Investigating the 2010 Undercount of Young Children – Child Undercount Probes

A New Design for the 21st Century

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INTRODUCTION

In this report, we define "young children" as children age 0 to 4. After the 2010 Census, Demographic Analysis estimated a net undercount of almost 1 million young children, about 4.6 percent (Hogan et al. 2013). O'Hare (2015) shows that the net undercount rates for young children increased from 1.4 percent in 1980 to 4.6 percent in 2010, while the net undercount rate for the adult population (age 18+) went from an undercount of 1.4 percent in 1980 to an overcount of 0.7 percent in 2010. The rapid rise in the undercount of young children underscores the importance of examining this coverage problem in greater detail.

In 2014, the Census Bureau released a task force report summarizing this issue and recommending research to better understand the possible causes for this undercount (U.S. Census Bureau 2014). An interdivisional team is currently working on several projects to review existing data sources that might provide insights into the high undercount of young children in the 2010 Census. This report analyzes responses to the 2010 Census coverage questions to identify households that might have had some confusion about whether or not to include a young child on their 2010 Census forms.

BACKGROUND

2.1 Data Collection - 2010 Census

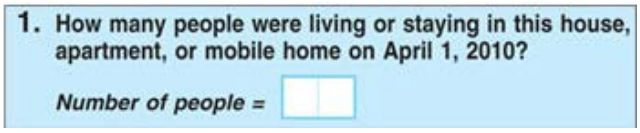
2.1.1 Overview

The 2010 Census, like previous censuses, relied largely on self-response to efficiently enumerate the country. The U.S. Postal Service and census enumerators delivered census questionnaires to nearly every address in the country, asking the households to complete and return the questionnaires by mail. The Census Bureau mailed or delivered bilingual (English/Spanish) questionnaires in some parts of the country. Forms and guides in other languages were available upon request. The Census Bureau conducted Nonresponse Followup (NRFU) to enumerate the households that failed to respond. In some more rural areas, self-response was not an option. Enumerators visited these households to collect the required information in an operation called Update/Enumerate. The vast majority of enumerator-completed forms were from the NRFU operation. Throughout this report, we use the term NRFU to refer to all enumerator-completed forms, which includes the Update/Enumerate operation.

Most 2010 Census data collection instruments were paper-based. The 2010 Census asked several household level questions such as tenure and household size. It also asked for the sex, age, race, and Hispanic origin of each person and their relationship to the householder. Self-response and NRFU questionnaires included coverage questions to identify households that might have omitted someone in error or included someone in error. The sections below provide details about these coverage questions.

2.1.2 Self-Response

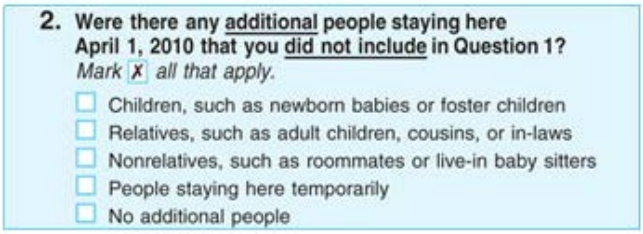
The 2010 Census self-response questionnaire asked households to determine the total number of people living at an address. Figure 1 is a facsimile of the population count question.


1. How many people were living or staying in this house, apartment, or mobile home on April 1, 2010?

Number of people =

Figure 1. Facsimile of Population Count Question on Self-Response Questionnaires - 2010 Census

Immediately following this question was an undercount question to identify possible census omissions. The undercount question asked about people staying at the housing unit that the respondent did not include in the population count (Figure 2).


2. Were there any additional people staying here April 1, 2010 that you did not include in Question 1?
Mark ✗ all that apply.

