

2020 Census Research and Testing Investigating the 2010 Undercount of Young Children – Examining the Coverage of Young Mothers

A New Design for the 21st Century

Issued June 7, 2016

Version 1.0

Prepared by Decennial Statistical Studies Division



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1. INTRODUCTION

The Census Bureau acknowledges the historical undercount of young children in decennial censuses and Census Bureau surveys. Demographers have documented the high undercount of children under the age of five (e.g., Robinson et al 1993, O'Hare 1999, West & Robinson 1999, O'Hare 2009). This is not a phenomenon unique to the U.S. as China, South Africa, Laos, the former Soviet Union, and Canada also experience this high net undercount of young children (Anderson & Silver 1985, Anderson 2004, Statistics Canada 2004 and 2010, Goodkind 2011). Evaluations show that Census Bureau surveys like the American Community Survey (ACS), the Current Population Survey (CPS), and the Survey of Income and Program Participation also undercount young children, which can result in biased survey estimates. In addition, these surveys will never fully correct for this undercoverage, given the use of decennial census counts with known undercoverage as inputs to final survey controls.

The 2010 Demographic Analysis estimated an undercount of almost 1 million children, aged 0 to 4 (about 4.6 percent). O'Hare (2012) found that the net undercount rates for young children in the U.S. Decennial Census increased from 1.4 percent in 1980 to 4.6 percent in 2010, while the net undercount rate for the adult population (age 18+) went from an undercount of 1.4 percent in 1980 to an overcount of 0.7 percent in 2010. The rapid rise in the undercount of young children underscores the importance of examining this population in more detail.

In 2014, the Census Bureau released a task force report summarizing this critical coverage issue and recommending research that the Bureau should consider to better understand the possible causes for this undercount (U.S. Census Bureau 2014b). An interdivisional team is currently working on several projects to investigate the undercount of young children in the 2010 Decennial Census. One of these projects explores the coverage of young mothers to determine if the census might miss young children along with their young mothers. This evaluation report summarizes the results of that investigation.

2. BACKGROUND

2.1 Statistics Canada Findings

Research undertaken by staff at Statistics Canada leveraged administrative records in a Reverse Record Check to understand the characteristics and probable causes for undercounting young children. They found that their census was more likely to exclude young children if the child's mother was young, especially young and unmarried. They noted that coverage was a problem for children in one-parent households, especially two-person households with a never-married parent. They found evidence that their current data collection methods resulted in undercoverage of both young mothers and their young children (Dolson 2013). This research did not include any information about probable causes.

It is reasonable to assume that the causes and characteristics of undercoverage in Canada could also exist in the United States. Unlike Statistics Canada, the U.S. Census Bureau does not have access to

record-level vital statistics data. We do, however, have access to summary level vital statistics data on births by age of mother. The aggregate vital statistics on the number of births (by maternal age) can serve as a benchmark for comparisons with ACS estimates of the number of women giving birth (by maternal age). Such a comparison would allow us to assess if we may be undercounting young mothers. If so, we would have information that points to a possible cause for the undercount of young children in the U.S. Census.

2.2 Young Mothers

The National Center for Health Statistics (NCHS) releases National Vital Statistics Reports on U.S. births each year. In 2010 the number of registered births was 3,999,386 (National Vital Statistics Reports 2012). NCHS birth records identified 367,678 births to women age 15-19.

The ACS and the CPS collect fertility data by demographic and geographic detail. The ACS estimated that in 2010 there were 4.2 million women who had a birth in the past 12 months with 282,737 of these women aged 15 to 19 (U.S. Census Bureau 2015)¹.

The U.S. Census Bureau produced two detailed reports on fertility based on 2008 and 2012 ACS and CPS data. In 2008 there were a total of 4.4 million women aged 15 to 50 who reported giving birth in the past 12 months; about 304,000 of these women were aged 15 to 19 (U.S. Census Bureau 2010). Analysts noted significant variation in the socioeconomic characteristics of recent mothers among the states, highlighting the above average proportions of mothers with newborns in the southern tier of states who were in poverty. Using 2012 ACS data, U.S. Census Bureau (2014a) found that about 4.1 million women had a birth in the past 12 months and more than one in five of these women reported that they were living in someone else’s home at the time of the survey. The 2012 ACS identified 20.8 percent of mothers with a recent birth as being foreign-born and 14.5 percent as non-citizens. The 2012 report includes detailed characteristics of births to young women (defined in that report as aged 15 to 22). Table 1 summarizes selected characteristics for this population. For this cohort of young mothers, about 60 percent reported that they were not living in their own household; three out of four of these young mothers who were not living in their own household were living with their own parent or parents (not shown in Table 1).

Table 1. Selected Characteristics of Young Women (Aged 15 to 22) Who Had a Birth in the Past 12 Months - 2012 ACS

Characteristic	Women 15 to 22 who had a Birth in the Past 12 Months	
	Total	Percent Distribution
Total	727,069	100.0
Not currently married or never married	551,916	75.9
Not living in own household	439,016	60.4
Foreign born	72,579	10.0
Foreign born and not a citizen	61,608	8.5
Below 100 percent of poverty in the past 12 months	344,351	47.7
Receiving public assistance	72,858	10.0

Source: U.S. Census Bureau (2014a)

¹ The estimate of 282,737 women aged 15 to 19 with a birth in the past 12 months has a standard error of 5,771.

