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Investigating the 2010 Undercount of Young Children – Further Analysis of Census Coverage Measurement Results

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1. INTRODUCTION

After the 2010 Census, Demographic Analysis (DA) estimated a net undercount of about 4.6 percent for young children (Hogan et al. 2013). This suggests a net undercount of about 1 million children under the age of 5. Several recent Census Bureau reports have provided additional information about the undercount of young children in the 2010 Census. One report summarized the analysis of data from the 2010 Census Coverage Measurement (CCM) program, focusing on characteristics of young children who were enumerated in the CCM but could not be matched to a child in the 2010 Census (U.S. Census Bureau 2017a). It also provided information about the types of nonmatches that involved young children. This data allowed us to determine:

- If children were nonmatches because the housing unit they lived in was a nonmatch.
- If nonmatching young children were the only nonmatches in a household.
- If they were nonmatches along with other household members.

In this report, we present further analyses of the CCM data. One recommendation from U.S. Census Bureau (2017a) was to create cross-tabulations of the CCM nonmatch data to gain greater insights into possible reasons for certain nonmatches. Our initial research showed important distinctions for young children based on their relationship to the householder and the size of the household. That research also found that young children living in a complex household had a greater likelihood of an enumeration error. Important differences were also found by race and Hispanic origin and by mode of data collection. This report will study the distributions of types of nonmatches by relationship to the householder and type of complex household. In addition, this report analyzes cross-tabulations of the CCM nonmatch rates for relationship to the householder by race and Hispanic origin and household size.

U.S. Census Bureau (2017a) also examined the nonmatch rates for young children by the mode of enumeration. That research showed higher nonmatch rates for young children enumerated in Nonresponse Followup (NRFU), especially when the NRFU interview was completed with a proxy respondent. In this report, we study the distribution of types of nonmatches by mode of enumeration. Our goal was to understand the reasons why young children might be missed in self-response and NRFU, and how these error sources may differ. Knowing these differences is important for taking measures to address the errors in future censuses and surveys.

In another analysis, we compare the CCM nonmatch rates for children in three age groups—0 to 4, 5 to 9, and 10 to 17. U.S. Census Bureau (2017b) showed that young children, age 0 to 4, were more likely than older children to have certain characteristics that were associated with high CCM nonmatch rates, such as a relationship other than biological or adopted child of the householder. This report studies whether the pattern of CCM nonmatch rates for young children hold for older children.

2. BACKGROUND

2.1 2010 Coverage Measurement Methodology

The 2010 CCM program used an independent post-enumeration survey and dual system estimation to estimate the coverage of the household population. The Census Bureau used the CCM survey to produce estimates of net coverage and components of census coverage (correct enumerations, erroneous enumerations, whole-person imputations, and omissions). Moldoff (2008) provides an overview of the 2010 CCM.

The CCM sample was an area-based sample of block clusters in each state, the District of Columbia, and Puerto Rico. Within these block clusters two lists were created, the E sample and the P sample. CCM listers independently listed all housing units in the sample block clusters. This listing became the frame for the P sample. Independent from the 2010 Census, the CCM enumerated everyone living in P-sample housing units. The E sample comprises the 2010 Census housing units and person enumerations in the same sample block clusters as the P sample. The CCM program matched people enumerated by the CCM (P sample) to people enumerated by the 2010 Census. This matching involved both computer and clerical components. Unresolved cases went to a field followup for resolution. If a residence or match status was unresolved after all follow-up attempts, the CCM used statistical techniques to impute the residence or match probability.

The CCM attempted to match all people in the P sample to where they were living on Census Day. The analysis in this paper and the analysis documented in U.S. Census Bureau (2017a) were limited to resolved nonmovers and inmovers in the P sample. Nonmovers are people who lived in the same unit on both Census Day and the day of the CCM interview. For nonmovers, the search area was the sample block cluster and the ring of surrounding blocks. Inmovers are people who lived in the sample unit on the day of the CCM interview, but lived elsewhere on Census Day. For inmovers, the search area was based on the information provided about the Census Day residence. The search area included a ring of surrounding blocks to account for small geographic errors. For more information on the 2010 CCM design and matching operations, see Moldoff (2008).