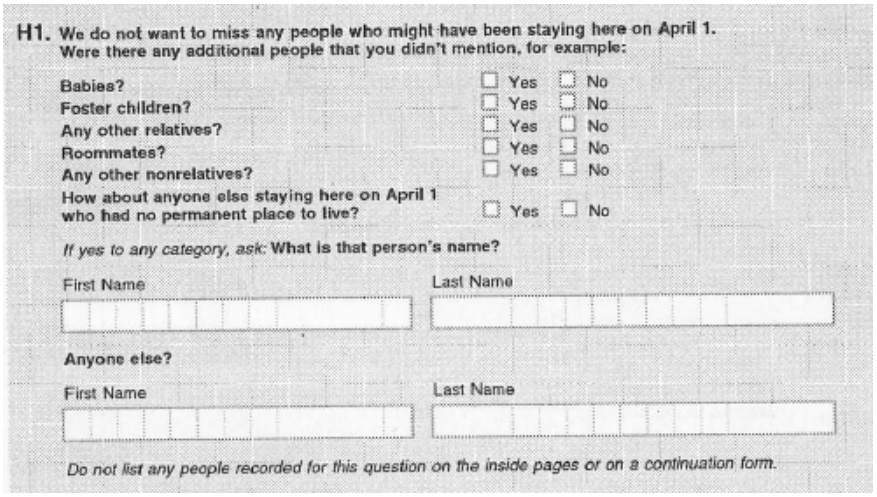
- ☐ Children, such as newborn babies or foster children
- ☐ Relatives, such as adult children, cousins, or in-laws
- ☐ Nonrelatives, such as roommates or live-in baby sitters
- ☐ People staying here temporarily
- ☐ No additional people

Figure 2. Facsimile of Self-Response Questionnaire's Undercount Question - 2010 Census

Self-response questionnaires with a positive response to the undercount question (i.e., questionnaires with any of the first four response boxes marked) were eligible for followup, specifically for an operation called Coverage Followup (CFU). The CFU operation assumed that a positive response to the undercount question was an indication that the person completing the form may have failed to include someone on their questionnaire who stayed with the household on April 1, 2010. The 2010 self-response questionnaire also included an overcount question, but, given our interest in omissions, those results are outside the scope of this report.

2.1.3 Nonresponse Followup

The questionnaire used in NRFU (and in Update/Enumerate) included a similar undercount question (Figure 3). The NRFU questionnaire allowed the collection of the names of two people whenever the response to one of the undercount categories was, “yes.” CFU attempted a followup interview with all cases with a positive response to the NRFU undercount questions. Data processing tentatively added any listed names from this question to the census roster before sending the case to CFU. Like self-response questionnaires, NRFU questionnaires also probed for possible overcount errors that are not in scope for this analysis.



H1. We do not want to miss any people who might have been staying here on April 1. Were there any additional people that you didn't mention, for example:

Babies?	☐ Yes	☐ No
Foster children?	☐ Yes	☐ No
Any other relatives?	☐ Yes	☐ No
Roommates?	☐ Yes	☐ No
Any other nonrelatives?	☐ Yes	☐ No
How about anyone else staying here on April 1 who had no permanent place to live?	☐ Yes	☐ No

If yes to any category, ask: What is that person's name?

First Name | Last Name

Anyone else?

First Name | Last Name

Do not list any people recorded for this question on the inside pages or on a continuation form.

Figure 3. Facsimile of the Enumerator Questionnaire's Undercount Question - 2010 Census

2.2 Coverage Followup - 2010 Census

The 2010 CFU operation identified self-response and NRFU questionnaires with suspected coverage errors. Some questionnaires were eligible for CFU based on their responses to the undercount and overcount questions described in Section 2.1. Additional questionnaires entered CFU based on discrepancies on the questionnaires that indicated possible response errors (e.g., differences between the total count of household members and the number of listed people). CFU relied on a centralized telephone followup to recontact these households to review the roster and determine the need for changes (additions or deletions). The 2010 CFU operation included more than 8 million households—6.9 million self-response households and 1.1 million NRFU households (U.S. Census Bureau 2012). CFU was able to complete interviews with about 60 percent of the CFU-eligible self-response households and 35 percent of the eligible NRFU households (U.S. Census Bureau 2012).