Both reports evaluate the quality of survey estimates and make comparisons with vital statistics. See section 4.5 for a discussion of some of the differences and how we addressed these potential limitations.

3. RESEARCH QUESTIONS

This report answers the following research questions.

1. Does the ACS undercount young mothers? How do vital statistics on the number of births (by maternal age) compare with the ACS estimate of women giving birth (by maternal age)?
2. How do these estimates of coverage vary by race and Hispanic origin of the mother?
3. Does the ACS undercount young unmarried mothers? How do vital statistics on the number of births to unmarried women (by maternal age) compare with the ACS estimate of unmarried women giving birth (by maternal age)?
4. How do these estimates of coverage vary by marital status of the mother?

4. METHODOLOGY

4.1 Sources

The decennial census does not collect information on births or women giving birth. However, a question exists on the ACS that we can use to estimate the number of women giving birth in a specific time period. We believe that using the ACS data will allow us to understand patterns of coverage in both the ACS and the decennial census. The ACS fertility question asks all females between the ages of 15 and 50, *“Has this person given birth to any children in the past 12 months?”* The 2010 ACS collects data on a continuous basis throughout calendar year 2010, so a reference period of the “last 12 months” identifies women giving birth in both 2009 and 2010. Respondents in early January of 2010 would be referring to the 12 months of 2009. Respondents in late December of 2010 would be referring to the 12 months of 2010. The 2010 ACS estimated that 4,168,720 million women had a birth in the previous 12 months (U.S. Census Bureau 2015).

As noted earlier, the NCHS releases National Vital Statistics Reports on U.S. births each year. In 2010 the number of registered births was 3,999,386 (National Vital Statistics Reports 2012). Given the rolling reference period for the ACS, the best comparison with vital statistics would be an average of calendar years 2009 and 2010. Given that the number of registered births in 2009 was 4,130,665, the simple average of the total number of births in 2009 and 2010 is 4,065,026 (National Vital Statistics Reports 2012). To match the ages of the women in the ACS, we dropped the women under 15 years old and the women over 50 years old. This left us with a 2-year average NCHS benchmark of 4,060,263 births.

The ACS cross classifies fertility data by age, marital status, race, and Hispanic origin of the mother. NCHS vital statistics reports include maternal characteristics such as age, marital status, race, and Hispanic origin. This report uses these cross classifications.

Given the sample size of the 2010 ACS, we chose to limit this evaluation to national-level results for the United States.

4.2 Definitions

All women aged 15 to 50 responding, “Yes” to the ACS fertility question represent the universe used to estimate the number of women giving birth in the past 12 months.

The NCHS defines married women as including women with a marital status of separated. We used the ACS marital status variable to define married versus unmarried women. To parallel the NCHS definition, “married” includes marital status responses of “married” and “separated.” We define “unmarried” as the sum of all other marital status responses (widowed, divorced, and never married).

The ACS converts reported maternal race in the ACS to one of 31 race definitions consistent with the 1997 Office of Management and Budget (OMB) standard on federal race reporting and tabulation. The first five categories in the standard are single races defined as White, Black or African American, American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, and Asian (Office of Management and Budget 1997). The remaining 26 definitions are multi-race combinations of the five single race categories. Respondents in the ACS who marked “some other race” were allocated to one of the five 1997 OMB categories or a multi-race category, based on a hot-deck method grouped by Hispanic origin (U.S. Census Bureau, 2002). After this race modification, we summarized the ACS results overall and by race and ethnicity into four categories:

- 1) Non-Hispanic White (alone or in combination),
- 2) Non-Hispanic Black (alone or in combination),
- 3) Non-Hispanic All Other Races (alone or in combination), and
- 4) Hispanic (any race).

The Non-Hispanic All Other Races category includes persons reporting as American Indian or Alaska Native (alone or in combination), Native Hawaiian or Other Pacific Islander (alone or in combination) or Asian (alone or in combination).

Preliminary research found that categorizing the ACS data into mutually exclusive race and ethnicity groups did not align as well with the NCHS data on mothers and resulted in classification errors. In addition, the relatively small sample size of mothers in some race and Hispanic origin groups for certain ages prevented us from disaggregating the non-Hispanic All Other Races (alone or in combination) group. Consequently, these four race and ethnicity categories are not mutually exclusive. An individual could be included in two or more categories if he or she reported multiple races.

The source of NCHS vital statistics data is 100 percent of birth certificates in all states and the District of Columbia. More than 99 percent of all births in the United States are registered (National Vital Statistics Reports 2012). The birth certificate reports maternal race and Hispanic origin independently. Some states report maternal race consistent with the updated 1997 OMB standard discussed earlier that allows multiple race reporting and differentiates Native Hawaiians and

Pacific Islanders from other Asian groups, while other states report race according to the previous OMB standard from 1977.

Prior to the 1997 OMB federal standard, race was reported in the four single race categories of White, Black or African American, American Indian or Alaska Native, and Asian or Pacific Islander. Multiple race categories were not included. In 2010, 38 states and the District of Columbia reported multiple-race data from the updated 1997 standard, while the remaining states continued to use the single race categories. The NCHS and U.S. Census Bureau provide a method, referred as “race-bridging,” to convert the 1997 multi-race categories to the 1977 single race to facilitate comparisons between data sets with different race reporting systems (National Center for Health Statistics 2003).

