

Investigating the 2010 Undercount of Young Children – Summary of Recent Research

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Executive Summary

In early 2015, the Census Bureau assembled an Undercount of Young Children Research Team to pursue research on the undercount of young children (defined here as age 0 to 4) in the decennial census. Since then, researchers on this team have analyzed multiple existing datasets to learn more about the undercount of young children in preparation for the 2020 Census. This report summarizes key findings from these studies, which are listed in Appendix A. This report also discusses steps the Census Bureau has taken to improve the count of young children in the 2020 Census based on the research results.

The research adds to our knowledge of the characteristics of the young children who were most at risk of being missed or incompletely enumerated in the 2010 Census. No group of young children was immune from the risk of being missed in the census, but some groups were at higher risk than others. The results underscore the importance of examining young children separately from older children when studying coverage. Young children with the highest risks of coverage errors include:

- Children who were not a biological or adopted child of the householder (i.e., grandchildren, other relatives, and children who were not related to the householder).
- Children who were Hispanic or racial minorities.
- Children living in complex households, defined as all households other than nuclear families, stem families (i.e., single-parent families), and single-person households.
- Children living in renter-occupied housing and multiunit structures.
- Very young children (those born in the few months prior to the census reference day).
- Children living in the largest and the smallest households.
- Children not enumerated by self-response.

There are multiple reasons why young children were missed in the 2010 Census. This research provided evidence of the following:

- Young children were missed because of different types of error, such as the housing unit was missed, the entire household was missed, and part of the household or just the child was missed. Whole-household errors were more common for biological and adopted children while partial-household errors were more common for grandchildren, other relatives, and nonrelatives of the householder.
- Young children were missed because they lived in hard-to-count households with enumeration challenges.
- Young children may have been missed along with their young mothers.
- Cooperative self-respondents made errors when they created household rosters. These often involved children who were not related to the householder or who were relatives other than biological and adopted children.

The Census Bureau has acted on the findings in these studies to improve the count of young children in the 2020 Census as documented beginning on page 11 below. For example, we have updated the wording of solicitation materials and the questionnaire, provided additional training and guidance to enumerators, and engaged in numerous outreach activities to increase awareness

about counting young children. We are actively pursuing additional avenues to address this important topic in the 2020 Census and beyond.

1. Introduction

During 2013, a group of Census Bureau staff from several divisions met on a regular basis to assess available Census Bureau data that could be analyzed to shed additional light on the high net undercount of young children, those age 0 to 4. This task force, known as the Task Force on the Undercount of Young Children, issued a report that documented the efforts they undertook and laid out a set of questions and potential research projects for the Census Bureau to consider (U.S. Census Bureau 2014). The projects identified in the 2014 report included research that could be undertaken with existing data as well as research that would require the collection of new data. In discussing possible analyses that would yield insights into the high net undercount of young children, the task force (U.S. Census Bureau 2014, page ii) concluded,

“Additional research using existing 2010 datasets, such as Demographic Analysis, population estimates, the planning database, census control and response files, and Census Coverage Measurement, holds promise to provide greater insights into causes and possible solutions.”

In early 2015, the Undercount of Young Children Research Team was assembled to pursue some of the suggestions from the 2014 report. Since then, researchers on this team have analyzed several existing datasets to learn more about the undercount of young children in preparation for the 2020 Census. This report summarizes key findings from these studies. Some of these findings reflect new information while others underscore or expand on previous research. Often, the findings highlighted here were observed in more than one of the reports. The methodologies and the analyses from those studies appear in a set of reports available on the Census Bureau website as part of the 2020 Census Memorandum Series¹. Appendix A lists all of the reports in the 2020 series that were produced by this research team along with a short description of each report.

2. Data Sources

The work discussed in this summary report involved many different datasets and several different methodological approaches. None of the existing data that the research team analyzed were collected specifically to study the undercount of young children. For this reason, most of the studies have important limitations. The data do not allow us to conclude how many young children were missed with a certain characteristic nor because of a certain reason. Rather, the results provide evidence of potential coverage errors for young children and how these errors may differ for subgroups. Appendix B provides brief descriptions of our methodological approaches and data sources, but readers are encouraged to review the original reports for more complete and detailed explanations of the datasets, methods, and limitations associated with each of these studies.

¹ <https://www.census.gov/programs-surveys/decennial-census/2020-census/planning-management/memo-series.html>

3. Key Findings from New Research on the Undercount of Young Children

The Undercount of Young Children Research Team identified the list of key findings provided below. In many cases the results reflect evidence from more than one study. We organized the findings into four categories. The first category includes information about the characteristics of young children with a higher likelihood of being missed in the 2010 Census. The second category provides a geographic perspective to examine where errors in counting young children were more likely to occur. The third category focuses on results that shed light on possible reasons why young children were missed in the 2010 Census. The final category highlights that coverage errors involving young children exist outside of the decennial census; several key household surveys share the same problem.

3.1. Characteristics of young children with higher risks of being missed in the 2010 Census

Our research found that young children with the following characteristics had greater evidence of potential coverage error. These findings provide a better idea of the types of children likely to be missed and the living situations that contribute to the undercount of young children. This information can be used to help guide communication and outreach efforts in the 2020 Census. This information could also be used to help train Nonresponse Followup (NRFU) enumerators and determine where to allocate greater resources in the 2020 Census.