2.2 Recent Analysis of 2010 Coverage Measurement Results

U.S. Census Bureau (2017a) studied the characteristics of young children who were enumerated in the CCM but could not be matched to a child in the 2010 Census. These nonmatches could be because of a true census omission, they could be nonmatches because of insufficient census data to facilitate a match (e.g., the census enumeration was missing the name), they could be nonmatches because of the census enumerating the child in the wrong location, or they could be erroneously enumerated in the P sample. While they are not necessarily census omissions, we interpret the young children who are CCM nonmatches to be instances of possible enumeration error.

For each nonmatching young child, it was possible to assess the match status of the child's housing unit and the match status of other people living with the young child. The universe for this analysis was restricted to young children living in households where all people were nonmovers. Table 1 summarizes the basic findings for these nonmatching young children. For ease of discussion, we

refer to the nonmover nonmatches simply as nonmatches. About 16 percent of the nonmatched young children were in P-sample housing units that did not match to a census address. The remaining 84 percent were in P-sample housing units that were matched to a census address. These nonmatches are broken into three groups:

- Young children only nonmatch: The only nonmatches in the P-sample household were young children. Any older children or adults in the P-sample household matched to a census enumeration.
- Young children and others (but not all) nonmatch: At least one other person in the P-sample household, either an older child or an adult, was also a nonmatch (partial-household nonmatch).
- Entire household nonmatch: All people in the P-sample household were nonmatches (whole-household nonmatch).

Table 1. Distribution of Type of Census Coverage Measurement Nonmatch for Young Children

Type of Nonmatch	**Percent of Total Nonmover Nonmatched Young Children**	
	Weighted Estimate	Standard Error
Total nonmover nonmatches	**100.0**	**--**
Housing unit nonmatch	15.5	1.6
Housing unit match	84.4	1.6
Young children only nonmatch	16.2	1.1
Young children and others (but not all) nonmatch	22.2	1.4
Entire household nonmatch	46.0	1.8

Source: U.S. Census Bureau (2017a)

The concept that most young children are left off of an otherwise correct enumeration is not supported by these data. Rather, we see that about 46 percent of all nonmatches (and more than half of all nonmatches when the housing unit matched) are instances where the child and all household members were nonmatches. An additional 22 percent of the total nonmatches were in a household where at least one other person (but not everyone) was a nonmatch. These whole- and partial-household nonmatches may include a large proportion of cases with incomplete data for matching. For example, a proxy respondent may have been able to provide a count of the number of people living at an address without all names. In the CCM analysis, these would appear as nonmatches. U.S. Census Bureau (2017a) acknowledged that this limitation does not allow for conclusions about the relative contributions of whole-household versus within-household omissions but that it highlights that a variety of error sources are possible. The data suggest that census errors involving young children may be because of an enumeration error involving the child's entire household or to the omission of a subfamily within an incorrectly enumerated household.

Table 2 shows the CCM nonmatch rates of young children by their relationship to the householder. Stepchildren, grandchildren, other relatives, and children who are not related to the householder each have higher CCM nonmatch rates than biological or adopted children. This indicates that the 2010 Census had more difficulty correctly enumerating children with these relationships types. Complex households are defined as households other than single-parent households with biological or adopted children or married-couple households with biological or adopted children. U.S. Census

Bureau (2017a) found that young children living in complex households had higher CCM nonmatch rates when compared with young children living in households that were not complex.

Table 2. Census Coverage Measurement Nonmatch Rates for Young Children by Relationship to Householder

Characteristic	Nonmatch Rate Weighted Estimate	Nonmatch Rate Standard Error
Relationship to Householder – Total	**11.1**	**0.3**
Biological child	9.8	0.3
Adopted child	6.8	1.8
Stepchild	17.9	3.0
Grandchild	15.6	0.9
Other relative	22.1	2.0
Foster child or other unrelated child	24.5	2.7
Type of Complex Household – Total	**11.1**	**0.3**
Complex	14.1	0.5
Not Complex	9.1	0.4

Source: U.S. Census Bureau (2017a)

U.S. Census Bureau (2017a) found differences in CCM nonmatch rates of young children by their race and Hispanic origin (Table 3). The race results were summarized for six single race groups and for one group comprising all multiple race responses. Young children with races of Black, American Indian and Alaska Native, and Native Hawaiian and Pacific Islander had some of the highest CCM nonmatch rates. People of Hispanic and non-Hispanic origin can be of any race. U.S. Census Bureau (2017a) found that young Hispanic children had higher CCM nonmatch rates than young non-Hispanic children.

