems must be provided and corrective actions taken, following the procedures described in the *Administrative Data Acquisition, Access, and Use Policy* and *the Handbook for admistrative data projects*.

Requirement B2-4: Documentation needed to replicate and evaluate projects using administrative data must be produced. The documentation must be retained, to the extent allowed by applicable policies and data-use agreements, and must be made available to Census Bureau employees who need it to carry out their work. (See Statistical Quality Standard S2, *Managing Data and Documents*.)

Examples of documentation, in addition to the documentation specified by the *Administrative Data Acquisition, Access, and Use Policy* and *the Handbook for admistrative data projects*, include:
- App B2 - Data Quality Assessment (DQA). Census Bureau staff should instead use our automated Data Management System (DMS).
- Transparent Reporting for Integrated Data Quality: Practices of Seven Federal Statistical Agencies[5]
- Descriptions of processes and procedures used to verify the data and evaluate its quality.
- Descriptions of processes and procedures used to develop estimates.
- Research reports used to guide decisions.
- Quality measures and evaluation results. (See Statistical Quality Standard D3, *Producing Measures and Indicators of Nonsampling Error*.)

Notes:
(1) Documentation may be publicly released as part of a formal research paper posted on Census servers or released on request to external users, unless the information is subject

to legal protections or administrative restrictions that would preclude its release. (See Data Stewardship Policy DS007, *Information Security Management Program*.[6])

(2) Statistical Quality Standard F2, *Documentation to Support Transparency in Information Products*, contains specific requirements about documentation that must be readily accessible to the public ensure transparency of information products released by the Census Bureau.

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[1] United States Government, *Code of Federal Regulations*, Federal Register, Washington D.C., Updated Annually, https://www.govinfo.gov/app/collection/cfr Accessed on 27 October 2020.

[2] Data Stewardship Executive Policy Committee, *Data Stewardship Policies*, U.S. Census Bureau, Washington D.C., October 2020. https://www.census.gov/about/policies/privacy/data_stewardship/dsep_committee.html Accessed on 2 March 2022

[3] Data Stewardship Executive Policy Committee *DS001a - Administrative Data Acquisition, Access, and Use Policy*, U.S. Census Bureau, Washington, D.C., October 25, 2016. https://www.census.gov/about/policies/privacy/data_stewardship/dsep_committee.html Accessed on 2 March 2022.

[4] Data Stewardship Executive Policy Committee, *DS001b - Handbook For Administrative Data Projects*, U.S. Census Bureau, Washington, D.C., February 22, 2019. https://www.census.gov/about/policies/privacy/data_stewardship/dsep_committee.html Accessed on 2 March 2022.

[5] Mark Prell, Chris Chapman, Samson Adeshiyan, Dennis Fixler, Tom Garin, Lisa Mirel, and Polly Phipps., *Transparent Reporting for Integrated Data Quality: Practices of Seven Federal Statistical Agencies*. Federal Committee on Statistical Methodology. FCSM 19-01. September 2019. https://nces.ed.gov/fcsm/pdf/Transparent_Reporting_FCSM_19.01.pdf. Accessed on September 22, 2020.

[6] Data Stewardship Executive Policy Committee. *DS007: Safeguarding and Managing Information*. U.S. Census Bureau, Washington, D.C., May 28, 2013. https://www.census.gov/about/policies/privacy/data_stewardship/dsep_committee.html Accessed on 2 March 2022.

Collecting And Acquiring Data
Statistical Quality Standard
App B2 - Data Quality Assessment (DQA)

Federal Statistical Agencies are obligated[1,2] to seek out alternative data sources and use the data in an appropriate manner. To facilitate data governance, the attached assessment helps an organization document key features and limitations of any **acquired** records.

Overview of Data Quality
Many factors influence a user's perception of quality. The basic acceptability of a data file can be evaluated by considering the following quality dimensions.
Relevance - the similarity of concepts, population of interest, and time periods.
Accuracy - known sources of error like missing information, misinterpretation of questions, and keying, coding, and duplication errors.
Timeliness - the delay between an event and publication of its statistic.
Accessibility - confidentiality constraints, cost, and means of data transfer.
Interpretability - definitions of data fields, questionnaire wording, and data collection instructions.
Coherence - the comparability over time including effects of changes in: the concepts being measured, questionnaire wording, classification codes, data collection methods, reference periods, and target populations.
Institutional Environment - the integrity of the data and credibility of the data source.
The data requestor and data provider are encouraged to have a conversation to promote a clear understanding of the dimensions of interest and elicit additional dimensions of importance.

Overview of the Data Quality Assessment Form
The assessment of data quality has three phases. The following sample forms show example responses to help users interpret how to respond to each assessment question..
Data Request
This phase is completed by the manager for the information product. The request establishes the desired data characteristics and when approved authorizes a search to acquire the data. The group approving the request would then typically assign a *Tracking #.*
Initial Assessment
This phase is primarily completed by the data provider. The responses document key quality factors. The manager for the information product makes a preliminary evaluation if it is worthwhile to acquire the data.
Detailed Evaluation
This phase is broken in to two sections--one completed by the data provider and one by the manager for the information product. The combined input confirms if the data is fit for use and how it may be used.

DATA REQUEST
Information Product: Supplemental Nutrition Survey **Tracking #:** BOC-SNS-002
What is the purpose for the desired data? *The U.S. Census Bureau would like to understand the participation dynamics for the Supplemental Nutrition Assistance Program (SNAP). Merging state SNAP administrative records to Census Bureau survey data can enrich demographic information for both participating and non-participating households.*

Relevance
What characteristics are needed for the data (demographic, economic, geographic, etc.)? *We need the demographic and economic records for SNAP program participants for all states, including those found ineligible.*
What record level entity is needed (e.g., person, household, establishment, company, etc.)? *Person level*
What reference time period is needed? *2004 to the Present calendar years.*

Accuracy
What is the desired coverage (full enumeration, sample, geographic limitations) for the population of interest? *We are seeking complete coverage of all participants in the SNAP program for all states.*

Timeliness
How soon after a reference period ends is the data needed? *Data is needed by the end of January for the prior calendar year.*

Interpretability
Describe the desired variables, their definitions, and note the desired format and valid values for each variable (reference any standard coding classifications i.e. NAICS, SOC where applicable). *The attached data dictionary describes the desired variables.*

Data Requestor
Contact: *John Doe, Chief Poverty Statistics Branch* **Organization**: U.S. *Census Bureau* **Address**: *4600 Silver Hill Rd* **City, St. Zip**: *Washington, DC 20233* **Phone:** 888-555-1212 **e-mail**: *j.doe@census.gov*

INITIAL ASSESSMENT

Data Provider
Contact: *Jane Smith, Administrator* **Organization:** *New York SNAP* **Address**: *1234 Anywhere Dr* **City, St. Zip** *New York, NY 10111* **Phone:** 800-123-4567 **e-mail**: *administrator@nysnap.com*

Relevance
What are the characteristics of the data (demographic, economic, geographic, etc.)? *We have the demographic and economic characteristics for SNAP program participants in the state of New York as well as records for those found ineligible for the SNAP program.*
What is the record level entity of the data (e.g.,person, household, establishment, company)? *Person level*
What reference time period(s) are available for the data? *Data from 2010 to present is available. Data prior to 2010 was purged from our archives.*

Accuracy
What is the coverage (full enumeration, sample) for the data? *Data is for all enrolled participants. A small percentage of those eligible are not enrolled.*

Timeliness
How soon after a reference period ends can data be made available? *Data can be made available by March 1 for the prior calendar year.*

Accessibility
Describe any legal, regulatory, or policy requirements restricting access to the data. *Data must be protected in accordance with USDA program guidelines.*
What reimbursement is expected for providing the data? (e.g.,An evaluation report, A fee) *No reimbursement is expected for the data.*

Interpretability
Provide a copy of any forms and instructions used to collect data from a respondent. *See www.nysnap.com/enrollment for the forms and instructions.*
Describe the relationship between the data file(s) to be used, list each variable desired/provided, and note the expected format and values for each variable (reference any standard coding classifications i.e. NAICS, SOC). *The desired files and variables are provided on the attached data dictionary. We show our variable names and as needed note their valid values.*

DATA REQUESTOR REVIEW
Describe if acquisition of the data is recommended and any anticipated limitations. *Historical data from 2004-2010 is not available. Data from 2010 to present however may be sufficient to establish an adequate time series. Data may only be accessible after March 1. With some changes to data processing, we may be able to compensate for a one month delay. I recommend proceeding with acquisition and explore options to acquire the data before March 1.* **Assessed by:** *J. Doe, Chief – Poverty Statistics Branch* **Date:** *05 May 2015*

DATA DICTIONARY

NYSNAP.txt field definitions

Field: **SNAPID** Field Description: SNAP ID # **(Primary Key)**
Data Type: Integer Length: 9 digits Format: None
Valid values:0 to 999999999

Field: **Link** Field Description: Applicants approval to link records
Data Type: Text Length: 3 Characters Format: None
Valid values: Yes, No

Field: **Date** Field Description: Date of application
Data Type: Date Length: 10 characters Format: mm/dd/yyyy
Valid values: mm: 1-12, dd: 1-31, yyyy:1900-2016

Field: **Mode** Field Description: Mode of data collection
Data Type: Text Length: 1 Characters Format: None
Valid values: W-Website Collection, M-Mailed Form, P-Personal Interview

Field: **IP** Field Description: IP Address
Data Type: Integer Length: 14 digits Format: ###.##.###.###
Valid values:000.00.000.000 to 999.99.999.999

Field: **Name** Field Description: Name of applicant
Data Type: Alphabetic Length: 32 characters Format: None
Valid Values: Any combination

Field: **House** Field Description: House Number
Data Type: Integer Length:6 digits Format: None
Valid values:0 to 999999

Field: **Street** Field Description: Street Name
Data Type: Alphanumeric Length: 32 characters Format: None
Valid Values: Any combination

Field: **Unit** Field Description: Within structure identifier
Data Type: Alphanumeric Length: 4 characters Format: None
Valid Values: Any combination

Field: **Zip** Field Description: U.S. Postal Zip code
Data Type: Text Length: 10 characters Format: ##### - ####
Valid Values: 00000 – 0000 to 99999 - 9999

Field: **Phone** Field Description: Telephone Number
Data Type: Numeric Length: 13 characters Format: (###)###-####
Valid Values: (000)000-0000 to (999)999-9999

Field: **DOB** Field Description: Date of birth of applicant
Data Type: Date Length:10 characters Format: mm/dd/yyyy
Valid values: mm: 1-12, dd: 1-31, yyyy:1900-2016

Field: **Income** Field Description: Applicants Annual Income
Data Type: Integer Length:6 digits Format: U.S. Dollars
Valid values:$0 to $999,999

Field: **Dependents** Field Description: Number of dependents
Data Type: Integer Length:2 digits Format: None
Valid values:0 to 20

Field: **Approval** Field Description: Applicants approval for SNAP
Data Type: Text Length: 3 Characters Format: None

DATA DICTIONARY
Valid values: Yes, No Field: **Benefit** Field Description: Applicants Total approved SNAP benefit amount Data Type: Integer Length:6 digits Format: U.S. Dollars Valid values:$0 to $999,999 Field: **Balance** Field Description: Applicants remaining SNAP benefit amount Data Type: Integer Length:6 digits Format: U.S. Dollars Valid values:$0 to $999,999

DETAILED EVALUATION
(Data Provider Input)

Interpretability
What is the data provider's purpose for collecting the data? *We verify eligibility for enrollment in the USDA supplemental nutritional assistance program.*
How is source data collected? (i.e., paper questionnaire, on-line questionnaire, personal interview) *Data is from an on-line questionnaire (79%), paper questionnaire (19%), and office visit (2%)*
Who is source data collected from? (i.e., Self-reported, Respondent Proxy, Linked records) *Self-reported by the applicant.*

Coherence
Describe any changes (i.e., legislation, eligibility requirements, geographical boundaries, or occurrence of natural disasters) that resulted in data anomalies within the reference period. *The occurrence of Hurricane Sandy increased SNAP enrollment in New York for 2012.*
Describe any changes to questions or instructions within the reference period. (i.e., adding questions, changing question wording, introducing new languages, deleting questions) *No changes were made within the reference period.*
Describe any changes within the reference period to how the data are processed. (i.e., changes to data collection mode, edits, classification codes, or the query used to extract the data) *No changes were made within the reference period.*
Describe any new records or revisions to existing records that may occur after data acquisition and when those changes are likely to occur. *No revisions to the data are anticipated after the data is provided.*

Accuracy
What percentage of those who are eligible/mandated to apply/report are not included on the data file(s)? What is known about their characteristics? *Less than 5% of those eligible to apply may not be enrolled. We have not estimated a more precise count of those who are eligible but not enrolled nor conducted any research to identify characteristics of those individuals.*
What percentage of entries in the data file(s) are duplicates? What is known about their characteristics? *A small percent of duplicate entries are identified each year. The duplicate entries typically arise in cases of shared custody of a minor when both parents apply separately. When identified the duplicates are removed.*
Which responses are revised the most, at what frequency, and are audit records kept? *Addresses are updated roughly 33% of the time, Income updated 25%, and other fields typically less than 1%. No audit records are kept.*
What are the primary reasons for data errors (e.g.,nonresponse, misinterpretation of questions, keying, coding) and the magnitude of their effect? *Some confusion arises over what should be included in "income" for question #4. Applicants under report their income in less than 5 percent of all cases. Under reported income is typically 40% less than actual.*

Institutional Environment
Describe the processes for ensuring data quality and the standards for what is acceptable from data collection and processing through retention. *The online questionnaire integrates quality control checks to ensure no nonresponse, keying, and coding errors. The applicants name, address, prior employment, and income are verified to ensure eligibility.*
Describe the quality controls for making changes to production processes. *We don't have a formal change control process. Changes are made as needed and reviewed by the requestor.*
Describe results of audits to validate your adherence to your procedures and quality standards. *Our processes have not been formally audited. We however have not noted any problems with our operational performance that would indicate concerns with our processes.*
Describe results of corrective actions taken to improve the quality of your processes. *No operational performance problems have been noted and no corrective actions taken.*

DATA PROVIDER ASSESSMENT
Are there any other issues that may limit the usefulness of the data and would you recommend using the data as intended? *Our office is not aware of any other issues that may limit the usefulness of the data and recommend using the data as intended.* **Assessed by:** *Jane Smith, Administrator NY SNAP* **Date:** *12 May 2015*

DETAILED EVALUATION
(Data Requestor Input)

Accuracy

Document the detailed characteristics of each field in the data file and ensure the provided data dictionary accurately reflects the actual contents of the file.

Filename: NYSNAP.txt
Storage Location: //datastore:/Commercial/NYSNAP

Number of fields:17
Number of records: 1,255,843
Duplicate Records Identified*: 1,576*
1,368 (0.10%) Repetitive submissions from the same IP address from 1 Jan 2010 to 6 May 2010
208 (0.01%) Duplicate applicants at different physical addresses.

Field: SNAPID
 # records that are not null: 1,255,843 (100%)

Field: Link
 # records that are not null: 1,233,191 (97.4%)

Field: Date
 # records that are not null: 1,255,843 (100%)
Change in value due to imputes & edits: N/A
 # edited records: 430 (0.03%)
430 (0.03%) Year value was out of sequence with other entries

Field: Mode
 # records that are not null: 1,255,843 (100%)
Change in value due to imputes & edits: N/A
 # edited records: 4,009 (0.3%)
4,009 (0.3%) Miscoded (Coded W-Website Collection but no IP address recorded)

Field: IP
 # records that are not null: 971,782 (77.4%)
1,368 (0.1%) Duplicate Records

Field: Name
 # records that are not null: 1,255,843 (100%)

Field: House
 # records that are not null: 1,255,843 (100%)

Field: Street
 # records that are not null: 1,255,843 (100%)

Accuracy
Field: Unit **# records that are not null:** 1,255,843 (100%) **Field:** Zip **# records that are not null:** 1,255,843 (100%) **Field:** Phone **# records that are not null:** 918,021 (73.1%) **Field:** DOB **# records that are not null:** 1,255,843 (100%) **Field:** Income **# records that are not null:** 1,255,843 (100%) 1,827 (0.14%) Exceeding Income threshold **Field:** Dependents **# records that are not null:** 1,255,843 (100%) 528,710 (42.1%) Have 1 or more dependents **Field:** Approval **# records that are not null:** 1,255,843 (100%) 1,827 (0.14%) Not Approved - Exceeding Income threshold **Field:** Benefit **# records that are not null:** 1,255,843 (100%) 1,827 (0.14%) – Shows $0 Benefits corresponding with not being approved. **Field:** Balance **# records that are not null:** 1,255,843 (100%) 1,827 (0.14%) – Show $0 Balance corresponding with not being approved.

DATA REQUESTOR ASSESSMENT
Describe any limitations and if the data will be fit for the intended use. *The data will be fit for our intended use.* **Assessed by:** *J. Doe, Chief – Poverty Statistics Branch* **Date:** *19 May 2015*

[1] Office of Management and Budget, *Guidelines for Ensuring and Maximizing the Quality, Objectivity, Utility, and Integrity of Information Disseminated by Federal Agencies,* Federal Register, Washington, D.C., February 22, 2002, 67 FR 8452-8460 https://www.federalregister.gov/documents/2002/02/22/R2-59/guidelines-for-ensuring-and-maximizing-the-quality-objectivity-utility-and-integrity-of-information Accessed on June 30, 2020.

[2] National Research Council, *Principles and Practices for a Federal Statistical Agency: Fifth Edition.* The National Academies Press, Washington, D.C., 2013, https://doi.org/10.17226/18318 Accessed on June 30,2020

Capturing And Processing Data
Statistical Quality Standard
C1 - Capturing Data

Purpose: The purpose of this standard is to ensure that methods are established and implemented to promote the accurate capture and conversion of paper forms or image files into data files for further processing.

Scope: The Census Bureau's statistical quality standards apply to all information products released by the Census Bureau and the activities that generate those products, including products released to the public, sponsors, joint partners, or other customers. All Census Bureau employees and Special Sworn Status (SSS) individuals must comply with these standards; this includes contractors and other individuals who receive Census Bureau funding to develop and release Census Bureau information products.

This standard applies to the development, modification, and implementation of post-collection data capture operations, such as:

- Operations to convert data on paper forms or maps into data files (e.g., key from paper (KFP) data entry, optical mark recognition (OMR), and optical character recognition (OCR)).
- Operations to convert image files (e.g., fax image files received directly from respondents and geographic image files) into data files (e.g., key from image (KFI) data entry, the Economic Programs' Paperless Fax Imaging Retrieval System (PFIRS), and operations to convert geographic image files into data files).

Exclusions:
In addition to the global exclusions listed in the Preface, this standard does not apply to:

- Electronic data collections (e.g., CATI, CAPI, and the Web). Statistical Quality Standard A2, *Developing a Data Collection Instrument,* addresses data capture performed within an instrument during data collection.

Key Terms: Data capture, key from image (KFI), key from paper (KFP), optical character recognition (OCR), fax imaging, and optical mark recognition (OMR).

Requirement C1-1: Throughout all processes associated with data capture, unauthorized release of protected information or administratively restricted information must be prevented by following federal laws[1] (e.g., Title 13, Title 15, and Title 26), Census Bureau policies[2] (e.g., Data Stewardship policies), and additional provisions governing the use of the data (e.g., as may be specified in a memorandum of understanding or data-use agreement). (See Statistical Quality Standard S1, *Protecting Confidentiality*.)

Requirement C1-2: A plan must be developed that addresses:

1. Requirements for the data capture systems.
2. Required accuracy levels for data capture.
3. Verification and testing of the data capture systems.

4. Training for the staff who perform the data capture operations (including SSS contractors).
5. Monitoring and evaluation of the quality of the data capture operations.

Notes:
(1) Statistical Quality Standard A1, *Planning a Data Program*, addresses overall planning requirements, including estimates of schedule and costs.
(2) A web-scraping plan must be approved by the Automated Internet Data Collection Review Board (AIDCRB). (See Data Stewardship Policy DS026, *Automated Collection of Data from the Internet* [3] for further guidance).

Requirement C1-3: Data collected on paper forms or in image files must be converted accurately into an electronic format suitable for subsequent processing.

Sub-Requirement C1-3.1: Specifications and procedures for the data capture operations must be developed and implemented.

Examples of activities that specifications and procedures might address include:
- KFP data entry.
- Scanning systems for paper forms and maps (e.g., OMR and OCR).
- Operations to convert image files (e.g., fax image files and geographic image files) into data files (e.g., KFI data entry and PFIRS).

Sub-Requirement C1-3.2: Data capture systems and procedures must be verified and tested to ensure that all components function as intended.

Examples of verification and testing activities include:
- Verifying that data capture specifications reflect the system requirements.
- Verifying that data capture systems and software adhere to the specifications.
- Verifying that data capture systems and software capture data accurately.

Sub-Requirement C1-3.3: Training for the staff (including SSS contractors) who perform the data capture operations (as identified during planning) must be developed and provided.

Sub-Requirement C1-3.4: Systems and procedures must be developed and implemented to monitor and evaluate the quality of the data capture operations and to take corrective actions if problems are identified.

Examples of monitoring and evaluation activities include:
- Monitoring captured data (keyed or captured through an automated system) to ensure that it meets the specified accuracy requirements.
- Monitoring and documenting the frequency and types of errors.
- Taking corrective actions when data do not meet accuracy requirements (e.g., rejecting and repairing unacceptable batches, retraining key-entry staff, and adjusting automated systems and retesting).

Requirement C1-4: Documentation needed to replicate and evaluate the data capture operations must be produced. The documentation must be retained, consistent with applicable policies and data-use agreements, and must be made available to Census Bureau employees who need it to carry out their work. (See Statistical Quality Standard S2, *Managing Data and Documents*.)

Examples of documentation include:

- Plans, requirements, specifications, and procedures for the data capture system.
- Problems encountered and solutions implemented during the data capture operations.
- Quality measures from monitoring and evaluating the data capture operations (e.g., error rates). (See Statistical Quality Standard D3, *Producing Measures and Indicators of Nonsampling Error*.)

Notes:

(1) The documentation must be released on request to external users, unless the information is subject to legal protections or administrative restrictions that would preclude its release. (See Data Stewardship Policy DS007, *Information Security Management Program*.[4])

(2) Statistical Quality Standard F2, *Documentation to Support Transparency in Information Products*, contains specific requirements about documentation that must be readily accessible to the public to ensure transparency of information products released by the Census Bureau.

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[1] United States Government, *Code of Federal Regulations*, Federal Register, Washington D.C., Updated Annually, https://www.govinfo.gov/app/collection/cfr Accessed on 27 October 2020.

[2] Data Stewardship Executive Policy Committee, *Data Stewardship Policies*, U.S. Census Bureau, Washington D.C., October 2020. https://www.census.gov/about/policies/privacy/data_stewardship/dsep_committee.html Accessed on 2 March 2022

[3] Data Stewardship Executive Policy Committee, *Data Stewardship Policies*, U.S. Census Bureau, Washington D.C., October 2020. https://www.census.gov/about/policies/privacy/data_stewardship/dsep_committee.html Accessed on 25 May 2022

[4] Data Stewardship Executive Policy Committee. *DS007: Safeguarding and Managing Information*. U.S. Census Bureau, Washington, D.C., May 28, 2013. https://www.census.gov/about/policies/privacy/data_stewardship/dsep_committee.html Accessed on 2 March 2022.

Capturing And Processing Data
Statistical Quality Standard
C2 - Editing and Imputing Data

Purpose: The purpose of this standard is to ensure that methods are established and implemented to promote the accurate correction of missing and erroneous values in survey, census, and administrative data through editing and imputation.

Scope: The Census Bureau's statistical quality standards apply to all information products released by the Census Bureau and the activities that generate those products, including products released to the public, sponsors, joint partners, or other customers. All Census Bureau employees and Special Sworn Status individuals must comply with these standards; this includes contractors and other individuals who receive Census Bureau funding to develop and release Census Bureau information products.

This standard applies to the development and implementation of editing and imputation operations for survey, census, administrative data, and geospatial data.

Exclusions:
In addition to the global exclusions listed in the Preface, this standard does not apply to:

- Estimation methods, such as nonresponse adjustments, that compensate for missing data. Statistical Quality Standard D1, *Providing Direct Estimates from Samples*, addresses requirements for estimation methods.

Key Terms: Editing, imputation, outliers, skip pattern, third-party data, and truth deck.

Requirement C2-1: Throughout all processes associated with editing and imputation, unauthorized release of protected information or administratively restricted information must be prevented by following federal laws[1] (e.g., Title 13, Title 15, and Title 26), Census Bureau policies[2] (e.g., Data Stewardship policies), and additional provisions governing the use of the data (e.g., as may be specified in a memorandum of understanding or data-use agreement). (See Statistical Quality Standard S1, *Protecting Confidentiality*.)

Requirement C2-2: A plan must be developed that addresses:

1. Requirements for the editing and imputation systems.
2. Verification and testing of the editing and imputation systems.
3. Monitoring and evaluation of the quality of the editing and imputation operations.

Note: Statistical Quality Standard A1, *Planning a Data Program*, addresses overall planning requirements, including estimates of schedule and costs.

Requirement C2-3: Data must be edited and imputed using statistically sound practices, based on available information.

Sub-Requirement C2-3.1: Specifications and procedures for the editing and imputation operations must be developed and implemented to detect and correct errors or missing data in the files.

Examples of issues that specifications and procedures might address include:

- Adding codes to collected data to identify aspects of data quality to allow users to appropriately analyze data files for missing data, duplicate records, and outliers (e.g., checks for possible erroneous extreme responses in income, price, and other such variables).
- Checks to verify the correct flow through prescribed skip patterns.
- Range checks or validity checks (e.g., to determine if numeric data fall within a pre-specified range or if discrete data values fall within the set of acceptable responses).
- Consistency checks across variables within individual records to ensure non-contradictory responses (e.g., if a respondent is recorded as 5 years old and married, the record contains an error).
- Longitudinal consistency checks for data fields not measuring period to period changes.
- Editing and imputation methods and rules (e.g., internal consistency edits, longitudinal edits, hot deck edits, and analyst corrections).
- Addition of flags on the data files to clearly identify all imputed and assigned values and the imputation method(s) used.
- Retention of the unedited values in the file along with the edited or imputed values.
- Checks for topology errors in geospatial data (e.g., lack of coincidence between boundaries that should align, gaps, overshoots, and floating segments).
- Checks for address range errors in geographic data (e.g., parity inconsistencies, address range overlaps and duplicates, and address range direction irregularities).
- Checks for duplicate map features.
- Standardization of street name information in geographic data (e.g., consistency of abbreviations and directionals, and consistent formatting).
- Rules for when data not from the data collection qualify as “equivalent-quality-to-reported-data” for establishment data collections.

Sub-Requirement C2-3.2: Editing and imputation systems and procedures must be verified and tested to ensure that all components function as intended.

Examples of verification and testing activities include:

- Verifying that edit and imputation specifications reflect the requirements for the edit and imputation systems.
- Validating edit and imputation instructions or programming statements against specifications.
- Verifying that the imputation process is working correctly using test files.
- Verifying that edit and imputation outcomes comply with the specifications.
- Verifying that edit and imputation rules are implemented consistently.
- Verify that the editing and imputation outcomes are consistent within records and consistent across the full file.

- Verifying that the editing and imputation outcomes that do not use randomization are repeatable.

Sub-Requirement C2-3.3: Systems and procedures must be developed and implemented to monitor and evaluate the quality of the editing and imputation operations and to take corrective actions if problems are identified.

Examples of monitoring and evaluation activities include:

- Monitoring and documenting the distributions of, and reasons for, edit and imputation changes to determine if corrections are needed in the system.
- Evaluating and documenting editing results for geospatial files (e.g., edits resulting in improvements in boundaries, feature coverage, and feature accuracy) and geographic files (e.g., address ranges, address parity, and geographic entity names and codes).
- Reviewing and verifying data when edits produce results that differ from the past.
- Using a truth deck to evaluate the accuracy of the imputed values.

Requirement C2-4: Documentation needed to replicate and evaluate the editing and imputation operations must be produced. The documentation must be retained, consistent with applicable policies and data-use agreements, and must be made available to Census Bureau employees who need it to carry out their work. (See Statistical Quality Standard S2, *Managing Data and Documents*.)

Examples of documentation include:

- Plans, requirements, specifications, and procedures for the editing and imputation systems, including edit rules.
- Distributions of changes from edits and imputations.
- Retaining original responses (before edit/imputation) on data files along with the final edited/imputed responses.
- Problems encountered and solutions implemented during the editing and imputing operations.
- Quality measures from monitoring and evaluating the editing and imputation operations (e.g., imputation rates and edit change rates). (See Statistical Quality Standard D3, *Providing Measures and Indicators of Nonsampling Error*.)

Notes:

(1) The documentation must be released on request to external users, unless the information is subject to legal protections or administrative restrictions that would preclude its release. (See Data Stewardship Policy DS007, *Information Security Management Program*.[3])

(2) Statistical Quality Standard F2, *Documentation to Support Transparency in Information Products*, contains specific requirements about documentation that must be readily accessible to the public to ensure transparency of information products released by the Census Bureau.

[1] United States Government, *Code of Federal Regulations*, Federal Register, Washington D.C., Updated Annually, https://www.govinfo.gov/app/collection/cfr Accessed on 27 October 2020.
[2] Data Stewardship Executive Policy Committee, *Data Stewardship Policies*, U.S. Census Bureau, Washington D.C., October 2020. https://www.census.gov/about/policies/privacy/data_stewardship/dsep_committee.html Accessed on 2 March 2022
[3] Data Stewardship Executive Policy Committee. *DS007: Safeguarding and Managing Information*. U.S. Census Bureau, Washington, D.C., May 28, 2013. https://www.census.gov/about/policies/privacy/data_stewardship/dsep_committee.html Accessed on 2 March 2022.

Capturing And Processing Data
Statistical Quality Standard
C3 - Coding Data

Purpose: The purpose of this standard is to ensure that methods are established and implemented to promote the accurate assignment of codes, including geographic entity codes, to enable analysis and tabulation of data.

Scope: The Census Bureau's statistical quality standards apply to all information products released by the Census Bureau and the activities that generate those products, including products released to the public, sponsors, joint partners, or other customers. All Census Bureau employees and Special Sworn Status individuals must comply with these standards; this includes contractors and other individuals who receive Census Bureau funding to develop and release Census Bureau information products.

This standard applies to the development and implementation of post-collection coding operations, including the assignment of:

- Codes to convert text and numerical data into categories.
- Geographic entity codes (geocodes) and geographic attribute codes to distinguish and describe geographic entities and their characteristics within digital databases.

Exclusions:
In addition to the global exclusions listed in the Preface, this standard does not apply to:

- Behavior coding activities associated with cognitive interviewing.

Key Terms: American National Standards Institute codes (ANSI codes), coding, geocoding, geographic entity code (geocode), Master Address File (MAF), North American Industry Classification System (NAICS), Standard Occupational Classification System (SOC), and Topologically Integrated Geographic Encoding and Referencing (TIGER).

Requirement C3-1: Throughout all processes associated with coding, unauthorized release of protected information or administratively restricted information must be prevented by following federal laws[1] (e.g., Title 13, Title 15, and Title 26), Census Bureau policies[2] (e.g., Data Stewardship policies), and additional provisions governing the use of the data (e.g., as may be specified in a memorandum of understanding or data-use agreement). (See Statistical Quality Standard S1, *Protecting Confidentiality*.)

Requirement C3-2: A plan must be developed that addresses:

1. Required accuracy levels for the coding operations, including definitions of errors.
2. Requirements for the coding systems, including requirements for input and output files.
3. Verification and testing of the coding systems.
4. Training for staff involved in the clerical coding operations.
5. Monitoring and evaluation of the quality of the coding operations.

Notes:

(1) Statistical Quality Standard A1, *Planning a Data Program*, addresses overall planning requirements, including estimates of schedule and costs.
(2) The Census Bureau Guideline, *Coding Verification*[3], provides guidance on coding procedures.

Requirement C3-3: Processes must be developed and implemented to accurately assign codes for converting text and numerical data to categories and geocodes to identify and distinguish geographic entities and their attributes within a digital database.

Sub-Requirement C3-3.1: Specifications and procedures for the coding systems and operations must be developed and implemented.

Examples of issues that coding specifications and procedures might address include:

- A list and description of the admissible codes or values for each item on the questionnaire.
- A list of acceptable reference sources printed and electronic, that may be used by the coding staff (e.g., Employer Name List).
- Procedures to add to the list of admissible codes or to add text responses to match existing codes.
- Consistency of codes across data collection periods.
- Procedures to assign and associate geocodes with other information within geographic files (e.g., the Master Address File/Topologically Integrated Geographic Encoding and Referencing (MAF/TIGER) database).

Sub-Requirement C3-3.2: Standardized codes, when appropriate, must be used to convert text data.

Examples of current coding standards include:

- American National Standards Institute / Federal Information Processing Standards (ANSI, FIPS) Codes[4].
- North American Industry Classification System (NAICS)[5].
- Standard Occupational Classification System (SOC)[6].

Sub-Requirement C3-3.3: Coding systems must be verified and tested to ensure that all components function as intended.

Examples of verification and testing activities include:

- Verifying that coding specifications and procedures satisfy the coding requirements.
- Validating coding instructions or programming statements against specifications.
- Verifying that coding rules are implemented consistently.
- Using a test file to ensure that the codes are assigned correctly.

Sub-Requirement C3-3.4: Training for staff involved in clerical coding operations (as identified during planning) must be developed and provided.

Sub-Requirement C3-3.5: Systems and procedures must be developed and implemented to monitor and evaluate the quality of the coding operations and to take corrective actions if problems are identified.

Examples of monitoring and evaluation activities include:

- Establishing a quality control (QC) system to check coding outcomes and providing feedback to coders or taking other corrective action.
- Monitoring QC results (such as referral rates, error rates), determining the causes of systematic errors, and taking corrective action (e.g., providing feedback or retraining to coders, updating coder reference materials, or other corrective actions).
- Incorporating a geocode verification within automated instruments and correcting geocodes when errors are detected.
- Evaluating the accuracy of geocoding and determining the cause of errors in incorrect geocodes.
- Reviewing and updating coding guidelines.
- Reviewing software and procedures to reflect any changes in the coding guidelines.

Requirement C3-4: Documentation needed to replicate and evaluate the coding operations must be produced. The documentation must be retained, consistent with applicable policies and data-use agreements, and must be made available to Census Bureau employees who need it to carry out their work. (See Statistical Quality Standard S2, *Managing Data and Documents*.)

Examples of documentation include:

- Plans, requirements, specifications, and procedures for the coding systems.
- Problems encountered and solutions implemented during the coding operations.
- Quality measures from monitoring and evaluating the coding operations (e.g., error rates and referral rates). (See Statistical Quality Standard D3, *Producing Measures and Indicators of Nonsampling Error*.)

Notes:

(1) The documentation must be released on request to external users, unless the information is subject to legal protections or administrative restrictions that would preclude its release. (See Data Stewardship Policy DS007, *Information Security Management Program*.[7])

(2) Statistical Quality Standard F2, *Documentation to Support Transparency in Information Products*, contains specific requirements about documentation that must be readily accessible to the public to ensure transparency of information products released by the Census Bureau.

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[1] United States Government, *Code of Federal Regulations*, Federal Register, Washington D.C., Updated Annually, https://www.govinfo.gov/app/collection/cfr Accessed on 27 October 2020.

[2] Data Stewardship Executive Policy Committee, *Data Stewardship Policies*, U.S. Census Bureau, Washington D.C., October 2020. https://www.census.gov/about/policies/privacy/data_stewardship/dsep_committee.html Accessed on 2 March 2022

[3] Methodology & Standards Council, *Census Bureau Guideline: Coding Verification*, U.S. Census Bureau, Washington D.C., June 13, 2002.
[4] Geography Division, *American National Standards Institute (ANSI)*, U.S. Census Bureau, Washington D.C., August 26, 2020 https://www.census.gov/library/reference/code-lists/ansi.html Accessed on November 30, 2020.
[5] Economic Directorate, *North American Industry Classification System*, U.S. Census Bureau, Washington D.C., https://www.census.gov/naics/ Accessed on March 17, 2022.
[6] Division of Occupational Employment Statistics, *Standard Occupational Classification*, U.S. Bureau of Labor Statistics, Washington D.C., 2018. https://www.bls.gov/soc/ Accessed on November 30, 2020.
[7] Data Stewardship Executive Policy Committee. *DS007: Safeguarding and Managing Information*. U.S. Census Bureau, Washington, D.C., May 28, 2013.
https://www.census.gov/about/policies/privacy/data_stewardship/dsep_committee.html Accessed on 2 March 2022.

Capturing And Processing Data
Statistical Quality Standard
C4 - Linking Data Records

Purpose: The purpose of this standard is to ensure that methods are established and implemented to promote the accurate linking of data records.

Scope: The Census Bureau's statistical quality standards apply to all information products released by the Census Bureau and the activities that generate those products, including products released to the public, sponsors, joint partners, or other customers. All Census Bureau employees and Special Sworn Status individuals must comply with these standards; this includes contractors and other individuals who receive Census Bureau funding to develop and release Census Bureau information products.

This standard applies to both automated and clerical record linkage used for statistical purposes. It covers linking that uses characteristics of an entity to determine whether multiple records refer to the same entity.