- **Children with a relationship to the householder other than biological child or adopted child**

Several analyses found that young children who were biological children or adopted children of the householder had a lower risk of being missed than young children who were grandchildren, other relatives, or not related to the householder (U.S. Census Bureau 2017c, Table 6; U.S. Census Bureau 2017d, Table 10). This was true for children in households enumerated by both self-response and NRFU. (NRFU is the operation in which census workers go door-to-door to complete in-person interviews with households that did not self-respond to the census.) These results suggest that respondents may be uncertain about including grandchildren, other relatives, and nonrelatives on their census rosters.

A closer look at one of our data sources revealed that for 2-person households, there was no difference in the evidence of potential coverage error by relationship to the householder. In contrast, young children living in all other household sizes had more evidence of potential coverage error when the young child's relationship to the householder was something other than a biological or adopted child (U.S. Census Bureau 2019c, Table 8). Similarly, young children with a relationship other than biological or adopted child had more evidence of potential coverage error regardless of race and Hispanic origin (U.S. Census Bureau 2019c, Table 8).

These findings are consistent with earlier research by Martin (1993, 1999, and 2007) who found that people with more tenuous ties to a household or householder were more likely to be missed. Martin calls this "residential ambiguity." Also, according to West and Robinson (1999, page 10) among the characteristics that may make a child vulnerable to being missed in the census is "a child who resides in a situation where he or she is only loosely connected to the

household, perhaps without a stable place of residence for long periods of time” and “a child that lives in more than one residence.”

These results are important because there is limited previous statistical research showing the connection between a young child’s relationship to the householder and the likelihood of being missed in the census.

- **Children who were racial or Hispanic minorities**

Several analyses found that young children who were racial or Hispanic minorities had a greater risk of being missed in the 2010 Census than young children who were White and young children who were non-Hispanic (U.S. Census Bureau 2017c, Table 5; U.S. Census Bureau 2017d, Table 10). The same patterns were evident when the race of the householder rather than the race of the child was examined (U.S. Census Bureau 2017b, Table 7; U.S. Census Bureau, 2017c, Table 12; U.S. Census Bureau 2017d, Table 12).

In three Census Bureau surveys, the estimated coverage rates were lower (indicating greater coverage error) for Hispanic young children and non-Hispanic Black young children compared with non-Hispanic White children (U.S. Census Bureau 2019a, Tables 2, 5 and 7).

These findings reinforce patterns seen in earlier studies. Velkoff (2011) documented a persistent high net undercount for Blacks since 1970. Hogan et al. (2013) described several differences in census undercoverage by race and Hispanic origin. O’Hare (2015, page 34) found young Black alone-or-in-combination and young Hispanic children had net undercount rates higher than average. The new findings provide evidence of potential coverage error for more detailed race groups than the net coverage estimates provided by DA, such as for American Indian & Alaska Native and Native Hawaiian & Pacific Islander young children.

These findings are important because they extend and underscore past research showing racial and Hispanic minorities have a greater risk of being missed in the census. This research is specific to young children and shows that the racial and ethnic differentials in coverage for the total population and for adults were also seen in young children.

- **Children living in complex households**

We define complex households as all households other than nuclear families, stem families (i.e., single-parent families), and single-person households. Complex households may be more difficult for the Census Bureau to enumerate and measure accurately. Data show that 40 percent of young children lived in complex households in 2010 compared with 33 percent of children age 10 to 17 (U.S. Census Bureau 2018, Table 1). The proportion of young children living in a complex household varied by race and Hispanic origin with more than 50 percent of Black, American Indian & Alaska Native, Native Hawaiian & Pacific Islander, and Hispanic young children living in a complex household in 2010 (U.S. Census Bureau 2018, Table 2).

We found more evidence of potential coverage error for young children living in complex households compared with young children living in households that were not complex (U.S. Census Bureau 2017b, Table 5; U.S. Census Bureau 2017c, Table 10; U.S. Census Bureau 2017d, Table 12). Specific types of complex households with more evidence of coverage error for young children included multigeneration households, skip-generation households, and family

households with other relatives or nonrelatives present (U.S. Census Bureau 2018, Tables 4 and 6).

The types of coverage error for young children differed by household type (U.S. Census Bureau 2019c, Table 6). We found more evidence of partial-household coverage error for young children in complex households. These were instances where the young child and possibly some, but not all, other household members may have been missed. In contrast, we found that children in households that were not complex were more likely to have been missed along with the whole household.

- **Children living in renter-occupied housing units and multiunit structures**

The potential for coverage error was higher for young children living in renter-occupied housing units and in multiunit structures (U.S. Census Bureau 2017b, Table 2; U.S. Census Bureau 2017d, Table 11).

These findings are consistent with past research that shows differential coverage by tenure with higher net undercount rates for people living in rental units compared with owner-occupied units (U.S. Census Bureau 2012). Tenure is listed as part of the Hard-to-Count factors (Bruce et al. 2001) as well as in the Census Bureau's Low Response Scores (Erdman and Bates 2017).

- **Children living in the smallest and the largest households**

Some of the data sources showed that children living in the largest households (generally six or more people) had the greatest evidence of potential coverage error (U.S. Census Bureau 2017b, Table 4; U.S. Census Bureau 2017c, Table 9). Analysis of housing data from the Census Bureau's Planning Data Base showed more evidence of potential coverage error for census tracts with the highest proportion of crowded housing (housing units with 1.01 or more occupants per room) (U.S. Census Bureau 2017f, Tables 8 and 15). Overcrowded housing units typically have larger household sizes.