Table 3. Census Coverage Measurement Nonmatch Rates for Young Children by Race and Hispanic Origin

Characteristic	Nonmatch Rate Weighted Estimate	Nonmatch Rate Standard Error
Race – Total	**11.1**	**0.3**
White Alone	9.1	0.3
Black Alone	17.2	1.1
American Indian & Alaska Native Alone	16.3	2.6
Asian Alone	10.0	1.2
Native Hawaiian & Other Pacific Islander Alone	18.6	5.8
Some Other Race Alone	14.7	1.0
Two or More Races	12.9	1.2
Hispanic Origin – Total	**11.1**	**0.3**
Hispanic	13.1	0.6
Non-Hispanic	10.4	0.4

Source: U.S. Census Bureau (2017a)

U.S. Census Bureau (2017a) also analyzed CCM nonmatches based on mode of data collection. Table 4 displays those results. The CCM nonmatch rate for young children in inmover households was much higher than the rate for young children living in households that were nonmovers. Households enumerated in NRFU, especially by a proxy, had high CCM nonmatch rates. This may be because of proxy-enumerated households lacking sufficient data for matching. Households residing in housing units misclassified in the 2010 Census as vacant or delete (not a housing unit) also had very high CCM nonmatch rates. Even though the nonmatch rates were lower for self-response

households, these results show that cooperative respondents who returned their census forms did make errors involving young children.

Table 4. Census Coverage Measurement Nonmatch Rates for Young Children by Mode of Data Collection

Characteristic	Nonmatch Rate Weighted Estimate	Nonmatch Rate Standard Error
Nonmover – Total	**8.2**	**0.3**
Self-response	3.7	0.2
NRFU – household respondent and Update/Enumerate	8.9	0.6
NRFU – Proxy respondent, occupied	54.7	2.3
NRFU – vacant or delete	73.4	3.8
Inmover – Total	**18.9**	**1.2**
Self-response	8.5	1.0
NRFU – household respondent and Update/Enumerate	20.2	2.4
NRFU – Proxy respondent, occupied	63.9	5.4
NRFU – vacant or delete	86.3	5.9

Source: U.S. Census Bureau (2017a)

3. RESEARCH QUESTIONS

This report answers the following research questions. The first two questions focus on young children alone. The last two questions compare the results for young children to the results for older children.

1. How does the distribution of type of CCM nonmatch for young children vary by the child's relationship to the householder, complex household type, and mode of data collection?
2. How do the CCM nonmatch rates for selected demographic and household characteristics of young children vary by the child's relationship to the householder?
3. How does the distribution of type of CCM nonmatch vary by child age groups?
4. How do the CCM nonmatch rates for selected demographic and household characteristics vary by child age groups?

4. METHODOLOGY

4.1 Sources

We used the final CCM match probabilities to identify instances where a child in the CCM survey did not match a person record in the 2010 Census. Match probabilities are essentially match rates but include imputed probabilities of a match for unresolved cases. All results are weighted using the final match weight and appropriate noninterview adjustments. See the methodology section of U.S. Census Bureau (2017a) for details.

4.2 Definitions and Limitations

We defined CCM nonmatches as CCM enumerated children that were nonmatches to the 2010 Census. Nonmatches include true census omissions, cases with insufficient data for matching, cases where the census counted the child in the wrong area, and erroneous enumerations in the P sample. We cannot conclude that all of these nonmatched children were not enumerated in the 2010

Census. It is possible that varying proportions of nonmatches for certain characteristics could be because of missing data. For example, it may be more likely that an entire household, rather than an individual child, is missing data. We also expect that the 2010 CCM missed some young children and those young children are not represented in these estimates. If the characteristics of the young children missing from the 2010 CCM differ in important ways from the children included in the CCM, then these nonmatch rates are not representative of the universe of 2010 Census omissions. Collectively, the nonmatches represent young children with enumeration challenges and potential coverage errors.