Exclusions:
In addition to the global exclusions listed in the Preface, requirements C4-2 and C4-3 do not apply to:

- Statistical attribute matching also known as integrating data based on aggregated statistics.
- Multi-file (more than 2) entity resolution methods defined as methods that simultaneously attempt record-level matching with more than two files. Methods that use multiple linkage passes with the same reference file are not exempt.
- Linkages performed using only a unique identifier (e.g., Protected Identification Key (PIK) from the Person Identification Validation System (PVS) or other internal reference number) when that identifier has already been associated with the records being linked. These are considered the outputs of the record-linkage process.
- Linkages performed for quality assurance purposes defined as linkages done to test software, statistical properties, or field performance. Linkages performed as part of a core statistical product that also provide quality assurance (e.g., a post-enumeration survey) are not exempt.

Key Terms: Automated record linkage, blocking, clerical record linkage, field follow-up, record linkage, scoring weights, entity resolution, and statistical attribute matching.

Requirement C4-1: Throughout all processes associated with linking, unauthorized release of protected information or administratively restricted information must be prevented by following federal laws[1] (e.g., Title 13, Title 15, and Title 26), Census Bureau policies[2] (e.g., Data Stewardship policies), and additional provisions governing the use of the data (e.g., as may be specified in a memorandum of understanding or data-use agreement). (See Statistical Quality Standard S1, *Protecting Confidentiality*.)

Requirement C4-2: A plan must be developed that addresses:

1. Objectives for linking the files.
2. Data sets and files to be linked.
3. Verification and testing of the linking systems and processes.
4. Training for staff involved in the clerical record linkage operations.
5. Evaluation of the results of the linkage (e.g., link rates and clerical error rates).

Notes:
(1) Statistical Quality Standard A1, *Planning a Data Program*, addresses overall planning requirements, including estimates of schedule and costs.

(2) The Data Stewardship Policy DS014, *Record Linkage*[3], states the principles that must be met for record linkage activities and a checklist that must be filled out before beginning record linkage activities.
(3) The Census Bureau Guideline *Quality Assurance of Record Linkage*[4] provides guidance on procedures for automated and clerical record linkage.

Requirement C4-3: Record linkage processes must be developed and implemented to link data records accurately.

Sub-Requirement C4-3.1: Specifications and procedures for the record linkage systems must be developed and implemented.

Examples of issues that specifications and procedures for automated record linkage systems might address include:
- Algorithmic method (e.g., Fellegi-Sunter, Bayesian Entity Resolution, etc.)
- Criteria for determining a valid link or estimating its probability distribution.
- Algorithmic parameters (e.g., scoring weights and the associated cut-offs).
- Blocking and linking variables.
- Standardization of the variables used in linking (e.g., state codes and geographic entity names are in the same format on the files being linked).

Examples of issues that specifications and procedures for clerical record linkage systems might address include:
- Criteria for determining that two records represent the same entity.
- Criteria for assigning records to a specific geographic entity or entities (i.e., geocoding).
- Linking variables.
- Guidelines for situations requiring clerical review.
- Criteria for sending cases to field follow-up.

Sub-Requirement C4-3.2: Record linkage systems must be verified and tested to ensure that all components function as intended.

Examples of verification and testing activities for automated record linkage systems include:
- Verifying that the specifications reflect system requirements.
- Verifying that the systems and software implement the specifications accurately.
- Performing a test linkage to ensure systems work as specified.

Examples of verification and testing activities for clerical record linkage systems include:

- Verifying that the specifications reflect system requirements.
- Verifying that the instructions will accomplish what is expected.
- Testing computer systems that support clerical linking operations.

Sub-Requirement C4-3.3: Training for the staff involved in clerical record linkage (as identified during planning) must be developed and provided.

Examples of training activities include:

- Instructing clerks on how to implement the specifications.
- Providing a training database to give clerks a chance to practice their skills.
- Assessing error rates of clerks and providing feedback.

Sub-Requirement C4-3.4: Systems and procedures must be developed and implemented to monitor and evaluate the accuracy of the record linkage operations and to take corrective actions if problems are identified.

Examples of monitoring and evaluation activities for automated record linkage operations include:

- Evaluating the accuracy of automated linkages by a manual review.
- Monitoring link rates and investigating deviations from historical results and taking corrective action if necessary.

Examples of monitoring and evaluation activities for clerical record linkage operations include:

- Establishing an acceptable error rate.
- Establishing quality control sampling rates.
- Monitoring clerks' error rates and referrals, and taking corrective action if necessary (e.g., feedback or retraining).

Requirement C4-4: Documentation needed to replicate and evaluate the linking operations must be produced. The accuracy must be documented by providing statistical evidence on the match quality. No fixed set of statistics are required but they should include estimated false match rates, estimated false nonmatch rates, or substitutes for these that are suggested by the relevant scientific literature. The documentation must be retained, consistent with applicable policies and data-use agreements, and must be made available to Census Bureau employees who need it to carry out their work. (See Statistical Quality Standard S2, *Managing Data and Documents*.)

Examples of documentation include:

- App C4 - Linkage Quality Assessment (LQA). Census Bureau staff should instead use our automated Data Management System (DMS).
- Plans, requirements, specifications, and procedures for the record linkage systems.
- Programs and parameters used for linking.
- Problems encountered and solutions implemented during the linking operations.

- Evaluation results (e.g., link rates and clerical error rates).

Notes:
(1) The documentation must be released on request to external users, unless the information is subject to legal protections or administrative restrictions that would preclude its release. (See Data Stewardship Policy DS007, *Information Security Management Program*.[5])
(2) Statistical Quality Standard F2, *Documentation to Support Transparency in Information Products*, contains specific requirements about documentation that must be readily accessible to the public to ensure transparency of information products released by the Census Bureau.

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[1] United States Government, *Code of Federal Regulations*, Federal Register, Washington D.C., Updated Annually, https://www.govinfo.gov/app/collection/cfr Accessed on 27 October 2020.
[2] Data Stewardship Executive Policy Committee, *Data Stewardship Policies*, U.S. Census Bureau, Washington D.C., October 2020. https://www.census.gov/about/policies/privacy/data_stewardship/dsep_committee.html Accessed on 2 March 2022
[3] Data Stewardship Executive Policy Committee, *DS014 - Data Linkage Policy*, U.S. Census Bureau, Washington, D.C., November 16, 2018. https://www.census.gov/about/policies/privacy/data_stewardship/dsep_committee.html Accessed on 2 March 2022.
[4] Methodology and Standards Council, *Census Bureau Guideline: Quality Assurance of Record Linkage*, U.S. Census Bureau, Washington, D.C., October 29, 2003.
[5] Data Stewardship Executive Policy Committee. *DS007: Safeguarding and Managing Information*. U.S. Census Bureau, Washington, D.C., May 28, 2013.
https://www.census.gov/about/policies/privacy/data_stewardship/dsep_committee.html Accessed on 2 March 2022.

Capturing And Processing Data
Statistical Quality Standard
App C4 - Linkage Quality Assessment (LQA)

Federal Statistical Agencies are obligated[1,2] to seek out data sources to minimize reporting burden and data collection costs. Consequently, data needs to be linked from different sources. To facilitate data governance and ensure data are used appropriately, the attached assessment helps an organization document the features and limitations of any **linked** records.

Overview of the Linkage Quality Assessment Form

The linkage quality assessment form is broken out into two major sections, a request and a post-linkage evaluation. Each section has key factors to address. Example responses are shown to help guide users to complete the assessment. A few key fields are explained below.

Linkage Request

The manager for the information product initiates a request and describes their data and needs. The manager for the data linkage completes the pre-linkage assessment to summarize if the desired linkage is feasible.

Tracking #:
This is the ID number a governing board assigns after authorizing the linkage.
Data Quality Assessment Filename:
This is the filename for each data quality assessment. These assessments explain the structure and definition of variables in addition to other key quality characteristics.
What is the minimum acceptable percentage of records that need to be matched?
This specifies the desired coverage limit.
How much error is tolerable for records that should not be matched?
This specifies the limit for false matches.
Linkage Quality Assessment Filename:
This is the filename used to save the attached form.

Post Linkage Evaluation

The manger for data linking describes the linkage process and the resulting quality of the linked file(s). The manger should include how they measured the degree of certainty for making a match. The manager of the information product completes the post linkage assessment to formally assess if the file will be fit for use and note any qualifications or limitations on its use.

Accuracy:
The manager for data linking will document the characteristics of each files used for linking. For each **source file**, document the number of total records and the number of unmatched records. Provide a frequency distribution indicating level of certainty and reason for why the records were not matched.

For each **linked file**, document the total number of records and the total number of matched records. Provide a frequency distribution indicating the level of certainty and reason for why records were matched. For each output field, indicate the number of records that were linked where data was present.

Data Dictionary:
For each **linked file**, describe all fields on the file segmenting the fields by their source file or if created during processing. Be sure to include a field that indicates the degree of certainty for matching each record.

LINKAGE REQUEST	
Information Product: *Wyoming Housing Survey* **Tracking #:** ***BOC-WHS-003***	
Description of Linkage Request: *Link the Wyoming Housing Survey (WHS-2014-Extract.csv) data to the Acme Property Tax data (APT-2014-Data.csv) by address. Return the property tax information for all matched records and document the method to determine a record match.*	
Requested by: *John Smith*	**Phone:** ***800-555-1212***
Date: *1/14/15*	**Email:** ***john.w.smith@census.gov***

INPUT

What are the legal, regulatory, and policy restrictions on <u>linking</u> the files? *The contract for acquisition of the APT data stipulates that it may only be used for the purposes of this one study. Furthermore, we may only link those records where the "Approved" field in the WHS data file is set to "Yes".*
What is the shared coverage between the linked file? (e.g., Geospatial, Temporal, Conceptual) *Both data files provide coverage of Wyoming for 2014.*
What are the expected linkages variables? *"House", "Street", "Unit", "Zip" fields in the WHS-2014-Data.csv file* *"House", "Street", "Unit", "Zip" fields in the APT-2014-Data.csv file.*
Describe the relationship between the data files (e.g., one-to-one, one-to-many)? *The address fields should result in a one-to-one match between the records.*

Where are the source files located? (Add rows as needed)

#	File Location //Server:/Directory	Data File Filename	Data Quality Assessment Filename
1	*//research1:/WHS*	*WHS-2014-Extract.csv*	*WHS-2014-Quality.txt*
2	*//datastore:/Commercial/APT*	*APT-2014-Data.csv*	*APT-2014-Quality.txt*
3			

OUTPUT

When is the linked file needed? 2/30/15
What is the minimum acceptable percentage of records that need to be matched? *We need property tax information for at least 80% of the records on the WHS data file.*
How much error is tolerable for records that should not be matched? *Try to limit false matches to 2 percent.*
List each variable desired in the resulting linked file AND describe the values of any new variables to be created. *Keep ALL fields in the WHS-2014-Extract.csv file* *Keep ALL fields in the APT-2014-Data.csv file* *Create a "Certainty" text field with values for the degree of certainty for making a valid match.*

Where should the resulting files be placed and what filenames should be used?			
#	**File Location //Server:/Directory**	**Linked File Filename**	**Linkage Quality Assessment Filename**
1	*//research1:/WHS*	*WHS-APT-2014-Data.csv*	*WHS-APT-2014-Quality.txt*
2			
3			

PRE-LINKAGE ASSESSMENT	
Summarize the feasibility that the resulting file may be fit for use. *We can link the files by address. The desired accuracy should be achievable given historical norms.*	
Reviewed by: *Dave Census* **Date:** *12/14/15*	**Phone:** *800-555-1213* **Email:** *dave.w.census@census.gov*

POST-LINKAGE EVALUATION

Description of the Linkage Process: *We extracted data for Wyoming from the Acme Property Tax data (APT-2014-Data.csv) file. We then grouped all addresses by zip code and where possible linked the APT data to the Wyoming Housing Survey (WHS-2014-Extract.csv) data by address. We linked 98.7% of the WHS records however only 96.9% of the records had property tax data. 0.3% of the WHS records either refused linkage, had no address, or were otherwise not able to be linked. No edits were performed to adjust the property tax data. The subject matter area will need to validate the reasonableness of the property tax data.*

What are the legal, regulatory, and policy restrictions on <u>using</u> the linked file?
Title 13 and ACME contractual restrictions for non-disclosure of personal information. (See program document library)
Title 13 safeguards for the physical security of the data file.

What is the resulting reference period for the linked file? *2014*

What are the primary characteristics of the records in the linked file (demographic, economic, geographic, etc.)?
Economic (Tax Data) and Geographic (Address records)

What is the resulting record level entity for the linked file?
Address

Describe each variable included in the linked file. For each variable, note the data source, variable format, and expected values.
See Attached Data Dictionary

Accuracy

File #1: WHS-2014-Extract.csv

Total number of Records: 411,057
<u># of Unmatched records: 5,219 (1.26%)</u>
<u>Frequency Distribution by Level of Certainty & Descriptive Reason</u>

4,246 (81.35%)	*@ N/A*	*Refused linkage*
273 (5.23%)	*@ 100%*	*No address on file*
700 (13.41%)	*@ 80-100%*	*Partial address*

File #2: APT-2014-Data.csv

Total number of Records: 136,623,812
<u># of Unmatched records: 136,217,974 (99.70%)</u>
<u>Frequency Distribution by Level of Certainty & Descriptive Reason</u>

136,203,542 (99.99%)	*@ 100%*	*Out of State*
14,432 (0.01%)	*@ 100%*	*No address on file*

Linked File: WHS-APT-2014-Data.csv

Total number of Records: 411,057
*<u># of Matched records: 405,828 (98.7%) **(Unit Response Rate)**</u>*
<u>Frequency Distribution by Level of Certainty & Descriptive Reason</u>

404,581 (99.7%)	*@ 100%*	*Matching Address*
1,247 (0.3%)	*@ 80-100%*	*Partial Address*

<u>Linked Fields</u>
<u>2014 Tax</u>
*398,325 (98.14%) of the linked records had property tax information **(Item Response Rate)***
7,513 (1.85%) of the linked records were missing property tax information

POST-LINKAGE ASSESSMENT
Describe if the resulting file is fit for the intended use and any qualifications or limitations on its use. *The file will be fit for our use.* **Requested by**: *John Smith* **Phone:** *800-555-1212* **Date**: *12/25/2015* **Email:** *john.w.smith@census.gov*

Data Dictionary for: WHS-APT-2014-Data.csv
Fields from: WHS-2014-Extract.csv Field: **MAFID** Field Description: Master Address File ID # (Primary Key) Data Type: Integer Length:9 digits Format: None Valid values:0 to 999999999 Field: **Approved** Field Description: Respondent approval to link records Data Type: Text Length: 3 Characters Format: None Valid values: Yes, No Field: **House** Field Description: House Number Data Type: Integer Length:6 digits Format: None Valid values:0 to 999999 Field: **Street** Field Description: Street Name Data Type: Alphanumeric Length: 32 characters Format: None Valid Values: Any combination Field: **Unit** Field Description: Within structure identifier Data Type: Alphanumeric Length: 4 characters Format: None Valid Values: Any combination Field: **Zip** Field Description: U.S. Postal Zip code Data Type: Text Length: 12 characters Format: ##### - #### Valid Values: 00000 – 0000 to 99999 - 9999 **Fields from: APT-2014-data.csv** Field: **AcmeID** Field Description: Acme ID # (Primary Key) Data Type: Integer Length:9 digits Format: None Valid values:0 to 999999999 Field: **House** Field Description: House Number Data Type: Integer Length:6 digits Format: None Valid values:0 to 999999 Field: **Street** Field Description: Street Name Data Type: Alphanumeric Length: 32 characters Format: None Valid Values: Any combination Field: **Unit** Field Description: Within structure identifier Data Type: Alphanumeric Length: 4 characters Format: None Valid Values: Any combination Field: **Zip** Field Description: U.S. Postal Zip code Data Type: Text Length: 12 characters Format: ##### - #### Valid Values: 00000 – 0000 to 99999 - 9999 Field: **2014 Tax** Field Description: 2013 Property Tax Amount

Data Type: Currency Length: 9 digits Format: $###,###,###
Valid values: $0 to $999,999,999
Linkage Processing fields:
Field: **Certainty** Field Description: Degree of certainty for a valid match
Data Type: Integer Length: 3 digits Format: None
Valid values: -40 to 40
-40.0 to 10 represents insufficient evidence to suggest a match
11 to 40 represents an acceptable match score

[1] United States Office of Management and Budget, *Guidelines for Ensuring and Maximizing the Quality, Objectivity, Utility, and Integrity of Information Disseminated by Federal Agencies,* Federal Register, Washington, D.C., February 22, 2002, 67 FR 8452-8460, https://www.federalregister.gov/documents/2002/02/22/R2-59/guidelines-for-ensuring-and-maximizing-the-quality-objectivity-utility-and-integrity-of-information Accessed on June 30, 2020.

[2] National Research Council, *Principles and Practices for a Federal Statistical Agency: Fifth Edition*. The National Academies Press, Washington, D.C. 2013, https://doi.org/10.17226/18318, Accessed on June 30, 2020.

Producing Estimates And Measures
Statistical Quality Standard
D1 - Producing Direct Estimates from Samples

Purpose: The purpose of this standard is to ensure that statistically sound practices are used for producing direct estimates from samples for information products.

Scope: The Census Bureau's statistical quality standards apply to all information products released by the Census Bureau and the activities that generate those products, including products released to the public, sponsors, joint partners, or other customers. All Census Bureau employees and Special Sworn Status individuals must comply with these standards; this includes contractors and other individuals who receive Census Bureau funding to develop and release Census Bureau information products.

This standard applies to the production of direct estimates from samples, and to estimates of their variances, for Census Bureau information products. The standard applies to estimates derived from:

- Samples selected for surveys or the Economic Census.
- Samples or subsamples selected for data analyses, evaluations, or quality assessments of surveys, censuses, or programs using administrative data.

Exclusions:
In addition to the global exclusions listed in the Preface, this standard does not apply to:

- 100 percent enumerations.
- Activities related to producing estimates from models. (See Statistical Quality Standard D2, *Producing Estimates from Models*.)

Key Terms: Calibration, coefficient of variation (CV), coverage error, cross-sectional studies, direct estimates, estimation, generalized variance function, imputation, longitudinal studies, post-stratification, raking, ratio estimation, replication methods, sanitized data, and Taylor series method for variance estimation.

Requirement D1-1: Throughout all processes associated with estimation, unauthorized release of protected information or administratively restricted information must be prevented by following federal laws[1] (e.g., Title 13, Title 15, and Title 26), Census Bureau policies[2] (e.g., Data Stewardship policies), and additional provisions governing the use of the data (e.g., as may be specified in a memorandum of understanding or data-use agreement). (See Statistical Quality Standard S1, *Protecting Confidentiality*.)

Requirement D1-2: A plan must be developed that addresses:

1. Key estimates that will be produced.
2. Estimation methodologies (e.g., population controls, post-stratification, nonresponse adjustments, ratio estimation, calibration, and raking).
3. Variance estimation methodologies (e.g., sampling formula variances, Taylor series (linearization) methods, replication methods, and generalized variance functions).
4. Verification and testing of the systems for generating estimates.

5. Verification of the estimates and evaluation of their quality.

Note: Statistical Quality Standard A1, *Planning a Data Program*, addresses overall planning requirements and development of schedules and costs.

Requirement D1-3: Estimates and their variances must be produced using statistically sound practices that account for the sample design and account for changes introduced by adaptive design procedures (e.g., subsampling of initial nonrespondents.), and reduce the effects of nonresponse and coverage error.

Examples of statistically sound practices include:

- Calculating estimates and variances in ways that take into account the probabilities of selection, stratification, and clustering.
- Developing generalized variance formulas for computing variances.
- Using auxiliary data or performing post-sampling adjustments to improve the precision and the accuracy of estimates (e.g., ratio or raking weighting adjustments for unit nonresponse and post-stratification).
- Accounting for post-sampling adjustments when computing variances (e.g., imputation effects in variance estimates).
- Generating weights or adjustment factors to allow both cross-sectional and longitudinal estimates for longitudinal surveys.

Note: Statistical Quality Standard A3, *Developing and Implementing a Sample Design*, specifies requirements for the design and selection of probability samples used to produce estimates or make inferences.

Sub-Requirement D1-3.1: Specifications for the estimation systems must be developed and implemented.

Examples of issues that specifications might address include:

- Methodological requirements for generating the estimates and variances.
- Data files used or saved during the estimation process (e.g., files used for program validation, verification, and research).

Sub-Requirement D1-3.2: Estimation systems must be verified and tested to ensure that all components function as intended.

Examples of verification and testing activities include:

- Verifying that specifications conform to the estimation methodologies.
- Validating computer code against specifications.
- Verifying that the estimates are computed according to the specifications.
- Using subject matter and statistical experts to review the estimation methodology.
- Conducting peer reviews (e.g., reviews of specifications, design documents, and programming code).
- Conducting verification and validation tests.
- Conducting internal user acceptance tests for estimation software.

Sub-Requirement D1-3.3: Methods and systems must be developed and implemented to verify the estimates and evaluate their quality.

Examples of verification and evaluation activities include:

- Comparing current estimates against historical results.
- Comparing the estimates derived from the survey to other independent collections of similar data.
- Comparing coefficients of variation (CVs) or variances of the estimates against historical results.
- Examining relationships among the estimates.
- Conducting studies to evaluate the performance of variance estimates.

Note: Statistical Quality Standard D3, *Producing Measures and Indicators of Nonsampling Error*, provides requirements for measuring and evaluating nonsampling error.

Requirement D1-4: Documentation needed to replicate and evaluate the estimation operations must be produced. The documentation must be retained, consistent with applicable policies and data-use agreements, and must be made available to Census Bureau employees who need it to carry out their work. (See Statistical Quality Standard S2, *Managing Data and Documents*.)

Examples of documentation include:

- Plans, requirements, specifications, and procedures for the estimation systems.
- Final weighting specifications, including calculations for how the final sample weights are derived.
- Final variance estimation specifications.
- Computer source code.
- Data files with weighted data and any design parameters that would be needed to replicate estimates and variances.
- Methodological documentation.
- Quality measures and evaluation results. (See Statistical Quality Standard D3, *Producing Measures and Indicators of Nonsampling Error*.)

Notes:

(1) The documentation must be released on request to external users, unless the information is subject to legal protections or administrative restrictions that would preclude its release. (See Data Stewardship Policy DS007, *Information Security Management Program*.[3])

(2) Statistical Quality Standard F2, *Documentation to Support Transparency in Information Products*, contains specific requirements about documentation that must be readily accessible to the public to ensure transparency of information products released by the Census Bureau.

[1] United States Government, *Code of Federal Regulations*, Federal Register, Washington D.C., Updated Annually, https://www.govinfo.gov/app/collection/cfr Accessed on 27 October 2020.

[2] Data Stewardship Executive Policy Committee, *Data Stewardship Policies*, U.S. Census Bureau, Washington D.C., October 2020. https://www.census.gov/about/policies/privacy/data_stewardship/dsep_committee.html Accessed on 2 March 2022

[3] Data Stewardship Executive Policy Committee. *DS007: Safeguarding and Managing Information*. U.S. Census Bureau, Washington, D.C., May 28, 2013. https://www.census.gov/about/policies/privacy/data_stewardship/dsep_committee.html Accessed on 2 March 2022.

Producing Estimates And Measures
Statistical Quality Standard
D2 - Producing Estimates from Models

Purpose: The purpose of this standard is to ensure that statistically sound practices are used to generate estimates from models for information products.

Scope: The Census Bureau's statistical quality standards apply to all information products released by the Census Bureau and the activities that generate those products, including products released to the public, sponsors, joint partners, or other customers. All Census Bureau employees and Special Sworn Status individuals must comply with these standards; this includes contractors and other individuals who receive Census Bureau funding to develop and release Census Bureau information products.

This standard applies to the production of estimates from models for Census Bureau information products. This standard applies to models (e.g., statistical, economic, demographic, machine learning) used to produce estimates, such as:

- Small domain estimates, including small area estimates.
- Demographic estimates and projections.
- Seasonal adjustment of estimates.
- Census coverage estimates.
- Synthetic data to protect microdata from disclosure.

Exclusions:
In addition to the global exclusions listed in the Preface, this standard does not apply to:

- Models that are not used to produce estimates for Census Bureau information products (e.g., models used for imputation or disclosure avoidance which are addressed in Statistical Quality Standard C2, *Editing and Imputing Data*, and Statistical Quality Standard S1, *Protecting Confidentiality*, respectively).

Key Terms: Administrative data, Autocorrelation function, autoregressive integrated moving average (ARIMA), cross-validation, goodness-of-fit, heteroscedastic, homoscedastic, model, model validation, Monte Carlo simulation, multicollinearity, projection, regression, revisions history, residual, sanitized data, seasonal adjustment, sensitivity analysis, sliding spans, small area estimation, spectral graphs, and third-party data.

Requirement D2-1: Throughout all processes associated with estimation, unauthorized release of protected information or administratively restricted information must be prevented by following federal laws[1] (e.g., Title 13, Title 15, and Title 26), Census Bureau policies[2] (e.g., Data Stewardship policies), and additional provisions governing the use of the data (e.g., as may be specified in a memorandum of understanding or data-use agreement). (See Statistical Quality Standard S1, *Protecting Confidentiality*.)

Requirement D2-2: A plan must be developed that addresses:

1. Purpose and rationale for using a model (e.g., data to compute precise estimates are not available, or modeling with additional data will provide more accuracy).
2. Key estimates that will be generated and the domain of application for the model.
3. Methodologies and assumptions related to the model, such as the:
   a. Model structure (e.g., functional form, variables and parameters, error structure, and domain of interest).
   b. Model estimation procedure (e.g., least squares estimation, maximum likelihood estimation, and demographic estimation methods).
   c. Data source and how the data will be used in the model, including key modifications to the data.
4. Criteria for assessing the model fit (e.g., goodness-of-fit statistics such as R-squared) and the model specification (e.g., model selection criteria, residual diagnostics).
5. Verification and testing of the systems for generating estimates.
6. Verification of the modeled estimates and evaluation of their quality.

Note: Statistical Quality Standard A1, *Planning a Data Program*, addresses overall planning requirements, including estimates of schedule and costs.

Requirement D2-3: Models must be developed and implemented using statistically sound practices.

Examples of statistically sound model development practices include:

- Ensuring definitions of variables are accurate (e.g., definitions of the geographic areas used in the model, and eligibility criteria in administrative data).
- Specifying a model that has a basis in verified empirical relationships.
- Examining preliminary model results for internal consistency and to ensure that logical relationships among the data are maintained (e.g., population estimates are not negative, and sub-domains (e.g., counties) sum to super-domains (e.g., states)).
- Estimating measures of statistical uncertainty (e.g., prediction error variances, measures of error associated with using synthetic data, or the Bayesian equivalents of these measures).
- Modifying the functional form, the variables, or the parameters of the model to address problems revealed by the model diagnostics and error estimates.
- Having experts perform a methodological review.
- Producing estimates using weighted data, when appropriate.
- Providing justification that the sample design and selection are adequately accounted for in the estimation process.

Examples of statistically sound practices for demographic estimates and projections include:

- Basing assumptions about future relationships among variables on empirical data or on assumptions that are considered statistically sound.
- Examining estimates to ensure that logical relationships are maintained.
- Providing quantitative or qualitative assessments of uncertainty for each estimated or projected data point, whenever possible.

Examples of statistically sound practices for seasonal adjustments include:

- Before the first seasonal adjustment of a series, conducting an analysis to determine whether seasonal patterns exist, and then periodically repeating the analysis.
- Seasonally adjusting only those component series that show identifiable seasonality for an aggregate series derived from a combination of component series.
- Using autoregressive integrated moving average (ARIMA) extrapolations in calculating seasonal factors (e.g., the X-13-ARIMA-SEATS method[3]).
- Reviewing appropriate modeling and seasonal adjustment diagnostics (e.g., revisions history, spectral graphs, plots of the sample autocorrelation function of the model residuals, forecast performance, and sliding spans) for information about model adequacy and adjustment stability.

Sub-Requirement D2-3.1: Model results must be evaluated and validated, and the results of the evaluation and validation must be documented.

Examples of evaluation and validation activities include:

- Validating the model by comparing with independent information sources.
- Generating and reviewing goodness-of-fit statistics (e.g., R-squared).
- Generating and reviewing model diagnostics and graphical output (e.g., reviewing for outliers, heteroscedasticity, and influential observations).
- Cross-validating the model using a subset of data withheld from the model fitting.
- Conducting sensitivity analyses to violations of the assumptions.

Note: Evaluation and validation is required when the model is developed. Models used in a continuing production setting must be re-evaluated periodically as appropriate.

Sub-Requirement D2-3.2: Specifications for the modeling and estimation systems must be developed and implemented.

Examples of information that specifications might address include:

- Descriptions of data files to be used in the model.
- Equations for computing estimates and variances.
- Instructions for running production software.
- Estimation algorithms.
- Convergence criteria for iterative model fittings.

Sub-Requirement D2-3.3: Estimation systems must be verified and tested to ensure that all components function as intended.

Examples of verification and testing activities include:

- Using subject matter and statistical experts to review the estimation methodology.
- Checking that the appropriate equations were used.
- Verifying that the specifications reflect requirements.
- Validating computer code against specifications.

- Assessing computer code to ensure that the appropriate data and variables are used and the code is correctly programmed.
- Performing test runs and debugging computer code.
- Testing iterative model fitting algorithms (e.g., for maximum likelihood estimation) to ensure models using maximum likelihood estimates that they converge consistently for the cases to which they are being applied.

Sub-Requirement D2-3.4: Methods and systems must be developed and implemented to verify the modeled estimates and evaluate their quality.

Examples of verification and evaluation activities include:

- Performing sensitivity analyses using alternative assumptions to inform users of model stability.
- Examining measures of statistical uncertainty.
- Ensuring that variances reflect both sampling error and modeling error.
- Comparing production estimates against comparable data from other sources, including previous estimates for the program or projections from prior cycles.
- Reviewing goodness-of-fit statistics and model diagnostics and documenting unexpected results to aid the revision of the model for the next cycle.
- Reviewing (during each seasonal adjustment run) newly identified outliers and changes to previously identified extreme values that may cause large revisions in the seasonally adjusted series.

Note: Statistical Quality Standard D3, *Producing Measures and Indicators of Nonsampling Error*, provides requirements for measuring and evaluating nonsampling error.

Sub-Requirement D2-3.4.1: The seasonal adjustment process and results must be reviewed annually by the program manager (or the appropriate mathematical statistician) to identify needed changes in the X-13-ARIMA-SEATS specification files. Using the required secure data transmission protocols, the program manager (or the appropriate mathematical statistician) must provide the following to the Time Series Methods Staff in the Economic Statistical Methods Division :

1. The new final X-13-ARIMA-SEATS specification files and the data used.
2. The revised X-13-ARIMA-SEATS specification file and the data used, whenever the seasonal adjustment options must be changed outside of the annual review period. This information must be provided immediately after release of the adjusted data.

Sub-Requirement D2-3.4.2: For indicator releases, any routine revisions to the annual review process, such as benchmarking and updating of seasonality factors, must be consolidated and released simultaneously. See Statistical Policy Directive No. 3. Deviations from this requirement must be approved as specified in the directive.

Requirement D2-4: Documentation needed to replicate and evaluate the modeling activities must be produced. The documentation must be retained, consistent with applicable policies and data use agreements, and must be made available to Census Bureau employees who need it to carry out their work. (See Statistical Quality Standard S2, *Managing Data and Documents*.)

Examples of documentation include:

- A clear explanation of underlying assumptions, accurate contextualization of uncertainties, and a description of the probabilities associated with both optimistic and pessimistic projections, including best-case and worst-case scenarios
- Plans, requirements, specifications, and procedures for the estimation systems.
- Data files with weighted and unweighted data.
- Computer source code.
- Results of outlier analyses, including information on cause of outliers, if available.
- Results of model diagnostics.
- Output data file with "predicted" results for every unit of analysis.
- Seasonal adjustment diagnostic measures (e.g., revisions history values and graphs, spectral graphs, forecast error values and graphs, and sliding spans results).
- Error estimates, parameter estimates, and overall performance statistics (e.g., goodness-of-fit and other such statistics).
- Methodologies used to improve the estimates.
- Quality measures and evaluation results. (See Statistical Quality Standard D3, *Producing Measures and Indicators of Nonsampling Error*.)

Notes:

(1) The documentation must be released on request to external users, unless the information is subject to legal protections or administrative restrictions that would preclude its release. (See Data Stewardship Policy DS007, *Information Security Management Program*.[4])

(2) Statistical Quality Standard F2, *Documentation to Support Transparency in Information Products*, contains specific requirements about documentation that must be readily accessible to the public to ensure transparency of information products released by the Census Bureau.

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[1] United States Government, *Code of Federal Regulations*, Federal Register, Washington D.C., Updated Annually, https://www.govinfo.gov/app/collection/cfr Accessed on 27 October 2020.

[2] Data Stewardship Executive Policy Committee, *Data Stewardship Policies*, U.S. Census Bureau, Washington D.C., October 2020. https://www.census.gov/about/policies/privacy/data_stewardship/dsep_committee.html Accessed on 2 March 2022

[3] Economic Directorate, *X-13ARIMA-SEATS Seasonal Adjustment Program*, U.S. Census Bureau, Washington D.C., March 24, 2017, https://www.census.gov/srd/www/x13as/ Accessed on December 1, 2020.

[4] Data Stewardship Executive Policy Committee. *DS007: Safeguarding and Managing Information*. U.S. Census Bureau, Washington, D.C., May 28, 2013. https://www.census.gov/about/policies/privacy/data_stewardship/dsep_committee.html Accessed on 2 March 2022.

Producing Estimates And Measures
Statistical Quality Standard
D3 - Producing Measures and Indicators of Nonsampling Error

Purpose: The purpose of this standard is to ensure that measures and indicators of nonsampling error are computed and documented to allow users to interpret the results in information products, to provide transparency regarding the quality of the data, and to guide improvements to a data program.

Scope: The Census Bureau's statistical quality standards apply to all information products released by the Census Bureau and the activities that generate those products, including products released to the public, sponsors, joint partners, or other customers. All Census Bureau employees and Special Sworn Status individuals must comply with these standards; this includes contractors and other individuals who receive Census Bureau funding to develop and release Census Bureau information products.

In particular, this standard applies to activities associated with producing measures or indicators of nonsampling error associated with estimates for Census Bureau information products. Examples of nonsampling error sources include:

- Nonresponse (e.g., bias from household/establishment nonresponse, person nonresponse, and item nonresponse).
- Coverage Errors (e.g., listing error, duplication, undercoverage, overcoverage, and mismatches between the frame of an administrative data source used and the universe of interest for the information product).
- Processing Errors (e.g., errors made in coding, data entry, editing, weighting, linking of records, and misapplication of disclosure avoidance methods).
- Measurement Errors (e.g., errors due to interviewer and respondent behavior, data collection instrument design, data collection modes, definitions of reference periods, reporting unit definitions, and inconsistencies in administrative data).

Exclusions:
In addition to the global exclusions listed in the Preface, this standard does not apply to:

- Errors strictly associated with a modeling methodology. Statistical Quality Standard D2, *Producing Estimates from Models*, addresses these types of error.

Key Terms: Administrative data, Convenience sample, coverage, coverage error, coverage ratio, equivalent quality data, item allocation rate, item nonresponse, key variables, latent class analysis, longitudinal survey, measurement error, nonresponse bias, nonresponse error, nonsampling error, probability of selection, quantity response rate, record linkage, reinterview, release phase, respondent debriefing, response analysis survey, third-party data, total quantity response rate, and unit nonresponse.

Requirement D3-1: Throughout all processes associated with producing measures and indicators of nonsampling error, unauthorized release of protected information or administratively restricted information must be prevented by following federal laws (e.g., Title 13, Title 15, and Title 26), Census Bureau policies (e.g., Data Stewardship policies), and

additional provisions governing the use of the data (e.g., as may be specified in a memorandum of understanding or data-use agreement). (See Statistical Quality Standard S1, *Protecting Confidentiality*.)

Requirement D3-2: A plan must be developed that addresses:

1. The general measures and indicators of nonsampling error that will be produced (e.g., coverage ratios, unit nonresponse rates, item nonresponse rates, data entry error rates, coding error rates, and interviewer quality control (QC) results).
2. Any special evaluations of nonsampling error to be conducted (e.g., studies of interviewer variance, measurement error, and nonresponse bias). Identify the:
   a. Motivation for the study.
   b. Types of errors addressed by the study.
   c. Measures and indicators to be generated.
   d. Data needed to conduct the evaluation and their sources.
   e. Methods for collecting and analyzing the data.
3. Verification and testing of systems for producing measures and indicators of nonsampling error.
4. Evaluating the measures and indicators to guide improvements to the data program.

Note: Statistical Quality Standard A1, *Planning a Data Program*, addresses overall planning requirements, including estimates of schedule and costs.

Requirement D3-3: Except in the situations noted below, weighted response rates must be computed to measure unit and item nonresponse. The weights must account for selection probabilities, including probabilities associated with subsampling for nonresponse follow-up. When using administrative data as a response (unit or item) this must be noted and a rate provided.

Response rates may be computed using unweighted data when:

1. Monitoring and managing data collection activities.
2. Making comparisons with surveys using unweighted response rates.
3. Using weighted response rates would disrupt a time series.
4. A weighted response rate would be misleading because the sampling frame population in an establishment survey is highly skewed, and a stratified sample design is employed. (See Sub-Requirement D3-3.2.)
5. The Census Bureau simply collects data for a sponsor and performs no post-collection estimation.

Note: In general, computing response rates is not appropriate for samples that are not randomly selected (e.g., convenience samples or samples with self-selected respondents).

