The Net Undercount of Children in the U.S. Decennial Census

Dr. William P. O'Hare
American Statistical Association/National Science Foundation/ Census Bureau Research Fellow, US Census Bureau, Washington DC. 20233.[1]

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Abstract

The U.S. Census Bureau's Demographic Analysis shows a net undercount rate of 4.6 percent for children age 0 to 4 in the 2010 Decennial Census, which is more than twice as high as any other age group. Despite the fact that the relatively high net undercount of young children was uncovered more than fifty years ago, this problem has received little systematic attention from demographers. This study examines the accuracy of the count of children in the U.S. Decennial Census. The initial focus on all children (i.e. the population age 0 to17) but then the focus shifts to a focus on young children (age 0 to4) where net undercount rates are the highest. Results from 2010are compared to results from earlier U.S. decennial censuses to examine trends over time.

1. Introduction

The net undercount of children has been documented historically in the U.S. Census and it has been observed in the censuses in many other countries around the world (Goodkind 2011; Anderson & Silver 1985; Anderson 2004). The Canadian censuses of 2001 and 2006 also show a relatively high net undercount for the population age 0 to 4 and show that younger children have a higher net undercount rate than older children (Statistics Canada 2004, 2010).

However, the net undercount of young children in the U.S. decennial census has received little systematic attention from researchers with only a handful of reports, working papers, and conference presentations focusing on this issue (O'Hare 1999; West & Robinson 1999; Edmonston 2001; Daponte&Wolfson 2003; Pitkin & Park 2005; Zeller 2006; O'Hare 2009; Hernandez & Denton no date).

This paper presents descriptive data on the net undercount of children in the U.S. Decennial Census. It is meant to provide a foundation for the presentations which follow in this session. After describing the Demographic Analysis (DA) estimation methodology, DA estimates for children are compared to the 2010 Decennial Census counts to detect net undercounts and overcounts. Results are examined by single-year of age, by sex, and by race and Hispanic Origin for children under age 18 and separately for those under age 5. Results from 2010 are compared to results from earlier U.S. decennial censuses to detect trends over time.

2. Demographic Analysis Methodology

[1]Any opinions and conclusions expressed herein are those of the author and do not necessarily represent the views of the U.S. Census Bureau.

Assessing the net undercounts in the census is typically based on one of two methods: 1) Demographic Analysis (DA), or 2) Dual System Estimates (DSE). This paper focuses on data from DA, which is based on comparing the census results to an independent population estimate based on births, deaths and net international migration.It is widely believed that the DA method is better suited to assessing net undercount rates for young children. Since there are already several detailed descriptions of the DA methodology available (Robinson 2010), I will only review the method briefly here.

The DA method has been used to assess the accuracy of decennial census figures for more than a half century and its origins are often traced back to an article by Price (1947). As Price documents, the unexpectedly high number of young men who turned up at the first compulsory selective service registration on October 6, 1940, alerted scholars to the possibility of under-enumeration in the 1940 decennial census.

The relatively high net undercount among young children was reportedbyCoale (1955) who found children under age 5 had a high net undercount rate in the censuses of 1940 and 1950. Siegel and Zelnik (1966) also found a significant net undercount of children under age 5 in the 1950 and 1960 censuses.

The DA method employed for the 2010 Census uses one technique to estimate the population under age 75 and another to estimate the population age 75 and older (West 2012). Since this study focuses on children, I only discuss the method used for people age 0 to 74 (people under age 1 are classified as age 0).

The 2010 DA estimates for the population age 0 to 74 are based on the compilation of historical estimates of the components of population change: Births (B), Deaths (D), and Net International Migration (NIM). The data and methodology for each of these components is described in a set of background documents prepared for the development and release of the 2010 DA estimates (Bhaskar et al. 2010; Devine et al. 2010; Robinson 2010).

The DA population estimates for age 0 to 74 are derived from the basic demographic accounting equation (1) applied to each birth cohort:

(1) $P_{0-74} = B - D + NIM$

P_{0-74} = population for each single year of age from 0 to 74

B = number of births for each age cohort

D = number of deaths for each age cohort since birth

NIM = net international migration for each age cohort

For example, the estimate of the population age 17 on the April 1, 2010,census date is based on births from April 1992 through March 1993, reduced by the deaths to that cohort in each year between April 1,1992, and April 1, 2010, and incremented by Net International Migration (NIM) of the cohort over the 17-year period.