CFU added a total of 53,741 young children. CFU validated an additional 15,642 young children that enumerators listed in the NRFU coverage question. Table 1 summarizes the number of young children that were included in the 2010 Census because of the CFU operation. A subset of those adds were in households that responded positively to one of the coverage questions. U.S. Census Bureau (2017) found that CFU accounted for 44,405 young children in households when the only reason the household was eligible for CFU was a positive response to a coverage question. The other children were in households that went to CFU for other reasons, such large households.

Table 1. Young Children Added or Validated in Coverage Followup

	All Reasons for CFU	Only Reason for CFU was a positive response to a Coverage Question
Young children added or validated during CFU interview	**69,383**	**44,405**
Self-response	47,144	25,287
Nonresponse Followup or Update/Enumerate	22,239	19,118

CFU: Coverage Followup

Source: U.S. Census Bureau (2017)

2.3 Coverage Followup - Evaluation Results

U.S. Census Bureau (2017) reviewed available information about the young children that CFU either added or validated. Some of these young children lived in households that self-identified a possible omission by responding positively to one of the undercount probes. To determine if certain households were more likely to have young children added in CFU, U.S. Census Bureau (2017) calculated CFU add rates. The authors defined these add rates as the ratio of the number of young children added in CFU with a certain characteristic to the total number of young children enumerated in the 2010 Census with that characteristic. Multiplying those results by 1,000 converted the ratios to an estimate of CFU adds per 1,000 enumerations. The report included add rates for the full universe of CFU adds and add rates for the CFU adds that were only in CFU because of a response to one of the coverage questions. CFU coverage questions accounted for about two out of every 1,000 young children on 2010 self-response questionnaires and about three out of every 1,000 young children on 2010 NRFU questionnaires. This is an underestimate of the impact of the coverage questions on CFU adds as it does not account for CFU adds when additional issues flagged a case for review during CFU.

An analysis of CFU add rates by type of housing unit, tenure, household size, and household type revealed characteristics with relatively high proportions of coverage errors involving young children that CFU corrected. Similar comparisons of the demographic characteristics of householders identified householders who may be making more errors when completing their census questionnaires. Specific findings in U.S. Census Bureau (2017) include higher CFU add rates based only on coverage questions for young children living in large households, complex households, nonrelated households, and related households other than husband-wife households. These results held in both data collection modes. For young children enumerated by self-response, we found slightly higher CFU add rates in Urban Update/Leave Areas.

The coverage questions accounted for a higher percentage of young children living in households with householders who were age 50 or older. This was especially true for young children enumerated in NRFU where the CFU add rate was almost 11 out of every 1,000 young children living with a householder age 50 or older. This may indicate that householders who are grandparents made errors by initially excluding their grandchildren who were living in the household; these were errors that CFU identified and corrected. U.S. Census Bureau (2017) also found higher CFU add rates for young children living in households with householders who were Hispanic, Black, American Indian or Alaska Native, or Native Hawaiian or Pacific Islander.

This report expands the U.S. Census Bureau (2017) analysis by studying the characteristics of the households that responded positively to one of the child-specific coverage probes, regardless of the CFU outcome. In contrast with that report that focused on households where CFU added a young child, this report identifies households with some potential confusion about including a child and does not rely on the success of CFU in making a second contact.

RESEARCH QUESTIONS

This report answers the following research questions.

1. What are the characteristics of the housing units that responded positively to the child undercount probes?
2. What are the characteristics of the households that responded positively to the child undercount probes?
3. What are the characteristics of the householders that responded positively to the child undercount probes?