Another source of data suggested that young children living in two-person households were most at risk of being missed (U.S. Census Bureau 2017d, Table 12). These are households where the young child lived with a single adult. These young children may have been missed along with the adult. Young children who were not a biological or adopted child of the householder had evidence of being missed across household sizes. Biological and adopted young children living in large households appear to have less of a coverage problem (U.S. Census Bureau 2019c, Table 8).

Household size has been suggested as a factor in census undercounts in the past. Erdman and Bates (2017) found that the variable "persons per household" was negatively associated with the 2010 Census mail return rate. These results are important because they identify a household characteristic (size of household) that is associated with potential coverage error.

- **Children who moved around the time of the census**

Data show 20 percent of young children moved in the previous year compared with only 12 percent of children age 10 to 17 (U.S. Census Bureau 2017e, Table 5). Our research showed that young children who moved within the few months after Census Day had more evidence of

coverage error than young children who did not move during these months (U.S. Census Bureau 2017d, Table 11). Mobility increases the risk of census omission. Martin (1999) cites mobility's association with high rates of census omissions.

- **Very young children**

Demographic Analysis (DA) estimates show that net coverage error generally falls as the age of the child increases. DA estimates also indicate that net coverage error is lower for children under age 1 than children ages 1 to 4 (U.S. Census Bureau 2014). A closer look at the very youngest children (those born in 2010) revealed that these children may be missed at a higher rate than the estimates of net coverage suggest. There is evidence that many of the children with a date of birth that was edited to be in January, February, and March of 2010 were children born after April 1, 2010, and should not have been included in the 2010 Census (U.S. Census Bureau 2019b). Without these erroneous inclusions, children under the age of 1 would have a net coverage error rate consistent with, or greater than, those for children age 1 and 2.

This finding explains why the 2010 Census coverage appears to improve for the very youngest children. The reality is that coverage may be worse for the very youngest children (those less than 3 months old). This is more consistent with hypotheses offered for the overall coverage pattern for young children. This finding also highlights the need to develop outreach and education programs to reduce omissions of these youngest children in 2020.

- **Children who were enumerated in the NRFU operation**

Our research showed more evidence of coverage error for young children in households that required NRFU than for young children in households that self-responded (U.S. Census Bureau 2017d, Table 13). This was especially true for young children living in households enumerated by a proxy respondent (e.g., a neighbor). This finding was likely because NRFU respondents, especially proxies, often did not provide complete name and characteristic information. These results for young children are likely also true for older children and adults.

3.2. Geographic areas with the greatest evidence of coverage errors involving young children

These findings are important because they help determine where the evidence for potential coverage error for young children is the highest, and this information can be used to help direct 2020 Census resources more effectively. The new research found clustering of potential coverage errors in certain areas.

- **States and counties**

We examined our indications of potential coverage errors in terms of totals and rates. Totals allow us to see where more potential coverage errors occurred, but this is strongly correlated with the size of the state or county. Rates take the size of the state or county into account and describe the proportion of households with potential coverage error for young children.

Not surprisingly, the five largest states in terms of total young children (California, Texas, New York, Florida, and Illinois) had the highest total indications of potential coverage error for

young children (U.S. Census Bureau 2017g, Tables 1 and 7). These five states included 38 percent of the young children counted in the 2010 Census. In terms of rates of potential coverage error, some of these large states also had high rates (California and New York). Other states with high rates of potential coverage error included Georgia, Hawaii, Maryland, and Mississippi (U.S. Census Bureau 2017g, Tables 5 and 11).

As with states, the largest counties had the highest total indications of potential coverage error for young children (U.S. Census Bureau 2017g, Tables 3 and 9). A review of the rates of potential coverage error found clustering of counties with high rates in the following areas (U.S. Census Bureau 2017g Figures 5 and 8).

- North Carolina, South Carolina, and Georgia.
- Throughout the Gulf Coast states, especially along the lower Mississippi River in Louisiana and Mississippi.
- Throughout Texas.
- Southern California.
- Bronx, Kings, and Queens counties in New York.
- In Maryland near the District of Columbia and Baltimore.
- Concentrations in Hawaii, Arizona, and New Mexico.

Despite higher rates often found for large counties, the results show that counties of all sizes share this coverage problem to some degree. Respondent errors involving young children were not limited to large urban centers.

- **Types of neighborhoods**

The Esri Tapestry and the Census Bureau's Planning Data Base (PDB) segmentation analysis identified neighborhoods and types of areas with high rates of potential coverage error for young children. See Appendix B for a description of these data sources. The PDB analysis identified several types of neighborhoods that had problems rostering young children in the 2010 Census, including neighborhoods with low predicted mail return rates, those with language barriers, low educational attainment, high levels of poverty, and high rates of unemployment (U.S. Census Bureau 2017f, Table 17). The Esri Tapestry segments with the highest rates of potential coverage error tended to be neighborhoods with recent immigrants, language barriers, and complex household compositions (U.S. Census Bureau 2017f, Table 17). These segments were concentrated in the South and West. The Esri Tapestry analysis showed that problems rostering young children were more likely to occur in neighborhoods in and around large urban centers.

3.3. Reasons for undercoverage of young children

The results show that young children were missed in the 2010 Census for many reasons. There was not just one factor or cause that explains the high net undercount of young children and the reasons likely vary by the child's relationship to the householder.

These findings are important because they provide some evidence about where the 2020 Census should focus outreach and education efforts. They point to areas where research findings should

shape messaging for the 2020 Census. This research identifies potential avenues to reach parents of young children and highlights the need for language support.