However, we opted to reduce the amount of processing of the birth records and collapse the data into the same four race and Hispanic origin categories defined above, based on the reporting system used in each state. To reiterate, we summarized the vital statistics data by the same categories used in the ACS data: Non-Hispanic White (alone or in combination), Non-Hispanic Black (alone or in combination), Non-Hispanic All Other Races (alone or in combination), and Hispanic (any race).

A small portion of the birth records in the 2009 and 2010 vital statistics data (under 1 percent for both years) had missing maternal Hispanic origin that required an imputation to create the race and Hispanic origin categories described previously. We analyzed public-use vital statistics data, where geographical identifiers such as residence of mother and maternal country of birth are not available. In the absence of this information, we opted to use the distribution of maternal Hispanic origin from birth records without missing values. Since around 75 percent of the births with non-missing maternal ethnicity were Non-Hispanic in 2009 and 2010, we randomly assigned seventy-five percent of the births with missing maternal Hispanic origin a Non-Hispanic ethnicity. Given the low rate of imputation (less than 1 percent) we do not consider this to be a significant limitation.

We used the individual age responses from the ACS to produce estimates for the following age groups: 15-19 years, 20-24 years, 25-29 years, 30-34 years, 35-39 years, and 40-50 years. Vital statistics reports and most ACS data products use these six age groupings. The NCHS produces statistics on births by age, race, and Hispanic origin of the mother. We used these data to create tabulations that matched those available from the ACS.

4.3 Weighting and Estimation

We used two sets of weights in this analysis to produce 2010 ACS estimates of the number of women giving birth in the past 12 months. We used the final person weights based on the PWGT variable as the primary measure and think these estimates best describe the population that the decennial census would have included. The final person weights reflect the use of census-based population and housing controls. We also produced results based on the ACS estimates before these controls; specifically, the ACS universe weights which use the WMBF variable. We think the estimates based only on the ACS universe weights are a better approximation of the women giving birth in the past 12 months that the ACS would have included. We calculated sampling errors associated with all ACS estimates.

We created a simple average of the 2009 and 2010 vital statistics to approximate the reference period of the 2010 ACS.

4.4 Coverage Estimates

We estimate coverage error based on the following definition:

$$\frac{(ACS\ estimate) - (Vital\ statistics\ estimate)}{(Vital\ statistics\ estimate)}$$

ACS estimate = 2010 ACS estimate of the number of women giving birth in the past 12 months

Vital statistics estimate = Simple average of the vital statistics estimate of the number of births in 2009 and 2010

We calculated these ratios for each age, marital status, and race/ethnicity combination and converted them to percentage values. Given this definition, negative values indicate undercounts and positive values indicate overcounts.

We computed 90 percent margins of error for each coverage rate using the standard errors derived from the replicate weights.

4.5 Limitations

The goal of this research was to assess the possibility of undercoverage of young mothers. The absolute precision of the estimates by age and marital status is not critical. There are several important limitations associated with these data. The ACS is a survey and the results therefore reflect sampling error.

As noted in the methodology section, the ACS reference period is not a clean calendar year like the NCHS data. To approximate the ACS reference period of the “previous 12 months” we chose to use NCHS data on births in 2009 and 2010. We believe that this simple average of vital statistics is a better comparison with the 2010 ACS estimates.

We expect that birth rates by age from the ACS will be slightly different from age-specific birth rates published by the NCHS since the ACS collects age at the time of the survey interview while the NCHS collects age at the time of birth. In U.S. Census Bureau (2014a) the authors note that, for example, about one half of the 19 year olds would be 20 by the time of the ACS. We chose to collapse the age categories to minimize this limitation but it may explain some of the observed differences.

Similarly, the ACS collects marital status at the time of the survey interview while the NCHS collects marital status at the time of birth. Changes in marital status and timing of data collection may explain some of the observed differences in results by marital status.

In addition, the difference in timing of data collection in the ACS and the NCHS vital statistics can affect who is in universe for this research. If the NCHS identifies the birth as having been at age 14 and the woman is 15 when the ACS interview takes place, she will show up in the ACS universe, but not in the NCHS data.

As noted earlier, the ACS measures women giving birth in the past 12 months. It is therefore an estimate of new mothers, not an estimate of newborn children. The ACS counts a mother giving birth to twins, for example, only once. The NCHS data tallies births and therefore would count twins as two births. The implication of this limitation is that the NCHS estimate should be higher than the ACS estimate. As noted earlier, at the national level, for the total population, the 2010 ACS estimate of women giving birth in the past 12 months (4.2 million) is about 100,000 higher than the simple average of the 2009 and 2010 NCHS estimates of births (4.1 million). U.S. Census Bureau (2010) and U.S. Census Bureau (2014) acknowledge this difference and note the potential for surveys to include some amount of nonsampling error. For example, response error in the ACS in the form of over-reporting of births could contribute to this difference (see Attachment 3 for additional information on this issue). It is also possible that response error in the form of underreporting of births may occur for young mothers. Despite the potential for some nonsampling error, we do not feel that this is a significant limitation.