Sub-Requirement D3-3.1: For demographic surveys and decennial censuses, when computing unit response rates, item response rates or item allocation/imputation rates (for key variables), and total item response rates:

1. Standard formulas must be used. (See Appendix D3-A.)

2. The final edited data or edited outcome codes must be used, when available. If the final edited data are not used to compute the response rates, it must be noted.
3. The definition or threshold of a sufficient partial interview must be noted if partial interviews are counted as interviews.

Sub-Requirement D3-3.2: For economic surveys and censuses, when computing unit response rates, quantity response rates (for key variables), and total quantity response rates:

1. Standard formulas must be used. (See Appendix D3-B.)
2. The type of response rate must be noted: unweighted response rate, quantity response rate, or total quantity response rate.
3. The variable used in computing the response rate must be noted (e.g., total retail sales of an establishment).
4. The definition of responding units (including whether using administrative data as a response) must be noted.
5. For total quantity response rates, the sources of equivalent quality data for nonresponding tabulation units must be listed (e.g., administrative data or qualified other sources such as Security Exchange Commission (SEC) filings or company annual reports).
6. The edited data at the time of each estimate's release phase must be used, when available.
7. The final edited data for the final release must be used, when available. If the final edited data are not used to compute the response rates, it must be noted.

Sub-Requirement D3-3.3: Rates for the types of nonresponse (e.g., refusal, unable to locate, no one home, temporarily absent, language problem, insufficient data, or undeliverable as addressed) must be computed to facilitate the interpretation of the unit response rate and to better manage resources.

Sub-Requirement D3-3.4: For panel or longitudinal surveys, cumulative response rates must be computed using weighted data or cumulative total quantity response rates must be computed to reflect the total attrition of eligible units over repeated waves of data collection. If a survey uses respondents from another survey or census as its sampling frame, then the response rate of the survey (or census) serving as the frame must be included in the computation of the cumulative response rate.

Sub-Requirement D3-3.5: Cumulative response rates must be computed using weighted data over successive stages of multistage data collections (e.g., a screening interview followed by a detailed interview). If estimated probabilities of selection must be used and the accuracy of the response rate might be affected, then a description of the issues affecting the response rate must also be provided.

Note: In most situations, a simple multiplication of response rates for each stage is appropriate. In other situations, a more complex computation may be required.

Sub-Requirement D3-3.6: Nonresponse bias analyses must be conducted when unit, item, or total quantity response rates for the total sample or important subpopulations fall below the following thresholds.

1. The threshold for unit response rates is 80 percent.

2. The threshold for item response rates of key items is 70 percent.
3. The threshold for total quantity response rates is 70 percent. (Thresholds 1 and 2 do not apply for surveys that use total quantity response rates.)

Note: If response rates fall below these thresholds in a reimbursable data collection, the sponsor is responsible for conducting a nonresponse bias analysis. The sponsor may contract with the Census Bureau to conduct a nonresponse bias analysis for them.

Requirement D3-4: Coverage ratios must be computed to measure coverage error, as an indicator of potential bias, using statistically sound methods (e.g., computing coverage ratios as the uncontrolled estimate of population for a demographic-by-geographic group divided by the population control total for the demographic-by-geographic cell used in post-stratification adjustments or using capture-recapture methods).

Note: If computing coverage ratios is not appropriate, a description of the efforts undertaken to ensure high coverage must be made available.

Requirement D3-5: Measures or indicators of nonsampling error associated with data from administrative data must be computed to inform users of the quality of the data.

Examples of measures and indicators include:
- Coverage of the target population by the set of administrative data.
- The proportion of administrative data that have missing data items or that have been imputed to address missing data.
- The proportion of data items with edit changes because the data items were invalid.
- The proportion of records lost from the analysis or estimate due to nonmatches between linked data sets.

Requirement D3-6: Measures or indicators of nonsampling error associated with data collection and processing activities must be computed to inform users of the quality of the data.

Examples of indicators of nonsampling error include:
- Error rates for data entry/data capture operations.
- Error rates and referral rates for coding operations.
- Imputation rates and edit change rates for editing and imputation operations.

Examples of analyses or studies that generate measures or indicators of nonsampling error include:
- Geocoding evaluation studies (e.g., address matching rates and analysis of rates of allocation to higher level geographic entities based on postal place-name or ZIP Code matches).
- Analyses of geospatial accuracy (e.g., analysis of locational information in relation to geodetic control points).
- Response error evaluation studies (e.g., reinterview and latent class analysis).
- Interviewer variance studies.
- Respondent debriefing studies.

- Response analysis surveys.
- Record check or validation studies.
- Mode effect studies.

Requirement D3-7: Methods and systems for calculating measures and indicators of nonsampling error must be verified and tested to ensure all components function as intended.

Examples of verification and testing activities include:
- Verifying that calculations are correct.
- Validating computer code against specifications.
- Conducting peer reviews of specifications and coding.
- Using test data to check computer programs.

Requirement D3-8: Measures and indicators of nonsampling error must be evaluated to guide improvements to the program.

Examples of evaluation activities include:
- Analyzing the quality control results of processing systems (e.g., error rates from clerical coding and clerical record linkage) and developing improvements to the systems (e.g., improving clerical coding tools or improving training for clerks).
- Evaluating the results of nonsampling error studies (e.g., response analysis surveys, respondent debriefing studies, and response error reinterview studies) and implementing improvements (e.g., revising questionnaire wording for problematic questions, revising interviewer procedures, or revising interviewer training).
- Analyzing the results of interviewer quality control systems (e.g., Quality Control (QC) reinterviews and Computer Assisted Telephone Interviewing (CATI) monitoring, and observations) and developing improvements (e.g., improving interviewer training programs or revising questionnaires to address systemic problems).

Requirement D3-9: Documentation needed to replicate and evaluate the activities associated with producing measures and indicators of nonsampling error must be produced. The documentation must be retained, consistent with applicable policies and data use agreements, and must be made available to Census Bureau employees who need it to carry out their work. (See Statistical Quality Standard S2, *Managing Data and Documents*.)

Examples of documentation include:
- Plans, requirements, specifications, and procedures for the systems.
- Computer source code.
- Results of quality control activities.
- Results of nonsampling error studies and evaluations.
- Quality measures and indicators (e.g., final coverage ratios and response rates).

Notes:
(1) The documentation must be released on request to external users, unless the information is subject to legal protections or administrative restrictions that would preclude its

release. (See Data Stewardship Policy DS007, *Information Security Management Program*.[1])

(2) Statistical Quality Standard F2, *Documentation to Support Transparency in Information Products*, contains specific requirements about documentation that must be readily accessible to the public to ensure transparency of information products released by the Census Bureau.

[1] Data Stewardship Executive Policy Committee. *DS007: Safeguarding and Managing Information*. U.S. Census Bureau, Washington, D.C., May 28, 2013. https://www.census.gov/about/policies/privacy/data_stewardship/dsep_committee.html Accessed on 2 March 2022.

App D3-A Demographic Surveys and Decennial Censuses Response Rates

1. Terms and Variables

The variables needed to calculate demographic survey and decennial census response rates are based on classifications suggested by the American Association for Public Opinion Research (AAPOR), 2008. This effort helps to ensure consistency to external standards while allowing the Census Bureau to adapt the classification to our specific circumstances.

The terms and variables are partitioned into three sections. The first section describes eligibility status. Variables in this section distinguish among sample units that are known to be eligible for data collection, are known to be ineligible for data collection, or have an unknown eligibility for data collection. The data collection target population guides the distinction between eligible and ineligible units. The second section describes the response status for eligible sample units. The third section provides detail on nonrespondents by identifying the type of (or the reason for) the nonresponse.

1.1 Eligibility Status

The total number of units selected for a sample is defined as *n*. These units can be classified by their eligibility status: eligible for data collection (*E)*, ineligible for data collection (*I)*, or of unknown eligibility (*U)*. The target population determines the classification of a unit as eligible or ineligible. The target population refers to persons, households, or other units upon which inferences (estimates) are made. Specific units may be considered eligible for one census or survey but ineligible for another, depending upon the target population. For example, in a survey of housing, vacant units may be part of the target population, but these same vacant units may be outside the target population in an income survey and would therefore be classified as ineligible.

Variable p_i (Probability of selection)
Definition Probability of selecting a unit for the sample, including all subsampling, even subsampling for nonresponse follow-up.

Variable w_i (Sample weight)
Definition The inverse of the final probability of selecting a unit for the sample, including all subsampling, such as subsampling for nonresponse follow-up. $w_i = \frac{1}{p_i}$

Term *E* (Eligible)

Definition The weighted count of sample units that are eligible for data collection. A person, household, or other unit is eligible if an attempt has been made to collect data and the unit is confirmed to be a member of the target population. Both occupied and vacant units can be considered eligible.

Variable e_i – An indicator variable for whether a unit selected for the sample is eligible for data collection. If a sample unit is eligible, $e_i = 1$, else $e_i = 0$.

Computation Sum of the sample weight for all eligible units.

$$E = \sum_{i=1}^{n} (w_i * e_i)$$

Reference Equivalent to the sum of AAPOR "Interview" disposition code (1.0) and "Eligible, non-interview" disposition code (2.0).

Term *I* (Ineligible)

Definition The weighted count of sample units that are ineligible for data collection. This is the number of units for which an attempt has been made to collect data and it is confirmed that the unit is not a member of the target population.

Variable i_i – An indicator variable for whether a unit selected for the sample is confirmed as not being a member of the target population at the time of data collection. Information confirming ineligibility may come from observation, from a respondent, or from another source. Some examples of ineligible units include: demolished structure, entire household in armed forces, unit under construction, unit screened out, nonresidential unit, fax/data line or disconnected number (in random-digit dial surveys), and vacant unit. If a sample unit is ineligible, $i_i = 1$, else $i_i = 0$.

Computation Sum of the sample weight for all ineligible units.

$$I = \sum_{i=1}^{n} (w_i * i_i)$$

Reference Equivalent to AAPOR "Not Eligible" disposition code (4.0).

Term *U* (Unknown eligible)

Definition The weighted count of sample units for which eligibility is unknown.

Variable u_i – An indicator variable for whether the eligibility of a unit selected for the sample could not be determined. This occurs if data are not collected from a unit and there is no information available about whether or not the unit is a member of the target population. Some examples of units with unknown eligibility include: unable to locate unit, unable to reach/unsafe area, address never assigned/worked, or number always busy or call screening/blocking (in random digit dial surveys). If a sample unit is of unknown eligibility, $u_i = 1$, else $u_i = 0$.

Computation Sum of the sample weight for all units with an unknown eligibility.

$$U = \sum_{i=1}^{n} (w_i * u_i)$$

Note Surveys that have large number of units with unknown eligibility (e.g., random-digit-dial surveys) may estimate the proportion of cases of unknown eligibility that are eligible, *ee*. This estimated proportion may be used to adjust the estimates of *I* and *E*. The survey must have a defensible basis for estimating *ee* (e.g., assume that the ratio of eligible to not eligible cases among the known cases applies to the unknown cases). Without a defensible basis, *ee* may not be used to adjust the estimates of *I* and *E*. The number of eligible units may be adjusted by adding (*ee* * *U*) to *E*. The number of ineligible units may be adjusted by adding (*U* - (*ee* * *U*)) to *I*. The basis for estimating *ee* must be stated explicitly and the justification described clearly.

Reference Equivalent to AAPOR "Unknown Eligibility, Non-Interview" disposition code (3.0).

Term *T* (Total count)

Definition The weighted count of all units (eligible, ineligible, and of unknown eligibility) selected for the sample.

Computation Sum of the sample weights for the eligibility status outcome of all units.

$$T = \sum_{i=1}^{n} [w_i * (e_i + i_i + u_i)]$$

The relationship between *E, I, U,* and *T* is $T = E + I + U$. For the *i*th unit $e_i + i_i + u_i = 1$.

1.2 Response Status

Response status is determined only for eligible sample units. The definition of sufficient data for a unit to be classified as a response will vary across surveys and will impact the count of responding units.

Term *R* (Response)

Definition The weighted count of eligible sample units with sufficient data to be classified as a response. In a multi-mode survey or census, responses may be obtained by mail, Internet, telephone, fax, touch-tone data entry/voice recognition, or personal visit.

Variable r_i – An indicator variable for whether an eligible unit selected for the sample responded to the survey and provided sufficient data. If a unit responded, $r_i = 1$ else $r_i = 0$ (note $r_i = 0$ for units classified as U or I and units that did not respond with sufficient data).

Computation Sum of the sample weights for all response outcomes.

$$R = \sum_{i=1}^{n} (w_i * r_i)$$

Reference Equivalent to AAPOR I+P (complete interviews + partial interviews) disposition codes (1.1) and (1.2).

1.3 Reasons for Nonresponse

To improve interpretation of the response rate and better manage resources, it is recommended that whenever possible, reasons for (or types of) nonresponse be measured. Six specific terms describing nonresponse reasons are defined below. These terms (*REF*, *NOH*, *TA*, *LB*, *INSF*, and *OTH*) define specific nonresponse reasons for sample units.

Term *REF* (Refusal)
Definition The weighted count of eligible sample units that refused to respond to the survey.
Variable ref_i – An indicator variable for whether an eligible sample unit refused to respond to the survey. If a unit refused to respond, $ref_i = 1$, else $ref_i = 0$.
Computation Sum of the sample weights for all "refusal" outcomes.

$$REF = \sum_{i=1}^{n} (w_i * ref_i)$$

Reference Equivalent to AAPOR "R" (refusal and break-off) – disposition code (2.10).

Term *NOH* (No one home)
Definition The weighted count of eligible sample units that did not respond because no one was found at home during the interviewing period.
Variable noh_i – An indicator variable for whether an eligible sample unit did not respond to the survey because no one was found at home during the interviewing period. If a unit was "no one home," $noh_i = 1$, else $noh_i = 0$.
Computation Sum of the sample weights for all "no one home" outcomes.

$$NOH = \sum_{i=1}^{n} (w_i * noh_i)$$

Reference Equivalent to AAPOR "No one at residence" – disposition code (2.24).

Term *TA* (Temporarily absent)
Definition The weighted count of eligible sample units that did not respond because the occupants were temporarily absent during the interviewing period.
Variable ta_i – An indicator variable for whether an eligible sample unit did not respond to the survey because the occupants were temporarily absent during the interviewing period. If a unit was "temporarily absent," $ta_i = 1$, else $ta_i = 0$.
Computation Sum of the sample weights for all "temporarily absent" outcomes.

$$TA = \sum_{i=1}^{n} (w_i * ta_i)$$

Reference Equivalent to AAPOR "Respondent away/unavailable" – disposition code (2.25).

Term *LB* (Language barrier)
Definition The weighted count of eligible sample units that did not respond because an interviewer or interpreter was not available to conduct the interview in the required language.
Variable lb_i – An indicator variable for whether an eligible sample unit selected for the sample did not respond to the survey because an interviewer or interpreter was not available to conduct the interview in the required language. If a unit did not respond due to a language barrier, $lb_i = 1$, else $lb_i = 0$.
Computation Sum of the sample weights for all "language barrier" outcomes.

$$LB = \sum_{i=1}^{n} (w_i * lb_i)$$

Reference Equivalent to AAPOR "Language" – disposition code (2.33).

Term *INSF* (Insufficient data)
Definition The weighted count of eligible sample units selected for the sample that participated but did not provide sufficient data to qualify as a response.
Variable $insf_i$ - An indicator variable for whether an eligible sample unit that was selected for the sample returned a questionnaire, but did not provide sufficient data to qualify as a response. If a unit returned a questionnaire but fails to provide sufficient data to qualify as a response, $insf_i = 1$, else $insf_i = 0$.
Computation Sum of the sample weights for "insufficient data" outcomes.

$$INSF = \sum_{i=1}^{n} (w_i * insf_i)$$

Reference Equivalent to AAPOR "Break off" and "Break-off questionnaire too incomplete to process" – disposition code (2.12).

Term *OTH* (Other nonresponse)
Definition The weighted count of sample units that did not respond for a reason other than refusal, no one home, language barrier, temporarily absent, insufficient data, or if a unit was classified as unknown eligibility.
Variable oth_i – An indicator variable for whether a unit selected for the sample was a nonresponse for a reason other than refusal, no one home, language barrier, temporarily absent, or insufficient data or if the unit was classified as unknown eligibility. If a unit does not respond for reasons other than refusal, no one home, language barrier, temporarily absent, insufficient data, or if a unit was classified as unknown eligibility, $oth_i = 1$, else $oth_i = 0$.
Computation Sum of the sample weights for "other nonresponse" outcomes.

$$OTH = \sum_{i=1}^{n} (w_i * oth_i)$$

Reference Equivalent to AAPOR "Other," "Dead," "Physically or mentally unable," and "Miscellaneous" – disposition codes (2.30), (2.31), (2.32), and (2.35).

2. Unit Response and Nonresponse Rates

2.1 Primary Response Rates

Rate *UR* rate (Unit Response Rate)
Definition The ratio of responding units to the sum of eligible units and units of unknown eligibility (expressed as a percentage).
Computation *UR* rate = [*R*/(*E*+*U*)] * 100
Reference Equivalent to AAPOR Response Rate 2 (RR2).

Rate *AR* rate *(*Alternative Response Rate)
Definition The ratio of responding units to estimated eligible units (expressed as a percentage).
Computation *AR* rate = [*R*/[(*E*)+*ee***U*] * 100 where: *ee* = estimated proportion of cases of unknown eligibility that are actually eligible. The survey must have a defensible basis for estimating *ee*. If such a basis does not exist, then *ee* may not be used to adjust the estimates of *I* and *E* and the survey may not estimate the *AR rate*.
Reference Equivalent to AAPOR Response Rate 3 (RR3).

Rate UR_M rate (Cumulative Unit Response Rate for multistage surveys)
Definition The product of unit response rates for all stages of the survey
Computation UR_M rate = $\prod_{j=1}^{k} UR_j$ where, UR_j is the unit response rate at stage *j* of the survey and *k* is the total number of stages. If another equation yields a more accurate estimate of the cumulative unit response rate because it uses additional information about the frame, then that equation should be used. If the cumulative response rate is misleading or inaccurate, an explanation of the problems must be documented.

2.2 Detailed Eligibility and Nonresponse Rates

Rate *REF* rate (Refusal Rate)
Definition The ratio of units classified as "refusals" to the sum of eligible units and units of unknown eligibility (expressed as a percentage).
Computation *REF* rate = [*REF*/(*E*+*U*)] * 100
Reference Equivalent to AAPOR Refusal Rate 1 (REF1).

Rate *NOH* rate (No One Home Rate)
Definition The ratio of units classified as "no one home" to the sum of eligible units and units of unknown eligibility (expressed as a percentage).
Computation *NOH* rate = [*NOH*/(*E*+*U*)] * 100
Reference No AAPOR equivalent.

Rate *TA* rate (Temporary Absent Rate)
Definition The ratio of units classified as "temporarily absent" to the sum of eligible units and units of unknown eligibility (expressed as a percentage).
Computation *TA* rate = [*TA*/(*E*+*U*)] * 100
Reference No AAPOR equivalent.

Rate *LB* rate (Language Barrier Rate)
Definition The ratio of units classified as "language barriers" to the sum of eligible units and units of unknown eligibility (expressed as a percentage).
Computation *LB* rate = [*LB*/(*E*+*U*)] * 100
Reference No AAPOR equivalent.

Rate *INSF* rate (Insufficient Data Rate)
Definition The ratio of units classified as having "insufficient data" to the sum of eligible units and units of unknown eligibility (expressed as a percentage).
Computation *INSF* rate = [*INSF*/(*E*+*U*)] * 100
Reference No AAPOR equivalent.

Rate *OTH* rate (Other Reason for Nonresponse Rate)
Definition The ratio of units classified as "other nonresponse" to the sum of eligible units and units of unknown eligibility (expressed as a percentage).
Computation *OTH* rate = [*OTH*/(*E*+*U*)] * 100
Reference No AAPOR equivalent.

Rate *U* rate (Unknown Eligibility Rate)
Definition The ratio of units classified as having an "unknown eligibility" to the sum of eligible units and units of unknown eligibility (expressed as a percentage).
Computation *U* rate = [*U*/(*E*+*U*)] * 100
Reference No AAPOR equivalent.

3. Item Response and Allocation Rates

3.1 Item Response Rates

Term $IREQ_A$ (Weighted total of responses required for data item A)
Definition The weighted count of sample units for which a response to item A is required. A response is required for item A unless it is a valid skip item.
Variable $ireq_{Ai}$ – An indicator variable for whether a response to item A is required. If a response is required, $ireq_{Ai} = 1$, else $ireq_{Ai} = 0$

Computation Sum of the sample weight for all units requiring a response to item A.

$$IREQ_A = \sum_{i=1}^{n} ireq_{Ai} * w_i$$

Term $ITEM_A$ (Total valid responses for data item A)
Definition The weighted count of sample units for which a valid response to item A is obtained.
Variable $item_{Ai}$ – An indicator variable for whether a valid response to item A is obtained. If a valid response is obtained, $item_{Ai} = 1$, else $item_{Ai} = 0$
Computation Sum of the sample weight for all units requiring a response to item A for which a valid response is obtained.

$$ITEM_A = \sum_{i=1}^{n} item_{Ai} * w_i$$

Rate IR_A rate (Item response rate for data item A)
Definition The ratio of the weighted count of units with a valid response to item A to the weighted count of units that required a response to item A.
Computation IR_A rate = $ITEM_A$ / $IREQ_A$

Rate TIR_A rate (Total item response rate for data item A)
Definition The product of the weighted item response rate for item A and either the unit response rate, reflecting the response rate to item A after accounting for both unit nonresponse and item nonresponse, or the cumulative unit response rate for multistage surveys.
Computation TIR_A rate = $IR_A * UR$ or
TIR_A rate = $IR_A * UR_M$

3.2 Item Allocation Rates

Item nonresponse is measured through the calculation of allocation rates. Allocation involves using statistical procedures, such as within-household or nearest neighbor matrices populated by donors, to impute for missing values.

Term $ALLO_A$ (Total number of responses allocated for item A)
Definition The weighted count of sample units for which a response is allocated to item A.
Variable $allo_{Ai}$ – An indicator variable for whether a response is allocated to item A. If a response is allocated, $allo_{Ai} = 1$, else $allo_{Ai} = 0$
Computation Sum of the sample weight for all units requiring a response to item A for which a response is allocated.

$$ALLO_A = \sum_{i=1}^{n} allo_{Ai} * w_i$$

Rate	IA_A rate (Item allocation rate for data item A)
Definition	The ratio of the weighted count of units with an allocated response to item A to the weighted count of units that required a response to item A.
Computation	IA_A rate = $ALLO_A$ / $IREQ_A$ = 1 - IR_A rate

References

The American Association for Public Opinion Research, *Standard Definitions: Final Dispositions of Case Codes and Outcome Rates for Surveys*. 5th edition. Lenexa, Kansas, 2008. Revised 2016 https://www.aapor.org/AAPOR_Main/media/publications/Standard-Definitions20169theditionfinal.pdf Accessed on November 17, 2020.

Producing Estimates And Measures
Statistical Quality Standard
App D3-B Economic Surveys and Censuses Response Rates

1. Terms and Variables

For many economic programs, there is a need to distinguish between the survey (sampling) unit, the reporting unit, and the tabulation unit:

A **survey unit** is an entity selected from the underlying statistical population of similarly-constructed units. Examples of survey units for different economic programs include establishments, Employer Identification Numbers (EIN), firms, state and local government entities, and building permit-issuing offices. Some programs use different survey units for different segments of the total population. For example, the Survey of Construction samples residential housing permits and newly constructed housing units in areas where no permit is required. For cross-sectional or longitudinal surveys, the survey unit may change in composition over time (perhaps due to mergers, acquisitions, or divestitures).

A **reporting unit** is an entity from which data are collected. Reporting units are the vehicle for obtaining data and may or may not correspond to a survey unit for several reasons. First, the composition of the originally-sampled entity can change over the sample's life cycle, as noted above. Second, for some surveys, an entity may request (or the Census Bureau may ask the entity) to report data in several separate pieces corresponding to different parts of the business or other entity type. For example, a large, diverse company in a company-based collection may request a separate form for each region or line of business in which it operates or may ask to report separately for each of its establishments to align with their record keeping practices. Similarly, many government programs have a central collection agency that provides the data for several governments, but issue additional mail-outs to obtain supplemental items that are not obtained by the central collection agency.

A **tabulation unit** houses the data used for estimation (or tabulation, in the case of a census). As with reporting units, the tabulation units may not correspond to a survey unit. Some programs consolidate establishment or plant-level data to a company level or parent government level to create tabulation units, so that the tabulation unit is often equivalent to the survey unit. Other programs create artificial units that split a reporting unit's data among the different categories in which the reporting unit operates; for example, creating separate tabulation units by industry. In this case, the tabulation unit represents a portion of a survey unit.

For each program, the "statistical period" describes the reference period for the data collection. For example, an annual program might collect data on the prior year's business; the statistical period refers to the prior year, but the data are obtained in the calendar year. During a given statistical period, all three types of units can be active, inactive, or ineligible. An active unit is in business and is in-scope for the program during the statistical period. An inactive unit is not operating or is not in-scope during the statistical period but is believed to have been active in the past and can potentially become active and in-scope in the future; examples include seasonal businesses for monthly or quarterly programs (temporarily idle) or businesses that operate in

more than one industry, with the primary activity for a given statistical period being conducted in an "out-of-scope" industry. Finally, a survey unit may become ineligible and permanently excluded from subsequent computations due to a merger or acquisition, a permanent classification category change, or a death. All units are considered active until verified evidence otherwise is provided.

Economic programs compute two different types of response rates: a unit response rate and weighted item response rates. The Unit Response Rate (URR) is defined as the ratio of the total unweighted number of "responding units" to the total number of units eligible for collection. URRs are indicators of the performance of data collection for obtaining usable responses. Consequently, the majority of business programs base URRs on their reporting units, whereas the majority of ongoing government programs base URRs on the survey units[1] that correspond to the tabulation units. Other exceptions are addressed on a case-by-case basis. The formulae for the URR provided in Section 2.1 and the detailed unit nonresponse rate breakdowns presented in the Section 2.2.1 use the term "reporting unit" for simplicity. A program can produce **at most** one URR per statistical period and per release phase.[2]
Quantity and Total Quantity Response Rates (QRR and TQRR) are item-level indicators of the "quality" of each estimate. In contrast to the URR, these weighted response rates are computed for individual data items, so that a program may produce several QRRs and TQRRs per statistical period and release. Both are weighted measures that take the size of the tabulation unit into account as well as the associated sampling parameters. These rates measure the proportion of each estimate obtained directly or indirectly from the survey unit and are consequently based on the tabulation units. The QRR measures the weighted proportion of an estimate obtained directly from the respondent for the survey/census; the TQRR expands the rate to include data from equivalent quality sources.

To compute the weighted item response rates, it is necessary to determine the source of the final tabulated value of the associated data item for each tabulation unit *i*. This value could be directly obtained from respondent data, indirectly obtained from other equivalent quality data sources, or imputed. The classification process is straightforward for items that are directly obtained from the survey questionnaire (i.e., form items), less so for items that are obtained as functions of collected items (i.e., derived items). The formulae provided in Sections 2.1 and 2.2.2. can be applied to either form or derived items, but require that the item value classification process be performed immediately prior and that the classification process or rules be documented.

1.1 Eligibility Status

The total number of active reporting units in a statistical period is defined as N_{RU}. These reporting units can be classified by their eligibility status: eligible for data collection (*E*), ineligible (*IA*), unknown eligibility (*U*), or data obtained from qualified administrative sources (*A*). Reporting units that have been determined to be out-of-scope for data collection during the statistical period are excluded from all computations, as are inactive cases. Note that the *U* cases are assumed to be active and in-scope in the absence of evidence otherwise. Reporting units may be considered eligible in one survey or census but ineligible for another, depending upon the

target population. For example, a reporting unit that was in business after October 2004 is eligible for the 2004 Annual Retail Trade Survey, but is ineligible for the October 2004 Monthly Retail Trade Survey.

Term *E* (Total Eligible)
Definition The count of reporting units that were eligible for data collection in the statistical period.
Variable e_i – An indicator variable for whether a reporting unit is eligible for data collection in the statistical period. These include chronic refusal units (eligible reporting units that have notified the Census Bureau that they will not participate in a given program). If a reporting unit is eligible, $e_i = 1$, else $e_i = 0$.
Computation The sum of the indicator variable for eligibility (e_i) over all the reporting units in the statistical period. $E = \sum_{i=1}^{N_{RU}} e_i$

Term *IA* (Total Ineligible/Inactive)
Definition The count of reporting units that were ineligible for data collection in the current statistical period.
Variable ia_i – An indicator variable for whether a reporting unit in the statistical period has been confirmed as not a member of the target population at the time of data collection. An attempt was made to collect data, and it was confirmed that the reporting unit was not a member of the target population at that time. These reporting units are not included in the URR calculations for the periods in which they are ineligible. Information confirming ineligibility may come from observation, from a respondent, or from another source. Some examples of ineligible reporting units include firms that went out of business prior to the survey reference period, firms in an industry that is out-of-scope for the survey in question, and governments that reported data from outside of the reference period. If a reporting unit is ineligible, $ia_i = 1$, else $ia_i = 0$.
Computation The sum of the indicator variable for ineligibility (ia_i) over all the reporting units in the statistical period. $IA = \sum_{i=1}^{N_{RU}} ia_i$

Term *U* (Total Unknown Eligibility)
Definition The count of reporting units in the statistical period for which eligibility could not be determined.
Variable u_i – An indicator variable for whether the eligibility of a reporting unit in the statistical period could not be determined. If a reporting unit is of unknown eligibility, $u_i = 1$, else $u_i = 0$. For example, units whose returns are marked as "undeliverable as addressed" have unknown eligibility ($u_i = 1$), as do unreturned mailed forms.

Computation The sum of the indicator variable for unknown eligibility (u_i) over all the reporting units in the statistical period. $U = \sum_{i=1}^{N_{RU}} u_i$

Term *A* (Administrative data used as source)
Definition The count of reporting units in the statistical period that belong to the target population and were pre-selected to use administrative data rather than collect survey data.
Variable a_i – An indicator variable for whether administrative data of equivalent-quality-to-reported data rather than survey data was obtained for an eligible reporting unit in the statistical period. The decision not to collect survey data must have been made for survey efficiency or to reduce respondent burden and not because that reporting unit had been a refusal in the past. These reporting units are excluded from the URR calculations because they were not sent questionnaires, and thus could not respond, although their data are included in the calculation of the TQRRs. If a reporting unit is pre-selected to receive administrative data, $a_i = 1$, else $a_i = 0$.
Computation The sum of the indicator variable for units pre-selected to use administrative data (a_i) over all the reporting units in the statistical period. $A = \sum_{i=1}^{N_{RU}} a_i$

The relationship among the counts of reporting units in the statistical period in the four eligibility categories is given by $N_{RU} = E + IA + U + A$. For the i^{th} reporting unit, $e_i + ia_i + u_i + a_i = 1$. Note that the value of N_{RU} may change by statistical period.

1.2 Response Status

Response status is determined only for the eligible active reporting units in the statistical period.

Term *R* (Response)
Definition The count of reporting units in the statistical period that were eligible for data collection in the statistical period and classified as a response.
Variable r_{ui} – An indicator variable for whether an eligible reporting unit in the statistical period responded to the survey. To be classified as a response, the respondent for the reporting unit must have provided sufficient data, and the data must satisfy all the critical edits. The definition of sufficient data will vary across surveys. Programs must designate required data items before the data collection begins. If a reporting unit responded, $r_{ui} = 1$, else $r_{ui} = 0$ (note $r_{ui} = 0$ for reporting units which were eligible but did not respond and for reporting units classified as *IA*, *U*, or *A*).
Computation The sum of the indicator variable for eligible reporting units that responded (r_{ui}) over all the reporting units in the statistical period. $R = \sum_{i=1}^{N_{RU}} r_{ui}$

1.3 Reasons for Nonresponse

To improve interpretation of the response rate and better manage resources, it is recommended that whenever possible, reasons for (or types of) nonresponse be measured on a flow basis whenever possible. These terms are used to describe "unit nonresponse" and will be presented in unweighted tabulations. Five specific terms describing nonresponse reasons are defined below. The first three terms (*REF*, *CREF*, and *INSF*) define nonresponse reasons for eligible reporting units. The final two terms (*UAA* and *OTH*) define the reasons for reporting units with unknown eligibility.

Term	*REF* (Refusal)
Definition	The count of eligible reporting units in the statistical period that were classified as "refusal."
Variable	ref_i – An indicator variable for whether an eligible reporting unit in the statistical period refused to respond to the survey. If a reporting unit refuses to respond, $ref_i = 1$, else $ref_i = 0$.
Computation	Sum of the indicator variable for "refusal" (ref_i) over all the reporting units in the statistical period. $REF = \sum_{i=1}^{N_{RU}} ref_i$

Term	*CREF* (Chronic refusal)
Definition	The count of eligible reporting units in the statistical period that were classified as "chronic refusals."
Variable	$cref_i$ – An indicator variable for whether an eligible reporting unit in the statistical period was a "chronic refusal." A chronic refusal is a reporting unit that informed the Census Bureau that it would not participate in a given program. The Census Bureau does not send questionnaires to chronic refusals, but they are considered to be eligible reporting units. Chronic refusals comprise a subset of refusals. If a reporting unit is a chronic refusal, $cref_i = 1$, else $cref_i = 0$.
Computation	The sum of the indicator variable for "chronic refusal" ($cref_i$) over all the reporting units in the statistical period. $CREF = \sum_{i=1}^{N_{RU}} cref_i$

Term	*INSF* (Insufficient data)
Definition	The count of eligible reporting units in the statistical period that were classified as providing insufficient data.

Variable $insf_i$ -- An indicator variable for whether an eligible reporting unit in the statistical period returned a questionnaire, but did not provide sufficient data to qualify as a response. If a reporting unit returned a questionnaire but failed to provide sufficient data to qualify as a response, $insf_i = 1$, else $insf_i = 0$.

Computation The sum of the indicator variable for "insufficient data" ($insf_i$) over all the reporting units in the statistical period. $INSF = \sum_{i=1}^{N_{RU}} insf_i$

Term *UAA* (Undeliverable as addressed)

Definition The count of reporting units in the statistical period that were classified as "undeliverable as addressed."

Variable uaa_i – An indicator variable for whether a reporting unit in the statistical period had a questionnaire returned as "undeliverable as addressed." These reporting units are of unknown eligibility. If a questionnaire is returned as "undeliverable as addressed," $uaa_i = 1$, else $uaa_i = 0$.

Computation The sum of the indicator variable for "undeliverable as addressed" (uaa_i) over all the reporting units in the statistical period. $UAA = \sum_{i=1}^{N_{RU}} uaa_i$

Term *OTH* (Other nonresponse)

Definition The count of reporting units in the statistical period that were classified as "other nonresponse."

Variable oth_i – An indicator variable for whether a reporting unit in the statistical period was a nonresponse for a reason other than refusal, insufficient data, or undeliverable as addressed. These reporting units are of unknown eligibility. If a reporting unit does not respond for reasons other than refusal, insufficient data, or undeliverable as addressed, $oth_i = 1$, else $oth_i = 0$.

Computation The sum of the indicator variable for "other nonresponse" (oth_i) over all the reporting units in the statistical period. $OTH = \sum_{i=1}^{N_{RU}} oth_i$

1.4 Quantity Response Rate Terms

The total number of active tabulation units in the statistical period is defined as N_{TU}. Recall that the number of tabulation units N_{TU} ***may*** differ from the number of reporting units N_{RU}, depending on the economic program. After a program creates tabulation units and performs any necessary data allocation procedures (from reporting unit(s) to tabulation unit(s)), the individual data items are classified according to the final source of data obtained for the units: data reported by the respondent, equivalent-quality-to-reported data obtained from the program-approved outside sources (such as company annual reports, Security Exchange Commission (SEC) sites, trade association statistics), or imputed data. Tabulation units that have been determined to be out-of-scope for data collection during the statistical period are excluded from all computations, as are inactive cases.

Variable v_{ti} (Tabulated value of data item t for tabulation unit i in the statistical period)
Definition The quantity stored in the variable for item t for the i^{th} tabulation unit in the statistical period. This quantity may be reported, equivalent-quality-to-reported, or imputed.

Term R_t (Reported data tabulation units for item t)
Definition The count of eligible tabulation units that provided reported data during the studied statistical period for item t that satisfied all critical edits. This count will vary by item and by statistical period.
Variable r_{ti} – An indicator variable for whether tabulation unit i in the statistical period provided reported data for item t that satisfied all edits. If the tabulated item t value for unit i (t_i) contains reported data, then $r_{ti} = 1$, else $r_{ti} = 0$.
Computation The sum of the indicator variable for reported data (r_{ti}) over all the tabulation units (N_{TU}) in the statistical period. $R_t = \sum_{i=1}^{N_{TU}} r_{ti}$

Term Q_t (Equivalent-quality-data tabulation units for item t)
Definition The count of eligible tabulation units that use equivalent-quality-to-reported data for item t. Note that these data are **indirectly** obtained for the tabulation unit. This count will vary by item and by statistical period.
Variable q_{ti} – An indicator variable for whether tabulation unit i in the statistical period contains equivalent-quality-to-reported data for item t. Such data can come from three sources: data directly substituted from another census or survey s (for the same reporting unit, data item concept, and time period), administrative data d, or data obtained from some other equivalent source c validated by a study approved by the program manager in collaboration with the appropriate Research and Methodology area (e.g., company annual reports, Securities and Exchange Commission (SEC) filings, trade association statistics). If the tabulated item t value for unit i (t_i) contains equivalent-quality-to-reported data then $q_{ti} = 1$, else $q_{ti} = 0$.
Computation The sum of the indicator variable for equivalent-quality-to-reported data (q_{ti}) over all tabulation units (N_{TU}) in the statistical period. $Q_t = \sum_{i=1}^{N_{TU}} q_{ti}$

Term S_t (Substituted data tabulation units for item t)
Definition The count of eligible tabulation units containing directly substituted data for item t. This count will vary by item and by statistical period.