The new research identified the following as possible explanations for the high net undercount of young children.

- **Housing unit coverage error**

We found evidence that some young children may have been omitted from the census because they were living in housing units that were not included on the final list of census addresses (U.S. Census Bureau 2017d, Table 8). Those housing units may have never been on the address list or they may have been deleted by one of the 2010 Census operations. The evidence for this type of error was more common for biological or adopted children than for children of other relationship types (U.S. Census Bureau 2019c, Table 5).

- **Errors enumerating the entire household**

Many children may have been missed with their whole household. This could occur when the address was included in the census but the entire household was either missed, enumerated in the wrong location, or enumerated without complete name and demographic information (U.S. Census Bureau 2017d, Table 8). Like the housing unit coverage error, the potential evidence for this type of error was more common for biological or adopted children than for children of other relationship types. Similarly, the potential evidence for this type of error was more common for children living in households that were not complex (U.S. Census Bureau 2019c, Table 5).

- **Within-household omissions**

Some children may have been missed with part, but not all, of their household. These situations may represent rostering errors with a child being omitted in error or a child along with his or her subfamily being omitted (U.S. Census Bureau 2017d, Table 8). The evidence for this type of coverage error was more common for children who were not the biological or adopted child of the householder (U.S. Census Bureau 2019c, Table 5).

- **More young children live in hard-to-count households and housing units**

Young children may be more likely to be missed than older children because of the characteristics of their household, their living arrangements, and the characteristics of their housing unit. It is possible that all household members in these situations suffer from enumeration errors.

Based on analysis of 2010 Census data (U.S. Census Bureau 2017a Figure 4), young children were more likely than older children to be:

- Living with a householder who is a grandparent.
- Living with a young householder (age 18 to 29).
- Living in a household that is not enumerated by self-response.
- Living in a complex household.
- Living in a renter-occupied household.

Based on analysis of 2010-2014 American Community Survey (ACS) data (U.S. Census Bureau 2017e Figure 2), young children were more likely than older children to be:

- Living in a household that received public assistance or Supplemental Nutrition Assistance Program (SNAP) benefits (food stamps).
- Living in a household with income below the poverty threshold.
- Living with a mother not in the labor force with no spouse present.
- Living with one parent.
- Living at a different address from where they lived one year ago.
- Living with a grandparent who is not responsible for the child.

There were also several hard-to-count characteristics where young children (age 0 to 4) and older children (age 10 to 17) had similar distributions, such as living in a household with six or more people (U.S. Census Bureau 2017a, Table 7) and living in a Spanish-speaking household with limited English proficiency (U.S. Census Bureau 2017e, Table 12).

These findings are important because they help focus attention on the characteristics that might explain the differences in census coverage for younger and older children. Any explanation of why young children were missed in the 2010 Census at such a high rate must explain why the coverage of young children was so different from that of older children. This research shows that young children were different from older children in several ways that are likely to make them more difficult to enumerate correctly.

These results are consistent with past research (O'Hare 2015, pages 90 to 96). The results extend and underscore past research showing young children have living situations that elevate their risk of being missed in the census.

- **Errors enumerating young mothers and their young children**

New young mothers were missed in the ACS at a higher rate than new older mothers. It seems reasonable to assume that coverage patterns seen in the ACS are similar to those seen in the decennial census. The estimated number of women age 15 to 19 who reported they had given birth in the past 12 months in the ACS was lower than the estimate derived from vital events data from the National Center for Health Statistics (U.S. Bureau of the Census 2016a, Table 3).

The marital status of the mother was an important determinant of coverage. The estimated number of young unmarried women giving birth in the past 12 months from the ACS was lower than the vital statistics estimate of births to young unmarried women. For young married mothers, the population estimates from the ACS and the vital statistics were similar, which does not suggest coverage error for this group (U.S. Census Bureau 2016a, Table 7).

It seems likely that if the mother of a newborn was not included in the census, then the newborn child was probably missed as well. These results are consistent with the findings in the 2011 Canadian census that young children were more likely to be missed if they lived with an unmarried young mother (Dolson 2013).

Analysis also showed that households with a householder age 18 to 29 (a similar age group to the young mothers) had higher rates of potential coverage error for young children when compared with households with older householders (U.S. Census Bureau 2017b, Table 6).

These results are important because they document a living situation where young children may be missed in the census because their mothers were also missed. It highlights a situation where householders or other potential respondents need to be educated on this issue.

- **Respondents make errors when they complete self-response forms**

Analysis of the data identified coverage errors for young children on self-response questionnaires that a Coverage Followup operation was able to correct (U.S. Census Bureau 2017c, Table 8). This indicates that respondents who were willing to complete a census questionnaire and return it by mail had some confusion about including young children when they completed their forms. Thus, the high net undercount of young children is not simply a product of households that do not self-respond to the census.

3.4. The undercount of young children is not limited to the decennial census

The undercount of young children was greater than the undercount of older children and adults in three Census Bureau surveys. In the 2015 ACS, children under age 5 had a lower coverage rate (i.e., higher coverage error) than children age 5 to 9, children age 10 to 17, and adults (U.S. Census Bureau 2019a, Table 1). Similar results were found for the 2015 Current Population Survey and the 2008 Survey of Income and Program Participation (U.S. Census Bureau 2019a, Tables 4 and 6).