METHODOLOGY

4.1 Sources of Data

This report uses response data from the Census Unedited File (CUF) to identify housing units with specific responses to the undercount questions. We matched these housing units to the Census Edited File (CEF) to obtain the final edited and imputed characteristics. In contrast with the CUF records, the CEF records include the final set of characteristics after all edits and imputations, i.e., the records that the 2010 Census used in most tabulations. We identified 611,606 occupied housing units with a positive response to one of the child-specific undercount probes. To calculate the proportion of housing units, households, and householders that responded positively, we used 2010 Census data on occupied housing units from the CEF as denominators. We restricted this denominator to occupied housing units without a blank response to the undercount question—115.6 million housing units.

4.2 Definitions

Appendix A includes a short glossary with some of the census terms used throughout this report.

4.2.1 Positive Responses to the Child Undercount Probes

In this report, we identified all households that marked the box for the "*children, such as newborn babies or foster children*" probe in the undercount question on self-response questionnaires. On NRFU questionnaires, we identified all households that responded "yes" to either the "*babies*" or "*foster children*" probes in the undercount question. While other undercount probes resulted in the identification of young children that respondents initially omitted and CFU added, we chose to focus on the probes specifically designed to identify rostering errors involving children.

4.2.2 Positive-Response Rates

To assess the proportion of households with certain characteristics that responded positively to one of the child undercount probes, we calculated positive-response rates. We defined these rates as the ratio of the number of households with a positive response to one of the child undercount probes with a certain characteristic to the total number of households in the 2010 Census with that characteristic. Multiplying those results by 1,000 converted the ratios to an estimate of positive responses per 1,000 enumerated housing units.

We determined that about five out of every 1,000 households responded positively to one of the undercount probes about children. Our goal is to compare these positive-response rates across housing units and households to identify characteristics with higher than average rates. We consider high rates to indicate characteristics with greater risks of coverage error. They identify households and householders that had some confusion about whether they should be including a child when they completed their census forms.

4.3 Limitations

Unlike the earlier CFU evaluation, this analysis does not rely on the successful completion of a CFU interview. Our focus is on the households that responded positively to one of the child undercount probes regardless of the CFU outcome.

It is possible that some households marked one of these boxes in error, without any confusion about whom to include on their form, or that some respondents self-corrected their response to the household count after responding to the undercoverage probe. Therefore, some households that responded positively to the coverage probes may not have omitted any children from their household count. It is also possible that during NRFU some enumerators provided guidance to respondents about whom to include on the form. This would reduce the number of positive responses to the NRFU undercount probes. We do not consider either of these limitations to be significant.

RESULTS

5.1 Housing Unit Characteristics

What are the characteristics of the housing units that responded positively to the child undercount probes?

The majority of households that responded positively to one of the child undercount probes lived in single-unit structures. These households had relatively low positive-response rates of fewer than five responses per 1,000. Households living in multiunit structures had higher positive-response rates than households living in single-unit structures or in trailers or other types of units. We find higher positive-response rates for renters compared with owners (seven per 1,000 versus four per 1,000, respectively). These results suggest that people living in renter-occupied units and multiunits structures were more likely to indicate a possible error involving children; they might therefore have greater chances of coverage error involving young children.

Table 2. Positive Responses to Child Undercount Probes - Housing Characteristics

Characteristic	Distribution of Positive Responses	Positive Responses per 1,000 Housing Units
TOTAL	**611,606**	**115,606,191**
Type of Unit	**100.0**	**5.3**
Single Unit	65.5	4.8
Multiunit	28.3	6.6
Trailer and Other	6.2	5.9
Tenure	**100.0**	**5.3**
Owner-occupied	53.5	4.3
Renter-occupied	46.5	7.1

Source: 2010 Census Unedited and Edited Files – Special Tabulation

For most of the country, the United States Postal Service delivered questionnaires to residents who were asked to complete and return the questionnaire by mail. The Census Bureau called these areas Mailout/Mailback areas. About 94 percent of households responding positively to one of the child undercount probes were living in Mailout/Mailback areas. In Update/Leave and Urban Update/Leave areas, census enumerators updated the address list while delivering questionnaires for respondents to complete and return by mail. About 4 percent of households that responded positively to a child undercount probe lived in Update/Leave areas and about 2 percent lived in Urban Update/Leave areas. In some rural areas, census enumerators updated the address list and conducted in-person interviews. Less than one percent of households with a positive response to one of the child undercount probes lived in these Update/Enumerate areas. Other types of enumeration areas primarily include military enumeration.