Births are by far the largest components of the population estimates in DA for children. Births account for 97 percent of DA population estimate for age 0 to 17 in 2010

and for 99.6 percent of the DA population estimate for the population age 0 to 4 (U.S. Census Bureau 2010b, Table 8).

The birth and death data used in the Census Bureau's DA estimates come from the U.S. National Center on Health Statistics (NCHS), and these records are widely viewed as being accurate and complete (Devine et al. 2010). The Census Bureau assumes death data have been complete since 1959 and birth data have been complete since 1985 (Devine et al. 2010.

The Census Bureau changed the way it calculated net international migration for the 2010 set of DA estimates (Bhaskar et al. 2010). The current method relies heavily on data from the American Community Survey (ACS) in which respondents are asked about the location of their Residence One Year Ago (ROYA). The total number of yearly immigrants was derived from this question in each year of the ACS, and then that total number was distributed to demographic cells (sex, age, and race) based on an accumulation of data over the last five years of the ACS. Five years of ACS data are used to provide estimates that are more reliable for small groups.

One of the major uncertainties in using DA estimates to assess the accuracy of census population counts is its assumptions about net international migration.According to Bhaskar, Scopilliti, Hollman, and Armstrong (2010, page 1), "The largest uncertainty in the Demographic Analysis (DA) estimates comes from the international migration component."

However, it is important to note that assumptions about net international immigration have minimal impact on the DA estimation for persons ages 0 to 4. Data from the 2010 American Community Survey show only 1 percent of children age 0 to 4 are foreign-born, compared to 20 percent of prime working-age adults (age 25-44) (U.S. Census Bureau 2011d). The DA estimates released in May 2012 assume a Net International Migration of only 244,000 out of a population of 21,172,000 for ages 0 to 4. Therefore, errors in this component of population change would not have a big impact on the final DA population estimate for the 0 to 4 age group.

One reason DA is the preferred method for assessing the net undercount of young children is related to the quality of vital events data. Vital events data for younger people are of a higher quality than those for older people. Thus, the quality of DA estimates for younger people is likely to be better than that for older people, both in terms of total numbers and racial composition. Improvement in the birth certificate data over time is a major reason the Census Bureau is now producing DA estimates for Hispanics under age 20. In the five scenarios for 2010 DA estimates released in December 2010, the birth and death assumptions are identical for children (U.S. Census Bureau 2010b). In comparing DA to DSE in 2000, Zeller (2006, page 3201) also concludes, "Since the Demographic Analysis estimates for young children depended primarily on highly accurate recent birth registration data, the Demographic Analysis estimate is believed to be more accurate,"

There are four major limitations to DA. First, it is only routinely available for the nation as a whole. The fact that many people move after birth is a barrier to employing this method at the subnational level. While attempts have been made to produce subnational DA estimates, they have not been widely used (Robinson, Ahmed, & Fernandez, 1993; Adlakha et al, 2003).

Second, DA estimates are only available historically for Black and Non-Black groups. This restriction is due the lack of race specificity and consistency for data collected on the birth and death certificates historically. The only group that has been identified consistently over time is Blacks (African-Americans). DA estimates for the net undercount of Hispanic children were made available for young children in 2000 and all children in 2010, but there are no such estimates prior to 2000.

The third limitation of the DA estimates is that they only supply net undercount/overcount figures. A zero net undercount could be the result of no one being missed (omissions) or double counted (erroneous enumerations) or it could be the result of ten percent of the population being missed and ten percent counted twice.

The fourth limitation of the DA methodology is the lack of any measures of uncertainty regarding the point estimates. However, in the DA release of December 2010, the Census Bureau offered results for five different DA scenarios to illustrate the uncertainty surrounding the DA estimates. For children age 0 to 17, the DA estimates ranged from a low of 75,042,000 to a high of 76,222,000 which amounts to a 1.6 percent difference between the lowest and highest estimates. The results for the population age 0 to 4, ranged from a low of 21,181,000 to high of 21, 265,000 for the five scenarios. In percentage terms, the difference between the lowest estimate and the highest estimate is 0.39 percent. This provides at least one guide to expected variation in the DA estimates and suggest that the DA estimates for children are likely to contain relatively little error.

Despite these limitations, DA has been used for many decades, the underlying data and methodology are solid, and it has provided useful information for those trying to understand the strengths and weaknesses of the U.S. decennial census. According to Robinson (2000, page 1), "The national DA estimates have become the accepted benchmark for tracking historical trends in net census undercounts and for assessing coverage differences by age, sex, and race (Black, all other)."