Another limitation involves race and Hispanic origin reporting. It is very possible for respondents to report their race and Hispanic origin in the ACS one way and for vital statistics to record the mother's race and Hispanic origin another way. Reporting of multiple races may, in particular, differ. This may distort some of the race and Hispanic origin findings as some of the observed differences that we define as coverage error may be due to reporting differences.

Finally, these data do not allow us to conclude that young children are missing from the ACS along with their young mothers. It is however, a reasonable hypothesis, given the Statistics Canada findings. We need to consider additional research on this population group.

5. RESULTS

5.1 Results by maternal age

Does the ACS undercount young mothers? How do vital statistics on the number of births (by maternal age) compare with the ACS estimate of women giving birth (by maternal age)?

Table 2 summarizes the coverage estimates and associated 90 percent margins of error for women giving birth in the past 12 months by age. These results reflect the use of all ACS weights, including population and housing controls. For this reason we think they are a reasonable proxy for coverage in the census. The red values highlight the coverage rates where the difference between the ACS estimate and the vital statistic estimate was significantly less than zero. Tables 8 and 9 in Attachment 1 include the estimates used in the calculation of these rates and the 90 percent margins of error associated with the ACS estimates.

Table 2. Estimated Coverage of New Mothers by Age (using final person weights)

Maternal Age	Estimated Coverage Rate	Margin of Error
15-19 years	-27.3	2.4
20-24 years	-7.9	1.8
25-29 years	-1.7	1.7
30-34 years	6.2	1.8
35-39 years	20.3	2.5
40 -50 years	136.6	7.8
15-50 years	2.7	1.0

Source: 2010 American Community Survey and 2009/2010 Birth Records from the National Center for Health Statistics

The data clearly indicate the undercoverage of young mothers. Women aged 15-19 have high estimated undercounts while older mothers have high rates of overcoverage. This overcoverage may be due to response error with older women responding positively to the question without acknowledging the “past 12 months.” The analysis summarized in Attachment 3 found that a high proportion of women aged 40 to 50 who reported giving birth in the past 12 months did not have a young child living in their household. This is in sharp contrast to the rates found for all other age groups suggesting that older mothers might be responding positively, in error. While rates of coverage varied across age, the bottom row documents that the 2010 ACS estimate of all women (aged 15 to 50) giving birth is higher than the simple average of the 2009 and 2010 NCHS vital statistics estimate of births (overcoverage rate of 2.7 percent).

Table 3 includes the same information but the estimates exclude the final ACS population and housing controls. These estimates are therefore better approximations of coverage of this population in the ACS. We find similar coverage patterns to those seen in Table 2 with higher undercoverage of the youngest mothers. In particular, we estimate that women, aged 15-19 have an undercoverage rate of almost 31 percent. In contrast with Table 2, however, the 2010 ACS estimate of all women (aged 15 to 50) giving birth (without adjustments to population and housing controls) is lower than the simple average of the 2009 and 2010 NCHS estimate of births as evidenced by the coverage rate of -1.6 percent.

Table 3. Estimated Coverage of New Mothers by Age (using ACS universe weights)

Maternal Age	Estimated Coverage Rate	Margin of Error
15-19 years	-30.9	2.4
20-24 years	-13.7	1.8
25-29 years	-4.8	1.6
30-34 years	3.0	1.7
35-39 years	15.6	2.3
40 -50 years	125.8	7.2
15-50 years	-1.6	0.9

Source: 2010 American Community Survey and 2009/2010 Birth Records from the National Center for Health Statistics

Tables 2 and 3 indicate that the ACS fails to include a noteworthy proportion of young mothers. Differences exist by age in terms of the percentage of the vital statistics estimate of births accounted for in the ACS as mothers giving birth in the past 12 months. We assume that this undercoverage also exists, to some extent, in the decennial census. The attachments include the

specific numerical differences that speak to the extent of this problem and the potential that it could explain the undercount of young children.

Figure 1 summarizes our estimates of the absolute differences between these two data sets by age of mother. These results use the final person weights. The distribution shows that we could be undercounting over 100,000 of the youngest mothers (age 15-19). Keep in mind that these estimates involve women giving birth in the past 12 months, essentially our ability to accurately identify mothers of children under the age of 1. We want to extrapolate to the undercount problem for young mothers of all young children (ages 0 through 4). If we assume that mothers of children ages 1 through 4 have similar levels of undercoverage as mothers of children under age 1 and that similar numbers of children are born each year, we can approximate that the ACS may miss as many as 500,000 young mothers. O'Hare (2012) estimated that the 2010 Census missed about 1 million young children. If, in addition to missing these young mothers, the Census also missed the children of these young mothers, the hypothesis that the Census misses these children due to missing their young mothers could explain a fair proportion of that 1 million. Note that this assumption of a constant coverage pattern for mothers of all young children may not hold. Figure 1 shows that the coverage of mothers improves as the age of the mother increases. As the child age increases from 0 to 4, the ages of the mothers will tend to increase, on average. Thus, the mothers of children age 4 may have lower levels of undercoverage than mothers of children under age 1.