We do not see much variation in positive-response rates by type of enumeration area. We find slightly higher positive-response rates for households in Urban Update/Leave areas when compared with households living in Mailout/Mailback and Update/Leave areas. We also see low positive-response rates for households enumerated in Update/Enumerate.

Table 3. Positive Responses to Child Undercount Probes - Type of Enumeration Area

	Distribution of Positive Responses	Positive Responses per 1,000 Housing Units
	611,606	**115,606,191**
	100.0	**5.3**
Mailout/Mailback	93.8	5.4
Update/Leave	3.9	4.0
Urban Update/Leave	1.9	6.1
Update/Enumerate	0.2	1.8
Other	0.2	5.1

Source: 2010 Census Unedited and Edited Files – Special Tabulation

5.2 Household Characteristics

What are the characteristics of the households that responded positively to the child undercount probes?

The household size distributions show that only about 9 percent of all households responding positively to a child undercount question were households of seven or more people. However, the positive-response rate of 25 per 1,000 for households with seven or more people is much greater than the positive-response rates for all other size households. We also see high positive-response rates for five-person and six-person

households. Large households may be households that include extended families or nonrelatives; these are households with more complicated living arrangements that respondents were not clear about how to report.

Table 4. Positive Responses to Child Undercount Probes - Household Size

	Distribution of Positive Responses	Positive Responses per 1,000 Housing Units
TOTAL	**611,606**	**115,606,191**
Household Size	**100.0**	**5.3**
1-person household	12.8	2.5
2-person household	21.0	3.4
3-person household	19.9	6.6
4-person household	17.2	6.8
5-person household	12.7	10.4
6-person household	7.3	14.7
7-or-more-person household	9.1	24.9

Source: 2010 Census Unedited and Edited Files – Special Tabulation

Table 5 looks at the types of households that responded positively to one of the child undercount probes. Related households are households where all members are related to the householder; nonrelated households are households that include at least one person who is not related to the householder. Related households accounted for the greatest proportion of households that responded positively to a child undercount probe but also had a lower positive-response rate when compared with nonrelated households. More than eight out of every 1,000 nonrelated households responded positively to one of the child undercount probes.

Table 5. Positive Responses to Child Undercount Probes - Household Characteristics

Characteristic	Distribution of Positive Responses	Positive Responses per 1,000 Housing Units
	611,606	**115,606,191**
	100.0	**5.3**
Related households	80.6	4.8
Male householder	45.0	4.3
Female householder	35.6	5.7
Nonrelated households	19.4	8.5
Male householder	10.2	8.3
Female householder	9.3	8.8
	80.6	**4.8**
Husband-wife	42.5	4.7
Female householder, no husband present	26.4	5.5
Other	11.6	4.1
	100.0	**5.3**
	55.9	3.8
Complex	44.1	10.1

*Not complex: 1) a single-parent householder with biological or adopted children or 2) a married-couple household with biological or adopted children.
Complex: All other households.
Source: 2010 Census Unedited and Edited Files – Special Tabulation

We defined complex households as all households other than 1) a single-parent householder with biological or adopted children or 2) a married-couple household with biological or adopted children.

Complex households were far more likely to identify a possible coverage concern involving children than households that were not complex (10 per 1,000 compared with four per 1,000).

5.3 Householder Characteristics

What are the characteristics of the householders that responded positively to the child undercount probes?