3. Using DA to Estimate the Black Population

As stated earlier, Black is the only race historically assessed using DA because Black is the only racial category for which data have been collected consistently in the birth and death certificates over time.The Census Bureau faces multiple problems trying to make the decennial census racial categories consistent with the race data collected on birth and death certificates. For example, the "Some Other Race" category is a response category for the race question in the decennial census but not in birth or death certificates. Because the birth certificate data does not have a "some other race" category, the Census Bureau constructs a set of modified race categories from the decennial census responses in which respondents in the some other race category are distributed to Black and Non-Black categories. Thus for making comparisons between DA estimates and the decennial census counts for Blacks and Non-Blacks, one must use the 2010 Decennial Census modified race tabulations available on the Census Bureau's website.

A second issue is the fact that decennial census respondents in 2000 and 2010 could mark more than one race. In 1997, the U.S. Office of Management and Budget (1997) updated Statistical Policy Directive 15 requiring federal data collection efforts to allow respondents to mark more than one race. Prior to the 2000 Census, respondents were only allowed to mark one race in the decennial census, which meant the race data from the decennial census and from vital events were consistent in this regard. This issue is

further complicated by the fact that it wasn't until 2003 that the federal government issued new standard birth certificate and death certificate forms that allow parents to mark more than one race. However, birth and death certificate data are collected by states and states only changed to the new form slowly over time. Every year after 2003, a new group of states adopted the new birth certificate and death certificate forms, so each year from 2003 to 2010 the Census Bureau had to process some data from the old forms that allowed only one race to be selected and some data from the new forms that allowed more than one race to be selected. The data from the birth (and death) certificates had to be put into Black and Non-Black categories, based on both single-race and multiple-race reported by mother and fathers. In addition, for the DA release of May 2012, DA estimates were provided for "Black alone" as well as "Black alone or in combination," so birth certificate data had to be put into these two different racial categories.

A third issue is that birth certificate forms only record the race of the mother and father. Thus, the race of the child must be inferred from the race of the parent(s). This is further complicated by a significant level of missing data. While data on the race of mother is relatively complete in 2009, 19 percent of birth certificate forms did not contain the race of the father (Martin et al. 2011).

When both parents report the same race, that is the race assigned to the child. When the two parents report different races on the birth certificate, newborns are assigned to a race category based on the reported race of their mother and father in combination with observed parent-child race relationships seen in the 2000 decennial census data (Ortman2012). This is also an issue for Hispanic newborns and a similar approach is used.

Mixed race parentage is a bigger statistical issue for young children than older people because increased rates of inter-marriage over time mean more children today are likely to have parents with different races and Hispanic status. One study found that about 15 percent of marriages in 2010 involved spouses of different race or ethnicity compared to 7 percent in 1980 (Wang 2012).

Assignment of race on death certificates is also a potential problem, but deaths contribute very little to the DA estimates for children (Aries et al. 2008).

4. Data Sources

In this study, I use the DA files that were released in May 2012 for all groups except Hispanics. The May 2012 DA update did not contain data for Hispanics, so I used the Hispanic data from the December 2010 DA release. For the 2010 Census counts, I used data for Summary File 1 except for the Black/Non-Black figures for which I used the modified race data from the 2010 Decennial Census. Population figures for modified race categories are available online at:http://www.census.gov/popest/data/national/totals/2011/index.html.

The DA program for 2010 continued the practice of producing estimates by age, sex, and Black and Non-Black. However, the 2010 DA analysis included two new facets. For the first time, the Census Bureau provided DA estimates for the Hispanic and Non-Hispanic populations under age 20. Also for the first time, the bureau produced DA estimates of "Black Alone" as well as "Black Alone or in combination."

I use the term children to refer to people age 0 to 17, and the term young children to refer to people age 0 to 4. I use the term adults to refer to people age 18 and over.

In the remainder of this paper, the difference between the census counts and DA estimates are shown as the census count minus the DA estimate. Therefore, a negative number implies a net undercount and a positive number implies a net overcount. In converting the numbers to percentages or rates, the difference between the census and DA estimate is divided by the DA estimate. All estimates are shown rounded to the nearest thousand and percentages are shown to one decimal place for readability.

5. Demographic Analysis Results

Figure 1 shows how the 2010 Decennial Census Count compared to the 2010 DA estimate and the Vintage 2010 Population Estimate for the total population. It also shows in the 2010 Decennial Census Count compare to the Census Coverage Measures (CCM) estimate of the total household population. These results suggest that the 2010 Decennial Census count is highly accurate since it closely matches independent estimates. When the 2010 Decennial Census count is compared to the DA estimate it indicates a net overcount of only 0.1 percent. This is very good by historical or international standards.