This finding reinforces similar findings from earlier research (O'Hare et al. 2013; O'Hare and Jensen 2014) that show lower coverage rates for young children in surveys. Martin (2007, page 436) concluded, "The same groups that are affected by coverage errors in the census also are affected in demographic surveys conducted by the U.S. Census Bureau and other organizations."

The results indicate that the problems with coverage of young children in the 2010 Census are also present in other data collections activities. It suggests that processes, mechanisms, and methods used in the decennial census that lead to a high net undercount of young children may also be found in major Census Bureau surveys. Moreover, if methods can be found that reduce the underreporting of young children in surveys, those methods may have applications in the census context as well. This finding is also important because it suggests there may be undetected undercounts of young children in other surveys conducted by federal statistical agencies. The results suggest the underreporting of young children could be a widespread problem.

4. Improving the Count of Young Children in the 2020 Census

In April 2017, the Census Bureau established an implementation team to oversee activities and operational changes to improve the count of young children in the 2020 Census. This implementation team began acting on the findings from the research summarized in this report. This section describes the activities the implementation team worked on in preparation for the

2020 Census. While the Census Bureau is engaged in a number of activities to improve the accuracy of the 2020 Census (e.g., increased language support from the 2010 Census), we discuss those efforts specific to the count of young children here. In addition to the activities below, the Census Bureau continues to explore ways to address the undercount.

- **Updated language about counting young children**

The team updated the wording of various census materials to reinforce the idea that the census counts everyone in the household, regardless of age or relationship to the householder. For the primary solicitation materials that most households will receive, the message to the respondent requests help counting “all adults, children, and babies living or staying at this address” instead of simply “everyone living or staying at this address.”

The team updated the wording of the undercount probe on the census questionnaire. This is a question that asks respondents if there were any additional people staying in the household who were not included in the household count provided in the previous question (see Appendix B for the 2010 undercount probe). The undercount probe provides a list of types of people who may be likely to be missed. The team updated the category about children to specifically mention “grandchildren” and “unrelated” children based on the findings about relationship to the householder discussed in this report.

The team included help text in the internet self-response instrument to provide additional guidance to respondents about counting young children. The help text instructs the respondent to count “babies and children of all ages (even newborns and infants)” and other types of children who are living or staying at the address most of the time around April 1.

- **Updated enumerator training materials**

The team improved enumerator training materials to emphasize the importance of including young children. Online training modules for NRFU enumerators included language to specifically mention counting babies and children, similar to the changes for the solicitation materials mentioned above. Knowledge check questions were added to reinforce that the census counts children of all ages. In-class trainings added a case study about counting young children. The enumerators work through a scenario where a respondent is caring for his grandchild. The exercise highlights the importance of counting children and people who may be staying at an address temporarily. Similar training scenarios are included for Census Questionnaire Assistance (CQA) enumerators. CQA is the telephone response option for the 2020 Census. The team also included content and topics related to counting children in the Frequently Asked Questions available to NRFU and CQA enumerators.

- **Outreach and awareness**

The team worked with the Partnerships and Communications teams to make sure they understood that an accurate count of young children is an important message in our outreach to respondents and communities. While creative development and the specifics of the communications plans have not yet been finalized, the Census Bureau has made it known that counting children will be an important component of the outreach efforts.

The team developed an infographic that summarizes the research to explain situations in which young children may be missed by the census and suggest ways for partners to discuss these situations with their communities and constituents². An entry in the Census Bureau Director's Blog recently discussed the undercount of young children³. The blog provided an overview of the findings from the research team and the work being done to improve the count of young children in the 2020 Census.

The team engaged with external groups, including the National Advisory Committee, the Partnership for America's Children, and the Census Information Centers. In April 2018, they conducted a Census Solutions Workshop in Providence, RI, hosted by the Urban League of Rhode Island that focused on the undercount of young children. These workshops bring together various organizations to discuss outreach strategies and ideas for achieving a complete and accurate count for the 2020 Census. The Statistics in Schools program is also looking to expand to Pre-K and network with schools in hard-to-count areas.

5. Conclusion

The Census Bureau has acknowledged that young children have experienced a high net undercount in the decennial census for decades. The 2014 report from the Task Force on the Undercount of Young Children found, however, that little research had been undertaken to document the characteristics of undercounted young children or to research the possible causes for this undercoverage. The Undercount of Young Children Research Team was able to leverage existing data to expand our understanding of the undercount of young children in the census.

The research summarized in this report tells us more about the young children that the 2010 Census may have missed and the households where they lived. The research begins to address the question of why young children are at a greater risk than older children or adults of being omitted during the census, but despite the advances spelled out in this report, much is still unknown. Continued research is necessary to improve the coverage of young children in the decennial census and in surveys such as the ACS, Current Population Survey, and Survey of Income and Program Participation.

The task force report expected that there were multiple reasons for the undercoverage of young children and that multiple efforts would be required to reduce the error. The research presented in this report underscores the extent to which there is no single answer to why young children are missed in the census at such a high rate.

The research reflected in this report is one step in the Census Bureau's effort to improve the count of young children. The Task Force on the Undercount of Young Children that operated in 2013 and issued a report in 2014 raised this issue higher on the Census Bureau's agenda and provided suggestions for further research. The research documented in this report reflects the results of

² <https://www.census.gov/library/visualizations/2018/comm/counting-children-2020.html>

³ https://www.census.gov/newsroom/blogs/director/2018/07/improving_our_count.html

many of the analyses suggested in the 2014 task force report. The 2020 Census could benefit from the results of this research by targeting areas and types of households with some of the greatest risks of undercoverage of young children. The findings from these studies can be used to enhance the allocation of Census Bureau resources to the geographic areas that are most at risk of missing young children in the census, improve the communication and outreach to the types of households and families that are most at risk of omitting young children, and improve enumerator training. We recommend that many of the analyses discussed in this report be repeated after the 2020 Census.