Because of small sample sizes, we collapsed the detailed relationship categories into two groups. The first group combines biological and adopted children of the householder. These categories had lower nonmatch rates (Table 2). The second group is a combination of all other relationship types. We also collapsed the detailed race and Hispanic origin results and the mode of data collection results in some tables.

5. RESULTS

5.1 Type of CCM nonmatch by the child's relationship to the householder

How does the distribution of type of CCM nonmatch for young children vary by the child's relationship to the householder, complex household type, and mode of data collection?

U.S. Census Bureau (2017a) found much higher CCM nonmatch rates for children who were not biological or adopted children of the householder. We hypothesized that nonmatched children with these other relationship types would be more likely than nonmatched biological and adopted children to have types of errors involving only the young children or a subset of the household. Likewise, we hypothesized that the types of errors for nonmatched biological and adopted children were more likely than nonmatched children of other relationships to involve the whole household. Simply put, we did not anticipate a high rate of parents who responded correctly for themselves but did not include their own children. For grandparents or respondents who were not related to some children in their household, we anticipated these respondents may have been confused or reluctant to include a young child on their census response.

Table 5 compares the distributions of the type of CCM nonmatch for young children by the young child's relationship to the householder. Recall that a housing unit nonmatch means that the P-sample housing unit in which the young child lived did not match to a census address. As shown in the first set of columns in Table 5, most CCM nonmatching young children were in a housing unit that matched to a census address, but all people in the household were classified as CCM nonmatches (46 percent). A large proportion of nonmatching young children were also found to be living in a household where children and other members were CCM nonmatches (22 percent).

Partitioning the type of CCM nonmatch results by relationship reveals important differences that support our hypotheses. The Rao-Scott chi-square test statistic for a difference between these two distributions is highly significant ($p < 0.0001$). Nonmatching biological or adopted young children

were more likely to be nonmatches along with their entire household than nonmatching young children with other relationships to the householder (54 percent compared with 24 percent). Many of these nonmatches may be cases where the census enumerated the household but did not collect sufficient information for matching any household members. Nonmatching young children with other relationship types have higher proportions of partial-household nonmatches than nonmatching biological or adopted young children (44 percent compared with 15 percent). For example, grandchildren may be missed along with their parents, one of which would be a child of the householder. Previous research has explored the undercount of young mothers, and hypothesized that young children may be missed along with their young mother (U.S. Census Bureau 2016). Table 5 also shows that the instances of children being the only nonmatch in a household are more common for young children with relationships other than biological or adopted children of the householder (22 percent compared with 14 percent). A greater proportion of nonmatches involving young biological or adopted children were because of housing unit nonmatches (18 percent compared with 10 percent).

Table 5. Distribution of Type of Census Coverage Measurement Nonmatch for Young Children by Relationship to Householder

Type of Nonmatch	Total Young Children		Biological or Adopted Young Children		Young Children With Other Relationships	
	Weighted Estimate	Standard Error	Weighted Estimate	Standard Error	Weighted Estimate	Standard Error
Total nonmover nonmatches	**100.0**	**--**	**100.0**	**--**	**100.0**	**--**
Housing unit nonmatch	15.5	1.6	17.5	1.9	9.8	1.9
Housing unit match						
Young children only nonmatch	16.2	1.1	14.3	1.2	21.9	2.4
Young children and others (but not all) nonmatch	22.2	1.4	14.8	1.3	44.0	3.0
Entire household nonmatch	46.0	1.8	53.5	2.1	24.3	2.7

Source: Special Tabulation of 2010 Census Coverage Measurement File

Complex household type distinguishes between young children living in a household that is considered not complex (single-parent households with biological or adopted children or married-couple households with biological or adopted children) and households that are complex (all other households). U.S. Census Bureau (2017a) found higher nonmatch rates for young children living in complex households. These young children may have relationships other than biological and adopted children of the householder. Our hypotheses were similar to those discussed above for relationship type. We hypothesized that nonmatched children in complex households would be more likely to have types of errors involving only the young children or a subset of the household. We could understand how respondents for these types of households may have erroneously excluded a subset of the household, especially if the household structure was fluid. We anticipated that nonmatched young children in households that were not complex would have lower rates for errors involving only a subset of the household.