Variable s_{ti} – An indicator variable for whether a tabulation unit in the statistical period contains directly substituted data from another census or survey for item t. The same reporting unit must provide the item value (in the other program), and the item concept and time period for the substituted values must agree between the

two programs. If the tabulated item *t* value for unit *i* (t_i) contains directly substituted data from another survey, $s_{ti} = 1$, else $s_{ti} = 0$.

Computation The sum of the indicator variable for directly substituted data (s_{ti}) over all tabulation units (N_{TU}) in the statistical period. $S_t = \sum_{i=1}^{N_{TU}} s_{ti}$

Term D_t (Administrative data tabulation units for item *t*)

Definition The count of eligible tabulation units containing administrative data for item *t*. This count will vary by item and by statistical period.

Variable d_{ti} – An indicator variable for whether a tabulation unit in the statistical period contains administrative data for item *t*. If the tabulated item *t* value for unit *i* (t_i) contains administrative data, $d_{ti} = 1$, else $d_{ti} = 0$.

Computation The sum of the indicator variable for administrative data (d_{ti}) over all tabulation units (N_{TU}) in the statistical period. $D_t = \sum_{i=1}^{N_{TU}} d_{ti}$

Term C_t (Equivalent source data tabulation units for item *t*)

Definition The count of eligible tabulation units containing equivalent-source data that is neither administrative data nor data substituted directly from another economic program for item *t*. This count will vary by item and by statistical period.

Variable c_{ti} – An indicator variable for whether a tabulation unit in the statistical period contains equivalent-source data validated by a study approved by the program manager in collaboration with the appropriate Research and Methodology area (e.g., company annual report, SEC filings, trade association statistics) for item *t*. If the tabulated item *t* value for unit *i* (t_i) contains equivalent-source data, then $c_{ti} = 1$, else $c_{ti} = 0$.

Computation The sum of the indicator variable for equivalent-source data (c_{ti}) over all tabulation units (N_{TU}) in the statistical period. $C_t = \sum_{i=1}^{N_{TU}} c_{ti}$

Term M_t (Imputed data tabulation units for item *t*)

Definition The count of eligible tabulation units containing imputed data for item *t*. This count will vary by item and by statistical period.

Variable m_{ti} – An indicator variable for whether a tabulation unit in the statistical period contains imputed data for item *t*. If the tabulated item *t* value for unit *i* (t_i) contains imputed data, $m_{ti} = 1$, else $m_{ti} = 0$.

Computation The sum of the indicator variable for imputed data (m_{ti}) over all tabulation units (N_{TU}) in the statistical period. $M_t = \sum_{i=1}^{N_{TU}} m_{ti}$

The relationship among Q_t, S_t, D_t, and C_t for item t in a statistical period is given by $Q_t = S_t + D_t + C_t$. The relationship among the counts of tabulation units for item t in the statistical period is given by $N_{TU} = R_t + Q_t + M_t$.

Variable f_i (Nonresponse weight adjustment factor)
Definition A tabulation unit nonresponse weight adjustment factor for the i^{th} tabulation unit in the statistical period. The variable f_i is set equal to 1 for surveys that use imputation to account for unit nonresponse.

Variable w_i (Sample weight)
Definition The design weight for the i^{th} tabulation unit in the statistical period. The design weight includes subsampling factors and outlier adjustments, but excludes post-sampling adjustments for nonresponse and for coverage. This variable represents the inverse unbiased probability of selection for the tabulation unit.

Variable t_i (Design-weighted value of item t for tabulation unit i)
Definition The design-weighted tabulated quantity of the variable for item t for the i^{th} tabulation unit in the statistical period (i.e, $t_i = w_i v_{ti}$). Note that this value has not been adjusted for unit nonresponse.

Term T (Total value for item t)
Definition The estimated (weighted) total of data item t for the entire population represented by the tabulation units in the statistical period. T is based on the value of the data provided by the respondent, equivalent-quality-to-reported data, or imputed data. The calculation of T incorporates subsampling factors, weighting adjustment factors for unit nonresponse (adjustment-to-sample procedures only), and outlier-adjustment factors, but does not include post-stratification or other benchmarking adjustments.
Computation The product of the design weighted tabulated value of item t for the i^{th} tabulation in the statistical period (t_i) and the nonresponse weight adjustment factor (f_i), summed over all tabulation units (N_{TU}) in the statistical period. $T = \sum_{i=1}^{N_{TU}} f_i t_i$

2. Response and Nonresponse Rates

The rates defined below serve as quality indicators in the process control sense for non-negatively valued items such as total employees or total payroll. For items that can take on positive and negative values, such as income or earnings on investments, the program should plan to develop two sets of weighted item response rates (QRRs and TQRRs) – one from negatively valued data and one from non-negatively valued data – or propose alternative quality indicators that provide adequate transparency into data quality and assist in taking corrective actions.

2.1 Primary Response Rates

Rate *URR* (Unit Response Rate)
Definition The proportion of reporting units in the statistical period based on unweighted counts, that were eligible or of unknown eligibility that responded to the survey (expressed as a percentage).
Computation $URR = [R/(E+U)] * 100$

Rate *QRR* (Quantity Response Rate for data item *t*)
Definition The proportion of the estimated (weighted) total (*T*) of data item *t* reported by the active tabulation units in the statistical period (expressed as a percentage).
Computation $$QRR = \left[\frac{\sum_{i=1}^{N_{TU}} r_{ti} \times t_i}{T} \right] * 100$$

Rate *TQRR* (Total Quantity Response Rate for data item *t*)
Definition The proportion of the estimated (weighted) total (*T*) of data item *t* reported by the active tabulation units in the statistical period or from sources determined to be equivalent-quality-to-reported data (expressed as a percentage).
Computation $$TQRR = \left[\frac{\sum_{i=1}^{N_{TU}} (r_{ti} + q_{ti}) \times t_i}{T} \right] * 100$$

2.2 Detailed Response and Nonresponse Rates

2.2.1 Unit Nonresponse Rate Breakdowns

The following breakdowns provide unweighted unit nonresponse rates.

Rate *REF* rate (Refusal Rate)
Definition The ratio of reporting units in the statistical period that were classified as "refusal" to the sum of eligible units and units of unknown eligibility (expressed as a percentage).
Computation $REF\ rate = [REF/(E+U)] * 100$

Rate *CREF* rate (Chronic Refusal Rate)
Definition The ratio of reporting units in the statistical period that were classified as "chronic refusals" to the sum of eligible units and units of unknown eligibility (expressed as a percentage).

Computation *CREF rate* = [*CREF*/(*E*+*U*)] * 100

Rate *INSF* rate (Insufficient Data Rate)
Definition The ratio of reporting units in the statistical period that were classified as "insufficient data" to the sum of eligible units and units of unknown eligibility (expressed as a percentage).
Computation *INSF rate* = [*INSF*/(*E*+*U*)] * 100

Rate *UAA* rate (Undeliverable as Addressed Rate)
Definition The ratio of reporting units in the statistical period that were classified as "undeliverable as addressed" to the sum of eligible units and units of unknown eligibility (expressed as a percentage).
Computation *UAA rate* = [*UAA*/(*E*+*U*)] * 100

Rate *OTH* rate (Other Reason for Nonresponse Rate)
Definition The ratio of reporting units in the statistical period that were classified as "other reason for nonresponse" to the sum of eligible units and units of unknown eligibility (expressed as a percentage).
Computation *OTH rate* = [*OTH*/(*E*+*U*)] * 100

Rate *U* rate (Unknown Eligibility Rate)
Definition The ratio of reporting units in the statistical period that were classified as "unknown eligibility" to the sum of eligible units and units of unknown eligibility (expressed as a percentage).
Computation *U rate* = [*U*/(*E*+*U*)] * 100

2.2.2 Total Quantity Response Rate Breakdowns

The following breakdowns provide weighted item response rates.

Rate *Q* rate (Equivalent-Quality-to-Reported Data Rate)
Definition The proportion of the total estimate for item *t* derived from equivalent-quality-to-reported data for tabulation units in the statistical period (expressed as a percentage).
Computation $Q \text{ rate} = \left[\frac{\sum_{i=1}^{N_{TU}} (s_{ti} + d_{ti} + c_{ti}) \times t_i}{T} \right] * 100 = \left[\frac{\sum_{i=1}^{N_{TU}} q_{ti} \times t_i}{T} \right] * 100$

Rate *S* rate (Survey Substitution Rate)

Definition The proportion of the total estimate for item *t* derived from substituted other survey or census data for tabulation units in the statistical period (expressed as a percentage). To be tabulated in this rate, substituted data items must be obtained from the same reporting unit in the same time period as the target program, and the item concept between the two programs must agree.

Computation $S \text{ rate} = \left[\frac{\sum_{i=1}^{N_{TU}} s_{ti} \times t_i}{T} \right] * 100$

Rate *D* rate (Administrative Data Rate)

Definition The proportion of the total estimate of item *t* derived from administrative data for tabulation units in the statistical period (expressed as a percentage).

Computation $D \text{ rate} = \left[\frac{\sum_{i=1}^{N_{TU}} d_{ti} \times t_i}{T} \right] * 100$

Rate *C* rate (Other Source Rate)

Definition The proportion of the total estimate of item *t* derived from other source data validated by a study approved by the program manager in collaboration with the appropriate Research and Methodology area (such as company annual reports, SEC filing, trade association statistics) for tabulation units in the statistical period (expressed as a percentage).

Computation $C \text{ rate} = \left[\frac{\sum_{i=1}^{N_{TU}} c_{ti} \times t_i}{T} \right] * 100$

Rate *M* rate (Imputation Rate)

Definition The proportion of the total estimate of item *t* derived from imputes for tabulation units in the statistical period (expressed as a percentage).

Computation $M \text{ rate} = \left[\frac{\sum_{i=1}^{N_{TU}} m_{ti} \times t_i}{T} \right] * 100$

[1] The central collection unit may provide the responses for the majority of the program data (e.g., providing responses from all associated sample units for most of the program items). Supplemental mailings are used to obtain the rest of the items.

[2] Leading indicator surveys often have more than one official release of the same estimate. For example, a program might release a preliminary estimate for the current statistical period along with a revised estimate from the prior period. Response rates should be computed at each release phase, and it is expected that the response rates (unit or item) will generally increase for the same estimate with each release.

Analyzing Data And Reporting Results
Statistical Quality Standard
E1 - Analyzing Data

Purpose: The purpose of this standard is to ensure that statistical analyses, inferences, and comparisons used to develop information products are based on statistically sound practices.

Scope: The Census Bureau's statistical quality standards apply to all information products released by the Census Bureau and the activities that generate those products, including products released to the public, sponsors, joint partners, or other customers. All Census Bureau employees and Special Sworn Status individuals must comply with these standards, including contractors and other individuals who receive Census Bureau funding to develop and release Census Bureau information products.

In particular, this standard applies to the analyses performed to generate information products. It includes analyses:

- Used to produce Census Bureau information products (e.g., reports, news releases, conference papers, journal articles, and maps), regardless of data source.
- Conducted using census data, survey data, administrative data, or any data linked with any of these sources.
- Performed during research to develop improved methodologies for frame construction, survey design, sampling, data collection, data capture, processing, estimation, analysis, or other statistical processes.
- Performed to evaluate the quality of Census Bureau data, methodologies, and processes.
- Conducted to guide decisions about processes or information products of the Census Bureau's programs.

Exclusions:
The global exclusions to the standards are listed in the Preface. No additional exclusions apply to this standard.

Key Terms: Bonferroni correction, cluster, covariance, direct comparison, goodness-of-fit, hypothesis testing, implied comparison, multivariate analysis, outliers, parameter, peer review, regression, sample design, Scheffe's method, sensitivity analysis, significance level, statistical inference, and Tukey's method.

Requirement E1-1: Throughout all processes associated with analyzing data, unauthorized release of protected information or administratively restricted information must be prevented by following federal laws (e.g., Title 13, Title 15, and Title 26), Census Bureau policies (e.g., Data Stewardship policies), and additional provisions governing the use of the data (e.g., as may be specified in a memorandum of understanding or data-use agreement). (See Statistical Quality Standard S1, *Protecting Confidentiality*.)

Requirement E1-2: A plan must be developed prior to the start of the analysis that addresses, as appropriate:

1. A description of the analysis, addressing issues such as:

- Purpose.
- Research questions or hypotheses.
- Relevant literature.

2. A description of the data, addressing issues such as:
   - The data source(s).
   - Key variables and how they relate to the concept(s) in the hypotheses.
   - Design and methods used to collect and process the data.
   - Limitations of the data.
3. A description of the methodology, addressing issues such as:
   - Analysis methods (e.g., demographic and economic analysis techniques, ANOVA, regression analysis, log-linear analysis, nonparametric approaches, box plots, and scatter plots).
   - Key assumptions used in the analysis.
   - Tests (e.g., z-tests, F-test, chi-square, and R-squared) and significance levels used to judge significance, goodness-of-fit, or degree of association.
   - Limitations of the methodology.
4. Appropriateness of the data and underlying assumptions and verification of the accuracy of the computations.

Notes:
(1) During a data analysis project, the focus of the analysis may change, as the researcher learns more about the data. The analysis plan should be updated, as appropriate, to reflect major changes in the direction of the analysis.
(2) Statistical Quality Standard A1, *Planning a Data Program*, addresses overall planning requirements, including schedule and estimates of costs.

Requirement E1-3: Statistically sound practices that are appropriate for the research questions must be used when analyzing the data.

Examples of statistically sound practices include:
- Reviewing data to identify and address nonsampling error issues (e.g., outliers, inconsistencies within records, missing data, and bias in the frame or sample from which data are obtained).
- Validating assumptions underlying the analysis, where feasible.
- Developing models appropriate for the data and the assumptions. (See Statistical Quality Standard D2, *Producing Estimates from Models*.)
- Using multiple regression and multivariate analysis techniques, when appropriate, to examine relationships among dependent variables and independent variables.
- Using a trend analysis or other suitable procedure when testing for structure in the data over time (e.g., regression, time series analysis, or nonparametric statistics).

Sub-Requirement E1-3.1: The data analysis must account for the sample design (e.g., unequal probabilities of selection, stratification, and clustering) and estimation methodology.

Notes:
(1) If it has been documented that a particular methodological feature has no effect on the results of the analysis, then it is not necessary to account for that feature in the analysis (e.g., if using weighted and unweighted data produce similar results, then the analysis may use the unweighted data; if the variance properties for clustered data are similar to those for unclustered data, then the analysis need not account for clustering).

Requirement E1-4: Any conclusions derived from sample data must be supported by appropriate measures of statistical uncertainty.

Examples of measures of statistical uncertainty that support conclusions include:
- Confidence or probability intervals with specified confidence levels.
- Margins of error for specified confidence levels, provided the sample size is sufficiently large that the implied confidence interval has coverage close to the nominal level.
- P-values for hypothesis tests, such as are implied when making comparisons between groups or over time. Comparisons with p-values greater than the stated significance level, if reported, should come with a statement that the difference is not statistically different from zero.
- Confidence intervals, probability intervals or p-values should be statistically valid and account for the sample design (e.g., accounting for covariances when the estimates are based on clustered samples) and multiple comparisons when appropriate. If based on a model, then the key assumptions of the model should be checked and not contradicted by the observed data. (See Statistical Quality Standard D2, *Producing Estimates from Models*.

Note: Although the p-value does not indicate the size of an effect (or the size of the difference in a comparison), p-values below 0.01 constitute strong evidence against the null, p-values between 0.01 and 0.05 constitute moderate evidence, and p-values between 0.05 and 0.10 constitute weak evidence.

Sub-Requirement E1-4.1: The same significance level or confidence level must be used throughout an analysis. Table A shows the requirements for specific information products:

Table A: Significance and Confidence Levels by Information Product

Information Product	Significance Level	Confidence Level
Core Statistical Products	0.10	0.90
News releases	0.10	0.90
All other information products (e.g., working papers, professional papers, and presentations)	0.10 or less	0.90 or more

Requirement E1-5: The data and underlying assumptions must be appropriate for the analyses and the accuracy of the computations must be verified.

Examples of activities to check the appropriateness of the data and underlying assumptions and the accuracy of the computations:
- Checking that the appropriate equations were used in the analysis.

- Reviewing computer code to ensure that the appropriate data and variables are used in the analysis and the code is correctly programmed.
- Performing robustness checks (e.g., checking that unexpected results are not attributable to errors, examining plots of residuals to assess fit of models and comparing findings against historical results for reasonableness).
- Performing sensitivity analyses using alternative assumptions to assess the validity of measures, relationships, and inferences.
- Requesting peer reviews by subject matter, methodological, and statistical experts to assess analysis approach and results.

Sub-Requirement E1-5.1: When conducting peer review, information product owners should ensure reviewers are asked to evaluate the objectivity of the underlying data and the sensitivity of the agency's conclusions to analytic assumptions.

Sub-Requirement E1-5.2: When influential information that has been peer reviewed changes significantly beyond just adoption of peer review recommendations, the information product owner should conduct another peer review.

Requirement E1-6: Documentation needed to replicate and evaluate the analysis must be produced. The documentation must be retained, consistent with applicable policies and data-use agreements, and must be made available to Census Bureau employees who need it to carry out their work. (See Statistical Quality Standard S2, *Managing Data and Documents*.)

Examples of documentation include:

- Plans, requirements, specifications, and procedures relating to the analysis.
- Computer code (e.g., SAS code).
- Data files with weighted and unweighted data.
- Outlier analysis results, including information on the cause of outliers, if available.
- Error estimates, parameter estimates, and overall performance statistics (e.g., goodness-of-fit statistics).
- Results of diagnostics relating to the analysis.

Notes:

(1) The documentation must be released on request to external users, unless the information is subject to legal protections or administrative restrictions that would preclude its release. (See Data Stewardship Policy DS007, *Information Security Management Program*.[1])

(2) Statistical Quality Standard F2, *Documentation to Support Transparency in Information Products*, contains specific requirements about documentation that must be readily accessible to the public to ensure transparency of information products released by the Census Bureau.

[1] Data Stewardship Executive Policy Committee. *DS007: Safeguarding and Managing Information*. U.S. Census Bureau, Washington, D.C., May 28, 2013. https://www.census.gov/about/policies/privacy/data_stewardship/dsep_committee.html Accessed on 2 March 2022.

Analyzing Data And Reporting Results
Statistical Quality Standard
E2 - Reporting Results

Purpose: The purpose of this standard is to ensure that information products meet statistical reporting requirements; that they provide understandable, objective presentations of results and conclusions; and that conclusions are supported by the data.

Notes:
(1) Requirement F1-4 of Statistical Quality Standard F1, *Releasing Information Products*, contains reporting requirements regarding information products affected by serious data quality issues that may impair the suitability of the products for their intended uses.
(2) Department Administrative Order (DAO) 219-1 establishes the policy for Commerce Department employees engaging in public communications.

Scope: The Census Bureau's statistical quality standards apply to all information products released by the Census Bureau and the activities that generate those products, including products released to the public, sponsors, joint partners, or other customers. All Census Bureau employees and Special Sworn Status individuals must comply with these standards; this includes contractors and other individuals who receive Census Bureau funding to develop and release Census Bureau information products.

In particular, this standard applies to the reporting of results in information products such as:

- News releases.
- Core Statistical Products (i.e., information products that the program's Associate Director has reviewed and approved and the Census Bureau has affirmed their content).
- Working papers (e.g., technical papers and division reports intended for release to the public).
- Professional papers (e.g., journal articles, book chapters, conference papers, poster sessions, and written discussant comments).
- Research reports used to guide decisions about Census Bureau programs.
- Abstracts.
- Presentations at public events, such as seminars or conferences. (Statistical Quality Standard E3, *Reviewing Information Products*, defines public events.)
- Handouts for distribution at public events.
- Tabulations, including custom tabulations, estimates, and their associated documentation.
- Statistical graphs, figures, and thematic maps.

Exclusions:

In addition to the global exclusions listed in the Preface, this standard does not apply to:

- Papers, presentations, or other public communications prepared or delivered by Census Bureau employees that are not related to programs, policies, or operations of the Department of Commerce (DOC) or the Census Bureau. (The DOC *Summary of Ethics Rules* state that you may use your Census Bureau affiliation in non-official

contexts only if it is used as part of general biographic information, and it is given no more prominence than other significant biographical details. Contact the Office of Analysis and Executive Support (OAES) for additional guidance.)

Key Terms: Core Statistical Products, coefficient of variation (CV), confidence interval, custom tabulations, derived statistics, design effect, direct comparison, estimate, implied comparison, information products, margin of error (MOE), metadata, nonsampling error, policy view, sampling error, significance level, standard error, statistical inference, statistical significance, synthetic data, transparency, and working papers.

Requirement E2-1: Throughout all processes associated with reporting results, unauthorized release of protected information or administratively restricted information must be prevented by following federal laws (e.g., Title 13, Title 15, and Title 26), Census Bureau policies (e.g., Data Stewardship policies), and additional provisions governing the use of the data (e.g., as may be specified in a memorandum of understanding or data-use agreement). (See Statistical Quality Standard S1, *Protecting Confidentiality*.)

Requirement E2-2: All information products must provide accurate and reliable information that promotes transparency and must present that information in an unbiased manner.

1. Information products based on data that have "serious quality issues" are not permitted except under the restrictions in Sub-Requirement F1-5.2 of Statistical Quality Standard F1, *Releasing Information Products*.

   Note: Requirement F1-5 in Statistical Quality Standard F1 describes serious data quality issues.

2. Except as noted below, information products (including each table, graph, figure, and map within an information product, and including stand-alone tables, such as custom tabulations) must include a source statement that:
   a. Indicates the program(s) that provided the data.
   b. Indicates the date of the source data.
   c. If multiple data sources are used, indicate the data supplied by each program.

   Note: Abstracts and presentation slides do not need source statements.

3. Except as noted below, information products (including tables, graphs, figures, and maps that stand alone) must indicate that the data are subject to error arising from a variety of sources, including (as appropriate) sampling error, nonsampling error, model error, and any other sources of error. Including one of the following in the information product will satisfy this requirement:
   a. An explicit statement indicating that the data are subject to error arising from a variety of sources.
   b. A description of the error sources.
   c. A discussion of the error sources.

Note: Abstracts and presentation slides do not need to indicate that the data are subject to error.

4. Except as noted below, information products must include a reference (i.e., URL) to the full methodological documentation of the program(s).

   Note: Abstracts and presentation slides do not need to include a reference to the full methodological documentation.

5. All inferences and comparisons of estimates based on sample data must include appropriate measures of statistical uncertainty, such as margins of error, confidence intervals, or p-values for hypothesis tests.

   a. Results that are not statistically significant must not be discussed in a manner that implies they are significant.

   b. The same significance or confidence level must be used throughout an information product. Table A shows the requirements for specific information products:

Table A. Significance and Confidence Levels by Information Product

Information Product	Significance Level	Confidence Level
Core Statistical Products	0.10	0.90
News releases	0.10	0.90
All other information products (e.g., working papers, professional papers, and presentations)	0.10 or less	0.90 or more

   c. Direct comparison statements that are not statistically significant must include a statement conveying the lack of statistical significance, such as:

   "The 90 percent confidence interval for the change includes zero. There is insufficient evidence to conclude that the actual change is different from zero."

   Such a statement may be given in a footnote. For example, "*Sales of nondurable goods were down 0.6 percent (+/- 0.8 %)**." Footnote: "**The 90 percent confidence interval includes zero. There is insufficient evidence to conclude that the actual change is different from zero.*"

   d. The text must clearly state whether each comparison (direct or implied) is statistically significant. This must be done either by:
      1) Using a blanket statement such as, "*All comparative statements in this report have undergone statistical testing, and, unless otherwise noted, all comparisons are statistically significant at the 10 percent significance level,"* and specifically noting any implied comparison statements that are not significant.
      2) Reporting a p-value for each comparison.
      3) Stating whether or not the confidence interval includes 0.

e. Statements of equality between population quantities that are being estimated with sampling error are not allowed. For example, the following statements **are not acceptable**, since they refer to unknown underlying population quantities:

- "*The poverty rate for state A equals the rate for state B.*"
- "*The poverty rate remained statistically unchanged*" (for a comparison across time).

It is acceptable to say that the estimates are "*not statistically different*" or (for comparisons over time) "*statistically unchanged,*" if the difference in the estimates is not statistically significant. For example, the following statements **are acceptable**, since they refer to the estimates of population quantities:

- "*The estimated poverty rate for state A, 8.1 percent (± 0.2), is not statistically different from the estimated poverty rate for state B, 8.1 percent (± 0.2).*"
- "*The estimated poverty rate remained statistically unchanged for non-Hispanic whites at 8.2 percent (± 0.2).*"

6. Key estimates in the text must be accompanied by confidence intervals or margins of error (MOEs) or their equivalents (e.g., equivalents for Bayesian inferences or for error arising from synthetic data) for the information products indicated in the table below. Providing a URL to these measures of statistical uncertainty is not sufficient.

Table B. Confidence Intervals or MOEs for Key Estimates by Information Product

Information Product	Confidence intervals or MOEs
Core Statistical Products	Required
News releases for the economic data items listed in Appendix E2	Required
News releases for all other data (e.g., economic data items not in Appendix E2, household-level data, and person-level data)	Not required
Abstracts and presentations slides	Not required
All other information products (e.g., working papers and professional papers)	Required

Notes:
(1) In working papers and professional papers, p-values, standard errors, coefficients of variation (CV), or other appropriate measures of statistical uncertainty may be used instead of confidence intervals or MOEs.
(2) If the width of a confidence interval rounds to zero, the interval may be replaced by a statement such as "*The width of the confidence interval for this estimate rounds to zero*."

7. Except as noted below, information products must include or make available by reference (URL) information that allows users to assess the statistical uncertainty of derived statistics as well as of the estimates themselves. For example,

- Measures of statistical uncertainty (e.g., variances, CVs, standard errors, error arising from synthetic data, or their Bayesian equivalents).
- Methods to estimate the measures of statistical uncertainty (e.g., generalized variance functions or equations and design effects).
- Methods to approximate the measures of statistical uncertainty for derived statistics, such as estimates of change or ratios of estimates.

Notes:
(1) This requirement does not apply to response rates, unless the information product analyzes the response rates or draws conclusions from them.
(2) Abstracts and presentation slides need not make available information on statistical uncertainty. Custom tabulations must provide information on statistical uncertainty as specified in Sub-Requirement E2-2.2, item 4.
(3) Maps need not portray or indicate information on statistical uncertainty, but if not, they must include a URL at which users can access measures of statistical uncertainty and other information about statistical uncertainty.
(4) When information on statistical uncertainty is made available by referencing a URL, the URL must direct users specifically to the location of the information.

8. If needed for readers to assess the results presented, the information product must include:
   a. A discussion of the assumptions made.
   b. The limitations of the data.
   c. A description of the methodology used to generate the estimates.
   d. An explanation of how the methodology and the limitations might affect the results.

9. The information presented must be technically and factually correct.

10. The information must be presented logically and any results must follow from the data and the analysis.

11. Any anomalous findings must be addressed appropriately.

12. The subject matter and methodological literature must be referenced, as appropriate.

13. Policy views must never be expressed.

14. Except as noted in Sub-Requirement E2-2.1 (item 3), personal views must not be expressed.

Sub-Requirement E2-2.1: In addition to the requirements for all information products, the requirements for research-based statistics (e.g., working papers, professional papers, research reports, presentation slides, handouts for distribution at presentations, and similar products) include the following:

1. Except as noted below, a disclaimer must be included on the title page. The author may determine the wording of the disclaimer as long as it indicates that any views expressed are those of the author and not those of the Census Bureau. An example of a disclaimer is: "*Any opinions and conclusions expressed herein are those of the author(s) and do not reflect the views of the U.S. Census Bureau.*"

   Note: The disclaimer is not needed for:
   - Core and Experimental Statistics, news releases, abstracts, and handouts for advisory committee meetings.
   - Information products that are distributed internally.
   - Information products that have been reviewed and approved by the Associate Director as not needing a disclaimer because the documents do not contain personal views.
   - Presentation slides that are distributed internally.

2. Working papers published on the Census Bureau's Web site and written entirely by non-Census Bureau individuals (e.g., external researchers at Federal Statistical Research Data Centers) must incorporate the disclaimer described above, with an additional statement indicating that the Census Bureau has not reviewed the paper for accuracy or reliability.

   Note: It is the Division Chief's decision, guided by data stewardship policy 027 – Transparency in Secondary Research[1], whether to publish a working paper on census.gov.

3. Personal views may be expressed only if they are appropriate for the paper or presentation because they are on statistical, methodological, technical, or operational issues.

4. Working papers and professional papers that discuss the results of qualitative research not supported by statistical testing (e.g., based on samples that are not random, are nonrepresentative, or are too small to provide statistical support of the results) must include a caveat explaining why the qualitative methods used do not support statistical testing. The caveat also must address how the findings can (or cannot) be extended to wider populations.

5. Information products based on data with "serious data quality issues" related to nonsampling error may be written only when their purpose is not to report, analyze, or discuss characteristics of the population or economy, but to:
   - Analyze and discuss data quality issues or research on methodological improvements, or to
   - Report results of evaluations or methodological research.

   Note: Statistical Quality Standard F1, *Releasing Information Products* describes serious data quality issues and the restrictions on releasing information products with such issues.

Note: Although not a requirement of the statistical quality standards, the Census Bureau requires presentation slides to use the PowerPoint templates featuring the Census Bureau wordmark provided at the Customer Liaison and Marketing Services Office Intranet Web site.

Sub-Requirement E2-2.2: In addition to the requirements for all information products, the requirements for tabulations include the following:

1. The level of detail for tabulations must be appropriate for the level of sampling error, nonsampling error, and any other error associated with the estimates.

2. All tabulations, except as noted for custom tabulations in item 4 below, must present estimates that take into account the sample design (e.g., weighted estimates).

3. All tabulations, except as noted for custom tabulations in item 4 below, must account for missing or invalid data items (e.g., use imputed data, adjust weights, or display the weighted total of the cases where the data were not reported).

4. Custom tabulations must:
   a. Present weighted estimates unless a client requests unweighted tabulations. If unweighted tabulations are produced for a client, a discussion of the issues associated with using unweighted counts must be provided with the tabulations. Providing a reference (URL) citing the discussion is not sufficient.
   b. Account for missing or invalid data items unless a client requests custom tabulations that exclude imputed data. If tabulations are produced for a client that exclude imputed data, additional metadata must be provided with the tabulations to describe and quantify the level and the extent of the missing data. Providing a reference (URL) citing the metadata is not sufficient.
   c. Include measures of statistical uncertainty (e.g., CVs, standard errors, MOEs, confidence intervals, or their Bayesian equivalents) with weighted tabulations, or include a reference (URL) to the measures of statistical uncertainty. If a program manager thinks that computing estimates of sampling error is not feasible (e.g., for reasons of cost, schedule, or resources), the program manager must work with their research and methodology Assistant Division Chief (ADC) or Assistant Center Chief (ACC) to provide the client with acceptable measures of statistical uncertainty or the means to compute them.

      Note: Although not a requirement of the statistical quality standards, program managers who produce custom tabulations must refer to and follow the requirements of Data Stewardship Policy DS021, *Custom Tabulations*[2].

5. If any differences are identified (e.g., with a footnote) as statistically significant in any table within an information product, then all statistically significant differences must be similarly identified in all the tables. However, it is not required to identify statistically significant differences in tables.

6. Tabulations must be formatted to promote clarity and comprehension of the data presented.

   Examples of formatting practices that promote clarity and comprehension include:
- Presenting at most four dimensions in a cross-tabulation.
- Labeling all variables.
- Using row or column percentages to reinforce the text description of the relationships involved.
- Labeling the type of statistics being presented (e.g., frequency, percentage, means, and standard errors).
- Presenting totals and subtotals when appropriate.
- Labeling header columns for each page in multi-page tabulations.
- Indicating when a data value is suppressed because of disclosure issues.
- Footnoting anomalous values (e.g., outliers).

7. Displaying estimates that equal zero and symbols in tables must be appropriate for the content/subject matter being presented and according to acceptable statistical practice. An estimate that equals zero should be shown as a numeric value, e.g., 0.00 for two-decimal accuracy. The exception is when the estimate is less than half of a unit of measurement from zero and there is a meaningful difference between an actual zero and a rounded zero for the particular statistics. Use the symbol without additional punctuation such as parenthesis. Use an "X" instead of "(X)".

   Examples of approved standard symbols:
   a. A 'Z' means the estimate rounds to zero.
   b. An 'S' means that the estimate is withheld because estimate did not meet publication standards.
   c. An 'X' means that the estimate is not applicable.
   d. An 'N' means that the estimate is not available or not comparable.
   e. A 'D' means that the estimate is withheld to avoid disclosing data for individual companies; data are included in higher level totals.
   f. A 'B' means the base estimate is too small to meet statistical standards for reliability of derived figure.

Sub--Requirement E2-2.3: In addition to the requirements for all information products, the requirements for statistical graphs, figures, and maps include the following:

1. The dimensions of graphs, figures, and maps must be consistent with the dimensions of the data (e.g., three-dimensional effects must not be used when displaying only two dimensions of data).

2. Graphs, figures, and maps must be formatted to promote clarity and comprehension of the data presented.

   Examples of formatting practices that promote clarity and comprehension include:
- Labeling axes and including the unit of measure.

- Including a legend that defines acronyms, special terms, and data values.
- Preparing graphs, figures, and maps in the same format throughout the information product.
- Using consistent scales across graphs, figures, or maps that are likely to be compared.
- Using units of measure appropriate to the scale of the graph, figure, or map.
- Starting the base of the graph or figure at zero to avoid giving an inappropriate visual impression.
- Ensuring that color hues correspond to the level of measurement (e.g., a light-to-dark color scheme corresponds with low-to-high values).
- Complying with accessibility requirements of Section 508 of the U.S. Rehabilitation Act.

Note: Additional guidance for developing data visualizations can be found at https://xdgov.github.io/data-design-standards/, the Census Bureau Guideline on the *Presentation of Statistical Graphics*[3], and the Administrative Customer Service Division (ACSD) *Chart Publishing Guidelines*[4].

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[1] Data Stewardship Executive Policy Committee, *DS-027 Transparency in Secondary Research*, U.S. Census Bureau, Washington, D.C., https://www.census.gov/about/policies/privacy/data_stewardship/dsep_committee.html Accessed on 6 April 2022.

[2] Data Stewardship Executive Policy Committee, *DS-021Policy on Providing Custom Tabulations and Custom Extracts Under 13 U.S.C. § 8(b)*, U.S. Census Bureau, Washington, D.C., August 20, 2015. https://www.census.gov/about/policies/privacy/data_stewardship/dsep_committee.html Accessed on 2 March 2022.

[3] Trudy Suchan, Amy Bishton, John Bushery, Gregory Carroll, Gia Donnalley, Pam Ferrari, Howard Hogan, Linda Orsini, Janet Sweeney, Amparo Emmy Warwick, *Census Bureau Guideline: Presentation of Statistical Graphics*, Methodology and Standards Council, U.S. Census Bureau, Washington, D.C., September 1, 2005.

[4] Administrative Customer Service Division, *Chart Publishing Guidelines*, U.S. Census Bureau, Washington, D.C., January 2005.

Analyzing Data And Reporting Results
Statistical Quality Standard
App E2 - Economic Indicator Variables

Direct comparison statements that are not statistically significant are not allowed, except for statements of changes in news releases for the economic indicator variables listed in the table below. In these news releases, a footnote must be provided to indicate that the comparison is not statistically significant such as

> *"The 90 percent confidence interval for the change includes zero. There is insufficient evidence to conclude that the actual change is different from zero."*

Program	*Frequency*	*Levels*	*Characteristics*	*Current Period to Prior Period*	*Current Period to same Period One Year Ago*	*Year-to-date to prior Year-to-date*
Advance Monthly Retail and Food Services Survey (MARTS)	*Monthly*	*Total retail & food services* *Total retail & food services excluding motor vehicles and parts dealers* *Total retail & food services excluding motor vehicles and gasoline stations* *Total retail & food services excluding gasoline stations* *Total retail*	*Sales*	*Yes*	*Monthly Yes* *Quarterly Yes*	*Yes*
Monthly Wholesale Trade Survey (MWTS)	*Monthly*	*Total wholesale* *Durable goods* *Nondurable goods*	*Sales, Inventories*	*Yes*	*Yes*	*No*

Program	*Frequency*	*Levels*	*Characteristics*	*Current Period to Prior Period*	*Current Period to same Period One Year Ago*	*Year-to-date to prior Year-to-date*
Quarterly Services Survey (QSS)	*Quarterly*	*Total* *2-digit sector totals*	*Receipts or revenue, Expenses*	*Yes*	*Yes*	*No*
Manufacturing and Trade Inventories and Sales (MTIS)	*Monthly*	*Total manufacturing, retail and wholesale trade*	*Distributive trades sales plus manufacturers' shipments and total business inventories*	*Yes*	*Yes*	*No*
Building Permits Survey (BPS)	*Monthly*	*U.S. Total and by size* *Region Total, 1-unit*	*Authorizations*	*Yes*	*Yes*	*Yes*
Survey of Construction (SOC)	*Monthly*	*U.S. Total and by size* *Region Total, 1-unit* *U.S. and region, 1-unit* *U.S. Median sales price* *U.S. Average sales price*	*Starts, Completions Sales*	*Yes*	*Yes*	*Yes*
Construction Spending (Value Put-in-Place, VIP)	*Monthly*	*Total* *Total residential* *Total nonresidential* *Private total* *Private residential* *Private nonresidential* *Public total* *Public educational* *Public highway*	*Construction expenditures*	*Yes*	*Yes*	*Yes*

Program	*Frequency*	*Levels*	*Characteristics*	*Current Period to Prior Period*	*Current Period to same Period One Year Ago*	*Year-to-date to prior Year-to-date*
Quarterly Financial Report (QFR)	*Quarterly*	*Total manufacturing Durable goods manufacturing Nondurable goods manufacturing*	*Seasonally-adjusted: After-tax profits Sales After-tax profits per dollar of sales*	*Yes*	*Yes*	*No*
Quarterly Financial Report (QFR)	*Quarterly*	*Total manufacturing Durable goods manufacturing Nondurable goods manufacturing Total mining Wholesale trade Retail trade*	*Not seasonally-adjusted: After-tax profits Sales fter-tax profits per dollar of sales*	*Yes*	*Yes*	*No*
E-Commerce	*Quarterly*	*Total retail*	*otal sales, E-commerce sales*	*Yes*	*Yes*	*Yes*
Housing Vacancies and Homeownership (CPS/HVS)	*Quarterly*	*U.S. Regions*	*Rental vacancy rate, Homeowner vacancy rate, Homeownership rate*	*Yes*	*Yes*	*No*

Analyzing Data And Reporting Results
Statistical Quality Standard
E3 - Reviewing Information Products

Purpose: The purpose of this standard is to ensure that information products released by the Census Bureau receive the appropriate reviews required to ensure they are of high quality and do not disclose protected information or administratively restricted information. This standard also ensures that plans to participate at public events are reviewed and approved.