The implementation team launched in 2017 began to oversee operational changes in the 2020 Census to reduce the undercount of young children. These activities will continue to help improve the count of young children in the 2020 Census. Recently, a new 2020 Census Undercount of Young Children Task Force has been established to organize and champion these efforts and to identify additional efforts to understand and address the potential undercount of children in the 2020 Census.

6. References

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U.S. Census Bureau (2017a). Investigating the 2010 Undercount of Young Children – A Comparison of Demographic, Housing, and Household Characteristics of Children by Age, January 18, 2017.

U.S. Census Bureau (2017b). Investigating the 2010 Undercount of Young Children – Child Undercount Probes, January 19, 2017.

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U.S. Census Bureau (2017d). Investigating the 2010 Undercount of Young Children – Analysis of Census Coverage Measurement Results, January 19, 2017.

U.S. Census Bureau (2017e). Investigating the 2010 Undercount of Young Children – A Comparison of Demographic, Social, and Economic Characteristics of Children by Age, July 25, 2017.

U.S. Census Bureau (2017f). Investigating the 2010 Undercount of Young Children – Analysis of Coverage Followup Results Using the Esri Tapestry Segmentation and Planning Database, July 25, 2017.

U.S. Census Bureau (2017g). Investigating the 2010 Undercount of Young Children – Geographic Distribution of Coverage Followup Results, July 25, 2017.

U.S. Census Bureau (2018). Investigating the 2010 Undercount of Young Children – Analysis of Complex Households, December 4, 2018.

U.S. Census Bureau (2019a). Investigating the 2010 Undercount of Young Children – Examining Coverage in Demographic Surveys, January 15, 2019.

U.S. Census Bureau (2019b). Investigating the 2010 Undercount of Young Children – Net Census Coverage of Very Young Children, January 15, 2019.

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Appendix A – List of Reports from Census Bureau Research Team on the Undercount of Young Children

Coverage of Young Mothers

This report used data from vital statistics and from the American Community Survey (ACS) to estimate survey coverage of new mothers by maternal age, marital status, and race. The results suggest that the ACS and likely the decennial census undercount young mothers, especially young, unmarried mothers. It is possible that the census misses young children along with their young mothers.

U.S. Census Bureau (2016a). 2020 Census Research and Testing Investigating the 2010 Undercount of Young Children – Examining the Coverage of Young Mothers, June 7, 2016

Census Omissions by Age

In this report, estimates from Demographic Analysis (DA) and Census Coverage Measurement (CCM) were combined to produce new estimates of census omissions by age. CCM estimates of erroneous enumerations and counts of whole-person imputations were also compared by age. The research found that a high omission rate, not a low erroneous enumeration rate or a low whole-person imputation rate, is driving the high net undercount of young children.

U.S. Census Bureau (2016b). Investigating the 2010 Undercount of Young Children – A New Look at 2010 Census Omissions by Age, July 26, 2016.

Characteristics of Children by Age

These two reports compared the characteristics of the youngest children (age 0 to 4) with those of older children in two age groups (age 5 to 9 and age 10 to 17). The first report used data from the 2010 Census, summarizing demographic, housing, and household characteristics. The second report used detailed demographic, social, and economic data from the 2010 to 2014 ACS five-year estimates. Both reports found that young children were more likely than older children to live in the kinds of households and housing units known to have greater enumeration challenges and coverage errors.

U.S. Census Bureau (2017a). Investigating the 2010 Undercount of Young Children – A Comparison of Demographic, Housing, and Household Characteristics of Children by Age, January 18, 2017.

U.S. Census Bureau (2017e). Investigating the 2010 Undercount of Young Children – A Comparison of Demographic, Social, and Economic Characteristics of Children by Age, July 25, 2017.

Analysis of the 2010 Coverage Followup (CFU) and Child Undercount Probes

These reports used data from the 2010 Census CFU operation. The first report profiled the characteristics of the households that responded positively to one of the 2010 Census child-specific coverage probes. It identified certain household types as having a greater likelihood of marking one of the child-specific coverage probes, which may reflect confusion about including a child on their

census form. The second report identified the young children who were added to a 2010 Census questionnaire based on follow-up interviews in CFU. The report found several characteristics with high CFU add rates, indicating that these types of households made errors when they initially completed their census forms. Results from the undercount probes and the CFU operation were also used to study the geographic distribution of errors involving young children.

U.S. Census Bureau (2017b). Investigating the 2010 Undercount of Young Children – Child Undercount Probes, January 19, 2017.

U.S. Census Bureau (2017c). Investigating the 2010 Undercount of Young Children – Examining Data Collected During Coverage Followup, January 19, 2017

U.S. Census Bureau (2017f). Investigating the 2010 Undercount of Young Children – Analysis of Coverage Followup Results Using the Esri Tapestry Segmentation and Planning Database, July 25, 2017.

U.S. Census Bureau (2017g). Investigating the 2010 Undercount of Young Children – Geographic Distribution of Coverage Followup Results, July 25, 2017.