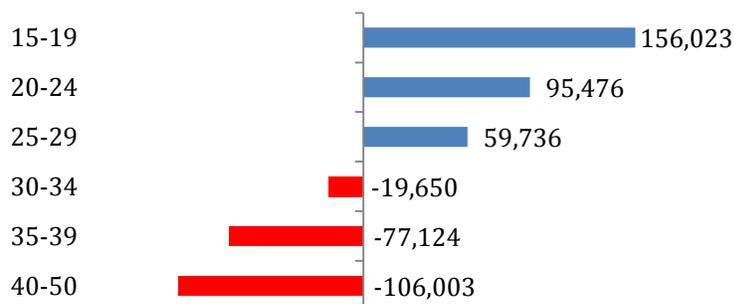


Figure 1. Differences in the Estimated Number of Women Giving Birth (ACS) and the Number of Births (Vital Statistics) by Age of Mother

We can partially explain the estimated overcount of older mothers as being due to response error by older mothers in responding “yes” to giving birth in the past 12 months when they meant that they had ever given birth. Attachment 3 estimated that close to half of these responses could be in error. That could account for over 100,000 women.

5.2 Results by maternal age, race and Hispanic origin

How do these estimates of coverage vary by race and Hispanic origin of the mother?

Tables 4 and 5 include estimated coverage rates by age, race, and Hispanic origin. The tables highlight in red the differences that are significantly less than zero. Tables 8 and 9 in Attachment 1 include the estimates used in the calculation of these rates and the 90 percent margins of error associated with the ACS estimates.

Table 4. Estimated Coverage of New Mothers by Age, Race, and Hispanic Origin (using final person weights)

Maternal Age	Race/Hispanic Origin							
	Non-Hispanic White		Non-Hispanic Black		Non-Hispanic All Other Races		Hispanic	
	Rate	MOE	Rate	MOE	Rate	MOE	Rate	MOE
15-19 years	-27.9	3.9	-22.0	5.2	-0.4	16.6	-26.7	4.3
20-24 years	-7.5	2.4	-0.5	3.8	23.6	10.9	-10.9	3.5
25-29 years	-2.0	1.9	3.1	4.5	11.6	6.5	-1.0	3.7
30-34 years	5.4	2.1	16.7	6.9	17.4	4.4	4.4	3.9
35-39 years	20.2	3.1	36.2	9.1	21.8	7.8	18.3	5.9
40 -50 years	130.9	9.6	181.7	29.8	154.6	25.1	134.3	20.3
15-50 years	3.6	1.2	7.1	2.7	22.2	3.7	-0.8	1.8

MOE: Margin of Error (90 percent)

Source: 2010 American Community Survey and 2009/2010 Birth Records from the National Center for Health Statistics

Table 4 uses the final person weights. We see that each race group shares a similar general pattern of coverage with young mothers undercounted and older mothers over counted. Non-Hispanic White, non-Hispanic Black, and Hispanic women giving birth, aged 15-19 have estimated undercoverage rates between 22 and 28 percent. The estimates for non-Hispanic All Other Races have large margins of error. The sample sizes for this group are small and the potential differential reporting of race and/or Hispanic origin may be driving some of the results.

As noted earlier, women giving birth, aged 40 -50, (across all race groups) have high estimated overcounts. A review of ACS data (see Attachment 3) found that some older mothers reported giving birth in the past year when they likely gave birth years earlier.

Table 5. Estimated Coverage of New Mothers by Age, Race, and Hispanic Origin (using ACS universe weights)

Maternal Age	Race/Hispanic Origin							
	Non-Hispanic White		Non-Hispanic Black		Non-Hispanic All Other Races		Hispanic	
	Rate	MOE	Rate	MOE	Rate	MOE	Rate	MOE
15-19 years	-28.2	3.9	-30.7	4.9	-10.3	14.5	-30.2	4.3
20-24 years	-10.7	2.5	-12.6	3.7	11.6	10.7	-16.8	3.4
25-29 years	-3.2	2.0	-5.6	4.5	7.3	7.1	-5.3	3.6
30-34 years	3.2	2.3	9.5	6.5	13.0	5.0	0.5	3.7
35-39 years	17.1	2.9	25.9	8.8	17.7	7.7	11.5	5.7
40 -50 years	124.1	9.6	160.2	28.7	143.4	24.6	118.6	18.7
15-50 years	1.4	1.2	-2.9	2.6	16.2	4.0	-5.9	1.7

MOE: Margin of Error (90 percent)

Source: 2010 American Community Survey and 2009/2010 Birth Records from the National Center for Health Statistics

The estimates in Table 4 indicate that the 2010 ACS estimates of all women (aged 15-50) giving birth were higher than the 2009/2010 NCHS average estimate of births for women reporting as non-Hispanic White, non-Hispanic Black, and non-Hispanic of other races. The 2010 ACS estimate for all Hispanic women (aged 15-50) giving birth was not significantly different from the 2009/2010 NCHS estimate of births. This may highlight true coverage differences for the full population of mothers or indicate reporting differences in race and Hispanic origin between the ACS and vital statistics. For example, the estimated overcoverage of women reporting as non-Hispanic of other races and the undercoverage of Hispanic women would result if some women who reported as Hispanic of some other race in vital statistics did not report as Hispanic in the ACS.

Without the final controls, the patterns across ages in Table 5 are very similar to those seen in Table 4 with undercoverage noted for the youngest women and overcoverage noted for the oldest women.