2010 DA Estimates for Adults Compared to Children

However, a more detailed examination suggests that the small overcount of the total population masks overall counter balancing differences for different age groups. Figure 2 shows that there was a net overcount of 0.7 percent for adults (age 18+) and a net undercount for children (age 0 to 17) of 1.7 percent. In population terms there was a net overcount of 1.7 million adults and a net undercount 1.3 million children.

2010 DA Estimates for Single Year of Age for Children

There are big differences in net undercount and overcount rates for children based on their age. Figure 3 shows net overcounts and net undercounts in the 2010 U.S. Decennial Census by single year of age for the population 0 to 17.

There are three key points that can be derived from Figure 3. First, the highest net undercount rates are among the children under age 5. More than three-quarters of the 1.3 million person net undercount for the population age 0 to17 can be accounted for by those age 0 to 4, where the net undercount is slightly under one million people (see Table 1).

Second, there is a net overcount rate for people age 14 to 17. The net overcount of children age 14 to 17 is completely accounted for by a high net overcount of Hispanics and Blacks in this age range (shown later).

Third, and perhaps the most interesting evidence reflected in Figure 2 is the clear age gradient along the age range from age 1 to 17. The net undercount rate declines steadily from age 1 to age 13, and there is a net overcount in the 14 to 17 age group. There is almost a perfect correlation between age and net undercount for the population under age 18 (the correlation coefficient is -.97). As age increases, net undercount decreases.

Seldom in social science research is there such a high correlation without some ideas about what accounts for it. In the case of the correlation between age and net undercount there is virtually nothing in the professional literature that addresses the cause of the association.

Figure 3 makes it clear that people under age 18 should not be treated as a homogeneous age group with regard to census undercounts and overcounts. The data show that young children have a relatively high net undercount, while people age 14 to 17 have a net overcount. Analyses that fail to make a distinction among age groups of children are likely to find interpretation of findings difficult. The explanation for why young children experience a high net undercount is likely to be quite different from the explanation for why teens (age 14 to 17) have a high net overcount.

Figure 4 shows net undercount rates in the 2010 U.S. Decennial Census for Black alone, Black Alone or in Combination, and Hispanic children by single year of age. Figure 3 also includes a set of figures for the group labeled"Not Black Alone or in Combination and Not Hispanic." This is not a category used but the Census Bureau, but I feel it is relatively good proxy for the Non-Hispanic white population. The figures for the Not Black Alone or in Combination and Not Hispanic populations are derived by subtracting the Black Alone or in Combination population as well as the Hispanic population from the total population in both the Census and the DA estimates. Based on data from the American Community Survey, about 93 percent of the Not Black Alone or in Combination and Not Hispanics is Non-Hispanic White.

The age gradient seen for the total population of children is seen consistently among all the groups examined here, while levels and the exact age breaks differ slightly. For all groups, as one moves up in age, the net undercounts decrease, and net overcounts begin to occur in the early teen years.

The high net undercount of young children and the net overcount of 14-to-17-year-olds are both accounted for largely by the net undercounts and net overcounts of Hispanics and Blacks. Hispanics and Blacks have higher than average net undercount rates among children under age 5, but higher than average overcounts among children age 14 to 17. There was a net overcount rate of 1.5 percent for the total population age 14 to 17 in the 2010 Census, but for Hispanics age 14 to 17 the net overcount rate was around 6 percent and for Blacks (both Black alone and Black alone or in combination) age 14-17, it was around 4 percent. The Not Black Alone or in Combination and Not Hispanic group has relatively low net undercounts rates at every age from 0 to 17.

The Population under Age 5

It is clear that children under age 5 have the highest net undercount rate of any age group in the 2010 Census. Table 1shows that the net undercount rate for the total population under age 5 was 4.6 percent, but this masks differences among groups. The net undercount rate for Black alone in this age range was 4.4 percent, the net undercount rate for Black Alone or in Combination was 6.3 percent, and the net undercount rate for Hispanic children in this age range was 7.5 percent. The net undercount rate for the Not Black Alone or in Combination and Not Hispanic group under age 5 is only 2.6 percent.

There was a total net undercount of slightly less than one million people under age 5 in the 2010 Census, including a net undercount of 247,000 Black alone or in combination and a net undercount of 414,000 Hispanics in this age range. Thus, young BlackAlone or in Combination and young Hispanic children account for about two-thirds of the net undercount in this age group even though they only account for about 40 percent of the population in this age range. Moreover, the net undercount of Black and Hispanic children under age 5 accounts for about half of the total net undercount of all people under age 18.