The results in Table 6 parallel the findings in Table 5. The Rao-Scott chi-square test statistic for a difference between these two distributions is highly significant ($p < 0.0001$). Nonmatched young children living in complex households were more likely than nonmatched young children living in households that were not complex to be to be in partial-nonmatch households. These may be instances where the respondent wasn't certain (because of the complexity of the household) if

these children should be included. Nonmatched young children living in households that were not complex were more likely to be CCM nonmatches along with their entire household. As noted earlier, these whole-household nonmatches may be driven by incomplete census enumerations.

The results in Table 5 and Table 6 suggests that householders in non-complex households are not necessarily forgetting to include their own biological and adopted children on their census response. While this may happen, it is more often that biological and adopted young children are impacted by errors involving the whole household. Young children with other relationship types and in complex households are more impacted by errors that involve only the young children or a subset of the household. Here, the respondent may be confused about who to include on the census form, especially if the household composition is fluid or people are staying there temporarily.

Table 6. Distribution of Type of Census Coverage Measurement Nonmatch for Young Children by Complex Household Type

	Total Young Children		**Young Children Living in Complex Households**		**Young Children Living in Not Complex Households**	
Type of Nonmatch	Weighted Estimate	Standard Error	Weighted Estimate	Standard Error	Weighted Estimate	Standard Error
Total nonmover nonmatches	**100.0**	**--**	**100.0**	**--**	**100.0**	**--**
Housing unit nonmatch	15.5	1.6	11.8	1.6	18.5	2.3
Housing unit match						
Young children only nonmatch	16.2	1.1	17.5	1.7	15.3	1.5
Young children and others (but not all) nonmatch	22.2	1.4	37.3	2.3	10.6	1.3
Entire household nonmatch	46.0	1.8	33.4	2.3	55.6	2.5

Source: Special Tabulation of 2010 Census Coverage Measurement File

To study data collection mode, we had to limit our analysis to nonmover nonmatches of young children when the housing unit they lived in was matched to a 2010 Census housing unit. These are the only households where we know the 2010 Census mode of data collection. Given this limitation, the reader should be cautious in drawing conclusions. Here, our hypothesis was that entire household errors would be more prevalent for nonmatched young children in NRFU or Update/Enumerate (U/E) households. Respondents who did not self-respond may have been reluctant to provide complete information during NRFU, or the NRFU interview may have been completed by a proxy respondent who did not know the names of the people in the household. In these situations, we anticipated that the errors would impact all people in the household, not just the young children.

We collapsed the full detail of data collection mode found in U.S. Census Bureau (2017a) into two modes—young children enumerated by self-response and young children enumerated in either NRFU or U/E. Table 7 shows the distributions of type of nonmatch by mode. The Rao-Scott chi-square test statistic for a difference between these two distributions is highly significant ($p < 0.0001$). Nonmatched young children enumerated by self-response were more likely to be in partial-nonmatch households than nonmatched young children enumerated in NRFU or U/E. The respondent may have been confused about who to count in their household or may have purposefully concealed the young children and other household members. These are respondents who willingly participated in the census but did not do so accurately.

A greater proportion of nonmatched young children enumerated in NRFU or U/E were entire household nonmatches. We believe this is driven by the incomplete enumeration of many NRFU households. Many of the CCM nonmatching people in these households may have lacked names needed for matching. In these situations, young children are impacted by errors that involve the whole household.

Table 7. Distribution of Type of Census Coverage Measurement Nonmatch for Young Children by Data Collection Mode

Type of Nonmatch	Young Children Enumerated by Self-Response		Young Children Enumerated in NRFU or U/E	
	Weighted Estimate	Standard Error	Weighted Estimate	Standard Error
Total Nonmover Nonmatches	**100.0**	**--**	**100.0**	**--**
Housing unit match				
Young children only nonmatch	32.5	2.7	13.6	1.4
Young children and others (but not all) nonmatch	34.7	3.0	23.1	1.9
Entire household nonmatch	32.7	3.0	63.3	2.1

NRFU: Nonresponse Followup; U/E: Update/Enumerate

Source: Special Tabulation of 2010 Census Coverage Measurement File

5.2 Comparison of nonmatch rates for young children by selected characteristics and relationship to the householder

How do the CCM nonmatch rates for selected demographic and household characteristics of young children vary by the child's relationship to the householder?