5.3 Results by maternal age and marital status

Does the ACS undercount young unmarried mothers? How do vital statistics on the number of births to unmarried women (by maternal age) compare with the ACS estimate of unmarried women giving birth (by maternal age)? How do these estimates of coverage vary by marital status of the mother?

Table 6 summarizes these coverage estimates by marital status of the mother. Given the smaller sample sizes, we chose not to break these data out by race and Hispanic origin of the mother. Like Tables 2 and 4, these estimates are fully weighted and speak to the potential coverage error in the census. Table 7 uses the ACS universe weights. Attachment 2 includes the ACS and vital statistics estimates used to create the coverage measures in Tables 6 and 7. The tables highlight in red the differences that are significantly less than zero.

Statistical testing confirms that we have a greater problem in undercounting young unmarried mothers compared with young married mothers. The unmarried population likely drives the overall result for the youngest mothers. Table 6 shows that there is an undercount of married mothers age 20 to 24, but the difference for the youngest married mothers, age 15 to 19, is not significantly different than zero.

From the shaded column in Table 6 we see that, unlike the population of all mothers, the ACS estimate of all unmarried mothers is lower than the count from vital statistics (9.5 percent estimated undercoverage with a margin of error of 1.4 percent). This indicates that the ACS undercounts unmarried new mothers, when combined across all age groups. This is not true for the population of married new mothers. Here the ACS estimate is greater than the count from vital statistics (11.1 percent estimated overcoverage with a margin of error of 1.3 percent).

Table 6. Estimated Coverage of New Mothers by Age and Marital Status (Using final person weights)

Maternal Age	Unmarried		Married	
	Rate	MOE	Rate	MOE
15-19 years	-30.4	2.6	-4.8	8.5
20-24 years	-10.2	2.2	-3.9	2.8
25-29 years	-7.1	2.5	1.0	2.0
30-34 years	-3.0	4.2	8.7	1.9
35-39 years	8.2	6.5	23.2	2.9
40 -50 years	144.4	16.4	134.4	8.4
15-50 years	-9.5	1.4	11.1	1.3

MOE: Margin of Error (90 percent)

Source: 2010 American Community Survey and 2009/2010 birth records from the National Center for Health Statistics

The results in Table 7 confirm that the final ACS weights correct for some of the survey's undercoverage of the unmarried mothers population. Without these final weights, the ACS estimates would understate the total unmarried mother population by close to 17 percent. The ACS appears to have coverage shortcomings with unmarried women under the age of 30.

Table 7. Estimated Coverage of New Mothers by Age and Marital Status (Using ACS universe weights)

Maternal Age	Unmarried		Married	
	Rate	MOE	Rate	MOE
15-19 years	-34.4	2.5	-6.1	8.2
20-24 years	-19.2	2.3	-4.7	2.6
25-29 years	-14.4	2.5	0.1	2.0
30-34 years	-10.4	3.7	6.5	1.8
35-39 years	0.0	5.9	19.3	2.8
40 -50 years	124.6	14.8	126.1	7.9
15-50 years	-16.9	1.4	9.0	1.2

MOE: Margin of Error (90 percent)

Source: 2010 American Community Survey and 2009/2010 birth records from the National Center for Health Statistics

From Tables 6 and 7 we can conclude that coverage of new mothers in the ACS varies by marital status. Estimates of the total number of married women reporting a birth in the past 12 months in the ACS exceeds the number of births from vital statistics for married women (coverage rate of 9.0 percent with margin of error of 1.2 percent). In contrast, estimates of the number of unmarried women giving birth in the past 12 months in the ACS is significantly lower than the vital statistics estimate of births for unmarried women (coverage rate of -16.9 percent with a margin of error of 1.4 percent). Some of this coverage error may be due to response error to the fertility question or the marital status question or to a change in marital status between the time of the birth and the time of the interview.

Of particular interest to this research, when we look at the coverage rates for the youngest mothers by marital status we see significantly higher estimates of undercoverage for unmarried, versus married new mothers under age 20.

6. CONCLUSION

These results suggest that the ACS, and likely the decennial census, undercounts young mothers. We observe this problem across race groups and for both married and unmarried young mothers with unmarried young mothers especially at risk. This is an important finding and should prompt attention into how survey and census data collection methods might improve the coverage of young mothers.

We expected ACS maternal ages to differ from vital statistics due to the differences in the time periods that we capture age (in vital statistics this is at the time of birth and in the ACS it is at the time of the interview). These definitional differences explain some of our observations. There could also be some amount of measurement error in the reporting of fertility in the ACS (false negatives). Despite these limitations, we believe that the results still indicate levels of undercoverage that we should investigate further. We need to connect these findings with our primary concern, the undercoverage of young children. It is possible that, as was true in Canada, the U.S. Census misses young children because it also misses their young mothers.

7. NEXT STEPS

The results likely identify some amount of measurement error in the ACS estimates of older women giving birth in the past year. An analysis of this issue suggests that some women may not be acknowledging the “past 12 months” when they answer positively to this question. See Attachment 3 for details. The American Community Survey Office (ACSO) and the Social, Economic, and Housing Statistics Division (SEHSD) plan to make changes to improve this question.