Scope: The Census Bureau's statistical quality standards apply to all information products released by the Census Bureau and the activities that generate those products, including products released to the public, sponsors, joint partners, or other customers. All Census Bureau employees and Special Sworn Status individuals must comply with these standards; this includes contractors and other individuals who receive Census Bureau funding to develop and release Census Bureau information products.

In particular, this standard applies to the review and approval of:

- Information products, including internal information products that are subsequently released to the public.

Notes:

- This standard addresses Census' plan to enact the Commerce Department Administrative Order (DAO) 219-1. This standard does not supersede DAO 219-1.
- Research-based statistical products (e.g., professional papers, presentations, or other materials) prepared by a Census Bureau employee without the use of Census Bureau resources (e.g., official working hours, computers) that pertain to the Census Bureau's programs, policies, or operations and are related to the employee's job or area of expertise are Non-Official Communications of Interest (DAO 219-1 §11.01). Census Bureau approval is not required for an employee to release such a communication. See Requirement E3-7.
- The use of one's Census Bureau affiliation on publications that used no government resources is governed by 5 C.F.R. §§ 2635.807(b)..
- Research-based statistical products are expected to meet appropriate scientific standards in the disciplines underlying the research as reflected in the required content, statistical and supervisory reviews.

Exclusions:
In addition to the global exclusions listed in the Preface, this standard does not apply to:

- Information products prepared or delivered by Census Bureau employees, but which are not related to programs, policies, or operations of the Department of Commerce or the Census Bureau. (Census Bureau employees or Special Sworn Status individuals, who want to include their Census Bureau affiliation as biographical information in the communication, should obtain guidance from the Policy Coordination Office.)

Key Terms: Administrative data, Core Statistical Products, custom tabulations, direct comparison, disclosure, implied comparison, information products, participation, policy view, public event, and working papers.

Requirement E3-1: All Census Bureau information products must be reviewed before release to ensure that disclosure avoidance techniques necessary to prevent unauthorized release of protected information or administratively restricted information have been implemented completely and correctly. Information protected by federal law (e.g., Title 13, Title 15, and Title 26) and by the Confidential Information Protection and Statistical Efficiency Act of 2018 (CIPSEA; Title III of the Foundations of Evidence-based Policymaking Act of 2018) is covered by this requirement. (Statistical Quality Standard S1, *Protecting Confidentiality*, addresses disclosure avoidance techniques.)

1. All publications must clearly indicate the Data Management System (DMS) Project Number (P-#######) which authorized the research and the Disclosure Review Board (DRB) Clearance Number under which approval to release the results was granted.

2. Information products disseminated as a collected work, such as a print publication or its equivalent electronic file, shall, at minimum, have the DMS and DRB number on either the FIRST page or the LAST page of the publication. It will typically be placed on the publication's cover page, the introduction, the acknowledgements, or the disclaimer. A recommended notation is:

   "The Census Bureau has reviewed this data product to ensure appropriate access, use, and disclosure avoidance protection of the confidential source data (Project No. #######, Disclosure Review Board (DRB) approval number: CBDRB-FY##-###)."

3. Information products where there is a high likelihood of tables / figures being split away from the original document shall have the DMS and DRB number included on the table / figure the same way that a source statement would be included. A recommended citation style is:

   Source: U.S. Census Bureau, [Program/Publication], [Page number], [Posted date/Date of source data], [Project No. ####### / Approval CBDRB-FY##-###], [URL or DOI], Accessed on [Date].

4. Information products disseminated by means of an online query tool shall include a simple table note providing a link to the methodology documentation (often called the "Accuracy of the Data" statement) which contains the DMS and DRB number.

5. Information products which combine previously published data sets, each with its own DMS Project number and DRB Clearance Number, shall reference the respective methodological documentation.

Note: See the DRB Intranet Web site for further guidance on DRB procedures.

Requirement E3-2: All information products must undergo review and receive approval before they are released to the public, to sponsors, or to other customers. Sub-Requirements E3-2.1 through E3-2.6 describe the types and levels of review needed.

Examples of information products covered by this requirement include, but are not limited to:

- News releases.
- Tweets
- Core Statistical Products (i.e., information products that the program's Associate Director has reviewed and approved and the Census Bureau has affirmed their content).
- Experimental Statistical Products
- Working papers (e.g., technical papers and division reports intended for release to the public).
- Professional papers (e.g., journal articles, book chapters, conference papers, poster sessions, and written discussant comments).
- Research reports used to guide decisions about Census Bureau programs.
- Abstracts.
- Presentations at public events, such as seminars or conferences. (See Requirement E3-4 for additional requirements for presentations.)
- Handouts for distribution at public events.
- Data sets (e.g., public-use files) and their associated documentation.
- Tabulations, including custom tabulations, estimates, and their associated documentation.
- Statistical graphs, Infographics, figures, and thematic maps.
- Interactive data visualizations

Notes:

(1) Drafts of information products (e.g., professional papers or presentations) to be released for limited circulation (i.e., not presented in a public forum, released in a scientific journal, or in conference proceedings, but provided as proof of work-in-progress or as part of collaborative work being done with external researchers for their input/review) outside the Census Bureau are subject to the requirements for a supervisory review as stated in Sub-Requirement E3-2.1. The other reviews (i.e., content/subject matter, statistical, and policy) are not required unless the supervisor determines that the product needs any of those reviews.

(2) While not a statistical quality requirement, Census Bureau Policy requires that the Chief of the Media Relations Branch in the Public Information Office (PIO) be informed of any information products or other materials being prepared for public use. (See the Census Bureau Policies and Procedures Manual, Chapter B-13 – *Clearance and Release of Public Information Materials*, for further guidance and procedures.)

Sub-Requirement E3-2.1: All information products must undergo a supervisory review and receive approval. The supervisory review is controlling. It is the responsibility of the supervisor to ensure that all required reviews have been properly conducted, and to make the ultimate decision regarding the information product's conformance with these standards. If the author and supervisor cannot agree, the author may appeal up the supervisory chain until the disagreement is resolved. The final authority is the Data Stewardship Executive Policy Committee.

1. The following table specifies who must perform the supervisory review and approval.

Type of Information Product	**Supervisory Reviewers**
Core Statistical Products	Author's immediate supervisor Author's Division or Office Chief Associate Director of the program releasing the information product
News releases	Author's immediate supervisor Author's Division or Office Chief Associate Director of the program releasing the information product Associate Director of the program releasing the information product
All other information products	Author's immediate supervisor Author's Division or Office Chief

2. The supervisory reviewer must verify that the following requirements have been met:
   <u>All information products</u>
   a. The content of the information product is technically and factually correct.
   b. All disclosure avoidance procedures approved by the DRB for the information product have been followed.
   c. The provisions for reviewing and releasing information products in any data-use agreements have been followed.
   d. The information product complies with the Census Bureau's Statistical Quality Standards.
   e. If the information product is a draft to be released for limited circulation outside the Census Bureau, it must include a disclaimer that states the draft is still under review and is not for distribution.

   <u>All information products containing text</u>
   f. No personal views are expressed in Core Statistical Products or news releases.
   g. Only personal views on statistical, methodological, technical, or operational issues are expressed in information products other than Core Statistical Products and news releases.
   h. The following disclaimer is included on the title page in all information products except as noted below. "*Any opinions and conclusions expressed herein are those of the author(s) and do not reflect the views of the U.S. Census Bureau.*"

      Note: The disclaimer is not needed for:

- Core and Experimental Statistics, news releases, abstracts, and handouts for advisory committee meetings.
- Information products that are distributed internally.
- Information products that have been reviewed and approved by the Associate Director as not needing a disclaimer because the documents do not contain personal views.
- Presentation slides that are distributed internally.

i. The information is presented logically and any results follow from the data and the analysis.
j. Any anomalous findings are addressed appropriately.
k. Correct grammar is used. (Note: see The Gregg Reference Manual[1])
l. Presentation slides use the required Census Bureau PowerPoint template found on the Center for New Media and Promotion Intranet Web site. (Note: This is a Census Bureau Corporate Identity Standard.)

Notes:
(1) When the author is a Division or Office Chief, the supervisory reviewer is the author's Associate Director. When the author is a higher-level manager than a Division or Office Chief, the supervisory review is determined by the author's immediate supervisor.
(2) When the author is a Senior Technical (ST) employee, the supervisory reviewer is the Chief Scientist (Associate Director for Research and Methodology), or the Senior Technical employee's Supervisor or Associate Director.

Sub-Requirement E3-2.2: All information products, except data sets and custom tabulations, must undergo a content/subject-matter review and receive approval. However, the documentation that accompanies data sets or custom tabulations must receive a content/subject matter review.

1. The following table specifies who must perform the subject matter review and approval:

Type of Information Product	**Content/Subject Matter Reviewers**
Abstracts	Author's Division or Office Chief
All other information products	Reviewers who are outside the author's organizational unit (branch), and who have expertise in the subject matter, operation, or statistical program discussed in the information product. If a qualified outside reviewer is not available, a reviewer within the author's organizational unit is permitted.

2. The content/subject matter reviewer must verify that the following requirements have been met:
   a. The content of the information product is technically and factually correct.
   b. The information is presented logically and any conclusions follow from the data and the analysis.
   c. Any anomalous findings are addressed appropriately.

d. Subject-matter literature is referenced in the information product, as appropriate.
e. Graphics/visualizations are clear and appropriate. (Note: https://xdgov.github.io/data-design-standards/ provide additional guidance on presenting graphics)

3. The content/subject matter reviewer must either approve the information product or provide the author with specific written instructions on issues to be addressed.

4. The content/subject matter reviewer must review the information product again after the author addresses any recommended revisions. If the reviewer and the author disagree with how the comments are addressed, they must inform their supervisors so that a resolution can be reached.

Note: If an information product is generated from a program sponsored by an outside organization or uses data provided by an outside organization, the author's Division or Office Chief should determine whether to send the product to the outside organization for an additional review.

Sub-Requirement E3-2.3: All information products must undergo a statistical review and receive approval, even if the author believes the information product involves no statistical methodologies.

1. The following table specifies who must perform the statistical review and approval:

Type of Information Product	**Statistical Reviewers**
Conference papers	Reviewers who have expertise in the statistical methodology or program discussed in the information product Note: Appendix E3-A provides a list of statistical review contacts for conference papers.
Abstracts	Author's Division/Center or Office Chief Note: If the Division/Center or Office Chief determines that an abstract requires a more rigorous statistical review, he or she must refer the abstract to the appropriate Assistant Division Chief (ADC) or Assistant Center Chief (ACC) for statistical methodology.
All other information products	Statistical methodology ADC or ACC of the program related to the topic of the information product Note: Appendix E3-A provides a list of statistical review contacts by topic/subject matter.

2. The statistical reviewer must verify that the following requirements have been met:
   a. The discussion of assumptions and limitations is accurate and appropriate.
   b. The description of the reliability of the data is accurate and complete.

c. Statistical testing is performed correctly to support any comparison statements, whether expressed directly or implied.
d. Calculations and equations are accurate and statistically sound.
e. The content, conclusions, and any recommendations on technical, statistical, or operational issues are supported by the methodology used and the data presented.
f. A source statement for each table, graph, figure, and map is included in the information product. (See Requirement E2-2, item 2, in Statistical Quality Standard E2, *Reporting Results*.)
g. Statistical uncertainty is appropriately conveyed. (See Requirement E1-4 in Statistical Quality Standard E1, *Analyzing Data*)
h. Comparison statements, such as historical comparisons, are appropriate.

3. The statistical reviewer must either approve the information product or provide the author with specific written instructions on issues to be addressed.

4. The statistical reviewer must review the information product again after the author addresses any recommended revisions. If the reviewer and the author disagree on how the comments are addressed, they must inform their supervisors so that a resolution can be reached.

Notes:
(1) Media releases that do not contain estimates or discussions of statistical or survey methodology need not undergo a statistical review (e.g., media advisories such as the one titled, "Census Bureau Releases Timetable for 2008 Income, Poverty and Health Insurance Estimates and American Community Survey Data").
(2) Two types of geographic products need not undergo a statistical review:
   a) Thematic maps presenting data from the Decennial Census data if the underlying data have been reviewed and approved.
   b) Geographic reference products (e.g., reference maps, and documents showing lists and numbers of geographic entities and relationships between entities).

Sub-Requirement E3-2.4: All information products must undergo a data visualization review. The review will make recommendations regarding the visualization. The supervisory review controls whether the visualization may be used.

1. The following table specifies who shall perform the data visualization review.

Type of visualization	Data visualization reviewers
Existing visualization types addressed in the standards.	The owner for the program area that produced the source data shall review data visualizations as part of a supervisory review.
Interactive visualizations that use Tableau	The developer of the data visualization shall ensure the Data Visualization Steering Committee reviews the visualization before it is submitted for final supervisory review.
New visualization not defined in the standards.	Data visualization experts will review all new visualization types (see list below).

2. The following table specifies the expectations to use as a basis for review.

Type of visualization	Basis of expectations for review
Existing visualization types addressed in the standards.	Reviews will be based on the data visualization requirements defined within Requirement E2-2.3.
New visualization not defined in the standards.	Reviews will be based on the principles and practices for data visualization.

3. The owner of the information product shall:
   a. Arrange for all applicable experts to meet and review the visualization.
   b. Ensure reviewers have a minimum of one week for a review.
   c. Ensure developers have a minimum of two weeks for corrective actions.
   d. Maintain documentation on the results of the review and corrective actions.

4. The reviewers of the data visualization shall:
   a. Determine if the data visualization is suitable for publication.
   b. Information product owners shall address any concerns raised by the data visualization reviewer.
   c. As needed, update the library of approved data visualizations.

Data visualization experts include representatives from:

- Geography (GEO) Division / Geographic Standards Criteria and Quality Branch (GSCQB) when a geographic framework and/or spatial data are used.
- GEO/Cartographic Products and Services Branch (CPSB) when a map, mapping tool, or mapping service are used.
- Communications Directorate (ADCOM) / Public Information Office (PIO) when charts for print publications are used.

- ADCOM/Center for New Media and Promotions (CNMP) to review web accessibility.
- Research and Methodology Directorate (ADRM) / Center for Behavioral Science Methods (CBSM) to review usability.
- ADRM / Quality Program Staff (QPS) to update quality standards.

Sub-Requirement E3-2.5: All information products involving methodologies other than statistical must undergo a methodological review and receive approval.

1. The review must be conducted by individuals with expertise in the methodologies used in the information product (e.g., cognitive psychology, economics, demographic analysis, geographic information systems, or any other specialized methodology).
2. The methodological reviewer must either approve the information product or provide the author with specific written instructions on issues to be addressed.
3. The methodological reviewer must review the information product again after the author addresses any recommended revisions. If the reviewer and the author disagree on how the comments are addressed, they must inform their supervisors so that a resolution can be reached.

Sub-Requirement E3-2.6: All information products must undergo a policy and sensitivity review by the author's Division/Center or Office Chief. The Division/Center Chief or Office Chief may not delegate this review.

Notes:
(1) Appendix E3-B provides a checklist developed by the Policy Coordination Office (PCO) to assist in the policy and sensitivity review. If the Division/Center or Office Chief needs guidance on a specific issue, he or she may refer the issue to the Associate Director, the PCO, the Office of Congressional and Intergovernmental Affairs (OCIA), or the PIO, as appropriate.
(2) When the author is a Division/Center or Office Chief or higher-level manager, the policy and sensitivity review is at the discretion of the author's supervisor.
(3) Per DAO-219-1, research products (e.g., audiovisual materials, working papers, conference proceedings, book chapters, and journal articles) produced using Census Bureau resources (e.g., official hours, computers) are considered "Fundamental Research Communications." As such, "these [review] procedures may not permit approval or non-approval to be based on the policy, budget, or management **implications** of the research." (DAO 219-1 §7.01)

Requirement E3-3: All presentations (with or without a paper) to be delivered by Census Bureau staff at meetings and conferences open to the public (including advisory and data user meetings) must undergo a dry run rehearsal.

1. A senior division manager (ADC or higher) must attend the dry run.
2. All reviewers must be invited to the dry run.
3. Authors must provide copies of their presentations and any other relevant materials to everyone invited, in advance of the dry run.

Notes:
(1) Presentations that have had a dry run and are simply being repeated at another venue do not need another dry run unless substantive changes have been made to the presentation.
(2) The dry run is optional for Division or Office Chiefs or higher and for Senior Technical (ST) employees, at the discretion of their supervisors.

Requirement E3-3.1: Authors of informal presentations (e.g., presentations without written remarks or audio-visual aids, including unwritten discussant or panelist remarks) must review their approach with their Division/Center or Office Chief.

Note: When the author is a Division/Center Chief, Office Chief, or other higher-level manager, this review is at the discretion of the author's supervisor.

Requirement E3-4: The results of the review and approval of information products must be documented, either electronically or on paper, and the documentation retained according to division or directorate policies and procedures.

Examples of documentation include:
- Completed approval forms.
- Approval e-mail messages from reviewers.

Requirement E3-5: The reviews above must be completed within 30 days of the author submitting the material. If the review cannot be completed within 30 days, the author must be notified in writing as to why more time is needed.

Note: Exception to Requirement E3-5 is for materials going through a formal review process such as papers going to a JSM conference. In that case, the timeline in the process must be adhered to and the author notified if that timeline is not going to be met.

Requirement E3-6: All information products prepared by a Census Bureau employee without the use of Census Bureau resources (e.g., official working hours, computers) that pertain to the Census Bureau's programs, policies, or operations and are related to the employee's job or area of expertise are subject to a limited review by the Census Bureau but do not require Census Bureau approval. Per DAO 219-1 §11.01, such information products are considered "Non-Official Communications of Interest."

Examples of information products covered by this requirement include:
- Papers based on dissertation-related research conducted entirely outside the Census Bureau.
- Papers based on research conducted at a previous employer.
- Papers based on research conducted on off-duty hours with non-government resources.

1. All written and audiovisual material that are a Non-Official Communication of Interest must be submitted to an author's immediate supervisor for a review to be concluded as soon as is reasonably practicable but no longer than 14 days.

2. The supervisor's review is to protect and promote the efficient operation of the Census Bureau by identifying communications that will impact the agency's operations because they (§11.01b):
   a. Contain Classified or otherwise restricted material (e.g., Controlled Unclassified Information).
   b. Violate applicable ethics regulations and statutes.
   c. Improperly attribute the personal views of the employee to the agency or that could be reasonably be perceived by the public as doing so.
3. After the review period, approval is not required for an employee to broadly distribute a Non-Official Communication of Interest.
4. The results of the review must be documented and retained, clearly noting that the work is a Non-Official Communication of Interest and therefore did not use any agency resources.
5. The author must use the following disclaimer: "*Any opinions and conclusions expressed herein are those of the author(s) and do not reflect the views of the U.S. Census Bureau.*"
6. Per 5 C.F.R. §§ 2635.807(b)(2), an employee is permitted to use his/her Census Bureau affiliation on a Non-Official Communication of Interest. In particular, "an employee may use, or permit the use of, his title or position in connection with an article published in a scientific or professional journal, provided that the title or position is accompanied by a reasonably prominent disclaimer satisfactory to the agency stating that the views expressed in the article do not necessarily represent the views of the agency or the United States."

Requirement E3-7: Per DAO-219-1 §12, an employee has the right to appeal the non-approval of that employee's research product and other matters. If an employee wishes to appeal, that person should contact the Quality Program Staff (adrm.qps.list@census.gov) for assistance. The appeal process will be completed within two weeks, and the employee will be notified of the outcome of the appeal within that time frame.

[1] William A. Sabin, *The Gregg Reference Manual*, 11th ed., McGraw-Hill, New York, 2011.

Analyzing Data And Reporting Results
Statistical Quality Standard
App E3-A Statistical Review Contacts

Statistical Review Contacts by Topic / Subject Matter

Topic / Subject Matter	Contact
Decennial censuses	Assistant Division Chief (ADC) for Sampling and Estimation (DSSD)
American Community Survey (ACS)	ADC for ACS Statistical Design (DSSD)
Demographic surveys (e.g., CPS, NHIS, and SIPP)	ADC for Sample Design and Estimation (DSMD)
Small area estimates	Chief, Center for Statistical Research and Methodology
Administrative data	Chief, Center for Economic Studies (CES), Chief Social, Economic, and Housing Statistics Division (SEHSD), Chief, Decennial Statistical Studies Division, or Chief Economic Statistical Methods Division (ESMD)
Economic Programs data	Chief, Economic Statistical Methods Division (ESMD) or appropriate Research and Methodology ADC
International data, multiple data sources, or other data and papers that are strictly methodological (not specific program-based)	Appropriate ADC or ACC for Research and Methodology for the author's directorate

Statistical Review Contacts for Conferences

Conference	Contact
Joint Statistical Meetings (JSM)	Chief, Center for Statistical Research and Methodology (CSRM)
American Association of Public Opinion Research (AAPOR)	Chief, Center for Behavioral Science Methods (CSRM)
International Conference on Establishment Statistics (ICES)	Chief, Economic Statistical Methods Division (ESMD)
Population Association of America (PAA)	ADC for Sample Design and Estimation (DSMD)
Federal Committee on Statistical Methodology (FCSM)	Chief, Quality Program Staff
American Economic Association (AEA)	Chief, Center for Economic Studies (CES)
Census Advisory Committee or National Academy of Sciences	Appropriate ADC for Research and Methodology for the author's directorate
International Statistical Institute (ISI)	Chief, Center for Statistical Research and Methodology (CSRM)
International Union for the Scientific Study of Population (IUSSP)	Chief, Demographic Statistical Methods Division (DSMD)

Conference	Contact
Other international conferences, including the UN Economic Commission for Europe and Organization for Economic Cooperation and Development (OECD)	Appropriate ADC for Research and Methodology for the author's directorate
Association of American Geographers (AAG)	Appropriate ADC for Research and Methodology for the author's directorate
SAS Users	Appropriate ADC for Research and Methodology for the author's directorate
International Field Directors and Technologies Conference (IFDTC)	Chief, Office of Survey and Census Analytics
All other conferences	Appropriate ADC for Research and Methodology for the author's directorate

Analyzing Data And Reporting Results
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App E3-B Policy & Sensitivity Review Checklist

All information products must undergo a policy and sensitivity review by the author's Division/Center or Office Chief. The Division/Center Chief or Office Chief may not delegate this review

This checklist should be used to determine the suitability for publication and release of official Census Bureau communications and information products. It should also be used to review Fundamental Research Communications so the Bureau is prepared for policy, budget, or management implications of the research.

If the answer to any of the following questions is "yes," then the information product proposed for publication/release must not be released until the issue raised by the question has been resolved appropriately.

(Note: Consistent with DAO 219-1, "these [review] procedures may not permit approval or non-approval to be based on the policy, budget, or management **implications** of the research." In the event that the communication or information product has policy, budget, or management implications which are expressed appropriately, release of the communication or information product may only be delayed for the minimum amount of time necessary for the agency to prepare an appropriate response.)

1. Is the information product inconsistent with the Census Bureau's mission?

2. Would publication/release of the information product compromise the Census Bureau's ability to perform its mission?

3. Does the information product express views on or discuss any of the following topics in an inappropriate manner or in a way that is inconsistent with laws, Commerce Department policies, or Census Bureau policies?

    a. Laws, regulations, *Federal Register* notices, court cases, congressional testimony, or policy statements or decisions pertaining to the Commerce Department or the Census Bureau.

        Examples include:
        - Sections of the Commerce Department's Code of Federal Regulations.
        - Chapters of the Census Bureau's Policies and Procedures Manual.
        - Census Bureau's Data Stewardship Policies.
        - Census Bureau's Information Technology Security Policies and Regulations.

    b. The Freedom of Information Act, Open Government Act, Paperwork Reduction Act, or the Privacy Act.

c. Matters that are currently being investigated by Congress.

d. Issues relating to privacy, confidentiality, data security, or access to and use of administrative data (including any issues related to personally or business identifiable information or data breaches).

e. Budget/appropriations issues.

f. Any issue that is politically sensitive or that has been the subject of recent news articles, correspondence, hearings, or current or potential lawsuits.

   Examples of sensitive issues include:
   - Current poverty estimates.
   - Concerns about the American Community Survey (ACS).
   - Concerns about Local Update of Census Addresses Program (LUCA).
   - Concerns about the enumeration of sensitive populations (racial or ethnic populations, immigrants, the homeless, or Group Quarter's (GQ) populations such as prisoners, residents of nursing homes, or college students).
   - Concerns about the enumeration of overseas Americans.
   - Concerns about statistical sampling.
   - Concerns about Disclosure Avoidance methods.
   - Concerns about the use of administrative data in the decennial census.

g. Sensitive historical issues like the internment of Japanese Americans or statistical adjustment of the decennial census.

4. Is it possible that release of the information product will affect any national policy issues related to the topics it discusses?

5. Does the information product discuss matters related to sharing or accessing confidential Title 13 and/or Title 26 information/data in a way that suggests the sharing is inconsistent with laws, Census Bureau policies, or IRS policies?

6. Does the information product suggest or imply that the Census Bureau may be cooperating in any way with another government agency to support enforcement or regulatory activities, or for the determination of benefits?

   An example would be a discussion of providing custom tabulations or extracts to a federal law enforcement agency. It would be acceptable to discuss the Census Bureau's Policy on *Providing Custom Tabulations and Custom Extracts Under 13 U.S.C. § 8(b)* and to inform the agency that any tabulations provided by the Census Bureau are subject to public disclosure.

7. Does the information product discuss specific contract/acquisitions issues or information in a manner that improperly discloses commercial proprietary information or trade secrets?

8. Does the information product single out a particular group or category of individuals to receive special treatment, consideration, or recognition (e.g., identifying key partners who contributed to the decennial census effort) in a manner that might compromise the Census Bureau's ability to perform its mission?

9. Does the information product contain any subject matter or language that might be deemed offensive, insensitive, or inappropriate?

10. Does the information product lack the disclaimer (if required) specified in Sub-Requirement E2-2.1 #1 (Statistical Quality Standard E2, *Reporting Results*, specifies when the disclaimer is required.)

Note: If the disclaimer is required but missing, the author **must** add it before the information product may be published or released.

Releasing Information
Statistical Quality Standard
F1 - Releasing Information Products

Purpose: The purpose of this standard is to establish quality criteria for releasing information products.

The OMB's Statistical Policy Directive No. 3 and Statistical Policy Directive No. 4 describe requirements for notifying the public of the release of information products. The Census Bureau's Product Release Notification Policy and Policies and Procedures Manual (Chapter B-13 – *Clearance and Release of Public Information Materials*) describe procedures for notifying the PIO about information products to be released to the public.

Note: Statistical Quality Standard F2, *Documentation to Support Transparency in Information Products*, contains specific requirements about documentation that must be readily accessible to ensure transparency in information products released outside the Census Bureau.

Scope: The Census Bureau's statistical quality standards apply to all information products released by the Census Bureau and the activities that generate those products, including products released to the public, sponsors, joint partners, or other customers. All Census Bureau employees and Special Sworn Status individuals must comply with these standards; this includes contractors and other individuals who receive Census Bureau funding to develop and release Census Bureau information products.

Exclusions:
In addition to the global exclusions listed in the Preface,
(1) Requirements F1-2 and F1-3 of this standard do not apply to:
- Professional papers, presentations, and similar information products.
- Information products delivered to sponsors or clients (e.g., data files and tabulations).

(2) Requirements F1-8 through F1-11 of this standard do not apply to:
- Professional papers, presentations, and similar information products.

Key Terms: Coefficient of variation (CV), coverage ratio, dissemination, estimate, information product, metadata, nonresponse bias, nonsampling error, releases of information products, response rate, sample design, and sampling error.

Requirement F1-1: Neither protected information nor administratively restricted information may be released outside the Census Bureau, except as allowed under applicable federal laws (e.g., Title 13, Title 15, and the Confidential Information Protection and Statistical Efficiency Act) and data-use agreements.

Sub-Requirement F1-1.1: Throughout all processes associated with releasing information products, unauthorized release of protected information or administratively restricted information must be prevented by following federal laws (e.g., Title 13, Title 15, and Title 26), Census Bureau policies (e.g., Data Stewardship policies), and additional provisions governing the use of

the data (e.g., as may be specified in a memorandum of understanding or data-use agreement). (See Statistical Quality Standard S1, *Protecting Confidentiality*.)

Requirement F1-2: Information products released to the public by the Census Bureau must be released according to a dissemination plan that addresses:

1. What information product(s) are planned for release.
2. The release schedule. The release schedule for all regular or recurring information products for the upcoming year must be published on www.census.gov before January 1 of that year. (See OMB Statistical Policy Directive No. 4.)
3. The reviews and approvals needed before releasing the information products to the public.
4. The mode of release by the Census Bureau.

Requirement F1-3: Policies and procedures for disseminating information products, including those related to any planned data revisions or any corrections for data quality issues identified after an information product has been released, must be documented and published on the Census Bureau's Internet Web site.

Requirement F1-4: Information products must not be released outside the Census Bureau until they receive the appropriate reviews and approvals. (See Statistical Quality Standard E3, *Reviewing Information Products*.)

Requirement F1-5: Embargoed news releases and data files must not be released to the public by any means (including print, broadcast, Internet, podcast, blogs, or in any other form) before the specified date and time of release. (See the U.S. Census Policy on Pre-release of Information[1].)

Requirement F1-6: For information products classified as experimental statistical products, the information product owner shall:

1. Keep a list of their experimental statistics.
2. Ensure that each statistic is clearly labeled as experimental in their information products.
3. Actively solicit user feedback by including the following statement with their information product: "Technical documentation for these experimental statistics and specific recommendations for interpreting these statistics are described on the product's webpage [insert URL on census.gov]. The Census Bureau invites users to provide feedback on how to improve this experimental product."
4. Establish a webpage for the experimental statistical product that shall
   a. Provide an overview of the experimental statistics,
   b. Link to relevant research studies supporting the feasibility for the experimental approaches,
   c. Document the data sources,
   d. Describe the methodology used,
   e. Note the periodicity for publication, ("intermittent" is an allowable periodicity),
   f. Provide summary quality measure that convey the coverage rates, imputation rates, and precision of the estimates, as applicable.

g. Document details about the potential impact of quality issues for each revision of the data. If quality issues extend beyond that anticipated in the original proposal for the experimental product the proposal shall be updated and provided to the M&S Council,
h. Link to a mechanism for users to provide feedback, and
i. Track web traffic for the experimental statistics.

Requirement F1-7: Information products (except research analysis of information products) must comply with the Census Bureau's statistical quality standards and must be free of serious data quality issues in order to be released outside the Census Bureau without restrictions.

1. Serious data quality issues related to sampling error occur when the estimated coefficients of variation (CV) for the majority of the key estimates are larger than 30 percent.

   Notes:
   (1) This requirement does not apply to secondary estimates. For example, if the estimated month-to-month change is the key estimate, and the monthly estimates are secondary, the requirement applies only to the estimated month-to-month change.
   (2) Statistical Quality Standard A1, *Planning a Data Program*, provides requirements for identifying key estimates.

2. Serious data quality issues related to nonsampling error occur when:
   a. All products:
      1) The data suggest that the primary survey concepts are not clearly defined or that measurement of the concepts failed for some reason.
      2) The key estimates are inconsistent with our base of knowledge about the characteristic being estimated.
      3) Issues that are serious enough to raise concerns about the accuracy of the data occur in sample design, sampling methods, questionnaire or forms design, data collection, data processing, estimation procedures, or the underlying assumptions of a model.

   b. Products derived primarily from census or survey data:
      1) Unit response rates for surveys or censuses, or cumulative unit response rates for panel or longitudinal surveys, are below 60 percent.
      2) Sample attrition from one wave to the next wave in panel or longitudinal surveys is greater than five percent.
      3) Item response rates or total quantity response rates on key items are below 70 percent.
      4) Coverage ratios for population groups associated with key estimates are below 70 percent.
      5) Combined rates for key estimates (e.g., computed as unit response * item response * coverage) are below 50 percent.

Notes:
(1) These thresholds are provided because bias is often associated with low response rates or with low coverage ratios. If nonresponse bias analyses or other studies show that the bias associated with nonresponse is at an acceptable level, or that steps taken to mitigate nonresponse bias or coverage error are effective then requirement F1-7 is not applicable. The bias studies and mitigation efforts however should be made publicly available per Requirements F2-2.3.2, S2-3, D3-9, and B1-4.
(2) The Census Bureau conducts a few surveys that do not use probability samples. Generally, they are establishment surveys that select the largest units in the target universe and do not attempt to collect data from the small units in the universe. For these surveys, the above thresholds do not apply. These surveys have serious data quality issues if the responding units do not comprise at least 70 percent of the target universe, based on the unit response rate or the total quantity response rate, as appropriate.
(3) Statistical Quality Standard D3, *Producing Measures and Indicators of Nonsampling Error*, specifies requirements on computing response rates.

Sub-Requirement F1-7.1: Information products with data free from the serious data quality issues described in Requirement F1-7 may be released outside the Census Bureau with no restrictions, subject to confidentiality constraints.

Sub-Requirement F1-7.2: Information products with data that have any of the serious data quality issues in Requirement F1-7 may be released outside the Census Bureau only under the restrictions described below.

1. Restrictions for information products with serious data quality issues related to sampling error:

   The information product must:
   a. Note that the CV exceeds 30 percent for a majority of the key estimates.
   b. Note that data users should exercise caution when using estimates with high sampling error.
   c. Indicate why the data are being released (e.g., aggregates of the estimates may be useful or the knowledge that the estimates have extremely high magnitude or extremely low magnitude may be useful).

2. Restrictions for information products with serious data quality issues related to nonsampling error:

   a. Products that are Core Statistical Products or regular or recurring products (i.e., products governed by Statistical Policy Directive No. 3 or Statistical Policy Directive No. 4):

      1) For statistics identified as experimental:

i. The information product must summarize any nonsampling error issues related to Requirement F1-7, item 2a (1 through 3).
ii. If response rates, coverage ratios, or the combined rates fall below the thresholds in Requirement F1-7, item 2b for the experimental statistics a table must be included that provides the response rates or coverage ratios for the experimental statistics in enough detail to allow users to evaluate how the issue may affect their use of the data. Other quantitative measures of the impact of the issue should be included to the extent feasible.

For all other statistics:

2) The program manager must obtain a waiver before releasing the information product.
3) The information product must summarize any nonsampling error issues related to Requirement F1-7, item 2a (1 through 3).
4) If response rates, coverage ratios, or the combined rates fall below the thresholds in Requirement F1-7, item 2b:
   i. The key estimates affected must be identified.
   ii. A table must be included that provides the response rates or coverage ratios for key estimates in enough detail to allow users to evaluate how the issue may affect their use of the data. Other quantitative measures of the impact of the issue should be included to the extent feasible.
5) The information product must include details about the potential impact of the quality issues on the data.
6) The information product must include the URL of the complete documentation on the nonsampling error issues.
7) In some cases, the serious data quality issues may not allow the release of the standard information product and may require additional methods to make the information product suitable for release. These additional methods may mean that less information is released. The additional methods and explanation of the methods need to be clearly documented to allow users to understand them.

b. Products released to sponsors:
   1) The information product must summarize any nonsampling error issues related to Requirement F1-7, item 2a (1 through 3).
   2) If response rates, coverage ratios, or the combined rates fall below the thresholds in Requirement F1-7, item 2b:
      i. The key estimates affected must be identified.
      ii. A table must be included that provides the response rates or coverage ratios for key estimates in enough detail to allow users to evaluate how the issue may affect their use of the data. Other quantitative measures of the impact of the issue should be included to the extent feasible.
   3) The information product must include details about the potential impact of the quality issues on the data.
   4) The delivery of the product to the sponsor must include the complete documentation on the nonsampling error issues or a URL where the documentation is accessible.

c. Products that are not Core Statistical Products or are not regular or recurring products (e.g., custom tabulations, data files, professional papers, working papers, technical reports, and similar products):
   1) Release to the public is not allowed, except as noted in item 2) below. The information product may be released only on request. If released on request, the information product must:
      i. Include this disclaimer: "*These data are being released on request, despite concerns about their quality. The Census Bureau's policy is not to withhold data that are available, unless releasing such data would violate confidentiality requirements. The Census Bureau recommends using these data only for research or evaluation purposes, and not to make statements about characteristics of the population or economy because they do not meet the criteria outlined in the Census Bureau's Statistical Quality Standard: Releasing Information Product.*"
      ii. Summarize the nonsampling error issues.
      iii. Include summary metadata describing the issues and the impact on the data.
      iv. Provide the URL of the complete documentation on the nonsampling error issues.
   2) Release is permitted only for information products whose purpose is not to report, analyze, or discuss characteristics of the population or economy, but whose purpose is to:
      - Analyze and discuss data quality issues or research on methodological improvements, or to
      - Report results of evaluations or methodological research
   3) External researchers at the Federal Statistical Research Data Centers may not have access to confidential data that are affected by serious data quality issues, except to analyze the data quality issues, including developing potential solutions. If the researcher has corrected the data quality issues and the Census Bureau has determined that the researcher's solutions are appropriate, the revised data may be used for subject-matter (e.g., poverty) analyses.