Census Coverage Measurement

In these reports, nonmatch rates derived from CCM results were used to examine the characteristics of young children who were enumerated in the 2010 CCM survey, but could not be matched to a 2010 Census record. The results provided a profile of the types of young children who were most at risk of undercoverage.

U.S. Census Bureau (2017d). Investigating the 2010 Undercount of Young Children – Analysis of Census Coverage Measurement Results, January 19, 2017.

U.S. Census Bureau (2019c). Investigating the 2010 Undercount of Young Children – Further Analysis of Census Coverage Measurement Results, January 15, 2019.

Complex Households

In this report, 2010 Census data on relationship to the householder were used to construct a detailed set of household types and those household types were categorized as complex or noncomplex. This typology was used to study the distribution of young children across household type and to examine the relationship between household type and potential coverage error.

U.S. Census Bureau (2018). Investigating the 2010 Undercount of Young Children – Analysis of Complex Households, December 4, 2018.

Coverage in Demographic Surveys

This report used population estimates to produce measures of coverage error for children in three age groups in three major Census Bureau surveys. The results showed a strong pattern of undercoverage for young children (age 0 to 4).

U.S. Census Bureau (2019a). Investigating the 2010 Undercount of Young Children – Examining Coverage in Demographic Surveys, January 15, 2019.

Coverage of Very Young Children

Vital statistics and detailed 2010 Census data on date of birth were used to estimate coverage for the youngest children (age 0). The research found that children born in 2010 may have been missed at higher rate than the DA estimates of net coverage error suggest.

U.S. Census Bureau (2019b). Investigating the 2010 Undercount of Young Children – Net Census Coverage of Very Young Children, January 15, 2019.

Appendix B – Overview of Data Sources and Methodology

To research the undercount of young children in the 2010 Census, the research team looked at the sources of data listed below.

2010 Census Data

Several projects used edited data from the 2010 Census. Edited data refers to the final census dataset after all edits of inconsistent reported data and imputations of missing data have been performed.

One project summarized edited data for children in three age groups to better understand how the characteristics of young children may have differed from those of older children in 2010. This research compared demographic, housing, and household characteristics of children age 0 to 4 with children age 5 to 9, and children age 10 to 17. The data source for all estimates was the 2010 Census Edited File. In addition to summarizing age, sex, race, and Hispanic origin distributions for the children in each age group, the study analyzed the relationship of children to the householder and the age, race, and Hispanic origin of the householder. The report also summarized housing characteristics such as type of structure and household characteristics such as the size of the household, tenure, and the mode of census enumeration.

2010 Census data on age and date of birth were used to study the coverage of very young children. The 2010 Census imputation flags allowed us to identify census records with reported date of birth versus imputed information about month and year of birth. In addition, comparisons were made of aggregate vital statistics estimates of births by month and year to 2010 Census counts of children by month and year of birth.

Data collected in the 2010 Census relationship question were used to examine the living situations of children. In the 2010 Census, a household included all of the people who occupied a housing unit. In each housing unit, one person was designated as the householder (generally a person who owns or rents the housing unit) and all other people in the housing unit reported their relationship to the householder (Figure 1).

2. How is this person related to Person 1? Mark ONE box.

<input type="checkbox"/> Husband or wife	<input type="checkbox"/> Parent-in-law
<input type="checkbox"/> Biological son or daughter	<input type="checkbox"/> Son-in-law or daughter-in-law
<input type="checkbox"/> Adopted son or daughter	<input type="checkbox"/> Other relative
<input type="checkbox"/> Stepson or stepdaughter	<input type="checkbox"/> Roomer or boarder
<input type="checkbox"/> Brother or sister	<input type="checkbox"/> Housemate or roommate
<input type="checkbox"/> Father or mother	<input type="checkbox"/> Unmarried partner
<input type="checkbox"/> Grandchild	<input type="checkbox"/> Other nonrelative

Figure 1. Facsimile of 2010 Census Relationship Question

Below is a summary of the detailed types of households identified in this study, grouped into not complex households and complex households. Readers are referred to the report for the definitions of each household type (see U.S. Census Bureau 2018).

Not Complex Households: *Nuclear family, Single-Parent Family (Stem family), Single-Person households*

Complex Households: *Blended family, Multigenerational family, Family with other relatives, Skip-generation household, Family with unmarried partner, Family with other nonrelatives, Nonfamily with unmarried partner, Nonfamily – other complex, and all other complex combinations*

In addition to summarizing the distribution of enumerated young children across these household types, the complex household typology was used in other analyses to determine if young children living in complex households were at higher risk of coverage error in the 2010 Census.

2010 Census Operational Data

The 2010 Census self-response questionnaire first asked households to determine the total number of people living in the housing unit (Figure 2).

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

Number of people =

Figure 2. Facsimile of Population Count Question on 2010 Census Self-Response Questionnaires

Immediately following this question, there was a question designed to identify possible census omissions (Figure 3). Note that the first response category explicitly asks about “children, such as newborn babies or foster children.”

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 3. Facsimile of Undercount Question on 2010 Census Self-Response Questionnaire

Questionnaires with a positive response to any of the first four boxes in Figure 3 were eligible for Coverage Followup (CFU). CFU was an operation in the 2010 Census that recontacted households where it appeared there might be a coverage error. The questionnaire used in NRFU and Update/Enumerate included a similar undercount question that was asked after the enumerator obtained the household roster.