Tables 6 and 7 summarize the demographic characteristics of the householder associated with a positive response. The householder is someone who owns or rents the home, is generally the person listed first on the form, and is often the person completing the form or the person the enumerator is interviewing.

A majority of the householders in households responding positively to a child undercount probe were male. However, we see slightly higher positive-response rates for households with a female householder. Householders in households responding positively to a child undercount probe were more often age 30 to 49 than other ages. Householders under age 50 were much more likely than the oldest householders (age 50 or older) to indicate some uncertainty about a child. This result may seem to contradict other analyses that hove shown greater confusion about counting grandchildren (e.g., U.S. Census Bureau 2017). However, the denominator of the positive-response rate in Table 6 is all households with a householder of the given age. For householders age 50+, the vast majority do not live with or have confusion about including a grandchild. This results in a lower positive-response rate for this age group.

Table 6. Positive Responses to Child Undercount Probes - Householder Characteristics

Characteristic	Distribution of Positive Responses	Positive Responses per 1,000 Housing Units
TOTAL	**611,606**	**115,606,191**
Sex of householder	**100.0**	**5.3**
Male	55.1	4.8
Female	44.9	6.1
Age of householder	**100.0**	**5.3**
18-29	15.6	7.0
30-49	47.9	6.9
50+	36.5	3.8

Source: 2010 Census Unedited and Edited Files – Special Tabulation

The distributions in Table 7 indicate that the householders with most of the positive responses were White alone (54 percent of positive responses) and non-Hispanic (73 percent of positive responses). However, we see much higher positive-response rates for householders who reported a race of Black alone, American Indian or Alaska Native (AIAN) alone, Asian alone, Native Hawaiian or Pacific Islander (NHPI) alone, Some Other Race (SOR) alone, and for householders reporting two or more races when compared with householders reporting a race of White alone. Hispanic householders had almost three times the positive-response rate of non-Hispanic householders (12 per 1,000 compared with four per 1,000).

Table 7. Positive Responses to Child Undercount Probes - Householder Characteristics

Characteristic	Distribution of Positive Responses	Positive Responses per 1,000 Housing Units
TOTAL	**611,606**	**115,606,191**
Race of householder	**100.0**	**5.3**
White alone	53.8	3.7
Black alone	22.5	9.9
AIAN alone	1.2	8.3
Asian alone	6.6	8.8
NHPI alone	0.2	9.7
SOR alone	10.6	13.4
Two or more races	5.0	14.1
Hispanic Origin of householder	**100.0**	**5.3**
Hispanic	26.8	12.3
Non-Hispanic	73.2	4.4

AIAN: American Indian or Alaska Native. NHPI: Native Hawaiian or Pacific Islander, SOR: Some Other Race
Source: 2010 Census Unedited and Edited Files – Special Tabulation

DISCUSSION

This report uses data from the 2010 Census to identify households that might have had some confusion about including a young child on their census questionnaire. The first question on the self-response questionnaire asked the respondent to count the number of people living or staying in their home on April 1. The second question asked if they might have omitted some people from that count, including, "*children, such as newborn babies or foster children.*" A similar coverage question appeared on the NRFU questionnaire, although the format differed. Two NRFU probes were child-specific, asking about "*babies*" and "*foster children.*" The enumerator collected the name(s) of the additional people that the respondent didn't initially mention.

Of the 115 million households in the 2010 Census, more than 611,000 (less than 1 percent) responded that they had not included a child staying with them in their initial household count. We don't know why respondents neglected to initially include these children in their household count nor if the 2010 Census should have included the child they were thinking about when they marked this coverage question box. However, we can interpret a positive response to this coverage probe as an indication of some uncertainty on the part of the respondent about whether or not they should include a child on their census form.

Our review of the households with a positive response to this undercount probe about children identifies certain kinds of housing units, households, and householders with relatively high positive-response rates, suggesting that these households had greater challenges in determining how to count young children. These households may benefit from additional education and outreach. Overall, about five out of every 1,000 households marked one of the child undercount probes. Table 9 lists the characteristics of households with positive-response rates of close to 10 per 1,000 or greater. The data suggest that large and complex households and households with Hispanic and non-White householders had the greatest challenges.