Requirement F1-8: When a data quality issue is suspected in a previously released information product, the program manager must notify Census Bureau senior management of the issue immediately after it has been identified. At a minimum, the senior managers to be notified include:

1. The Division/Center Chief(s) responsible for the program with the suspected data quality issue.
2. The Associate Director responsible for the program with the suspected data quality issue.

Note: These senior managers will decide whether the issue should be escalated to the Deputy Director and provide guidance on the appropriate actions to take and the specific stakeholders or organizations to notify regarding the suspected data quality issue.

Requirement F1-9: When serious data quality issues are identified in a previously released information product, a notification must be disseminated to alert the public. If the product was released to a sponsor, the notifications must be made to the sponsor.

1. The notification must be disseminated immediately after identifying a serious data quality issue, even if the issue is not yet fully understood.
    a. If appropriate the data affected by the data quality issue must be removed from the Census Bureau's Internet Web site at this time.
2. The notification must include the following components, with additional information that facilitates understanding the issue and its effects as appropriate:
    a. A description of the issue.
    b. A description of what is known about the effect on the data.
    c. A description of what is known about the cause.
    d. A statement indicating the data have been removed until the issue has been fixed (if appropriate).
    e. Plans for addressing the issue.
    f. Expected release dates of revised products.
3. If the notification is disseminated before the issue is fully understood, it must be updated when a more complete understanding is achieved.

    Note: Program managers must notify the responsible Division/Center Chief(s) and Associate Director (Requirement F1-8) before making notifications to the public or sponsors.

Requirement F1-10: Any serious error or data quality issue identified in a previously released information product must be addressed appropriately.

Examples of appropriate actions to address serious errors and data quality issues include:

- Correct the error and re-release the product.
- Release an "errata" document for the product, describing the error and the correction.
- If it is not feasible to correct an error, release a description of the error and its likely effects on the program's estimates and results.
- If a data user or a sponsor reported the error, acknowledge the report and indicate when the issue is expected to be resolved. If the error will not be corrected, respond and explain to the user why it will not be corrected and what actions will be taken to address the error.

Sub-Requirement F1-10.1: Serious errors or data quality issues identified in a previously released information product must be documented by completing the Dissemination Incident Report found in Appendix F1 and submitting it to the Quality Program Staff.

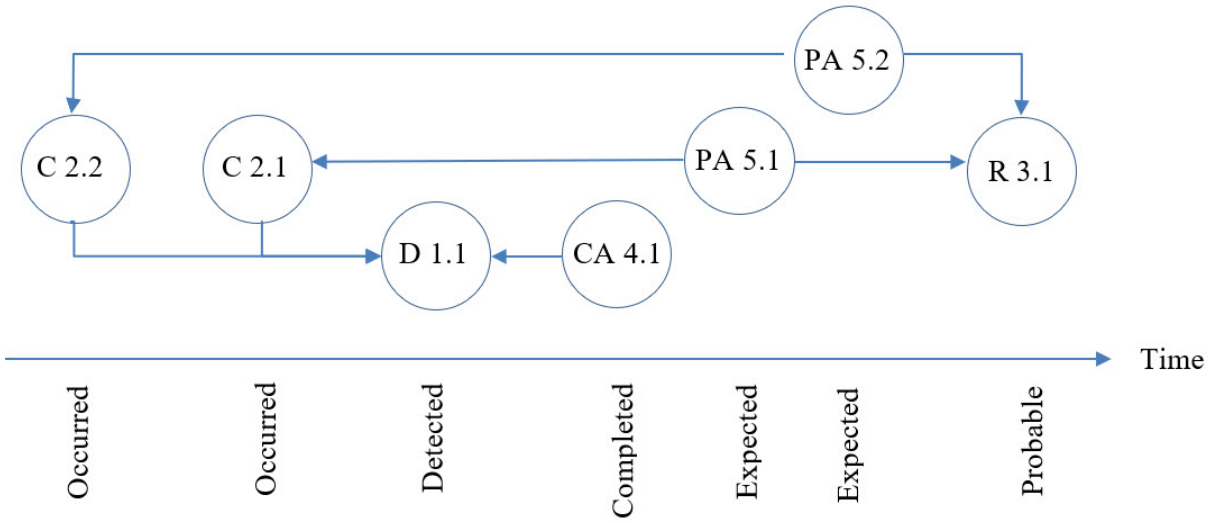
Requirement F1-11: Information products approved for release to the public must be published on the Census Bureau's Internet Web site and must adhere to the requirements of Section 508 of the U.S. Rehabilitation Act.

[1] Policy Coordination Office, *Policy on Pre-release of information*, Policy Coordination Office, U.S. Census Bureau, Washington D.C., August 26, 2015.

Releasing Information
Statistical Quality Standard
App F1 - Dissemination Incident Report

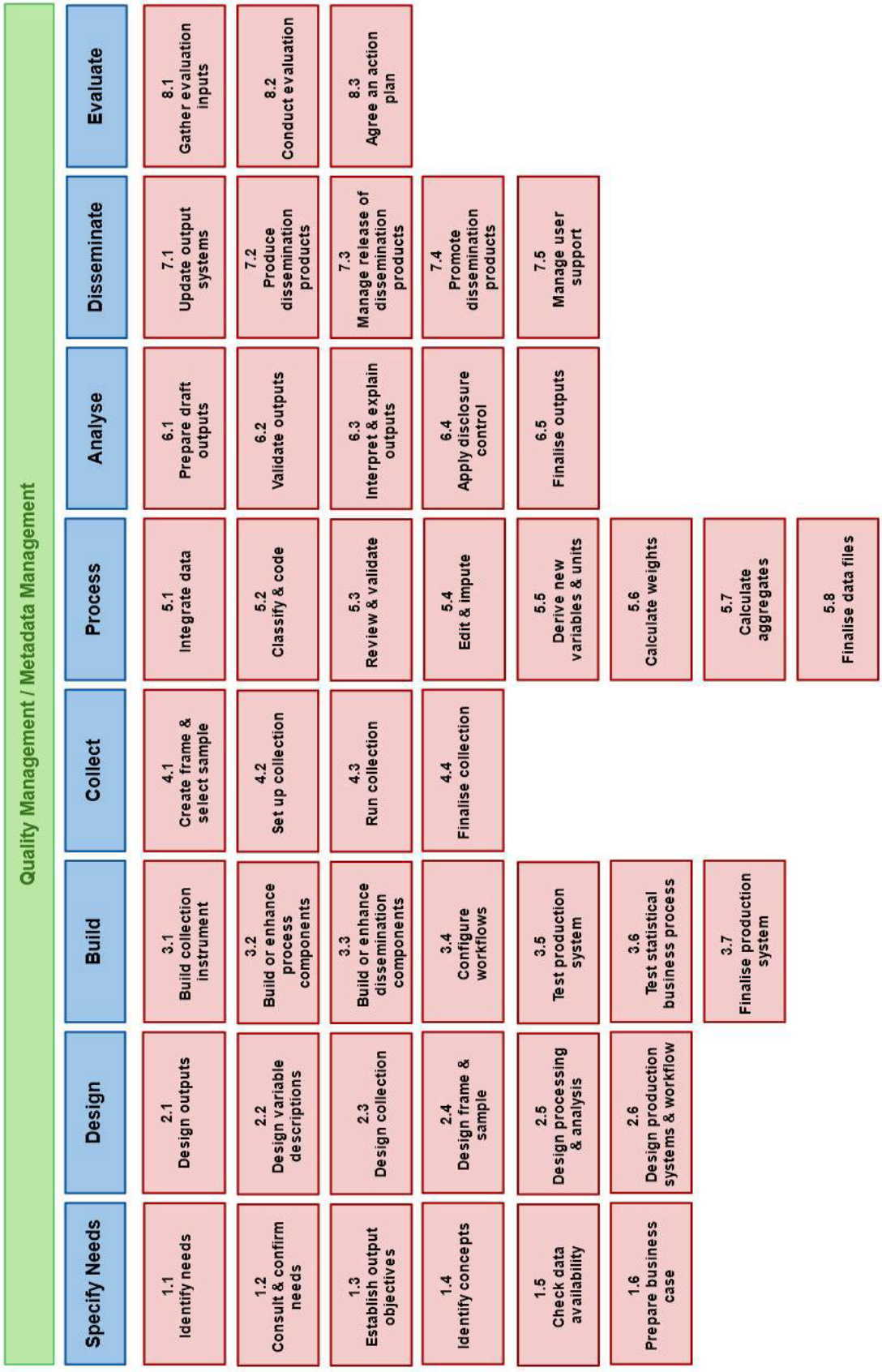
This report documents quality-related problems when information products are released with a defect or are almost released but the defect is unexpectedly detected. When you become aware of an incident, complete this report and send it to the Quality Program Staff at: dir.quality.program.staff.list@census.gov. The analysis of these reports will help us identify system failures and prevent future incidents.

Figure 1 - Diagram of a basic incident from the defect (D), its causal factors (C), to the corrective actions (CA), preventive actions (PA), and potential risks (R).



The attached report allows for a concise description of each section and follows with a series of questions to help code key factors.

Each Defect ID represents a unique information product. The description for the Defect ID includes a summary of defective statistics within that information product, an assessment of the impact of the defective statistics and uses the taxonomy in the U.S. Census Bureau Enterprise Risk Management Plan[1] to code the responses. The description of the causal factors lays out what processes failed and uses the Generic Statistical Business Process Model (GSBPM)[2] shown on the following page to code the responses. The description of the causal factors also includes a relation identifier to establish a cause and effect sequence of events. If multiple defects or causal factors occur, repeat sections as needed. The description of risks are for potentially undetected defects or errant processes that might continue to create more defects. The last part of this report documents the actions that were or will be taken to correct the defect(s) and the actions that will be taken to prevent the cause(s) from reoccurring or risks from being realized


Quality Management / Metadata Management
Specify Needs
Design
Build
Collect
Process
Analyse
Disseminate
Evaluate
1.1 Identify needs
2.1 Design outputs
3.1 Build collection instrument
4.1 Create frame & select sample
5.1 Integrate data
6.1 Prepare draft outputs
7.1 Update output systems
8.1 Gather evaluation inputs
1.2 Consult & confirm needs
2.2 Design variable descriptions
3.2 Build or enhance process components
4.2 Set up collection
5.2 Classify & code
6.2 Validate outputs
7.2 Produce dissemination products
8.2 Conduct evaluation
1.3 Establish output objectives
2.3 Design collection
3.3 Build or enhance dissemination components
4.3 Run collection
5.3 Review & validate
6.3 Interpret & explain outputs
7.3 Manage release of dissemination products
8.3 Agree an action plan
1.4 Identify concepts
2.4 Design frame & sample
3.4 Configure workflows
4.4 Finalise collection
5.4 Edit & impute
6.4 Apply disclosure control
7.4 Promote dissemination products
1.5 Check data availability
2.5 Design processing & analysis
3.5 Test production system
5.5 Derive new variables & units
6.5 Finalise outputs
7.5 Manage user support
1.6 Prepare business case
2.6 Design production systems & workflow
3.6 Test statistical business process
5.6 Calculate weights
3.7 Finalise production system
5.7 Calculate aggregates
5.8 Finalise data files

Contact: Click here to enter text.
Email address: Contact's email address
Phone number: (###) ###-####

Reported: 7/15/2020
Directorate: Select Directorate
Division: Enter Division

Executive Summary: Concisely **(5 LINES)** note the defects, causes, risks, corrective and preventive actions. For example, "The estimates were understated by 20%. Edit programs omitted three variables. Additional defects are unlikely. We fixed the defects and programming. We will check changes from now on."

1.0 Defect(s):
(Repeat the section below for each defect.)
Defect ID #: Assign an ID # **Detected**: Select when the defect was detected.
Description: Concisely describe the defective statistics within the information product, their impact, and how they were detected.
(*If practical, attach a pdf file with each defect highlighted*)
Information product: Enter the name of affected information product
Location: Enter location/URL of the information product
Impact: Select the impact of the defect
Importance of the Information: Select the most important data item.
Type of defect: Select type of defect
Number of affected statistics: Select Range.
Magnitude of errors: Select Range
Who detected the defect(s): Select who detected the defect
Method of detection: Select how the defect was detected
Initial reason for detection: Select why the defect was detected?

2.0 Causal Factor(s):
Causal ID #: 2.1 **Occurred**: Select when the cause occurred.
Description: Quality Check failed to detect the defect.
Relation: Enter the defect ID#'s related to this causes (ex. Defect 1.1)
Affected process: 6.5 Finalize outputs
Affected requirement(s): Enter the requirement(s) related to this causal factor (ex. E3-2.1 #2a)
Causal factors: (Select all that apply below)

Management	☐ Scope: Conflicting priorities	☐ Cost: Inadequate resources
	☐ Time: Excessive time constraints	
Inputs	☐ Inaccurate input (ex. data)	☐ Inadequate input (ex. directions)
Process	☐ Hardware failure	☐ Software/Programming failure
	☐ Excessively complex process	☐ Inadequate/suboptimal process
Personnel	☐ Inadequate attention/review	☐ Inadequate training/experience
Other Factors	☐ Changed the normal process	☐ *Other factors, See description*

(Repeat the section below for each causal factor.)
Causal ID #: Assign an ID # **Occurred**: Select when the cause occurred.
Description: Concisely describe the causal factor.

Relation: Enter the defect ID#'s related to this causes (ex. Defect 1.1)
Affected process: Select a GSBPM process (see reference 1 for more detail)
Affected requirement(s): Enter the requirement(s) related to this causal factor (ex. E3-2.1 #2a)
Causal factors: (Select all that apply below)

Management	☐ Scope: Conflicting priorities	☐ Cost: Inadequate resources
	☐ Time: Excessive time constraints	
Inputs	☐ Inaccurate input (ex. data)	☐ Inadequate input (ex. directions)
Process	☐ Hardware failure	☐ Software/Programming failure
	☐ Excessively complex process	☐ Inadequate/suboptimal process
Personnel	☐ Inadequate attention/review	☐ Inadequate training/experience
Other Factors	☐ Changed the normal process	☐ *Other factors, See description*

3.0 Risks:
(Repeat the section below for each risk.)
Risk ID #: Assign an ID # **Probable**: Select date when the risk may be discovered.
Description: Concisely note the risk of finding any undetected defects or reoccurrence of causal factors.
Affected process: Select a GSBPM process (see reference 1 for more detail)
Affected requirement(s): Enter the requirement(s) related to this risk factor (ex. E3-2.1 #2a)
Probability of occurrence: Select probability of occurrence
Potential Impact: Select the impact of the defect

4.0 Corrective Actions:
(Repeat the section below for each corrective action.)
Correction ID #: Assign an ID # **Completed**: Select date action is completed.
Relation: Enter the defect ID#'s related to this corrective action (ex. Defect 1.1)
Description: Concisely describe the corrective action to be taken.

☐ Notified Associate Director (Mandatory)	☐ Notified Division Chief (Mandatory)
☐ Notified Sponsor/Partner (Mandatory)	☐ Notified Public – Posted user note
☐ Retracted information	☐ Posted Revised Data
☐ *Other actions, See description*	

What additional resources are needed? List additional resources needed here.

5.0 Preventive Actions:
(Repeat the section below for each preventive action.)
Prevention ID #: Assign an ID # **Expected**: Select date of preventive action.
Relation: Enter the causal or risk factor ID#'s related to this preventive action (ex. Cause 2.1)
Description: Concisely describe the preventive action to be taken.
What additional resources are needed? List additional resources needed here.

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[1] Office of Risk Management and Program Evaluation, *U.S. Census Bureau Enterprise Risk Management Plan,* U.S. Census Bureau, Washington D.C. 20233, Sept 2015.
[2] United Nations Economic Commission for Europe, (UNECE) *Generic Statistical Business Process Model (GSBPM) Version 5.1*, UNECE Statistical Division Palais des Nations CH-1211 Geneva 10 Switzerland, January 2019, https://statswiki.unece.org/display/GSBPM/GSBPM+v5.1 Accessed on July 15, 2020

Releasing Information
Statistical Quality Standard
F2 - Documentation to Support Transparency in Information Products

Purpose: The purpose of this standard is to specify the documentation that must be readily accessible to the public to ensure transparency and reproducibility in information products released by the Census Bureau.

The documentation required by this standard aims to provide sufficient transparency into the Census Bureau's information products so that qualified users can reproduce the estimates and results in the products. However, federal law (e.g., Title 13, Title 15, and Title 26) and Census Bureau policies require safeguarding the confidentiality of protected information or administratively restricted information. Therefore, complete transparency and reproducibility may not always be possible. At a minimum, the documentation will allow users to assess the accuracy and reliability of the estimates and results in the Census Bureau's information products.

Note: Statistical Quality Standard F1, *Releasing Information Products*, addresses the required documentation and metadata to describe any serious data quality problems and the likely effects of the problems on the data and estimates in the Census Bureau's information products.

Scope: The Census Bureau's statistical quality standards apply to all information products released by the Census Bureau and the activities that generate those products, including products released to the public, sponsors, joint partners, or other customers. All Census Bureau employees and Special Sworn Status individuals must comply with these standards; this includes contractors and other individuals who receive Census Bureau funding to develop and release Census Bureau information products.

Exclusions:
The global exclusions to the standards are listed in the Preface. No additional exclusions apply to this standard.

Key Terms: Administrative data, Administratively restricted information, data program, information product, protected information, qualified user, readily accessible, reproducibility, third-party data, and transparency.

Requirement F2-1: Documentation that would breach the confidentiality of protected information or administratively restricted information or that would violate data-use agreements with other agencies must not be released. (See Statistical Quality Standard S1, *Protecting Confidentiality*.)

Requirement F2-2: Documentation must be readily accessible in sufficient detail to allow qualified users to understand and analyze the information and to reproduce (within the constraints of confidentiality requirements) and evaluate the results. The documentation must be made readily accessible by doing one or more of the following:

1. Including the documentation in the information product if it is necessary for readers to understand the results.

2. Referencing the full methodological documentation in the information product (e.g., providing a URL) and publishing the documentation on the Census Bureau's Internet Web site.
3. Delivering the full methodological documentation to the sponsors of reimbursable programs or providing them with a URL to the documentation.

Note: The Census Bureau Geospatial Product Metadata Standard (GPMS), and the Federal Geographic Data Committee (FGDC) Content Standard for Digital Geospatial Metadata (CSDGM) provide additional requirements for geospatial products.

Sub-Requirement F2-2.1: Descriptions of the data program must be readily accessible.

Examples of information that describes the data program include:
- The purpose of the program (e.g., survey, census, evaluation study, or research).
- The organizational sponsor(s) of the program.
- The organization that conducted the program.
- The data source (e.g., organization or agency) and the database or systems from which the data are drawn for administrative data.
- The universe of inference or target population for the program.

Sub-Requirement F2-2.2: Descriptions of the concepts, variables, and classifications that underlie the data must be readily accessible.

Examples of concepts, variables, and classifications that underlie the data include:
- Definitions of the primary concepts being measured.
- The wording of questions asked in surveys or censuses.
- Identification of the key variables.
- Descriptions of the concepts underlying all variables.
- Geographic levels of the data.
- The reference dates for the data and for the geographic levels.
- Descriptions of any derived measures.

Sub-Requirement F2-2.3: Descriptions of the methodology, including the methods used to collect and process the data and to produce estimates, must be readily accessible.

Examples of documentation of the methodology include:
- Discussion of methods employed to ensure data quality.
- Quality profiles. (See the Census Bureau Guideline on *Quality Profiles*.)
- Documentation of pretesting of the data collection instruments, including qualitative studies.
- Source and accuracy statement.
- Description of the sampling frame.
- Description of the sample design.
- The size of the sample.
- Information on eligibility criteria and screening procedures.

- Description of sample weights, including adjustments for nonresponse.
- The mode and methods used to collect the data.
- The dates of data collection.
- Description of any bounding methods used to control telescoping.
- Description of estimation procedures, including weighting, editing, and imputation methods.
- Reasons for not imputing the data when imputation for item nonresponse is not carried out.
- Description of how to calculate variance estimates.
- Discussion of potential nonsampling errors (e.g., nonresponse, coverage, processing, and measurement).
- Discussion of the methods to approximate the standard errors of derived statistics.
- Description of any substantial changes in procedures or methodology over time and the known impact on the data.
- References to methodological documentation maintained by the source organization supplying administrative data.
- Model description, including assumptions and type of model.
- Equations or algorithms used to generate estimates.
- Description of seasonal adjustment methods. (See the Census Bureau Guideline on *Seasonal Adjustment Diagnostics*.)
- Description of small area estimation methods.
- Any limitations or data quality problems affecting the estimates or projections.
- Descriptions of known data anomalies and corrective actions.

For surveys employing adaptive survey design, examples of documentation of the methodology include:

- The data on the sampling frame, or auxiliary data linked to the frame that is used in monitoring sample quality during data collection.
- The paradata (e.g., cost, contact experience) used to monitor expenditure of resources and the response propensity of open cases.
- The indicators of sample quality monitored (e.g.,achieved sample representativeness, response rate)
- The key survey estimates monitored during data collection.
- A description of models, incorporating frame data and paradata employed to assess response propensity and achieved sample quality.
- A description of data collection methods that will be employed and prospective modifications to them during the field period, in response to observations of the costs incurred, the achieved sample quality, the stability of key survey estimates and the response propensity of open cases.
- The process for ensuring that planned interventions are executed faithfully (e.g.,checks on programming, training and monitoring of Field Representatives).
- The protocol for monitoring and modifying data collection methods, including the preliminary schedule and the criteria employed in deciding on modifications (including stopping rules).
- The modifications to data collection methods that were executed and the schedule.

Sub-Requirement F2-2.3.1: Measures and indicators of the quality of the data must be readily accessible.

Examples of measures and indicators of the quality of the data include:

- The disposition of sample cases (e.g., numbers of interviewed cases, ineligible cases, and nonresponding cases).
- Unit response rates or quantity response rates.
- Item response rates, item allocation rates, total quantity response rates, or quantity response rates for key data items.
- Rates for the types of nonresponse (e.g., refusal, unable to locate, no one home, temporarily absent, language problem, insufficient data, and undeliverable as addressed).
- Coverage ratios.
- Indicators of the statistical precision of the estimates (e.g., estimates of sampling variances, standard errors, coefficients of variation, or confidence intervals).
- Coverage of the target population by the set of administrative data.
- The proportion of administrative data that have missing data items or that contain invalid data for key variables.
- The proportion of data items with edit changes because the data items were invalid or otherwise required changes.
- The proportion of records lost from the analysis or estimate due to nonmatches when linking data sets.
- Effects on the estimates related to coverage issues, nonmatches in record linking, and missing data items in surveys, censuses, administrative data.
- Model diagnostics (e.g., goodness of fit, coefficient of variation, and percent reduction in confidence interval of the direct estimates).

Note: Statistical Quality Standard D3, *Producing Measures and Indicators of Nonsampling Error*, contains requirements on producing measures and indicators of nonsampling error.

Sub-Requirement F2-2.3.2: The methodology and results of evaluations or studies of the quality of the data must be readily accessible.

Examples of evaluations or studies of the quality of the data include:

- Nonresponse bias analyses.
- Evaluation studies (e.g., evaluation studies of response error, interviewer variance, respondent debriefing, record check or validation, and mode effects).
- Response analysis surveys.
- Comparisons with independent sources, if available.
- Match analyses.
- Reconciliations (e.g., a comparison of import and export data).
- Periodic summaries of quality control results (e.g., interviewer quality control (QC) results and error rates measured by data entry QC and coding QC).

Note: Results of routine reviews and verifications need not be readily accessible unless needed for data users to assess the quality of the information product.

Sub-Requirement F2-2.4: Documentation of public-use data files must be readily accessible in sufficient detail to allow a qualified user to understand and work with the files.

Examples of documentation of public-use data files include:

- File description.
- File format (e.g., SAS file or text file).
- Variable names and descriptions (e.g., data dictionary or record layout).
- Data type for each variable (e.g., numeric, alphanumeric, and length).
- Description of variables used to uniquely identify records in the data file.
- Description of flags to indicate missing and imputed items.

Releasing Information
Statistical Quality Standard
F3 - Addressing Information Quality Guideline Complaints

Purpose: The purpose of this standard is to ensure that complaints alleging that information products are not in compliance with the Census Bureau's Information Quality Guidelines are addressed.

Scope: The Census Bureau's statistical quality standards apply to all information products released by the Census Bureau and the activities that generate those products, including products released to the public, sponsors, joint partners, or other customers. All Census Bureau employees and Special Sworn Status individuals must comply with these standards; this includes contractors and other individuals who receive Census Bureau funding to develop and release Census Bureau information products.

In particular, this standard applies to information products released by the Census Bureau for which a party outside the Census Bureau alleges that the Census Bureau has not adhered to its information quality guidelines.

Exclusions:
In addition to the global exclusions listed in the Preface, this standard does not apply to:

- Information released by the Census Bureau before October 1, 2002.

Key Terms: Information products, information quality, and releases of information products.

Requirement F3-1: Complaints must be reviewed by the program manager responsible for the information product being challenged.

Note: The Census Bureau Information Quality Web site contains the correction procedures complainants must follow to submit complaints for information they believe does not comply with the Census Bureau's Information Quality Guidelines.

Requirement F3-2: Except as noted below, program managers must follow the procedure in Appendix F3 to investigate and resolve complaints.

Note: These programs have developed correction procedures specific to their information products and must follow their own correction procedures. The appeals process, when not separately defined in the program's procedures, will be managed as stated in Appendix F3.

- Count Question Resolution (CQR).
- Local Update of Census Addresses (LUCA).
- Governmental Unit Boundaries.
- Street and Address Range Information.
- Small Area Income and Poverty Estimates (SAIPE).
- Annual Estimates of the Total Population.
- International Trade Statistics.

Requirement F3-3: Corrected information must be readily accessible on the Census Bureau's Internet Web site (www.census.gov) and subsequent issues of recurring information products, including subsequent annual reports, must reflect the corrected data.

> Note: Because the Information Quality Guidelines under which these corrections will occur are for statistical information released after October 1, 2002, any correction of historical data suggested by a complaint with which the Census Bureau concurs will be performed at the discretion of the program area.

Requirement F3-4: In the case of a serious error that could potentially mislead policy makers, any published reports containing the erroneous data must be reissued.

Requirement F3-5: Complaints and the resulting actions must be documented by the program manager and submitted to the Chair of the M&S Council.

Releasing Information
Statistical Quality Standard
App F3 - Procedures for Correcting Information

The following procedures must be followed when complaints alleging that the Census Bureau has not adhered to its information quality guidelines are received.

Note: These procedures do not apply to the seven programs listed in Requirement F3-2 of Statistical Quality Standard F3, *Addressing Information Quality Guideline Complaints*. Those programs follow their own correction procedures that are specific to their data products.

1. The Census Bureau's Quality Program Staff will notify the Department of Commerce within ten business days of receiving a complaint that alleges a violation of the information quality guidelines.

2. The program manager must review:
   a. The information being challenged in consultation with the appropriate methodology staff.
   b. The processes that were used to create and disseminate the information.
   c. Whether the information conforms or does not conform to the Census Bureau's Information Quality Guidelines.

3. Based on the outcome of the above review, the Census Bureau will determine if a correction (or corrections) must be made.

4. If the Census Bureau concurs with a complaint, the responsible program manager will, with the concurrence of the area Associate Director in consultation with the M&S Council, determine the appropriate corrective action, taking into account such factors as:
   - The nature of the information involved.
   - The significance and magnitude of the error with respect to the use of the information.
   - The cost of implementing the correction.
   - The effectiveness of the correction in terms of timeliness.

5. The Census Bureau will respond in writing to the affected person within 60 days of receiving the complaint.
   a. The Chair of the M&S Council will share draft response to the request for corrections (RFC) with OMB prior to release to the requestor.
   b. If the Census Bureau has completed its review, the response will explain the process that the Census Bureau followed in its review of the complaint, the point–by-point findings of the review, and the resolution. The response will not opine on the requestor's or the agency's policy positions.
   c. If the Census Bureau has not completed its review, the response will notify the affected person that a review is underway, and provide an expected completion date. When the review is complete, the Census Bureau must again contact the affected person in writing, and explain the process that the Census Bureau followed in its review of the complaint, the findings of the review, and the resolution.

d. If a correction is warranted, the response will include a progress report, and a subsequent written response will be sent when the correction action is complete.
e. If a correction is not warranted, the Census Bureau will explain that a correction will not be made, and why.

6. If the Census Bureau declines to correct the challenged data, and the affected party appeals, a panel appointed by the M&S Council will manage the appeal process ensuring that those individuals reviewing and responding to the appeals request were not involved in the review and initial response to the RFC.
   a. The Chair of the M&S Council will share draft responses to an appeal with OMB prior to release to the requestor.
   b. The Census Bureau will respond to all requests for appeals within 60 days of receipt.
   c. If the appeal requires more than 60 days to resolve, the Census Bureau will inform the appellant that more time is required, indicate the reason why, and provide an estimated decision date.

Supporting Standards And Documentation
Statistical Quality Standard
S1 - Protecting Confidentiality

Purpose: The purpose of this standard is to ensure the confidentiality of protected information and administratively restricted information.

Scope: The Census Bureau's statistical quality standards apply to all information products released by the Census Bureau and the activities that generate those products, including products released to the public, sponsors, joint partners, or other customers. All Census Bureau employees and Special Sworn Status (SSS) individuals must comply with these standards; this includes contractors and other individuals who receive Census Bureau funding to develop and release Census Bureau information products.

In particular, this standard applies to:

- Data collected from respondents and protected under Title 13.
- Data protected under the Confidential Information Protection and Statistical Efficiency Act (CIPSEA).
- Data collected under Title 15 and protected by legislation governing sponsoring agencies.
- Administrative data provided by source agencies, such as Federal Tax Information (FTI) protected under Title 13 and Title 26.

Exclusions:

The global exclusions to the standards are listed in the Preface. No additional exclusions apply to this standard.

Key Terms: Administratively restricted information, bottom-coding, business identifiable information, cell suppression, confidentiality, controlled rounding, controlled tabular adjustment, disclosure, noise injection, personally identifiable information, protected information, random rounding, recoding, swapping, synthetic data, and top-coding.

Requirement S1-1: All Census Bureau employees and SSS individuals must follow the provisions of federal laws (e.g., Privacy Act, Title 13, Title 15, and Title 26), Census Bureau policies (e.g., Information Technology (IT) Security policies and Data Stewardship policies, such as DS018 *Unauthorized Browsing Policy*[1] and DS022 *Personally Identifiable Information (PII) Breach Policy*[2]), and data-use agreements to prevent unauthorized release of protected information and administratively restricted information.

Sub-Requirement S1-1.1: Neither protected information nor administratively restricted information may be released outside the Census Bureau, except as allowed under applicable federal laws (e.g., Title13, Title 15, and CIPSEA) and data-use agreements.

Requirement S1-2: Disclosure avoidance techniques must be used to prevent unauthorized release of protected information and administratively restricted information, particularly personally identifiable information or business identifiable information.

Examples of disclosure avoidance techniques include:

- Random rounding.
- Controlled rounding.
- Top-coding.
- Bottom-coding.
- Recoding.
- Data swapping.
- Generating synthetic data.
- Noise infusion (also called noise injection).
- Using rules to define sensitive cells (e.g., thresholds).
- Protecting sensitive cells (e.g., cell suppression, random rounding, controlled rounding, collapsing cells, and controlled tabular adjustment).

Requirement S1-3: Only the Disclosure Review Board (DRB), as constituted in Data Stewardship policy DS025[3], may make the determination that an information product meets the Census Bureau's disclosure avoidance requirements. The DRB clearance number documents this requirement

Notes:

(1) Contact the Census Bureau's Disclosure Review Board (DRB) for guidance on disclosure avoidance techniques.
(2) Sub-Requirement E3-1.1 of Statistical Quality Standard E3, *Reviewing Information Products*, addresses requirements for disclosure avoidance review.
(3) Statistical Policy Working Paper 22: *Report on Statistical Disclosure Limitation Methodology*, published by the Office of Management and Budget's Federal Committee on Statistical Methodology, provides information on various techniques to prevent disclosure of protected information.

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[1] Data Stewardship Executive Policy Committee, *DS018: Unauthorized Browsing Policy*, U.S. Census Bureau, Washington, D.C., April 1, 2020. https://www.census.gov/about/policies/privacy/data_stewardship/dsep_committee.html Accessed on 2 March 2022

[2] Data Stewardship Executive Policy Committee, *DS022: Personally Identifiable Information (PII) Breach Policy*, U.S. Census Bureau, Washington, D.C., June 29, 2018. https://www.census.gov/about/policies/privacy/data_stewardship/dsep_committee.html Accessed on 2 March 2022.

[3] Data Stewardship Executive Policy Committee, *DS025: Organization of the Disclosure Review Board*, U.S. Census Bureau, Washington, D.C., January 13, 2020. https://www.census.gov/about/policies/privacy/data_stewardship/dsep_committee.html Accessed on 2 March 2022.

Supporting Standards And Documentation
Statistical Quality Standard
S2 - Managing Data and Documents

Purpose: The purpose of this standard is to ensure that data and documentation internal to the Census Bureau are appropriately managed (i.e., files are retained, secured, and accessible to authorized users) to promote the transparency and reproducibility of Census Bureau processes and products, and to inform future projects and improvement efforts.

> Note: Statistical Quality Standard F2, *Documentation to Support Transparency in Information Products*, contains specific requirements about documentation that must be readily accessible to the public to ensure transparency in information products released by the Census Bureau.

Scope: The Census Bureau's statistical quality standards apply to all information products released by the Census Bureau and the activities that generate those products, including products released to the public, sponsors, joint partners, or other customers. All Census Bureau employees and Special Sworn Status individuals must comply with these standards; this includes contractors and other individuals who receive Census Bureau funding to develop and release Census Bureau information products.

In particular, this standard applies to activities related to managing Census Bureau data and documentation needed to replicate results (e.g., models or survey estimates) from research and evaluation studies, surveys, censuses, administrative data.

> **Exclusions:**
> The global exclusions to the standards are listed in the Preface. No additional exclusions apply to this standard.

Key Terms: Administrative data, Administratively restricted information, protected information, reproducibility, third-party data, transparency, and version control.

Requirement S2-1: Throughout all processes associated with managing data and documents, unauthorized release of protected information or administratively restricted information must be prevented by following federal laws (e.g., Title 13, Title 15, and Title 26), Census Bureau policies (e.g., Information Technology (IT) Security policies and Data Stewardship policies, such as DS007 *Information Security Management Program*[1]), and additional provisions governing the use of the data (e.g., as may be specified in a memorandum of understanding or data-use agreement). (See Statistical Quality Standard S1, *Protecting Confidentiality*.)

Requirement S2-2: A plan for data and document management must be developed that addresses:

1. Individuals and divisions responsible for managing the data and documents.
2. Data and documents to be managed.

3. Technical issues relevant to managing the data and documents (e.g., media, retention periods, storage locations, user access rules, version control, file naming conventions, and inventory of files retained).
4. Special operations needed to store and access information (e.g., scanning, encrypting, or compressing data).
5. Timetables for reviewing retained files to verify their usefulness and readability in the stored format (e.g., every five years).

Note: The Disposition of Federal Records: A Records Management Handbook provides guidance on establishing, managing, and operating a records disposition program within a Federal agency. The Census Bureau Guideline on the *Long-Term Backup of Research and Evaluation Files*[2] and the ACSD records management Intranet page provide additional guidance on managing data files.

Requirement S2-3: Data and documentation needed to replicate and evaluate program or research results must be retained according to Census Bureau policies (e.g., Census Bureau Records Schedules, Records Management Policies in the Census Bureau's Policies and Procedures Manual, and division-level policies), data-use agreements with providers of administrative data, and appropriate Federal records disposition and archival regulations (e.g., National Archives and Records Administration's (NARA) statutes).

Examples of data and documentation to retain include:

- Data files and description of variables.
- Planning and design decisions, including the OMB (Office of Management and Budget) Information Collection Request package.
- Analysis plans.
- Field test design and results.
- Cognitive or usability testing results.
- Sampling plan and justifications, including the sampling frame used and any deviations from the plan.
- Justifications for the items on the survey instrument, including why the final items were selected.
- Instructions to respondents and interviewers.
- Description of the data collection and data processing methodologies.
- Questionnaire images.
- Description of the weighting and estimation methods, including variance estimation.
- Description of the imputation and data editing methodologies.
- Specifications and computer code (e.g., specifications and code for sampling, editing, weighting, imputation, analysis, variance estimation, and tabulation).
- Description of models used for estimates and projections.
- Documentation of disclosure avoidance techniques.
- Quality measures, including the equations and interpretations of the measures.
- Evaluation reports, including special evaluations such as nonresponse bias analyses and interviewer variance studies.
- Publicly available documentation associated with the release of data.