Table 8 includes the CCM nonmatch rates of young children for selected characteristics by the two relationship groups. For biological or adopted young children, non-Hispanic Black young children have a higher nonmatch rate than the other groups. For other relationship types, the nonmatch rate for young non-Hispanic Black children is not significantly different from young non-Hispanic Other children or young Hispanic children. The results show that the difference in nonmatch rates for biological and adopted children when compared with all other relationship categories holds across all race groups.

Biological or adopted young children have a high nonmatch rate in two-person households. These are households where there is a single adult and single young child. This nonmatch rate is the highest household size nonmatch rate for biological or adopted young children. Young children with other relationships have high nonmatch rates across all household sizes. For other relationship types, there are no significant differences in the CCM nonmatch rates by household size. This implies that young children of other relationship types are difficult to count regardless of the household size.

Table 8. Census Coverage Measurement Nonmatch Rates for Young Children by Selected Characteristics and Relationship

Characteristic	Total Young Children		Biological or Adopted Young Children		Young Children With Other Relationships	
	Weighted Estimate	Standard Error	Weighted Estimate	Standard Error	Weighted Estimate	Standard Error
Race and Hispanic Origin – Total	**11.1**	**0.3**	**9.7**	**0.3**	**17.7**	**0.8**
Non-Hispanic White Alone	8.4	0.4	7.4	0.4	15.3	1.1
Non-Hispanic Black Alone	17.0	1.1	15.9	1.2	20.6	2.1
Non-Hispanic Other	12.5	0.9	11.1	0.9	19.6	2.5
Hispanic	13.1	0.6	11.5	0.6	18.4	1.4
Household Size – Total	**11.1**	**0.3**	**9.7**	**0.3**	**17.7**	**0.8**
2-person household	19.3	1.5	19.3	1.6	19.8	6.8
3-person household	11.9	0.5	11.2	0.6	20.5	2.4
4-person household	9.3	0.5	8.5	0.5	16.5	1.7
5-person household	10.5	0.6	8.9	0.7	17.8	1.7
6-person household	10.7	0.9	8.1	0.9	17.9	2.1
7-or-more-person household	12.5	1.0	8.8	1.2	17.0	1.6

Source: Special Tabulation of 2010 Census Coverage Measurement File

5.3 Type of nonmatch by child age group

How does the distribution of type of CCM nonmatch vary by child age groups?

Table 9 shows the distribution of the type of nonmatch for three child age groups. To facilitate comparisons across the age groups, the definitions of partial-household and children-only nonmatches differ slightly from those used in Tables 5, 6, and 7. Here, a household is classified as a partial-household nonmatch if there is at least one adult (age 18+) nonmatch in the household. Thus, the children-only nonmatch category is for households where all of the nonmatches are children (age 0 to 17). The distributions of the type of nonmatch are similar across age groups. Young children age 0 to 4 have a slightly higher proportion of CCM nonmatches when compared with older children because of partial-household nonmatches (i.e., being in a unit where at least one adult is also a nonmatch).

Table 9. Distribution of Type of Census Coverage Measurement Nonmatch by Age Group

Type of Nonmatch	Children Age 0 to 4		Children Age 5 to 9		Children Age 10 to 17	
	Weighted Estimate	Standard Error	Weighted Estimate	Standard Error	Weighted Estimate	Standard Error
Total Nonmover Nonmatches	**100.0**	**--**	**100.0**	**--**	**100.0**	--
Housing Unit Nonmatch	15.5	1.6	16.5	1.7	16.3	1.7
Housing Unit Match						
Children only nonmatch	21.3	1.3	21.2	1.3	24.8	1.3
Children and adult (partial household) nonmatch	17.0	1.2	13.3	1.2	12.3	1.0
Entire household nonmatch	46.0	1.8	49.0	1.9	46.5	1.6

Source: Special Tabulation of 2010 Census Coverage Measurement File

5.4 Comparison of nonmatch rates for selected characteristics by age groups

How do the CCM nonmatch rates for selected demographic and household characteristics vary by child age groups?