It makes sense to research the characteristics of households that include young mothers to improve our understanding of the possible reasons (and potential solutions) for this undercoverage. U.S. Census Bureau (2014a) found that about 60 percent of young mothers reported that they were not living in their own household; three out of four of these young mothers were living with their own parent or parents. It would be valuable to understand if the census is correctly enumerating households with these types of subfamilies. A recent detailed tabulation of relationship data for households with young children allows us to profile the complex living situations that involve these youngest children. We would also like to use vital statistics data to develop a profile on young mothers. Finally, we believe that outreach efforts may help to ensure that the census accurately enumerates young mothers and their young children. This should be a part of the 2020 communications campaign.

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Table 8. Number of Women Giving Birth in the Past 12 Months by Age, Race and Hispanic Origin - 2010 ACS

Maternal Age	All		Non-Hispanic White		Non-Hispanic Black		Non-Hispanic All Other Races		Hispanic, any race	
	Estimate	MOE	Estimate	MOE	Estimate	MOE	Estimate	MOE	Estimate	MOE
Final Person Weights										
15-19 years	282,737	9,494	110,207	5,983	73,323	4,935	12,163	2,031	95,024	5,623
20-24 years	901,711	17,141	444,227	11,515	191,326	7,228	49,344	4,355	237,244	9,343
25-29 years	1,130,600	19,440	643,497	12,738	156,285	6,770	86,327	5,010	262,039	9,670
30-34 years	1,018,444	17,311	604,453	12,284	117,486	6,924	105,069	3,951	203,899	7,591
35-39 years	564,962	11,892	325,604	8,348	68,567	4,602	60,593	3,886	116,530	5,784
40-50 years	270,266	8,881	152,555	6,376	38,445	4,067	28,504	2,814	54,652	4,726
15-50 years	4,168,720	39,147	2,280,543	25,447	645,432	16,354	342,000	10,416	969,388	18,018
ACS Universe Weights										
15-19 years	268,673	9,524	109,783	5,959	65,207	4,577	10,952	1,766	90,435	5,602
20-24 years	844,260	17,646	429,124	11,999	167,940	7,067	44,550	4,277	221,412	8,927
25-29 years	1,095,299	18,974	635,720	12,866	143,066	6,785	82,948	5,515	250,598	9,591
30-34 years	987,128	16,553	591,495	13,375	110,212	6,553	101,098	4,462	196,188	7,267
35-39 years	542,695	11,025	317,300	7,926	63,370	4,411	58,543	3,854	109,862	5,624
40-50 years	257,969	8,268	148,068	6,334	35,511	3,911	27,252	2,753	50,987	4,362
15-50 years	3,996,024	38,428	2,231,490	26,234	585,308	15,657	325,344	11,087	919,483	16,614

Source: 2010 American Community Survey – special tabulation

MOE: Margin of Error (90 percent)

Table 9. Number of Births by Age, Race and Hispanic Origin - 2009 and 2010 Vital Statistics*

Maternal Age	Race/Hispanic origin				
	All	Non-Hispanic White	Non-Hispanic Black	Non-Hispanic All Other Races	Hispanic, any race
15-19 years	388,740	152,879	94,037	12,216	129,609
20-24 years	978,835	480,477	192,248	39,925	266,187
25-29 years	1,150,250	656,758	151,562	77,340	264,591
30-34 years	958,708	573,344	100,651	89,485	195,229
35-39 years	469,487	270,872	50,354	49,753	98,509
40-50 years	114,243	66,077	13,646	11,195	23,326
15-50 years	4,060,263	2,200,405	602,496	279,913	977,450

Source: 2009 and 2010 Birth Records from the National Center for Health Statistics

*Simple Average of 2009 and 2010 Births

Table 10. Number of Women Giving Birth in Past 12 Months by Age & Marital Status- 2010 ACS

Maternal Age	Unmarried		Married	
	Estimate	MOE	Estimate	MOE
Final Person Weights				
5-19 years	236,962	8,887	45,775	4,068
20-24 years	549,875	13,177	351,836	10,366
25-29 years	362,152	9,810	768,448	15,369
30-34 years	194,847	8,420	823,597	14,153
35-39 years	97,888	5,846	467,074	10,838
40-50 years	60,148	4,031	210,118	7,539
15-50 years	1,501,872	23,440	2,666,848	30,131
ACS Universe Weights	Estimate	MOE	Estimate	MOE
15-19 years	223,530	8,558	45,144	3,953
20-24 years	495,251	14,068	349,009	9,607
25-29 years	333,777	9,560	761,521	15,122
30-34 years	179,905	7,439	807,223	13,913
35-39 years	90,506	5,326	452,189	10,618
40-50 years	55,267	3,648	202,702	7,125
15-50 years	1,378,236	22,426	2,617,788	29,795

Source: 2010 American Community Survey – special tabulation

MOE: Margin of Error (90 percent)

Table 11. Number of Births by Maternal Age & Marital Status- 2009 and 2010 Vital Statistics*

Maternal Age	Marital Status	
	Unmarried	Married
15-19 years	340,668	48,072
20-24 years	612,563	366,272
25-29 years	389,711	760,540
30-34 years	200,824	757,885
35-39 years	90,472	379,015
40-50years	24,606	89,638
15-50 years	1,658,842	2,401,421

Source: 2009 and 2010 Birth Records from the National Center for Health Statistics

*Simple Average of 2009 and 2010 Births

An Assessment of Measurement Error in the 2010 ACS Fertility Question

The ACS fertility question asks all females between the ages of 15 and 50, “*Has this person given birth to any children in the past 12 months?*” The format of the question on the paper form has the phrase, “in the past 12 months” on the second line of the question where it is possible that it is missed. Interviewers may also truncate this question in error without recognizing the critical nature of the “past 12 months.” In the past few years, data review analysts in SEHSD noted unusually high ACS fertility rates in some areas. An investigation determined that a small number of interviewers did not ask the question correctly and falsely identified women as giving birth in the past 12 months when they really had given birth at any earlier point in time. The Census Bureau suppressed the fertility data for these areas and retrained the interviewers.