Sub-Requirement S2-3.1: An inventory must be developed and maintained to allow authorized users to identify and access the retained data and documents.

Note: The Census Bureau Guideline on the *Long-Term Backup of Research and Evaluation Files* provides information on producing an inventory to explain retained data and documents to potential users.

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[1] Data Stewardship Executive Policy Committee. *DS007: Safeguarding and Managing Information*. U.S. Census Bureau, Washington, D.C., May 28, 2013. https://www.census.gov/about/policies/privacy/data_stewardship/dsep_committee.html Accessed on 2 March 2022.
[2] Mackey Lewis, Jan Dickerson, Jerry Imel, Jacki Jonas, Kristin McCue, Pam McGovern, Chad Russell, George Train. Ken McCathran, *Long-term backup of research and evaluation files*, Methodology and Standards Council, U.S. Census Bureau, Washington D.C., May 4, 2006.

Supporting Standards And Documentation
Statistical Quality Standard
Mapping of Requirements

OMB	U.S. Census Bureau		Core Statistical Products				Experimental Products				Research-based Products *			
			Census Collected		Admin Data		Census Collected		Admin Data		Census Collected		Admin Data	
Statistical Policy Directive #2	Req.	Title	100%	Sample	100%	Sample	100%	Sample	100%	Sample	100%	Sample	100%	Sample
		Preface	■	■	■	■	■	■	■	■	■	■	■	■
	A1	**Planning a Data Program**												
3.4	A1-1	Confidentiality	■	■	■	■	■	■	■	■	■	■	■	■
1.1, 1.2, 5.1, 7.3	A1-2	Planning	■	■	■	■	■	■	■	■	■	■	■	■
	A1-2.1	Reimbursable Projects	■	■	■	■	■	■	■	■	■	■	■	■
1.1, 1.2, 7.3	A1-3	Survey Design	■	■			■	■			■	■		
	A1-3.1	Adaptive Surveys	■	■			■	■			■	■		
7.3	A1-4	Admin Rec Study Design			■	■			■	■			■	■
	A1-5	Contract Statement of Work	■	■	■	■	■	■	■	■	■	■	■	■
	A1-6	Quality Control	■	■	■	■	■	■	■	■	■	■	■	■
	A1-7	Experimental Statistics					■	■	■	■				
	A1-7.1	Proposal for Experimental Statistics					■	■	■	■				
	A1-7.2	Transition to Core Statistical Products					■	■	■	■				
7.3	A1-8	Documentation	■	■	■	■	■	■	■	■	■	■	■	■
	A2	**Data Collection Instruments**												
3.4	A2-1	Confidentiality	■	■			■	■			■	■		
1.2, 7.3	A2-2	Planning	■	■			■	■			■	■		
2.3	A2-3	Testing Instruments	■	■			■	■			■	■		
7.3	A2-3.1	Develop & Implement	■	■			■	■			■	■		

OMB	U.S. Census Bureau		Core Statistical Products				Experimental Products				Research-based Products *			
			Census Collected		Admin Data		Census Collected		Admin Data		Census Collected		Admin Data	
Statistical Policy Directive #2	Req.	Title	100%	Sample	100%	Sample	100%	Sample	100%	Sample	100%	Sample	100%	Sample
2.2	A2-3.2	Notifications	■	■			■	■			■	■		
1.4	A2-3.3	Pretesting	■	■			■	■			■	■		
1.4	A2-3.4	Verify & Test	■	■			■	■			■	■		
7.3	A2-4	Documentation	■	■			■	■			■	■		
	A3	**Sample Design**												
3.4	A3-1	Confidentiality		■		■		■		■		■		■
1.1, 1.2, 7.3	A3-2	Planning		■		■		■		■		■		■
2.1	A3-3	Sampling Frames		■		■		■		■		■		■
1.2, 1.3	A3-4	Sample Design		■		■		■		■		■		■
2.1	A3-5	Sample Selection		■		■		■		■		■		■
	A3-5.1	Specifications & Procedures		■		■		■		■		■		■
	A3-5.2	Verify & Test		■		■		■		■		■		■
7.3	A3-5.3	Monitor & Evaluate		■		■		■		■		■		■
1.2, 7.3	A3-6	Documentation		■		■		■		■		■		■
	B1	**Data Collection Methods**												
3.4	B1-1	Confidentiality	■	■			■	■			■	■		
7.3	B1-2	Planning	■	■			■	■			■	■		
2.3	B1-3	Design & Implement Methods	■	■			■	■			■	■		
	B1-3.1	Systems & Procedures	■	■			■	■			■	■		
	B1-3.2	Verify & Test	■	■			■	■			■	■		
	B1-3.3	Train	■	■			■	■			■	■		
3.2, 7.3	B1-3.4	Monitor & Evaluate	■	■			■	■			■	■		
7.3	B1-4	Documentation	■	■			■	■			■	■		
	B2	**Administrative Data**												

OMB	U.S. Census Bureau		Core Statistical Products				Experimental Products				Research-based Products *			
			Census Collected		Admin Data		Census Collected		Admin Data		Census Collected		Admin Data	
Statistical Policy Directive #2	Req.	Title	100%	Sample	100%	Sample	100%	Sample	100%	Sample	100%	Sample	100%	Sample
3.4	B2-1	Confidentiality			■	■			■	■			■	■
7.3	B2-2	Planning			■	■			■	■			■	■
	B2-3	Review			■	■			■	■			■	■
	B2-3.1	Evaluate Quality			■	■			■	■			■	■
	B2-3.2	Corrective Action			■	■			■	■			■	■
7.3	B2-4	Documentation			■	■			■	■			■	■
	C1	**Capturing Data**												
3.4	C1-1	Confidentiality	■	■			■	■			■	■		
7.3	C1-2	Planning	■	■			■	■			■	■		
	C1-3	Capture from Paper	■	■			■	■			■	■		
7.3	C1-3.1	Specifications & Procedures	■	■			■	■			■	■		
	C1-3.2	Verify & Test	■	■			■	■			■	■		
	C1-3.3	Train	■	■			■	■			■	■		
7.3	C1-3.4	Monitor & Evaluate	■	■			■	■			■	■		
7.3	C1-4	Documentation	■	■			■	■			■	■		
	C2	**Editing & Imputing Data**												
3.4	C2-1	Confidentiality	■	■	■	■	■	■	■	■	■	■	■	■
	C2-2	Planning	■	■	■	■	■	■	■	■	■	■	■	■
3.1	C2-3	Edit & Impute	■	■	■	■	■	■	■	■	■	■	■	■
3.1, 3.3, 7.3	C2-3.1	Specifications & Procedures	■	■	■	■	■	■	■	■	■	■	■	■
	C2-3.2	Verify & Test	■	■	■	■	■	■	■	■	■	■	■	■
7.3	C2-3.3	Monitor & Evaluate	■	■	■	■	■	■	■	■	■	■	■	■
7.3	C2-4	Documentation	■	■	■	■	■	■	■	■	■	■	■	■
	C3	**Coding**												

OMB	U.S. Census Bureau		Core Statistical Products				Experimental Products				Research-based Products *			
			Census Collected		Admin Data		Census Collected		Admin Data		Census Collected		Admin Data	
Statistical Policy Directive #2	Req.	Title	100%	Sample	100%	Sample	100%	Sample	100%	Sample	100%	Sample	100%	Sample
3.4	C3-1	Confidentiality	■	■	■	■	■	■	■	■	■	■	■	■
7.3	C3-2	Planning	■	■	■	■	■	■	■	■	■	■	■	■
	C3-3	Processes	■	■	■	■	■	■	■	■	■	■	■	■
7.3	C3-3.1	Specifications & Procedures	■	■	■	■	■	■	■	■	■	■	■	■
3.3	C3-3.2	Standardized Codes	■	■	■	■	■	■	■	■	■	■	■	■
	C3-3.3	Verify & Test	■	■	■	■	■	■	■	■	■	■	■	■
	C3-3.4	Train	■	■	■	■	■	■	■	■	■	■	■	■
7.3	C3-3.5	Monitor & Evaluate	■	■	■	■	■	■	■	■	■	■	■	■
7.3	C3-4	Documentation	■	■	■	■	■	■	■	■	■	■	■	■
	C4	**Linking Data**												
3.4	C4-1	Confidentiality	■	■	■	■	■	■	■	■	■	■	■	■
7.3	C4-2	Planning	■	■	■	■	■	■	■	■	■	■	■	■
	C4-3	Processes	■	■	■	■	■	■	■	■	■	■	■	■
7.3	C4-3.1	Specifications & Procedures	■	■	■	■	■	■	■	■	■	■	■	■
	C4-3.2	Verify & Test	■	■	■	■	■	■	■	■	■	■	■	■
	C4-3.3	Train	■	■	■	■	■	■	■	■	■	■	■	■
7.3	C4-3.4	Monitor & Evaluate	■	■	■	■	■	■	■	■	■	■	■	■
7.3	C4-4	Documentation	■	■	■	■	■	■	■	■	■	■	■	■
	D1	**Estimates from Samples**												
3.4	D1-1	Confidentiality		■		■		■		■		■		■
7.3	D1-2	Planning		■		■		■		■		■		■
4.1	D1-3	Produce Estimates & Variances		■		■		■		■		■		■
7.3	D1-3.1	Specifications & Procedures		■		■		■		■		■		■
	D1-3.2	Verify & Test		■		■		■		■		■		■

OMB	U.S. Census Bureau		Core Statistical Products				Experimental Products				Research-based Products *			
			Census Collected		Admin Data		Census Collected		Admin Data		Census Collected		Admin Data	
Statistical Policy Directive #2	Req.	Title	100%	Sample	100%	Sample	100%	Sample	100%	Sample	100%	Sample	100%	Sample
4.1, 7.3	D1-3.3	Verify & Evaluate		■		■		■		■		■		■
7.3	D1-4	Documentation		■		■		■		■		■		■
	D2	**Estimates from Models**												
3.4	D2-1	Confidentiality	■	■	■	■	■	■	■	■	■	■	■	■
7.3	D2-2	Planning	■	■	■	■	■	■	■	■	■	■	■	■
4.1	D2-3	Develop Models	■	■	■	■	■	■	■	■	■	■	■	■
7.3	D2-3.1	Evaluate and Validate	■	■	■	■	■	■	■	■	■	■	■	■
7.3	D2-3.2	Specifications	■	■	■	■	■	■	■	■	■	■	■	■
	D2-3.3	Verify & Test	■	■	■	■	■	■	■	■	■	■	■	■
4.1, 7.3	D2-3.4	Verify & Evaluate	■	■	■	■	■	■	■	■	■	■	■	■
	D2-3.4.1	Annual Review	■	■	■	■	■	■	■	■	■	■	■	■
	D2-3.4.2	Indicator Release Simultaneously	■	■	■	■	■	■	■	■	■	■	■	■
7.3	D2-4	Documentation	■	■	■	■	■	■	■	■	■	■	■	■
	D3	**Nonsampling Error**												
3.4	D3-1	Confidentiality	■	■	■	■	■	■	■	■	■	■	■	■
7.3	D3-2	Planning	■	■	■	■	■	■	■	■	■	■	■	■
1.3, 3.2, 7.3	D3-3	Weighted Response Rates	■	■	■	■	■	■	■	■	■	■	■	■
3.2	D3-3.1	Demo & Decennial Rates	■	■	■	■	■	■	■	■	■	■	■	■
3.2	D3-3.2	Econ Rates	■	■	■	■	■	■	■	■	■	■	■	■
3.2, 3.2	D3-3.3	Types of Nonresponse	■	■	■	■	■	■	■	■	■	■	■	■
	D3-3.4	Cumulative Response Rates	■	■	■	■	■	■	■	■	■	■	■	■
	D3-3.5	Multistage Collections	■	■	■	■	■	■	■	■	■	■	■	■
1.3	D3-3.6	Nonresponse Bias	■	■	■	■	■	■	■	■	■	■	■	■
7.3	D3-4	Coverage ratios	■	■	■	■	■	■	■	■	■	■	■	■

OMB	U.S. Census Bureau		Core Statistical Products				Experimental Products				Research-based Products *			
			Census Collected		Admin Data		Census Collected		Admin Data		Census Collected		Admin Data	
Statistical Policy Directive #2	Req.	Title	100%	Sample	100%	Sample	100%	Sample	100%	Sample	100%	Sample	100%	Sample
3.2, 7.3	D3-5	Admin Rec Nonsampling error			■	■			■	■			■	■
3.2, 7.3	D3-6	Data Collection Nonsampling error	■	■	■	■	■	■	■	■	■	■	■	■
	D3-7	Verify & Test	■	■	■	■	■	■	■	■	■	■	■	■
3.2, 3.5, 7.3	D3-8	Evaluate	■	■	■	■	■	■	■	■	■	■	■	■
7.3	D3-9	Documentation	■	■	■	■	■	■	■	■	■	■	■	■
	E1	**Analyzing Data**												
3.4	E1-1	Confidentiality	■	■	■	■	■	■	■	■	■	■	■	■
5.1, 7.3	E1-2	Planning	■	■	■	■	■	■	■	■	■	■	■	■
5.1	E1-3	Use sound practice	■	■	■	■	■	■	■	■	■	■	■	■
	E1-3.1	Account for sample design	■	■	■	■	■	■	■	■	■	■	■	■
	E1-4	Measures of uncertainty	■	■	■	■	■	■	■	■	■	■	■	■
	E1-4.1	Use same significance level	■	■	■	■	■	■	■	■	■	■	■	■
	E1-5	Assumptions & Verify	■	■	■	■	■	■	■	■	■	■	■	■
	E1-5.1	Peer Review	■	■	■	■	■	■	■	■	■	■	■	■
	E1-5.2	Re-Peer Review	■	■	■	■	■	■	■	■	■	■	■	■
7.3	E1-6	Documentation	■	■	■	■	■	■	■	■	■	■	■	■
	E2	**Reporting Results**												
3.4	E2-1	Confidentiality	■	■	■	■	■	■	■	■	■	■	■	■
5.2, 7.3	E2-2	Provide Information	■	■	■	■	■	■	■	■	■	■	■	■
	E2-2.1	Working paper requirements	■	■	■	■	■	■	■	■	■	■	■	■
	E2-2.2	Tabulation Requirements	■	■	■	■	■	■	■	■	■	■	■	■
	E2-2.3	Graph Requirements	■	■	■	■	■	■	■	■	■	■	■	■
	E3	**Reviewing Information Products**												
3.4	E3-1	Confidentiality	■	■	■	■	■	■	■	■	■	■	■	■

OMB	U.S. Census Bureau		Core Statistical Products				Experimental Products				Research-based Products *			
			Census Collected		Admin Data		Census Collected		Admin Data		Census Collected		Admin Data	
Statistical Policy Directive #2	Req.	Title	100%	Sample	100%	Sample	100%	Sample	100%	Sample	100%	Sample	100%	Sample
	E3-1.1	DMS #	■	■	■	■	■	■	■	■	■	■	■	■
6.1	E3-2	Review & Approval	■	■	■	■	■	■	■	■	■	■	■	■
	E3-2.1	Supervisory Review	■	■	■	■	■	■	■	■	■	■	■	■
6.1	E3-2.2	Subject Matter Review	■	■	■	■	■	■	■	■	■	■	■	■
6.1	E3-2.3	Statistical Review	■	■	■	■	■	■	■	■	■	■	■	■
	E3-2.4	Data Viz Review	■	■	■	■	■	■	■	■	■	■	■	■
6.1	E3-2.5	Other Metholdology Review	■	■	■	■	■	■	■	■	■	■	■	■
	E3-2.6	Policy Review	■	■	■	■	■	■	■	■	■	■	■	■
	E3-3	Dry Run	■	■	■	■	■	■	■	■	■	■	■	■
	E3-3.1	Informal Presentations	■	■	■	■	■	■	■	■	■	■	■	■
	E3-4	Documentation	■	■	■	■	■	■	■	■	■	■	■	■
	E3-5	30 day complete review	■	■	■	■	■	■	■	■	■	■	■	■
	E3-6	Require Census Approval	■	■	■	■	■	■	■	■	■	■	■	■
	E3-7	Appeal non-approval	■	■	■	■	■	■	■	■	■	■	■	■
	F1	**Releasing Information Products**												
3.4, 7.2	F1-1	CIPSEA	■	■	■	■	■	■	■	■	■	■	■	■
7.2	F1-1.1	Confidentiality	■	■	■	■	■	■	■	■	■	■	■	■
7.1	F1-2	Planning	■	■	■	■	■	■	■	■	X	X	X	X
7.1	F1-3	Dissemination Policies & Procedures	■	■	■	■	■	■	■	■	X	X	X	X
	F1-4	Review & Approval Required	■	■	■	■	■	■	■	■	■	■	■	■
	F1-5	Embargoed Releases	■	■	■	■	■	■	■	■	■	■	■	■
	F1-6	Experimental Statistics					■	■	■	■				
	F1-7	Serious Data Quality Issues	■	■	■	■	■	■	■	■	X	X	X	X
	F1-7.1	No Serious Data Quality Issues	■	■	■	■	■	■	■	■	X	X	X	X

OMB	U.S. Census Bureau		Core Statistical Products				Experimental Products				Research-based Products *			
			Census Collected		Admin Data		Census Collected		Admin Data		Census Collected		Admin Data	
Statistical Policy Directive #2	Req.	Title	100%	Sample	100%	Sample	100%	Sample	100%	Sample	100%	Sample	100%	Sample
	F1-7.2	Restrictions on release with Issues	[redacted]								X	X	X	X
	F1-8	Notifications for Quality Errors	[redacted]								X	X	X	X
	F1-9	Notifications to public & sponsors	[redacted]								X	X	X	X
	F1-10.1	Rectify Errors	[redacted]								X	X	X	X
	F1-10.1	Incident Report	[redacted]								X	X	X	X
	F1-11	Adhere to section 508	[redacted]								X	X	X	X
	F2	**Documentation**												
3.4	F2-1	Confidentiality	[redacted]											
7.3	F2-2	Scientific Replicablity	[redacted]											
	F2-2.1	Description of program data	[redacted]											
	F2-2.2	Description of Concepts, variables,	[redacted]											
	F2-2.3	Description fo methodology	[redacted]											
3.2, 4.1	F2-2.3.1	Measures of quality	[redacted]											
3.5	F2-2.3.2	Evaluation Results and Methodology	[redacted]											
	F2-2.4	Documentation public use files	[redacted]											
	F3	**Addressing Complaints**												
	F3-1	Review by Manager Responsible	[redacted]											
	F3-2	Investigate and resolve complaints	[redacted]											
	F3-3	Accessibility for corrected information	[redacted]											
	F3-4	Reissue information with serious errors	[redacted]											
	F3-5	Document complaints	[redacted]											
	S1	**Protecting Confidentiality**												
3.4	S1-1	Data Stewardship	[redacted]											
3.4	S1-1.1	Protect restricted information	[redacted]											

OMB	U.S. Census Bureau		Core Statistical Products				Experimental Products				Research-based Products *			
			Census Collected		Admin Data		Census Collected		Admin Data		Census Collected		Admin Data	
Statistical Policy Directive #2	Req.	Title	100%	Sample	100%	Sample	100%	Sample	100%	Sample	100%	Sample	100%	Sample
3.4	S1-2	Disclosure Avoidance	■	■	■	■	■	■	■	■	■	■	■	■
	S1-3	Disclosure Review Board	■	■	■	■	■	■	■	■	■	■	■	■
	S2	**Managing Data and Documents**												
3.4	S2-1	Confidentiality	■	■	■	■	■	■	■	■	■	■	■	■
	S2-2	Planning	■	■	■	■	■	■	■	■	■	■	■	■
7.3	S2-3	Retain Data to Replicate & Evaluate	■	■	■	■	■	■	■	■	■	■	■	■
	S2-3.1	Inventory of data and documents	■	■	■	■	■	■	■	■	■	■	■	■
		Waiver Procedure	■	■	■	■					■	■	■	■
		Glossary	■	■	■	■	■	■	■	■	■	■	■	■

Notes:
* Research authored solely by external researchers in the FSRDC is, except for Standard S1, exempt from the standards.

Legend
■ In Scope
Out of Scope
X Specific Exemption of the product in the standard

Supporting Standards And Documentation
Statistical Quality Standard
Waiver Procedure

Introduction

The Census Bureau's statistical quality standards apply to all Census Bureau's information products and the programs that develop and release those products, as described in the Scope statement in the Preface to these standards. If a program is not complying or anticipates that they may be unable to comply with any requirements of these standards, the program manager must apply for a waiver.

This waiver procedure provides a consistent mechanism to excuse a program from compliance with a statistical quality standard. Waivers will be granted when the circumstances warrant it however, no waivers to Statistical Quality Standard S1, *Protecting Confidentiality*, will be granted.

This procedure promotes proper management and control in implementing the standards and ensures that appropriate documentation of exceptions to the standards is generated and maintained. This documentation is important for providing transparency into the quality of the Census Bureau's information products and for informing future revisions of the statistical quality standards.

Procedure

1. The M&S Council Representative will:
   a. Schedule a review of a waiver with the M&S Council.
   b. Prepare a *Waiver Request*, in consultation with the program manager, their Division/Center Chief, and the Quality Program Staff.
   c. Review the waiver request with the M&S Council and come to an agreement on the conditions of the waiver.

2. The Quality Program Staff will:
   a. Finalize the waiver request.
   b. Route a PDF copy of the finalized waiver for digital signatures.
   c. Retain the final signed waiver.
   d. Follow-up on implementation of corrective actions.
   e. Report on progress to the M&S Council.

Questions

If you have questions regarding the waiver procedure or whether a waiver is needed, contact the Quality Program Staff or the appropriate M&S Council representative.

Affected Program(s)/Information Product(s):
Indicate the specific Program(s)/Information Product(s) to be exempted by this waiver.

Requirement(s) to be waived:
Indicate Requirement I.D.– Text of Requirement to be waived.

<For example:
Requirement E2-2: *All information products must provide accurate and reliable information that promotes transparency and must present that information in an unbiased manner.*
#3 – Except as noted below, information products (including tables, graphs, figures, and maps that stand alone) must indicate that the data are subject to error arising from a variety of sources, including (as appropriate) sampling error, nonsampling error, model error, and any other sources of error. Including one of the following in the information product will satisfy this requirement
a. An explicit statement indicating that the data are subject to error arising from a variety of sources
.b. A description of the error sources.
c. A discussion of the error sources
Note: Abstracts and presentation slides do not need to indicate that the data are subject to error.>

Noncompliance:
Describe how the program area is or will not be in compliance.
Indicate Requirement I.D.– Text of describing noncompliance

<For Example:
E2-2 #3 – The information product for our mobile application does not indicate that the data are subject to error.>

Anticipated effects:
Describe any anticipated effects that may result from the noncompliance.
Indicate Requirement I.D.– Text of anticipated effects

<For Example:
E2-2 #3 –Users will not be informed about errors associated with the data.>

Justification:
Explain why the program area is not able to comply with the specific requirement.
Indicate Requirement I.D.– Text justifying the noncompliance

<For Example:
E2-2 #3 – There is limited screen real estate to display the notice for the mobile application.>

Mitigating Actions:
Describe any actions being taken to mitigate the effects of noncompliance.

Note: Program managers shall include a notice to the public about the quality concerns necessitating this waiver.
Indicate Requirement I.D.– Text of Requirement

<For Example:
E2-2 #3 –We are working with the vendor of the application to explore options for displaying the information.>

Corrective Action Plan:
Describe the corrective actions planned to achieve compliance. Include milestones dates for key accomplishments including the date when the Program(s)/Information Product(s) will be brought into compliance.
Indicate Requirement I.D.– Milestone date – Key accomplishment

<For Example:
E2-2 #3 –5/12/12 – Determine the appropriate placement of the notice within the mobile application and submit change requests to the vendor to correct the display.5/30/12 – Corrective actions completed and Information Products brought into compliance.>

Subject Matter Division/Center Chief:
< Subject Matter Division/Center Chief Name >
< Subject Matter Division/Center Chief Title> *Signature of Acknowledgement*

M&S Council Representative:
<M&S Council Representative Name>
<M&S Council Representative Title> *Signature of Acknowledgement*

Methodology and Standards Council:
<Name of M&S Council Chairperson>
Associate Director for Research & Methodology
Chair, Methodology and Standards Council *Signature of Acknowledgement*

Associate Director:
<Name of Associate Director >
<Title of Associate Director> *Signature of Approval*

Supporting Standards And Documentation
Statistical Quality Standard
Glossary

-A-

Accuracy of survey results refers to how closely the results from a sample can reproduce the results that would be obtained from a complete count (i.e., census) conducted using the same techniques at the same time. The difference between a sample result and the result from a complete census taken under the same conditions and at the same time is an indication of the precision of the sample result.

Adaptive survey design is a survey design that provides a framework for data-driven tailoring of data collection procedures to different sample members, often for cost and bias reduction. People vary in how likely they are to respond and in how they respond. This variation leads to opportunities to selectively deploy design features in order to control both nonresponse and measurement errors. Adaptive survey design aims at the optimal matching of design features and the characteristics of respondents given the survey budget.

Administrative data refer to microdata records contained in files collected and maintained by administrative or program agencies and commercial entities. Government and commercial entities maintain these files for the purpose of administering programs and providing services. Administrative data are distinct from systems of information collected exclusively for statistical purposes, such as data from censuses and surveys that are produced under the authority of Title 13, U.S.C. The Census Bureau primarily draws upon administrative data developed by federal, state, local agencies, and tribal governments, but also obtains data from commercial entities. Data we acquire from commercial entities are often dubbed "third party" data. Administrative data may also be culled from public sources.

Administrative records and **administrative record data** refer to micro data records contained in files collected and maintained by administrative or program agencies and commercial entities. Government and commercial entities maintain these files for the purpose of administering programs and providing services. Administrative records (e.g., Title 26 data) are distinct from systems of information collected exclusively for statistical purposes, such as data from censuses and surveys that are collected under the authority of Titles 13 or 15 of the United States Code (U.S.C.). For the most part, the Census Bureau draws upon administrative records developed by federal agencies. To a lesser degree, it may use information from state, local, and tribal governments, as well as commercial entities. To obtain these data, the Census Bureau must adhere to a number of regulatory requirements.

Administratively restricted information (as defined in Data Stewardship Policy DS007, *Information Security Management Program*[1]) consists of agency documentation that is not intended as a public information product and other pre-release or embargoed public information. Examples of administratively restricted information include:

- "For Official Use Only" (FOUO) information: Internal Census Bureau documentation consisting of program or operational materials (e.g., contracting, financial, budget, security, legal, policy documents) determined by management to be either protected under the

Freedom of Information Act and/or of a nature that release could negatively impact the mission of the Census Bureau.
- Embargoed data or reports that have not been released, but meet Disclosure Review Board requirements for public release.
- Proprietary contractor information, such as its cost proposal and labor rates.
- All information not otherwise protected by statutory authority, but that is subject to access and/or use restrictions, as provided in a valid Agreement with the government agency or other entity supplying the information.
- All personally identifiable information (PII) not protected by an existing legal authority.
- All business identifiable information (BII) not protected by an existing legal authority.

Allocation involves using statistical procedures, such as within-household or nearest neighbor matrices populated by donors, to impute for missing values.

American National Standards Institute codes (ANSI codes) are a standardized set of numeric or alphabetic codes issued by the American National Standards Institute (ANSI) to ensure uniform identification of geographic entities through all federal government agencies.

Attrition Rate is a measure of sample units lost during a sample period expressed as a percentage of the sample units at the start of the period. Calculated from the number of units remaining in a sample at the end of a period (SE) and the number of units in a sample at the start of the period (SS) where Attrition rate = ((SS-SE)/SS)*100.

The **autocorrelation function** of a random process describes the correlation between the processes at different points in time.

Automated record linkage is the pairing of data, primarily via computer software.

An **autoregressive integrated moving average (ARIMA)** model is a generalization of an autoregressive moving average or (ARMA) model for nonstationary time series. A nonstationary time series is a time series not in equilibrium about a constant mean level. In a nonstationary time series, the mean or variance of the series may not be the same at all time periods. The model is generally referred to as an ARIMA(p,d,q) model where p, d, and q are integers greater than or equal to zero and refer to the order of the autoregressive, integrated (differencing), and moving average parts of the model respectively.

An **autoregressive moving average (ARMA)** model is a stationary model of time series data where the current data point and current stochastic error are each modeled as finite linear regressions of previous data points or stochastic errors respectively. The regression for the data points is referred to as an autoregression. The regression for the stochastic errors is referred to as a moving average. Symbolically, the model is denoted as an ARMA (p,q) model where p and q are integers greater than or equal to zero and refer to the order of the autoregressive and moving average parts of the model respectively. A stationary time series is a time series in equilibrium about a constant mean level. These models are fitted to time series data either to better understand the data or to predict future points in the series.

-B-

Behavior coding of respondent/interviewer interactions involves systematic coding of the interaction between interviewers and respondents from live or taped field or telephone interviews to collect quantitative information. When used for questionnaire assessment, the behaviors that are coded focus on behaviors indicative of a problem with the question, the response categories, or the respondent's ability to form an adequate response.

Bias is the difference between the expected value of an estimator and the actual population value.

Blocking is grouping the records of a set into mutually exclusive, exhaustive pieces by using a set of fields (e.g., state, last name, first initial). Usually used in the context of record linkage.

Bonferroni correction is a method used to address the problem of multiple comparisons. It is based on the idea that if an experimenter is testing n dependent or independent hypotheses on a set of data, then one way of maintaining the family-wise error rate is to test each individual hypothesis at a statistical significance level of 1/n times what it would be if only one hypothesis were tested.

Bottom-coding is a disclosure limitation technique that involves limiting the minimum value of a variable allowed on the file to prevent disclosure of individuals or other units with extreme values in a distribution.

A **bridge study** continues an existing methodology concurrent with a new methodology for the purpose of examining the relationship between the new and old estimates.

Business identifiable information is information defined in the Freedom of Information Act (FOIA) as trade secrets or commercial or financial information, that is obtained from a person representing a business entity, and which is privileged and confidential (e.g., Title 13) and exempt from automatic release under FOIA. Also included is commercial or other information that, although it may not be exempt from release under the FOIA, is exempt from disclosure by law (e.g., Title 13). Also see **Personally identifiable information**.

-C-

The **calibration** approach to estimation for finite populations consists of: (a) a computation of weights that incorporate specified auxiliary information and are restrained by calibration equation(s); (b) the use of these weights to compute linearly weighted estimates of totals and other finite population parameters: weight times variable value, summed over a set of observed units; (c) an objective to obtain nearly design unbiased estimates as long as nonresponse and other nonsampling errors are absent.

Cell suppression is a disclosure limitation technique where sensitive cells are generally deleted from a table and flags are inserted to indicate this condition.

A **census** is a data collection that seeks to obtain data directly from all eligible units in the entire target population. It can be considered a sample with a 100 percent sampling rate. The Economic Census may use administrative data rather than interviews for some units.

Clerical record linkage is record matching that is primarily performed manually.

A **cluster** is a set of units grouped together on the basis of some well-defined criteria. For example, the cluster may be an existing grouping of the population such as a city block, a hospital, or a household; or may be conceptual such as the area covered by a grid imposed on a map.

Coding is the process of categorizing response data using alphanumeric values so that the responses can be more easily analyzed.

Coefficient of variation (CV) is a measure of dispersion calculated by dividing the standard deviation of an estimate by its mean. It is also referred to as the relative standard error.

Cognitive interviews are used as a pretesting technique consisting of one-on-one interviews using a draft questionnaire to find out directly from respondents about their problems with the questionnaire. In a typical cognitive interview, respondents report aloud everything they are thinking as they attempt to answer a survey question. Cognitive interviews can also be used to evaluate communications with respondents, such as survey contact materials.

Computer-assisted personal interviewing (CAPI) is an interviewing technique similar to computer-assisted telephone interviewing, except that the interview takes place in person instead of over the telephone. The interviewer sits in front of a computer terminal and enters the answers into the computer.

Computer-assisted telephone interviewing (CATI) is an interviewing technique, conducted using a telephone, in which the interviewer follows a script provided by a software application. The software is able to customize the flow of the questionnaire based on the answers provided, as well as information already known about the participant.

A **confidence interval** is a range of values determined in the process of estimating a population parameter. The likelihood that the true value of the parameter falls in that range is chosen in advance and determines the length of the interval. That likelihood is called the confidence level. Confidence intervals are displayed as (lower bound, upper bound) or as *estimate* ± *MOE*, where *MOE = z-value * standard error of the associated estimate* (when the confidence level = 90%, the *z-value* = 1.645).

Confidence level is the probability that an assertion about the value of a population parameter is correct.

Confidence limits are the upper and lower boundaries of the confidence interval.

Confidentiality involves the protection of personally identifiable information and business identifiable information from unauthorized release.

Context effects are the process through which prior questions affect responses to later questions in surveys.

Controlled rounding is a form of random rounding, but it is constrained to have the sum of the published entries in each row and column equal the appropriate published marginal totals.

Controlled tabular adjustment is a perturbative method for statistical disclosure limitation in tabular data. This method perturbs sensitive cell values until they are considered safe and then rebalances the nonsensitive cell values to restore additivity.

A **convenience sample** is a nonprobability sample, from which inferences cannot be made. Convenience sampling involves selecting the sample from the part of the population that is convenient to reach. Convenience sampling is not allowed for Census Bureau information products.

Core Statistical Products are information products with a production system, regular funding, regular release schedule, and active user base. These information products are backed and released by the Census Bureau to the public. "Backed and released by the Census Bureau" means that the Census Bureau's senior management officials (at least through the Associate Director responsible for the product) have reviewed and approved the product and the Census Bureau affirms its content. Because publications do not contain personal views, these information products do not include a disclaimer. They are subject to all OMB statistical policy directives as implemented in these quality standards and other Census Bureau policies.

Covariance is a characteristic that indicates the strength of relationship between two variables. It is the expected value of the product of the deviations of two random variables, x and y, from their respective means.

Coverage refers to the extent to which elements of the target population are listed on the sampling frame. **Overcoverage** refers to the extent that elements in the population are on the frame more than once and **undercoverage** refers to the extent that elements in the population are missing from the frame.

Coverage error which includes both undercoverage and overcoverage, is the error in an estimate that results from (1) failure to include all units belonging to the target population or failure to include specified units in the conduct of the survey (undercoverage), and (2) inclusion of some units erroneously either because of a defective frame or because of inclusion of unspecified units or inclusion of specified units more than once in the actual survey (overcoverage).

A **coverage ratio** is the ratio of the population estimate of an area or group to the independent estimate for that area or group. The coverage ratio is sometimes referred to as a coverage rate and may be presented as a percentage.

Cross-sectional studies (also known as cross-sectional analysis) form a class of research methods that involve observation of some subset of a population of items all at the same time. The fundamental difference between cross-sectional and longitudinal studies is that cross-sectional studies take place at a single point in time whereas a longitudinal study involves a series of measurements taken on the same units over a period of time. See **Longitudinal survey**.

Cross-validation is the statistical practice of partitioning a sample of data into subsets such that the analysis is initially performed on a single subset, while the other subset(s) are retained for subsequent use in confirming and validating the initial analysis.

Custom tabulations are tables prepared by the Census Bureau at the request of a data user or program sponsor. This terminology does not apply to tables produced by Census Bureau software (e.g., Ferret and data.census.gov).

A **cut-off sample** is a nonprobability sample that consists of the units in the population that have the largest values of a key variable (frequently the variable of interest from a previous time period). For example, a 90 percent cut-off sample consists of the largest units accounting for at least 90 percent of the population total of the key variable. Sample selection is usually done by sorting the population in decreasing order by size, and including units in the sample until the percent coverage exceeds the established cut-off.

-D-

Data capture is the conversion of information provided by a respondent into electronic format suitable for use by subsequent processes.

Data collection involves activities and processes that obtain data about the elements of a population, either directly by contacting respondents to provide the data or indirectly by using administrative data. Respondents may be individuals or organizations.

Data collection instrument refers to the device used to collect data, such as a paper questionnaire or computer assisted interviewing system.

A **data program** is a program that generates information products, often on a regular schedule. These programs include efforts such as the censuses and surveys that collect data from respondents. Data programs also include operations that generate information products from administrative data and operations that combine data from multiple sources, such as various surveys, censuses, administrative data. Specific examples of multiple source data programs include the Small Area Income and Poverty Estimates (SAIPE) program, the Population Division's "Estimates and Projections" program, the National Longitudinal Mortality Study, and the Annual Survey of Manufactures (ASM). One-time surveys also are considered data programs.

Data management system (DMS) is the Census Bureau's internal system for managing projects, permissions, data provisioning, and conformance with all legal and policy requirements associated with those projects.

Data-use agreements for administrative data are signed documents between the Census Bureau and other agencies to acquire restricted state or federal data or data from vendors. These are often called Memoranda of Understanding (MOU).

Derived statistics are calculated from other statistical measures. For example, population figures are statistical measures, but population-per-square-mile is a derived quantity.

The **design effect** is the ratio of the variance of a statistic, obtained from taking the complex sample design into account, to the variance of the statistic from a simple random sample with the same number of cases. Design effects differ for different subgroups and different statistics; no single design effect is universally applicable to any given survey or analysis.