Table 10 shows the nonmatch rates by race, Hispanic origin, and age group. In general, the patterns of nonmatch rates observed for young children are similar to those for older children. For example, non-Hispanic Black children have the highest CCM nonmatch rates when compared with non-

Hispanic White and non-Hispanic Other in all three age groups. Looking across race and Hispanic origin groups, children age 0 to 4 generally have the highest CCM nonmatch rates.

Table 10. Census Coverage Measurement Nonmatch Rates by Race, Hispanic Origin, and Age Group

	Children Age 0 to 4		**Children Age 5 to 9**		**Children Age 10 to 17**	
	Weighted Estimate	Standard Error	Weighted Estimate	Standard Error	Weighted Estimate	Standard Error
Race – Total	**11.1**	**0.3**	**9.0**	**0.3**	**8.0**	**0.2**
White Alone	9.1	0.3	7.8	0.3	7.0	0.3
Black Alone	17.2	1.1	13.5	0.9	11.2	0.6
American Indian & Alaska Native Alone	16.3	2.6	12.9	2.4	12.9	1.9
Asian Alone	10.0	1.2	6.6	1.0	7.1	0.9
Native Hawaiian & Other Pacific Islander Alone	18.6	5.8	14.3	5.4	12.7	3.8
Some Other Race Alone	14.7	1.0	11.9	0.9	10.4	0.8
Two or More Races	12.9	1.2	8.5	1.1	7.9	0.9
Hispanic Origin – Total	**11.1**	**0.3**	**9.0**	**0.3**	**8.0**	**0.2**
Hispanic	13.1	0.6	11.0	0.6	9.2	0.5
Non-Hispanic	10.4	0.4	8.4	0.3	7.6	0.3
Non-Hispanic White	8.4	0.4	7.0	0.3	6.7	0.3
Non-Hispanic Black	17.0	1.1	13.5	0.9	11.2	0.6
Non-Hispanic Other	12.5	0.9	9.0	0.8	8.4	0.7

Source: Special Tabulation of 2010 Census Coverage Measurement File

For relationship to the householder, the oldest children (age 10 to 17) have CCM nonmatch rates for stepchildren or grandchildren that are similar to those for biological or adopted children. This differs from the nonmatch rates observed for these relationship groups for young children. This may be because these older step children and grandchildren have been in the household for a longer period of time compared with children under the age of 5. The CCM nonmatch rate is highest for children in two-person households for both young children (0 to 4) and the oldest children (10 to 17); for children age 5 to 9, the nonmatch rates for two-person and three-person households are not significantly different.

Table 11. Census Coverage Measurement Nonmatch Rates for Selected Characteristics by Age Group

	Children Age 0 to 4		**Children Age 5 to 9**		**Children Age 10 to 17**	
	Weighted Estimate	Standard Error	Weighted Estimate	Standard Error	Weighted Estimate	Standard Error
Relationship to Householder – Total	**11.1**	**0.3**	**9.0**	**0.3**	**8.0**	**0.2**
Biological child	9.8	0.3	8.2	0.3	7.4	0.3
Adopted child	6.8	1.8	5.7	1.4	7.1	1.2
Stepchild	17.9	3.0	11.3	1.4	8.4	0.8
Grandchild	15.6	0.9	12.4	1.0	9.8	0.9
Other relative	22.1	2.0	18.5	2.0	12.3	1.1
Foster child or other unrelated child	24.5	2.7	17.0	2.2	17.7	1.7
Household Size – Total	**11.1**	**0.3**	**9.0**	**0.3**	**8.0**	**0.2**
2-person household	19.3	1.5	12.4	1.3	13.6	0.9
3-person household	11.9	0.5	11.6	0.7	8.9	0.5
4-person household	9.3	0.5	7.9	0.4	6.8	0.3
5-person household	10.5	0.6	8.3	0.5	7.3	0.5
6-person household	10.7	0.9	9.1	0.8	8.4	0.7
7-or-more-person household	12.5	1.0	9.2	0.8	6.9	0.7

Source: Special Tabulation of 2010 Census Coverage Measurement File

6. DISCUSSION

U.S. Census Bureau (2017a) found important differences in CCM nonmatch rates based on the young child's relationship to the householder. Young children living in complex households and in households enumerated in NRFU or U/E also had high CCM nonmatch rates. The goal of this additional research was to try to understand possible reasons for the high CCM nonmatch rates by creating additional cross tabulations of the available CCM data.