Comparison of 2010 Census results with Earlier U.S. Censuses.

Figure 5 shows the mean of single year of age net undercount rates for all U.S. Decennial Censuses since 1950. While the age gradient for all U.S. Decennial Censuses since 1950 is not as steep as that seen in the 2010 U.S. Decennial Census there is still a noticeable age gradient. Young children have tended to have higher net undercount rates than older children in most U.S. Decennial Censuses since 1950. Figure 5 also shows the age heaping on age 10 that was prevalent in the earlier part of the period examined here. If age-heaping had not occurred, the age gradient would be much smoother.

The final figure presented here examines the net undercount rates of adults and young children in every U.S. Decennial Census since 1950. Figure 6 shows that there have been two distinct periods since 1950. From 1950 to 1980, The net undercount rates of young children and adults were relatively similar and they were both improving.

However, after 1980, the net undercount rates of these two age groups moved in very different directions. The net undercount rate of adults continued to improve to the point that there were slight overcounts in 2000 and 2010. However, the net undercount rate for young children tripled between 1980 and 2010. In 1980, the net undercount rate was 1.4 percent (same as adults) but by 2010 is had increased to 4.6 percent. There was a big increase in the net undercount rate of young children between 1980 and 1990, not much change between 1990 and 2000, and then another big increase in the net undercount rate of young children from 2000 to 2010. Ironically, the net undercount rate of young children in 2010 is almost identical to the rate in 1950.

6. Discussion

The data presented in the previous section raise several questions. A few of the key questions are outlined below.

First, what accounts for the high net undercount rate of young children in the 2010 U.S. Decennial Census? This question has received almost no attention from demographers or statisticians. Currently, we do not even know how much of the net undercount of young children is due to missing whole households where young children live and how much is due to young children being left off census questionnaires that were returned. Given the fact that the population age 0 to 4 had a net undercount rate that was more than twice as high as any other age group, this should be a key focus in planning for the 2020 U.S. Decennial Census.

Second, what explains the net overcount of children age 14 to 17? While this is probably not as large of a problem as the net undercount of young children because the

magnitude is smaller and overcounts are less of a public relations issue, it is still an intriguing social science/demographic question.

Third, what accounts for the very high correlation between age and net undercount rates for the population under age 18 in the 2010 U.S. Decennial Census? It is surprising that there is so little research on this issue. Associations of this magnitude typically generate a myriad of hypothesis about their cause. The fact that the age gradient has been seen for many decades and is seen among different race/ethnic groups, make it even more fascinating.

Fourth, what accounts for the big increase in net undercount rates of young children after 1980? The different trajectories of net undercount rates for adults and young children since 1980 are conspicuous. It is unclear if the changes after 1980 are due to some changes in census operations or procedures or if they reflect changes in society such as willingness to respond to government surveys and/or changing living arrangements.

7. Conclusions

The very small net overcount for the total population reflected in the DA estimates masks important differences by age. There was a net overcount of 0.7 percent for adults (people age 18 +) but a net undercount of 1.7 percent for children (people age 0-17). In addition, there are important differences in net undercount and net overcount rates for children by age. The net undercount rate for people under age 5 in the 2010 Census (4.6 percent) is higher than any other age group, while there was a small net overcount for the population age 14 to 17.

It is clear that children (people under age 18) should not be treated as a homogeneous group with regard to the likelihood of being undercounted or overcounted in the decennial census. In the 2010 U.S. Decennial Census young children (age 0 to 4) had a high net undercount rate while older children (age 14 to 17) had a net overcount.

There is a clear relationship between age and the net undercount. In all the groups examined here young children (age 0 to 4) had the highest net undercount rates, but the net undercount rate diminished as children age and a net overcount rate occurs by the time children are 14 to 17 years old.

Given the magnitude and the persistence of the net undercount of young children I believe young children should be the focus of attention for those desiring a more complete and accurate count in the 2020 U.S. Decennial Census. Young children should be the focus of attention in research leading up to the 2020 U.S. Decennial Census to gain a better understanding of why young children have such a high net undercount. In addition, I believe households with young children, especially black and Hispanic young children, should be the focus of the Census outreach campaign in 2010.

References

Anderson, B. A, & Silver, B.D., (1985).“Estimating Census Undercount from School Enrollment Data: An Application to the Soviet Censuses on 1959 and 1970,” Demography, Vol. 22, No. 2 (May) pp 289-308.