We worked with ACSO staff to look more closely at this potential measurement error across modes. Using unedited 2010 ACS data, we calculated national-level results on the number of women aged 15-50, the number of women responding “yes” to the fertility question, and the number of women responding “yes” with at least one child aged 0 or 1 in the household. We studied the data overall and by mode of data collection. We calculated two ratios:

- **Percent “Yes”** = The ratio of the number of women aged 15 to 50 who responded “yes” to the fertility question to the total number of women aged 15 to 50
- **Percent with Children** = The ratio of the number of women responding “yes” to the fertility question with at least one child age 0 or 1 to the total number of women responding “yes” to the fertility question

Table 12 summarizes these results overall and by mode. We did not expect the “percent with children” to be 100 percent for numerous reasons (e.g., death of child, child living elsewhere, child given up for adoption, parent “forgot” to report the child) but we did expect the rate to be quite high and it is. Overall the proportion of women reporting as giving birth within the past 12 months who have a young child living in the household is about 89 percent. We see a slightly higher rate for the mail mode. Self-selection into this mode might explain this difference.

Table 12. Measurement Error Metrics by Mode

Mode	Percent “yes”	MOE	Percent with Children	MOE
All modes	5.4	0.1	88.9	0.3
Mail	5.1	0.1	86.5	0.3
Telephone	4.7	0.1	90.8	0.6
Personal Visit	6.0	0.1	91.0	0.4

Source: 2010 American Community Survey – special tabulation

MOE: Margin of Error (95 percent)

Table 13 displays these results by age of mother. Here we see important differences for the oldest women. When we look at the total across all modes of data collection, we see expected differences in fertility rates by maternal age (percent reporting “yes” to a birth in the past 12 months). The “percent with children” rates for all modes combined show a very low rate for the oldest mothers. Only about 53 percent of the women aged 40-50 who reported giving birth in the past 12 months have a young child living in the household. For all other age groups this rate is close to 90 percent. When we look at this by mode we see that self-response households had a rate of only about 46 percent. This could suggest that respondents are misreading the question and reporting births in general, rather than births in the past 12 months. The rates in the interviewer-administered modes still indicate the potential for response error, although to a lesser degree.

Table 13. Measurement Error Metrics by Mode and Age of Mother

Mode	15-19 (MOE)	20-24 (MOE)	25-29 (MOE)	30-34 (MOE)	35-39 (MOE)	40-50 (MOE)	TOTAL (MOE)
Percent yes”							
All modes	2.7 (0.1)	8.9 (0.2)	10.7 (0.2)	10.1 (0.2)	5.5 (0.1)	1.1 (0.0*)	5.4 (0.1)
Mail	1.8 (0.1)	6.9 (0.2)	10.4 (0.2)	11.2 (0.2)	6.1 (0.1)	1.2 (0.0*)	5.1 (0.1)
Telephone	2.4 (0.2)	8.9 (0.5)	11.3 (0.6)	10.6 (0.4)	5.7 (0.3)	0.7 (0.1)	4.7 (0.1)
Personal Visit	3.8 (0.2)	10.2 (0.3)	10.9 (0.3)	8.8 (0.3)	4.7 (0.2)	1.0 (0.1)	6.0 (0.1)
Percent with children							
All modes	86.6 (1.2)	91.3 (0.5)	93.6 (0.4)	92.5 (0.5)	87.3 (0.7)	52.7 (1.5)	88.9 (0.3)
Mail	83.9 (2.0)	89.4 (0.8)	92.9 (0.5)	91.9 (0.5)	84.8 (0.7)	45.8 (1.7)	86.5 (0.3)
Telephone	83.4 (2.8)	88.6 (1.7)	92.5 (1.3)	94.9 (1.2)	94.5 (1.3)	73.2 (4.3)	90.8 (0.6)
Personal Visit	88.4 (1.8)	92.8 (0.8)	94.3 (0.6)	92.9 (0.9)	89.3 (1.5)	60.6 (3.0)	91.0 (0.4)

Source: 2010 American Community Survey – special tabulation

* Value is less than 0.05

MOE: Margin of Error (95 percent)

These results explain some of the measured overcoverage of older mothers found in this report. The vital statistics numbers are lower than the ACS estimates due to errors by older women who incorrectly report giving birth in the past 12 months.

These data point to a potential measurement error problem with the ACS fertility question across all modes. While our focus in this attachment was on older women, it is possible that women in any age group could be over reporting births if they fail to read the reference period in the question. The mode-level results point to mail responses (self-response) as especially concerning. The interviewer-administered modes also show some potential for response error and the need to ensure that interviewers read this question in full to avoid false positive responses.