Table 8. Summary of Characteristics with High Positive-Response Rates

Characteristic	Positive Responses Per 1,000 Enumerations
7-person households	24.9
6-person households	14.7
Two or more race householders	14.1
Some Other Race householders	13.4
Hispanic householders	12.3
5-person households	10.4
Complex households	10.1
Black householders	9.9
NHPI householders	9.7

NHPI: Native Hawaiian or Pacific Islander

Source: 2010 Census Unedited and Edited Files – Special Tabulation

CONCLUSIONS

A relatively low proportion of all households in the 2010 Census expressed some question about including young children on their forms. These results show, however, that this rate varied considerably based on household characteristics. Large households and complex households were far more likely to indicate that they may have omitted a child. Similarly, Hispanic and non-White households were more likely to self-identify as possibly leaving a child off their roster. Targeted outreach and education to these groups could reduce coverage errors involving children in the 2020 Census.

NEXT STEPS

This research tells us more about the types of households that may erroneously exclude young children from their census forms. It does not, however, tell us why. We can hypothesize that complex living arrangements may make it harder for some households to correctly apply the census residence rules. It would be useful to consider some additional research to study the scanned images of census forms with positive responses to these child undercount probes to better understand the possible context for the errors. If we can create more specific profiles of households at risk of omitting young children, we might be able to build a better methodology to identify and correct these errors in 2020.

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Glossary of Terms

Be Counted Form – The 2010 Census provided "Be Counted Forms" for upon request to individuals who had not received a questionnaire and thought they were not counted in the census. These forms collected critical information to enumerate these people.

Complex households –Households other than households with householder parents with no spouse present or married-couple households with biological or adopted children.

Coverage Followup – A coverage improvement operation in the 2010 Census that recontacted households to review and correct possible coverage errors.

Coverage Followup Add – A person added during the Coverage Followup (CFU) operation. If CFU validated a person listed on the self-response questionnaire (including the extended roster) or after the NRFU undercount question, the person was not considered a CFU add.

Enumerator-completed – Households enumerated in the 2010 Census by an enumerator (in Nonresponse Followup, Update/Enumerate, Vacant/Delete Followup) and count imputation households.

Extended household – Households that contain a child who has a relative present who is not his or her parent or sibling, or who has a nonrelative present.

Fulfillment – In the 2010 Census, a respondent could call to request census materials in different languages. The operation that "fulfilled" those requests was called, "Fulfillment."

Household – All of the people who occupy a housing unit.

Householder – A person who owns or rents the housing unit.

Large household – A self-response questionnaire with a population count of seven or more was considered a large household and was eligible for Coverage Followup.

Mailout/Mailback areas – Areas that received a questionnaire from the U.S. Postal Service with instructions to complete and return the form by mail.

Multigenerational households – Family households consisting of three or more generations. These households include households with a householder, a parent or parent-in-law of the householder and a child of the householder; or a householder, a child of the householder, and a grandchild of the householder; or a householder, a parent or parent-in-law of the householder, a child of the householder, and a grandchild of the householder.

Nonrelated household – A household that includes at least one person who is not related to the householder.

Nonresponse Followup – The operation that followed up on all households that failed to respond by mail to the 2010 Census.

Related household – A household where all members are related to the householder.

Self-response – Households responding to the 2010 Census by mail or during Coverage Followup.

Update/Enumerate areas – Rural areas where census enumerators updated the address list and enumerated households.

Update/Leave areas – Primarily rural areas where census enumerators updated the address list and dropped off questionnaires for respondents to complete and return by mail.

Urban Update/Leave areas – Urban areas where census enumerators updated the address list and dropped off questionnaires for respondents to complete and return by mail.