Anderson, B. A., (2004).Undercount in China's 2000 Census in Comparative Perspective, PSC Research Report, NO. 04-565, Population Studies Center, University of Michigan, Ann Arbor, MI.

Aries, E, Schauman W.S., Eschbach K., Sorlie P.D.,Backlund E.,(2008). The Validity of race and Hispanic Origin reporting on death certificates in the United States, National Center for Health Statistics, Vital Health Stat 2 (148).

Bhaskar, R., Scopilliti, M., Hollman, F. & Armstrong, D, (2010). "Plans for Producing Estimates of Net International Migration for the 2010 Demographic Analysis Estimates," Census Bureau Working Paper No. 90, Available online at http://www.census.gov/population/www/documentation/twps0090/twps0090.pdf

Coale, A. J., (1955). "The Population of the United States in 1950 Classified by Age, Sex and Color-a Revision of Census Figures," Journal of the American Statistical Association, 50:16-54.

Daponte, B.O. &Wolfson, L.J., (2003). "How Many American Children are Poor? Considering Census Undercount by Comparing Census to Administrative Data" Carnegie Mellon University, February 7.

Devine, J., Sink, L.,DeSalvo, B., &Cortes R., (2010). "The Use of Vital Statistics in the 2010 Demographic Analysis Estimates," Census Bureau Working Paper No. 88, available online at http://www.census.gov/population/www/documentation/twps0088/twps0088.pdf

Edmonston, B. (2001).Effects of Census Undercoverage on Analyses of School Enrollments: A Case Study of Portland Public Schools, U.S. Census Monitoring Board, Report Series Report No. 05, February.

Goodkind, D. (2011)."Child Underreporting, Fertility and Sex Ratio Imbalance in China," Demography, Vol. 48, pp 291-316.

Hernandez, D. & Denton, N. (no date). "Census Affects Children in Poverty," U.S. Census Monitoring Board, Presidential Members.

Martin, J.A., Hamilton, B.E., Ventura, S. J, et al (2011).Births: Final Data for 2009, National Vital Statistics System, Vol. 60, No.1, Hyattsville, MD; National Center for Health Statistics.

O'Hare, W. P., (1999).The Overlooked Undercount: Children Missed in the Decennial Census, The Annie. E. Casey Foundation, Baltimore, MD.

O'Hare, W. P., (2009).Why Are Young Children Missed So Often in the Census, KIDS COUNT Working Paper, December, Available online at http://www.aecf.org/~/media/Pubs/Other/W/WhoAreYoungChildrenMissedSoOftenintheCensus/final%20census%20undercount%20paper.pdf

Ortman, J.M. (2012) Estimating Multiple-Race Births for the 2010 Demographic Analysis Estimates, Paper presented a the Applied Demography Conference, University of Texas at San Antonio, San Antonio, TX

Pitkin, J & Park, J. (2005). "The Gap Between Births and Decennial Census Counts of Children Born in California: Undercount or Transnational Movement?" Paper presented at the Population Association of America Conference, Philadelphia PA.

Price, D. O., (1947). "A Check on the Underenumeration in the 1940 Census," American Sociological Review, Vol. 12, pp 44-49.

Robinson, J. G. (2000).Accuracy and Coverage Evaluation: Demographic Analysis Results, U.S. Census Bureau, DSSD Census 2000 procedures for operations Memorandum Series B-4.

Robinson, J. G., (2010). "Coverage of Population in Census 2000 Based on Demographic Analysis: The History Behind the Numbers, Census Bureau, Working Paper N0. 91, available online at http://www.census.gov/population/www/documentation/twps0091/twps0091.pdf

Siegel, J. S., &Zelnik, M. (1966)."An Evaluation of Coverage in the 1960 Census of Population by Techniques of Demographic Analysis and by Composite Methods." In *Proceedings of the Social Statistics Section of the American Statistical Association*: (1966): 71-85. Washington, D.C.: American Statistical Association.

Statistics Canada (2010).2006 Census Technical Report: Coverage, Statistics Canada Catalogue no. 92-567-X Ottawa Ontario.