Data from the CFU operation were analyzed in two different ways. First, we noted if a household responded positively to one of the undercount probes related to children. Positive responses identify respondents (households and householders) who had some confusion about whether they should be including a child when they completed their census forms. Positive-response rates were based on the ratio of the number of households with a positive response to a child-specific undercount question to the number of total households. Second, we noted if a young child was added to the 2010 Census count based on the CFU operation. Young children added to the 2010 Census are children that the 2010 Census would have omitted without the CFU operation. CFU add rates were based on the ratio of the number of CFU-added young children to the number of total young children. Positive-response rates and CFU add rates were produced for several population subgroups and displayed as positive-responses per 1,000 households and CFU-added young children per 1,000 total young children.

Both the positive-response rates and the CFU add rates were also examined from a geographic perspective to identify states, counties, and neighborhoods with high rates. We consider areas with high rates of positive responses or CFU adds to indicate areas with greater risks of coverage error involving young children.

Census Coverage Measurement

The 2010 Census Coverage Measurement (CCM) operation was designed to evaluate coverage in the 2010 Census. As part of the CCM operation, a post-enumeration survey was conducted in a sample of census blocks around the country. In each sampled block, addresses were listed and a roster of people was obtained for each household as it existed at the time of the CCM interview. The CCM operation attempted to match all people in the CCM sample to where they were living on Census Day. The CCM program produced estimates of net undercoverage and components of coverage error. Two research projects leveraged CCM results.

The first project used the components of coverage derived from the CCM. The study of 2010 Census omissions by age involved combining CCM data and Demographic Analysis data to provide a more complete and accurate picture of omissions, erroneous enumerations, and whole-person imputations of young children in the 2010 Census (see Demographic Analysis, below).

The second project used microdata from the CCM, specifically, records of young children who were identified in the CCM survey that could not be matched to a 2010 Census record. The study of CCM nonmatching young children defined nonmatch rates as the ratio of young children in the CCM sample with a given characteristic that were nonmatches to all young children in the CCM survey with that characteristic. Nonmatches include true census omissions, cases with insufficient data for matching, cases where the census counted the person in the wrong area, and cases erroneously

included in the CCM sample. The study also examined the match status for the housing unit and the people in the household other than young children.

Demographic Analysis

Demographic Analysis (DA) is a set of techniques used to develop national population estimates by age, sex, and race. DA estimates are constructed using vital statistics, estimates of net international migration, and, for the population age 65 and over, data from Medicare. The Census Bureau uses DA estimates to assess the quality of the decennial census. The study of 2010 Census omissions by age used CCM and DA results to estimate omissions, erroneous enumerations, and whole-person imputations in the 2010 Census. Gross omissions were defined as the difference between the DA-based estimate of total population for a certain group and the CCM estimate of correct enumerations for that group. Gross omission rates were defined as the ratio of omissions to the DA-based estimate of total population.

Population Estimates

The Census Bureau's Population Estimates Program (PEP) produces estimates of the population for the United States and Puerto Rico. The PEP also releases subnational estimates for states, counties, cities, towns, and municipios. The PEP uses data on births, deaths, and migration to calculate population change since the most recent decennial census. For children under age 10 in 2010, the population estimates are based only on births, deaths, and migration because these children were born after the 2000 Census.

We used the PEP estimates to construct survey coverage rates by age, race, and Hispanic origin for three major demographic surveys conducted by the Census Bureau—the American Community Survey (ACS), the Current Population Survey (CPS), and the Survey of Income and Program Participation (SIPP). Survey coverage rates were calculated as the ratio of the population estimate from the survey to the PEP estimate. The percent undercount of a population in a survey is expressed as the difference between the coverage rate and full coverage. For example, if a population has a coverage rate of 0.90 in a survey, the percent undercount of that population would be $(1.00 - 0.90) \times 100$ percent, or 10 percent.

Vital Statistics

The National Center for Health Statistics' vital statistics on births were used to estimate coverage of new mothers by maternal age. We based the estimated coverage of new mothers on a comparison of the 2010 ACS estimate of the number of women age 15 to 50 giving birth in the previous 12 months with the simple average of the number of women age 15 to 50 giving birth in 2009 and 2010 from vital statistics. The research produced estimates by maternal age, marital status, race, and Hispanic origin.

To study coverage of very young children, we compared aggregate vital statistics data using month of birth from birth records with 2010 Census counts of young children by year and month of birth. This research project focused on the very youngest children, those less than 1 year old.

American Community Survey Data

In addition to the survey coverage rates derived from comparisons with population estimates, two research projects used data from the ACS.

One project compared detailed demographic, housing, social, and economic characteristics of children age 0 to 4 with children age 5 to 9 and children age 10 to 17. The source for all estimates was the 2010-2014 ACS 5-year estimates. Differences between age groups were tested for statistical significance based on sampling error in the ACS estimates. Some of the characteristics analyzed in this report were mobility status, poverty status, employment status of parents, and household language and English proficiency.

A second research study used data from the ACS fertility question to produce estimates of the number of new mothers by age, marital status, race, and Hispanic origin. We compared these ACS estimates with aggregate vital statistics to estimate coverage of new mothers.

Esri and Census Bureau Planning Database

We examined data from the CCM and CFU in the context of the Esri Tapestry market segmentation and using selected variables from the Census Bureau's Planning Data Base (PDB). The Esri Tapestry system uses data to group all census tracts in the country into a small number of categories based on socioeconomic and demographic similarities. Variables from the Census Bureau's PDB were used to construct groups of census tracts along several dimensions. These data sources allowed us to study the undercount of young children by many local characteristics that were not collected as part of the 2010 Census.