A **direct comparison** is a statement that explicitly points out a difference between estimates.

Direct estimates are estimates of the true values of the target populations, based on the sample design and resulting survey data collected on the variable of interest, only from the time period of interest and only from sample units in the domain of interest. Direct estimates may be adjusted using explicit or implicit models (e.g., ratio adjustment, hot or cold deck imputation, and nonresponse adjustment) to correct for nonresponse and coverage errors.

Disclosure is the release of personally identifiable information or business identifiable information outside the Census Bureau.

Dissemination means Census Bureau-initiated or sponsored distribution of information to the public (e.g., publishing information products on the Census Bureau Internet Web site). Dissemination does not include distribution limited to government employees or agency contractors or grantees; intra-agency or inter-agency use or sharing of government information; and response to requests for agency records under the Freedom of Information Act, the Privacy Act, or other similar law. This definition also does not include distribution limited to correspondence with individuals or persons, press releases, archival records, public filings, subpoenas, or adjudicative processes.

A **dress rehearsal** is a complete test of the data collection components on a small sample under conditions that mirror the full-implementation. See **Field test**.

-E-

Editing is the process of identifying and examining missing, invalid, and inconsistent entries and changing these entries according to predetermined rules, other data sources, and recontacts with respondents with the intent to produce more accurate, cohesive, and comprehensive data. Some of the editing checks involve logical relationships that follow directly from the concepts and definitions. Others are more empirical in nature or are obtained through the application of statistical tests or procedures.

Entity Resolution (ER) is the task of disambiguating records that correspond to real world entities across and within datasets.

Equivalent quality data is data obtained from another source than the respondent, which have quality equivalent to data reported by the respondent. Equivalent quality data have three possible sources: 1) data directly substituted from another census or survey (for the same reporting unit, question wording, and time period); 2) data from administrative records; or 3) data obtained from some other equivalent source that has been validated by a study approved by the program manager in collaboration with the appropriate Research and Methodology area (e.g., company annual reports, Securities and Exchange Commission (SEC) filings, and trade association statistics).

An **estimate** is a numerical quantity for some characteristic or attribute calculated from sample data as an approximation of the true value of the characteristic in the entire population. An estimate can also be developed from models or algorithms that combine data from various sources, including administrative data.

Estimation is the process of using data from a survey or other sources to provide a value for an unknown population parameter (such as a mean, proportion, correlation, or effect size), or to provide a range of values in the form of a confidence interval.

Estimation Error is the difference between an estimated value and the true value of a parameter or, sometimes, of a value to be predicted.

Experimental statistical products are developed to satisfy emerging data user needs. These products should have a reasonable expectation of producing relevant and useful statistics but may benefit from user feedback and be useful in gauging user demand to determine if more resources should be invested to create a recurring core statistical product. The products may be new or innovative in some respect but should be supported by existing research or in extreme cases a plan for research to be run in parallel. Innovations may include the use of new data sources and/or methodologies both of which may have unproven quality. Users should therefore be informed of the relevant research and processes involved in the development of the statistics and any quality issues that may arise with each revision.

Exploratory studies (also called **Feasibility studies**) are common methods for specifying and evaluating survey content relative to concepts. In economic surveys, these studies often take the form of company or site visits.

External users – see **Users**.

-F-

Fax imaging is properly called Paperless Fax Imaging Retrieval System (PFIRS). This collection method mails or faxes a paper instrument to respondents. The respondents fax it back to the Census Bureau, where it is automatically turned into an image file.

Feasibility studies (also called **Exploratory studies**) are common methods for specifying and evaluating survey content relative to concepts. In economic surveys, these studies often take the form of company or site visits.

Field follow-up is a data collection procedure involving personal visits by enumerators to housing units to perform the operations such as, resolving inconsistent and/or missing data items on returned questionnaires, conducting a vacant/delete check, obtaining information for blank or missing questionnaires, and visiting housing units for which no questionnaire was checked in.

A **field test** is a test of some of the procedures on a small scale that mirrors the planned full-scale implementation. See **Dress rehearsal**.

A **focus group** is a pretesting technique whereby respondents are interviewed in a group setting to guide the design of a questionnaire based on the respondent's reaction to the subject matter and the issues raised during the discussion.

A **frame** consists of one or more lists of the units comprising the universe from which respondents can be selected (e.g., Census Bureau employee telephone directory). The frame may include elements not in the universe (e.g., retired employees). It may also miss elements that are in the universe (e.g., new employees).

The **frame population** is the set of elements that can be enumerated prior to the selection of a sample.

-G-

Geocoding is the conversion of spatial information into computer-readable form. As such, geocoding, both the process and the concepts involved, determines the type, scale, accuracy, and precision of digital maps.

A **geographic entity** is a spatial unit of any type, legal or statistical, such as a state, county, place, county subdivision, census tract, or census block.

A **geographic entity code (geocode)** is a code used to identify a specific geographic entity. For example, the geocodes needed to identify a census block for Census 2000 data are the state code, county code, census tract number, and block number. Every geographic entity recognized by the Census Bureau is assigned one or more geographic codes. "To geocode" means to assign an address, living quarters, establishment, etc., to one or more geographic codes that identify the geographic entity or entities in which it is located.

A **generalized variance function** is a mathematical model that describes the relationship between a statistic (such as a population total) and its corresponding variance. Generalized variance function models are used to approximate standard errors of a wide variety of characteristics of the target population.

Goodness-of-fit means how well a statistical model fits a set of observations. Measures of goodness of fit typically summarize the discrepancy between observed values and the values expected under a model. Such measures can be used in statistical hypothesis testing (e.g., to test for normality of residuals, to test whether two samples are drawn from identical distributions, or to test whether outcome frequencies follow a specified distribution).

A **graphical user interface (GUI)** emphasizes the use of pictures for output and a pointing device such as a mouse for input and control whereas a command line interface requires the user to type textual commands and input at a keyboard and produces a single stream of text as output.

-H-

Random variables are **heteroscedastic** if they have different variances. The complementary concept is called homoscedasticity.

Random variables are **homoscedastic** if they have the same variance. This is also known as homogeneity of variance. The complement is called heteroscedasticity.

A **housing unit** is a house, an apartment, a mobile home or trailer, a group of rooms or a single room occupied as separate living quarters or, if vacant, intended for occupancy as separate living quarters. The Census Bureau's estimates program prepares estimates of housing units for places, counties, states, and the nation.

Hypothesis testing draws a conclusion about the tenability of a stated value for a parameter. For example, sample data may be used to test whether an estimated value of a parameter (such as the difference between two population means) is sufficiently different from zero than the null hypothesis, designated H_0 (no difference in the population means), can be rejected in favor of the alternative hypothesis, H_1 (a difference between the two population means).

-I-

An **implied comparison** between two (or more) estimates is one that readers might infer, either because of proximity of the two estimates in the text of the report or because the discussion presents the estimates in a manner that makes it likely readers will compare them. For an implied comparison to exist between two estimates:

- The estimates must be for similar subgroups that it makes sense to compare (e.g., two age subgroups, two race subgroups).
- The estimates must be of the same type (e.g., percentages, rates, levels).
- The subgroups must differ by only one characteristic (e.g., teenage males versus teenage females; adult males versus adult females; teenage males versus adult males). If they differ by more than one characteristic an implied comparison does not exist (e.g., teenage males versus adult females).
- The estimates appear close enough to each other in the report that the reader would make a connection between them. Two estimates in the same paragraph that satisfy the first three criteria will always constitute an implied comparison. However, if the two estimates were in different sections of a report they would not constitute an implied comparison.

Estimates presented in tables do not constitute implied comparisons. However, if a table displays the difference between two estimates, it is a direct comparison.

Imputation is a procedure for entering a value for a specific data item where the response is missing or unusable.

Information products is an overarching term for any statistical product produced either by Census Bureau staff or using Census Bureau data. This includes core statistical products, experimental statistical products, and research-based statistical products.

Information quality is an encompassing term comprising utility, objectivity, and integrity.

Integration testing is the phase of software testing in which individual software modules are combined and tested as a group. The purpose of integration testing is to verify functional, performance and reliability requirements placed on major design items. Integration testing can expose problems with the interfaces among program components before trouble occurs in real-world program execution.

Integrity refers to the security of information – protection of the information from unauthorized access or revision, to ensure that the information is not compromised through corruption or falsification.

Internal users – see **Users**.

Interviewer debriefing has traditionally been the primary method used to evaluate field or pilot tests of interviewer-administered surveys. Interviewer debriefing consists of group discussions or structured questionnaires with the interviewers who conducted the test to obtain their views of questionnaire problems.

An **item allocation rate** is the proportion of the estimated (weighted) total (T) of item t that was imputed using statistical procedures, such as within-household or nearest neighbor matrices populated by donors, for that item.

Item nonresponse occurs when a respondent provides some, but not all, of the requested information, or if the reported information is not useable.

-J-

Joint partners refers to projects where both the Census Bureau and another agency are collecting the data together, but for their own use. It is a collaborative effort to reduce overall costs to the government and increase efficiency.

-K-

Key from image (KFI) is an operation in which keyers enter questionnaire responses by referring to a scanned image of a questionnaire for which entries could not be recognized by optical character or optical mark recognition with sufficient confidence.

Key from paper (KFP) is an operation in which keyers enter information directly from a hard-copy questionnaire that could not be read by optical character or optical mark recognition with sufficient confidence.

Key variables are main classification variables (e.g., geography, demographic attributes, economic attributes, industry etc.) of units to be studied.

-L-

Latent class analysis is a method for estimating one or more components of the mean squared error or an estimator.

Linear regression is a method that models a parametric relationship between a dependent variable Y, explanatory variables Xi, i = 1, ..., p, and a random term ε. This method is called "linear" because the relation of the response (the dependent variable Y) to the independent variables is assumed to be a linear function of the parameters.

Linking – see **Record linkage**.

Load testing is the process of putting demand on a system or device and measuring its response. Load testing generally refers to the practice of modeling the expected usage of a software program by simulating multiple users accessing the program concurrently.

Logistic regression is a model used for prediction of the probability of occurrence of an event. It models the logit of the probability as a linear function of the parameters using explanatory variables X_i, i = 1, ..., p.

A **longitudinal survey** is a correlational research study that involves repeated observations of the same items over long periods of time, often many decades.

Longitudinal studies are often used in psychology to study developmental trends across the life span. The reason for this is that unlike cross-sectional studies, longitudinal studies track the same unit of observation, and therefore the differences observed in those people are less likely to be the result of cultural differences across generations.

-M-

Mail-out/mail-back is a method of data collection in which the U.S. Postal Service delivers addressed questionnaires to housing units. Residents are asked to complete and mail the questionnaires to a specified data capture center.

The **margin of error (MOE)** is a measure of the precision of an estimate at a given level of confidence (e.g., 90%). The larger the margin of error, the less confidence one should have that the reported results are close to the "true" figures; that is, the figures for the whole population.

Master Address File (MAF)/Topologically Integrated Geographic Encoding and Referencing (TIGER) is a topologically integrated geographic database in which the topological structures define the location, connection, and relative relationship of streets, rivers, railroads, and other features to each other, and to the numerous geographic entities for which the Census Bureau tabulates data for its censuses and sample surveys.

Matching – see **Record linkage**.

Measurement error is the difference between the true value of the measurement and the value obtained during the measurement process.

Metadata are data about data. Metadata are used to facilitate the understanding, use and management of data. An item of metadata may describe an individual datum or content item, or a collection of data including multiple content items.

Methodological expert reviews are independent evaluations of an information product conducted by one or more survey methodologists or questionnaire-design experts. These experts may be within the Census Bureau or outside the Census Bureau, such as advisory committees. See also **Peer reviews**.

A **microdata** file includes the detailed information about people or establishments. Microdata come from interviews, administrative data.

A **model** is a formal (e.g., mathematical) description of a natural system. The formal system is governed by rules of inference; the natural system consists of some collection of observable and latent variables. It is presumed that the rules of inference governing the formal system mimic in some important respect the causal relations that govern the natural system (e.g., the formal laws of arithmetic apply to counting persons).

Model-based estimates (contrast with design estimates) are the statistical output of a mathematical model that relates the probability distributions of the data generating processes, the estimation processes, disclosure avoidance operations, and other salient sources of uncertainty to the estimands and their associated measures of uncertainty. Model-based estimates may be specific to a particular domain (e.g., small-area estimation) or generic (e.g., time series models).

Model validation involves testing a model's predictive capabilities by comparing the model results to "known" sources of empirical data.

Monte Carlo simulation is a technique that converts uncertainties in input variables of a model into probability distributions. By combining the distributions and randomly selecting values from them, it recalculates the simulated model many times and brings out the probability of the output.

In **multi-stage sampling**, a sample of clusters is selected and then a subsample of units is selected within each sample cluster. If the subsample of units is the last stage of sample selection, it is called a two-stage design. If the subsample is also a cluster from which units are again selected, it is called a three-stage design, etc.

Multicollinearity is a statistical term for the existence of a high degree of linear correlation amongst two or more explanatory variables in a multiple regression model. In the presence of multicollinearity, it is difficult to assess the effect of the independent variables on the dependent variable.

Multivariate analysis is a generic term for many methods of analysis that are used to investigate relationships among two or more variables.

-N-

Noise injection is a method of disclosure avoidance. Input noise injection modifies the confidential data at the record level by injecting randomness with known properties. Output noise injection modifies the output statistics by injecting randomness with known properties. Noise injection methods, including those known as formal privacy, may be applied to data from households, persons, businesses or establishments.

Nonresponse means the failure to obtain information from a sample unit for any reason (e.g., no one home or refusal). There are two types of nonresponse – see **Unit nonresponse** and **Item nonresponse**.

Nonresponse bias is the deviation of the expected value of an estimate from the population parameter due to differences between respondents and nonrespondents. The impact of nonresponse on a given estimate is affected by both the degree of nonresponse and the degree that the respondents' reported values differ from what the nonrespondents would have reported.

Nonresponse error is the overall error observed in estimates caused by differences between respondents and nonrespondents. It consists of a variance component and nonresponse bias.

Nonresponse follow-up is an operation whose objective is to obtain completed questionnaires from housing units for which the Census Bureau did not have a completed questionnaire in mail areas (mailout/mailback, update/leave, and urban update/leave).

Nonresponse subsampling is a method for reducing nonresponse bias in which new attempts are made to obtain responses from a subsample of sampling units that did not provide responses to the first attempt.

Nonsampling errors are survey errors caused by factors other than sampling (e.g., nonsampling errors include errors in coverage, response errors, nonresponse errors, faulty questionnaires, interviewer recording errors, and processing errors).

The **North American Industry Classification System (NAICS)** is the standard used by federal statistical agencies in classifying business establishments for the purpose of collecting, analyzing, and publishing statistical data related to the U.S. business economy. Canada, Mexico, and the U.S. jointly developed the NAICS to provide comparability in statistics about business activity across North America. NAICS replaced the U.S. Standard Industrial Classification (SIC) system in 1997, (For more information, see https://www.census.gov/naics/).

-O-

Objectivity focuses on whether information is accurate, reliable, and unbiased, and is presented in an accurate, clear, complete, and unbiased manner.

Optical character recognition (OCR) is a technology that uses an optical scanner and computer software to "read" human handwriting and convert it into electronic form.

Optical mark recognition (OMR) is a technology that uses an optical scanner and computer software to recognize the presence of marks in predesignated areas and assign a value to the mark depending on its specific location and intensity on a page.

Outliers in a set of data are values that are so far removed from other values in the distribution that their presence cannot be attributed to the random combination of chance causes.

-P-

The ***p*-value** is the probability that the observed value of the test statistic or a value that is more extreme in the direction of the alternative hypothesis, calculated when H_0 is true, is obtained.

Parameters are unknown, quantitative measures (e.g., total revenue, mean revenue, total yield or number of unemployed people) for the entire population or for specified domains that are of interest. A parameter is a constant in the equation of a curve that can be varied to yield a family of similar curves or a quantity (such as the mean, regression coefficient, or variance) that characterizes a statistical population and that can be estimated by calculations from sample data.

Participation means that the employee takes an active role in the event.

A peer review is an independent evaluation of an information product conducted by one or more technical experts.

Personally identifiable information refers to any information about an individual maintained by the Census Bureau which can be used to distinguish or trace an individual's identity, such as their name, social security number, date and place of birth, biometric records, etc., including any other personal information which is linked or linkable to an individual. Also see **Business identifiable information**.

Census Bureau information products must not contain **policy views**. The Census Bureau's status as a statistical agency requires us to absolutely refrain from taking partisan political positions. Furthermore, there is an important distinction between producing data and using that data to advocate for program and policy changes. The Census Bureau's duty is to produce high quality,

relevant data that the nation's policy makers can use to formulate public policy and programs. The Census Bureau should not, however, insert itself into a debate about the program or policy implications of the statistics it produces. We produce poverty statistics; we do not advocate for programs to alleviate poverty.

Population estimates (post-censal or intercensal estimates) are prepared for demographic groups and geographic areas. These estimates usually are developed from separate measures of the components of population change (births, deaths, domestic net migration, and net international migration) in each year but may be supplemented with other methodologies in the absence of current measures of components.

Post-stratification is applied to survey data by stratifying sample units after data collection using information collected in the survey and auxiliary information to adjust weights to population control totals or for nonresponse adjustment.

Precision of survey results refers to how closely the results from a sample can be obtained across repeated samples conducted using the same techniques from the same population at the same time. A precise estimate is stable over replications.

Pretesting is a broad term that incorporates many different techniques for identifying problems in questionnaires for both respondents and interviewers with regard to question content, order/context effects, skip instructions, and formatting**.** Pretesting may also be used to evaluate communications with respondents, such as survey contact materials.

Primary sampling units (PSU) are clusters of reporting units selected in the first stage of a multi-stage sample.

Probabilistic methods for survey sampling are any of a variety of methods for sampling that give a known, non-zero probability of selection to each member of the frame. The advantage of probabilistic sampling methods is that sampling error can be calculated without reference to a model assumption. Such methods include random sampling, systematic sampling, and stratified sampling.

The **probability of selection** is the probability that a population (frame) unit will be drawn in a sample. In a simple random selection, this probability is the number of elements drawn in the sample divided by the number of elements on the sampling frame.

Probability sampling is an approach to sample selection that satisfies certain conditions:
1. We can define the set of samples that are possible to obtain with the sampling procedure.
2. A known probability of selection is associated with each possible sample.
3. The procedure gives every element in the population a nonzero probability of selection.
4. We select one sample by a random mechanism under which each possible sample receives exactly its probability of selection.

A **project** is a temporary endeavor undertaken to create a unique product, service, or result.

A **projection** is an estimate of a future value of a characteristic based on trends.

Protected information (as defined in Data Stewardship Policy DS007, *Information Security Management Program*[2]) includes information about individuals, businesses, and sensitive statistical methods that are protected by law or regulation. The Census Bureau classifies the following as protected information:

- Individual census or survey responses.
- Microdata or paradata, containing original census or survey respondent data and/or administrative data that do not meet the disclosure avoidance requirements.
- Address lists and frames, including the Master Address File (MAF).
- Pre-release Principal Economic Indicators and Demographic Time-Sensitive Data.
- Aggregate statistical information produced for internal use or research that do not meet the Disclosure Review Board disclosure avoidance requirements, or that have not been reviewed and approved for release.
- Internal use methodological documentation in support of statistical products such as the primary selection algorithm, swapping rates, or Disclosure Review Board checklists.
- All personally identifiable information (PII) protected by an existing legal authority (such as Title 13, Title 15, Title 5, and Title 26).
- All business identifiable information (BII) protected by an existing legal authority.

A **public event** means that the event is open to the general public, including events that require a registration fee.

-Q-

A **qualified user** is a user with the experience and technical skills to meaningfully understand and analyze the data and results. For example, a qualified user of direct estimates produced from samples understands sampling, estimation, variance estimation, and hypothesis testing.

Qualitative research is commonly used for pretesting and evaluating survey questions, data collection instruments, and related communication materials (such as advance letters), in order to assess and improve the question-answer process. Examples include: cognitive interviews, focus groups, ethnographic/observational studies, usability testing, respondent and interviewer debriefings, behavior coding and the like.

A **quantity response rate** is the proportion of the estimated (weighted) total (T) of data item t reported by tabulation units in the sample (expressed as a percentage). [Note: Because the value of economic data items can be negative (e.g., income), the absolute value must be used in the numerators and denominators in all calculations.]

A **questionnaire** is a set of questions designed to collect information from a respondent. A questionnaire may be interviewer-administered or respondent-completed, using paper-and-pencil methods for data collection or computer-assisted modes of completion.

-R-

Raking is a method of adjusting sample estimates to known marginal totals from an independent source. For a two-dimensional case, the procedure uses the sample weights to proportionally adjust the weights so that the sample estimates agree with one set of marginal totals. Next, these adjusted weights are proportionally adjusted so that the sample estimates agree with the second set of marginal totals. This two-step adjustment process is repeated enough times until the sample estimates converge simultaneously to both sets of marginal totals.

In **random rounding,** cell values are rounded, but instead of using standard rounding conventions a random decision is made as to whether they will be rounded up or down.

Ratio estimation is a method of estimating from sample data. In ratio estimation**,** an auxiliary variate x_i, correlated with y_i is obtained for each unit in the sample. The population total X of the x_i must be known. The goal is to obtain increased precision by taking advantage of the correlation between y_i and x_i. The ratio estimate of Y, the population total of y_i, is $\hat{Y}_R = X\left(\frac{y}{x}\right)$, where y and x are the sample totals of y_i and x_i respectively.

Readily accessible means that users can access the documentation when they need it, not that it is only available on request.

Recoding is a disclosure limitation technique that involves collapsing/regrouping detail categories of a variable so that the resulting categories are safe.

Record linkage is the process of linking or matching two or more records that are determined to refer to the same person or establishment.

Regression is a statistical method which tries to predict the value of a characteristic by studying its relationship with one or more other characteristics.

A **regression model** is a statistical model used to depict the relationship of a dependent variable to one or more independent variables**.**

Reimbursable projects are those for which the Census Bureau receives payment (in part or in total) from a customer for products or services rendered.

Reinterview is repeated measurement of the same unit intended to estimate measurement error (response error reinterview) or designed to detect and deter falsification (quality control reinterview).

A **release phase** refers to the point in the statistical process where you release the data. It may be to the public, the sponsor, or any other user for whom the data was created.

Releases of information products are the delivery or the dissemination of information products to government agencies, organizations, sponsors, or individuals outside the Census Bureau, including releases to the public.

Replication methods are variance estimation methods that take repeated subsamples, or replicates, from the data, re-compute the weighted estimate for each replicate, and then compute the variance based on the deviations of these replicate estimates from the full-sample estimate. The subsamples are generated to properly reflect the variability due to the sample design.

Reproducibility means that the information is capable of being substantially reproduced, subject to an acceptable degree of imprecision. For information judged to have more (less) important impacts, the degree of imprecision that is tolerated is reduced (increased). If the Census Bureau applies the reproducibility test to specific types of original or supporting data, the associated guidelines shall provide relevant definitions of reproducibility (e.g., standards for replication of laboratory data). With respect to analytic results, "capable of being substantially reproduced" means that independent analysis of the original or supporting data using identical methods would generate similar analytic results, subject to an acceptable degree of imprecision or error.

Research-Based Statistical Products include professional papers (including journal articles, book chapters, conference papers, poster sessions, and written discussant comments), working papers, technical reports, research presentation to external audiences, and other information products that are not core or experimental products. Research-based statistical products are expected to meet appropriate scientific standards in the disciplines underlying the research as reflected in the required content, statistical and supervisory reviews.

A **residual** is the observed value minus the predicted value.

Respondent burden is the estimated total time and financial resources expended by the respondent to generate, maintain, retain, and provide census or survey information.

Respondent debriefing is a pretesting technique that involves using a structured questionnaire following data collection to elicit information about respondents' interpretations of survey questions.

A **response analysis survey** is a technique for evaluating questionnaires from the perspective of the respondent. It is typically a respondent debriefing conducted after a respondent has completed the main survey.

Response error is the difference between the true answer to a question and the respondent's answer. It may be caused by the respondent, the interviewer, the questionnaire, the survey procedure or the interaction between the respondent and the interviewer.

A **response rate** measures the proportion of the selected sample that is represented by the responding units.

Revisions history is a stability diagnostic to compare regARIMA modeling and seasonal adjustment results over lengthening time spans. History analysis begins with a shortened series. Series values are added, one at a time, and the regARIMA model and seasonal adjustment are reestimated. Comparing different sets of adjustment options for the same series may indicate

that one set of options is more stable. Among adjustment options whose other diagnostics indicate acceptable quality, options that result in fewer large revisions, that is, fewer large changes as data are added, usually are preferred.

-S-

The **sample design** describes the target population, frame, sample size, and the sample selection methods.

The **sample size** is the number of population units or elements selected for the sample, determined in relation to the required precision and available budget for observing the selected units.

A **sample survey** is a data collection that obtains data from a sample of the population.

The **sampled population** is the collection of all possible observation units (objects on which measurements are taken) that might have been chosen in the sample. For example, in a presidential poll taken to determine who people will vote for, the target population might be all persons who are registered to vote. The sampled population might be all registered voters who can be reached by telephone.

Sampling is the process of selecting a segment of a population to observe and facilitate the estimation and analysis of something of interest about the population. The set of sampling units selected is referred to as the sample. If all the units are selected, the sample is referred to as a census.

Sampling error is the uncertainty associated with an estimate that is based on data gathered from a sample of the population rather than the full population.

A **sampling frame** is any list or device that, for purposes of sampling, de-limits, identifies, and allows access to the sampling units, which contain elements of the frame population. The frame may be a listing of persons, housing units, businesses, records, land segments, etc. One sampling frame or a combination of frames may be used to cover the entire frame population.

Sampling units are the basic components of a sampling frame. The sampling unit may contain, for example, defined areas, houses, people, or businesses.

Sampling weight is a weight assigned to a given sampling unit that equals the inverse of the unit's probability of being included in the sample and is determined by the sample design. This weight may include a factor due to subsampling.

Sanitized data, used for testing, may be totally fictitious or based on real data that have been altered to eliminate the ability to identify the information of any entity represented by the data.

Scheffé's method is a method for adjusting significance levels in a linear regression analysis to account for multiple comparisons. It is particularly useful in analysis of variance, and in constructing simultaneous confidence bands for regressions involving basis functions. Scheffé's

method is a single-step multiple comparison procedure which applies to the set of estimates of all possible contrasts among the factor level means, not just the pairwise differences considered by the Tukey method.

A **scoring weight** is the amount of value assigned when a pair of records agree or disagree on the same matching variable. Each matching variable is assigned two scoring weights --- a positive weight for agreement and a negative weight for disagreement. After comparing all matching variables on a matching variable by matching variable basis, the resulting set of assigned weights are added to get a total score for the total record. Pairs of records with scores above a predetermined cut-off are classified as a match; pairs of records with scores below a second predetermined cut-off are classified as a non-match.

Seasonal adjustment is a statistical technique that consists of estimating seasonal factors and applying them to a time series to remove the seasonal variations in the estimates.

Sensitivity analysis is designed to determine how the variation in the output of a model (numerical or otherwise) can be apportioned, qualitatively or quantitatively, to changes in input parameter values and assumptions. This type of analysis is useful in ascertaining the capability of a given model, as well its robustness and reliability.

Sequential sampling is a sampling method in which samples are taken one at a time or in successive predetermined groups, until the cumulative result of their measurements (as assessed against predetermined limits) permits a decision to accept or reject the population or to continue sampling. The number of observations required is not determined in advance, but the decision to terminate the operation depends, at each stage, on the results of the previous observations. The plan may have a practical, automatic termination after a certain number of units have been examined.

Significance level refers to the probability of rejecting a true null hypothesis.

Simple random sampling (SRS) is a basic probability selection scheme that uses equal probability sampling with no strata.

A **skip pattern** in a data collection instrument is the process of skipping over non-applicable questions depending upon the answer to a prior question.

Sliding spans diagnostics are seasonal adjustment stability diagnostics for detecting adjustments that are too unstable. X-13-ARIMA-SEATScreates up to four overlapping subspans of the time series, seasonally adjusts each span, then compares the adjustments of months (quarters with quarterly data) common to two or more spans. Months are flagged whose adjustments differ by more than a certain cutoff. (The default cutoff is 3% for most comparisons.) If too many months are flagged, the seasonal adjustment is rejected for being too unstable. The series should not be adjusted unless other software options are found that lead to an adjustment with an acceptable number of flagged months. Sliding spans diagnostics can include comparisons of seasonally adjusted values, seasonal factors, trading day factors, month-to-month changes and year-to-year changes. (Year-to-year change results are not used to accept or reject an adjustment.)

Small area estimation is a statistical technique involving the estimation of parameters for small sub-populations where a sample has insufficient or no sample for the sub-populations to be able to make accurate estimates for them. The term "small area" may refer strictly to a small geographical area such as a county, but may also refer to a "small domain," i.e., a particular demographic within an area. Small area estimation methods use models and additional data sources (such as census data) that exist for these small areas in order to improve estimates for them.

Social media also known as "Web 2.0" or "Gov 2.0," are web-based tools, websites, applications, and media that connect users and allow them to engage in dialogue, share information, collaborate, and interact. Common platforms include YouTube®, Flickr®, Facebook®, Twitter®, and Instagram®.

Special sworn status (SSS) is conferred upon individuals who have sworn the lifetime confidentiality oath and for whom the Census Bureau approves access to confidential Census Bureau data in furtherance of a Title 13 purpose. SSS individuals are subject to same legal penalties for violation of confidentiality as employees.

Spectral graphs are diagnostic graphs that indicate the presence of seasonal or trading day effects. Visually significant peaks at the marked seasonal and/or trading day frequencies usually indicate the presence of these effects, in some cases as residual effects after an adjustment that is not fully successful for the span of data from which the spectrum is calculated. Spectral graphs are available for the prior-adjusted series (or original series if specified), regARIMA model residuals, seasonally adjusted series, and modified irregular.

Split panel tests refer to controlled experimental testing of questionnaire variants or data collection modes to determine which one is "better" or to measure differences between them.

Stakeholders include Congress, federal agencies, sponsors, state and local government officials, advisory committees, trade associations, or organizations that fund data programs, use the data, or are affected by the results of the data programs.

The **standard deviation** is the square root of the variance and measures the spread or dispersion around the mean of a data set.

The **standard error** is a measure of the variability of an estimate due to sampling or modeling.

The **Standard Occupational Classification System (SOC)** is used to classify workers into occupational categories for the purpose of collecting, calculating, or disseminating data (for more information, see www.bls.gov/soc/).

Statistical attribute matching consists of comparing two records, determining if they refer to "similar" entities (but not necessarily the same entity), and augmenting data from one record to the other.

Statistical inference is inference about a population from a random or representative sample drawn from it. It includes point estimation, interval estimation, and statistical significance testing.

A **statistical model** consists of a series of assumptions about a data generating process that explicitly involve probability distributions and functions on those distributions, in order to construct an estimate or a projection of one or more phenomena.

Statistical purposes refer to the description, estimation, or analysis of the characteristics of groups without identifying the individuals or organizations that compose such groups.

Statistical significance is attained when a statistical procedure applied to a set of observations yields a *p*-value that exceeds the level of probability at which it is agreed that the null hypothesis will be rejected. See also hypothesis testing

Strata are created by partitioning the frame and are generally defined to include relatively homogeneous units within strata.

Stratification involves dividing the sampling frames into subsets (called strata) prior to the selection of a sample for statistical efficiency, for production of estimates by stratum, or for operational convenience. Stratification is done such that each stratum contains units that are relatively homogeneous with respect to variables that are believed to be highly correlated with the information requested in the survey.

Stratified sampling is a sampling procedure in which the population is divided into homogeneous subgroups or strata and the selection of samples is done independently in each stratum.

Sufficient data is determined for a survey by whether the respondent completes enough items for the case to be considered a completed response.

Supplemental reinterview allows the regional offices to select any field representative (FR) with an original interview assignment for reinterview. All assigned cases that are not selected for reinterview are available as inactive supplemental reinterview cases. The regional office may place a field representative in supplemental reinterview for various reasons: the FR was not selected for reinterview; the FR was hired during the assignment period; or the regional office needs to reinterview additional cases to investigate the FR for suspected falsification.

Swapping is a disclosure limitation technique that involves selecting a sample of records, finding a match in the database on a set of predetermined variables, and swapping all other variables.

Synthetic data are microdata records created to improve data utility while preventing disclosure of confidential respondent information. Synthetic data is created by statistically modeling original data and then using those models to generate new data values that reproduce the original

data's statistical properties. Users are unable to identify the information of the entities that provided the original data.

Systematic sampling is a method of sample selection in which the sampling frame is listed in some order and every k^{th} element is selected for the sample, beginning from a random start between 1 and k.

A **systems test** is used to test the data collection instrument along with the data management systems.

-T-

The **target population** is the complete collection of observations under study. For example, in a presidential poll taken to determine who people will vote for, the target population might be all persons who are registered to vote. The sampled population might be all registered voters who can be reached by telephone.

A **Taylor series** is a representation of a function as an infinite sum of polynomial terms calculated from the values of its derivatives at a single point.

The **Taylor series method for variance estimation** is used to estimate variances for non-linear estimators such as ratio estimators. If the sample size is large enough so that the estimator can be closely approximated by the first order (linear) terms in the Taylor series, then the variances can be approximated by using variance methods appropriate for linear statistics. The Taylor series approximation to the ratio estimator is: $\hat{Y}_R \approx Y + (y - Y) - (Y/X)(x - X)$. This approximation is linear in the survey sample totals x and y.

Testing is a process used to ensure that methods, systems or other components function as intended.

Third-party data is any data obtained from public domain, contract, or memorandum of understanding from a non-governmental source.

A **time series** is a sequence of data values obtained over a period of time, usually at uniform intervals.

Timeliness of information reflects the length of time between the information's availability and the event or phenomenon it describes.

Top-coding is a disclosure limitation technique that involves limiting the maximum value of a variable allowed on the file to prevent disclosure of individuals or other units with extreme values in a distribution.

Topologically Integrated Geographic Encoding and Referencing (TIGER) – see definition for Master Address File (MAF)/Topologically Integrated Geographic Encoding and Referencing (TIGER).

A **total quantity response rate** is the proportion of the estimated (weighted) total (T) of data item t reported by tabulation units in the sample or from sources determined to be equivalent-quality-to-reported data (expressed as a percentage).

Touch-tone data entry (TDE) is a data collection method that uses an electronic instrument to collect and capture data by telephone.

Transparency refers to providing documentation about the assumptions, methods, and limitations of an information product to allow qualified third parties to reproduce the information, unless prevented by confidentiality or other legal constraints.

Truth decks are used to test imputation methods by comparing the imputed values to the original values for the items flagged as missing. The truth deck originates as a file of true responses. Certain responses are then blanked in a manner that reflects the probable nonresponse in the sample. The truth deck is then run through the imputation process in order to evaluate the accuracy of the imputed values.

Tukey's method is a single-step multiple comparison procedure and statistical test generally used in conjunction with an ANOVA to find which means are significantly different from one another. Named after John Tukey, it compares all possible pairs of means, and is based on a studentized range distribution q (this distribution is similar to the distribution of t from the t-test).

-U-

Unduplication involves the process of deleting units that are erroneously in the frame more than once to correct for overcoverage.

Unit nonresponse occurs when a sampled unit fails to respond or a sampled unit response does not meet a minimum threshold and is classified as not having responded at all.

Usability testing in surveys is the process whereby a group of users are asked to interact and perform tasks with survey materials (e.g., computer-assisted forms) to determine if the intended users can carry out planned tasks efficiently, effectively, and satisfactorily.

A **user interface** is the aspects of a computer system or program that can be seen (or heard or otherwise perceived) by the human user, and the commands and mechanisms the user uses to control its operation and input data.

Users are organizations, agencies, the public, or any others expected to use the information products. Census Bureau employees, contractors, and other Special Sworn Status individuals affiliated with the Census Bureau are **internal users**. Users outside of the Census Bureau, including Congress, federal agencies, sponsors, other Special Sworn Status individuals, and the public, are **external users**.

Utility refers to the usefulness of the information for its intended users.

-V-

Variance is a measurement of the error associated with nonobservation, that is, the error that occurs because all members of the frame population are not measured. The measurement is the average of the squared differences between data points and the mean.

Version Control is the establishment and maintenance of baselines and the identification of changes to baselines that make it possible to return to the previous baseline. A baseline, in the context of documentation, is a document that has been formally reviewed and agreed on.

-W-

Weights are values associated with each sample unit that are intended to account for probabilities of selection for each unit and other errors such as nonresponse and frame undercoverage so that estimates using the weights represent the entire population. A weight can be viewed as an estimate of the number of units in the population that the sampled unit represents.

Working papers are information products that are prepared by Census Bureau employees (or contractors), but the Census Bureau does not necessarily affirm their content. They include technical papers or reports, division reports, research reports, and similar documents that discuss analyses of subject matter topics or methodological, statistical, technical or operational issues. The Census Bureau releases working papers to the public, generally on the Census Bureau's Web site. Working papers must include a disclaimer.

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[1] Data Stewardship Executive Policy Committee. *DS007: Safeguarding and Managing Information*. U.S. Census Bureau, Washington, D.C., May 28, 2013. https://www.census.gov/about/policies/privacy/data_stewardship/dsep_committee.html Accessed on 2 March 2022.

[2] Data Stewardship Executive Policy Committee. *DS007: Safeguarding and Managing Information*. U.S. Census Bureau, Washington, D.C., May 28, 2013. https://www.census.gov/about/policies/privacy/data_stewardship/dsep_committee.html Accessed on 2 March 2022.