Statistics Canada (2004).2001 Census Technical Report: Coverage. Statistics Canada Catalogue no. 92-394-X. Ottawa, Ontario

The Annie E. Casey Foundation, (2012), "Data Snapshot on High Poverty Communities," The Annie E. Casey Foundation, Baltimore, MD available online at http://www.aecf.org/Newsroom/NewsReleases/HTML/2012Releases/DataSnapshotHighPovertyCommunities.aspx

U.S. Census Bureau (2010b). DA Tables released at Census Bureau's December 6th, 2010 Conference, available online athttp://www.census.gov/coverage_measurement/demographic_analysis/

U.S. Census Bureau (2011). 2010 American Community Survey, Table B 06001 available on Factfinder at http://factfinder2.census.gov/faces/nav/jsf/pages/searchresults.xhtml?ref=top&refresh=t#none

U.S. Office of Management and Budget, (1997). Revisions to the Standards for the Classification of Federal Data on Race and Ethnicity, Statistical Policy Directive 15, Federal Register Notice October 30, 1997, available online at http://www.whitehouse.gov/omb/fedreg_1997standards

Wang, W., (2012).The Rise of Intermarriage, Pew Social and Demographic Trends, February, 16, available online at http://pewresearch.org/pubs/2197/intermarriage-race-ethnicity-asians-whites-hispanics-Blacks

West, K. (2012). "Using Medicare Enrollment File for the DA 2010 Estimates," Paper presented at the Applied Demography Conference at the University of Texas at San Antonio Texas, January.

West, K. & Robinson, J.G., (1999).What Do We Know About the Undercount or Children? U.S. Census Bureau, Population Division working paper.

Zeller, A., (2006). "Inconsistency Between Accuracy and Coverage Evaluation Revision II and Demographic Analysis Estimates for Children 0 to 9 Years of Age", paper delivered at the American Statistical Association annual conference, available in conference proceedings, Page 3201, available online at http://www.amstat.org/sections/srms/Proceedings/y2006f.html

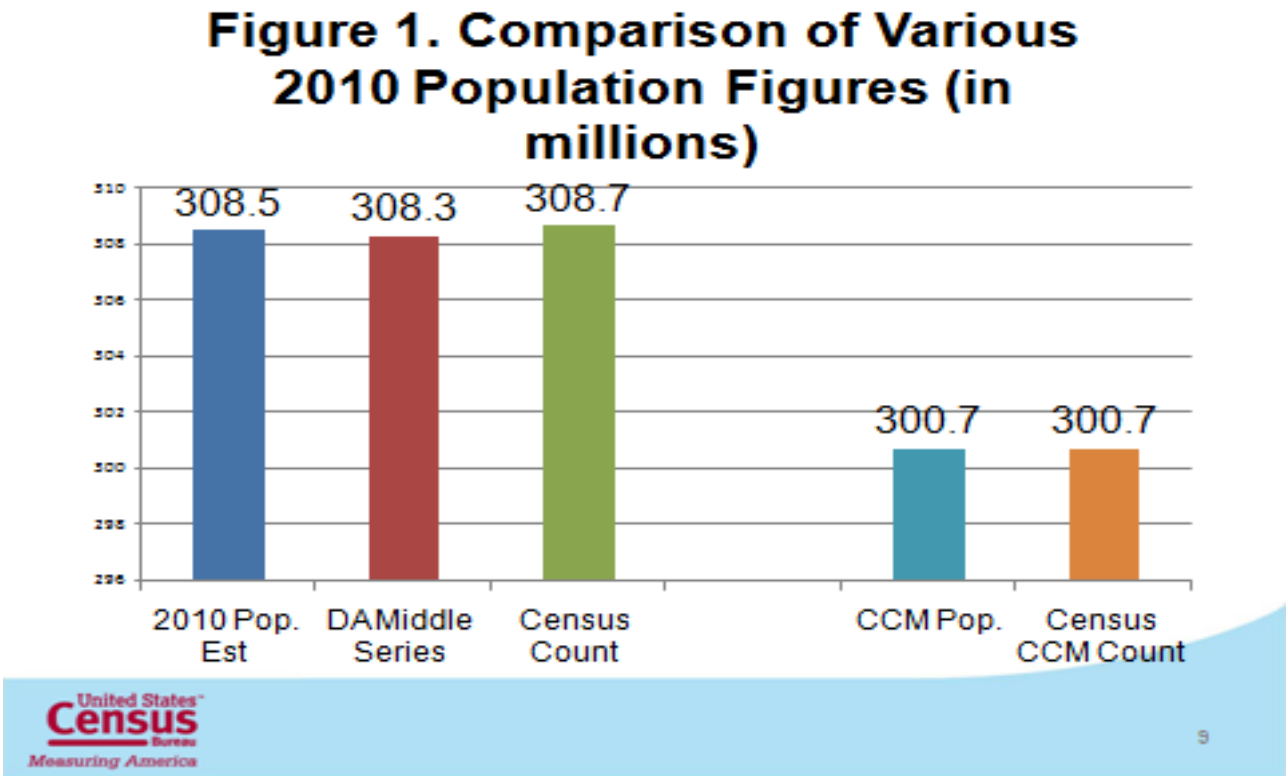


Figure 1. Comparison of Various 2010 Population Figures (in millions)
310
308
306
304
302
300
298
296
308.5
308.3
308.7
300.7
300.7
2010 Pop. Est
DAMiddle Series
Census Count
CCM Pop.
Census CCM Count
United States Census Bureau
Measuring America
9