In this report we looked at how the distribution of types of nonmatches varied by the relationship of the child to the householder and the household type. While some limitations exist because of small sample sizes and other characteristics of the data, the results revealed the following.

Biological or adopted young children

- Most nonmatches occurred when the entire household was enumerated in error—54 percent of the nonmatches were whole-household nonmatches.
- The differences observed for all young children by race and Hispanic origin held. Nonmatch rates were higher for Hispanic, non-Hispanic Black, and non-Hispanic Other young children when compared with non-Hispanic White young children.
- The nonmatch rates were higher for young children living in two-person and three-person households.

Children with other relationships

- Most nonmatches occurred when only part of the household was enumerated in error—66 percent of the nonmatches were within-household nonmatches.
- The differences observed for all young children by race and Hispanic origin held but differences were not as pronounced as they were for biological and adopted young children.
- The nonmatch rates were high for young children in all household sizes.

Household Structure

- The results for complex and not complex households parallel these findings for relationship. Young children living in not complex households are by definition biological or adopted young children while young children living in complex households tend to have other relationships to the householder.
- Most nonmatches for young children living in households that were not complex occurred when the entire household was enumerated in error—56 percent of the nonmatches were whole-household nonmatches.
- Most nonmatches for young children living in complex households occurred when only part of the household was enumerated in error—55 percent of the nonmatches were within-household nonmatches.

Type of nonmatch by data collection mode

- Most nonmatches for young children enumerated by self-response occurred when only part of the household was enumerated in error—67 percent of the nonmatches were within-household nonmatches.
- Most nonmatches for young children enumerated during NRFU or U/E occurred when the entire household was enumerated in error—62 percent of the nonmatches were whole-household nonmatches.

This indicates that self-response households are making rostering errors. This is important to keep in mind for outreach for the 2020 Census. The Census Bureau encourages self-response for both cost and quality reasons. Our results suggest that the messaging should not only encourage self-response, but should also encourage accurate self-response. Given these partial-household errors for young children in self-response households, simply pushing more people to complete the census via a self-response option may not be enough to improve the coverage of young children.

In contrast to the self-response results, most CCM nonmatched young children enumerated in NRFU or U/E are instances when the entire household was a nonmatch. The reasons for these errors are NRFU enumeration errors and may include the collection of data from proxies (who may not have provided the names for the household members), the misclassification of occupied housing units as vacant or deleted, apartment mix-ups, and census nonresponse.

7. CONCLUSIONS

These results provide important information about the likely reasons for enumeration errors involving young children. There appear to be rostering errors for biological or adopted young children. Most of these young children were omitted or incompletely enumerated along with their entire household (Table 5). This might indicate that a householder is not "forgetting to list their biological or adopted children" but that these young children are omitted or incompletely enumerated because the housing unit they live in, and the entire household they are a part of, are enumerated in error. This holds for households that are not complex where the types of enumeration errors tend to involve the entire household (Table 6).

One reason for enumeration errors involving young children living in complex households and children with relationships other than biological or adopted child could be confusion about who should be included on a census form. Children with a more distant relationship to the person completing the census form may be omitted or incompletely enumerated because it wasn't clear to the respondent that these young children (and possibly their parents) should be included. This would explain why most of the enumeration errors for these young children are for them only or for them and some, but not all, household members.

The comparisons of CCM nonmatch rates by children age groups showed very similar patterns across the age groups. The characteristics that appear to be problematic for young children are generally the same characteristics that appear to be problematic for children age 5 to 9 and children age 10 to 17.

8. REFERENCES

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