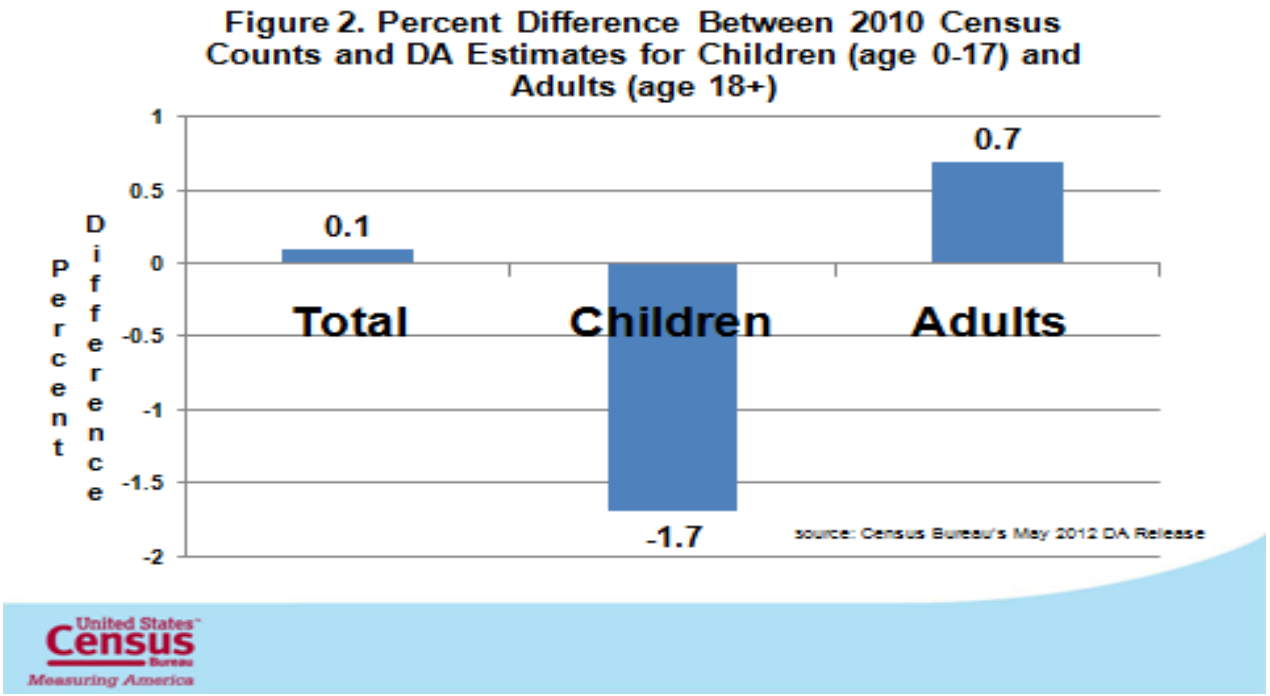


Figure 2. Percent Difference Between 2010 Census Counts and DA Estimates for Children (age 0-17) and Adults (age 18+)
Percent Difference
1
0.5
0
-0.5
-1
-1.5
-2
0.1
-1.7
0.7
Total
Children
Adults
source: Census Bureau's May 2012 DA Release
United States Census Bureau
Measuring America

Table 1. Difference Between 2010 Decennial Census and DA for Population Age 0 to 4, by Sex, Race and Hispanic Origin

	2010 Decennial Census Count (in 1000s)	2010 DA Estimate (in 1000s)	Numeric Difference Between Decennial Census Count and DA Estimate	Percent Difference Between Decennial Census Count and DA Estimate
TOTAL	20,201	21,171	-970	-4.6
FEMALE	9,882	10,353	-471	-4.5
MALE	10,320	10,821	-501	-4.6
BLACK ALONE	3,055	3,195	-140	-4.4
BLACK ALONE OR IN COMBINATION	3,658	3,905	-247	-6.3
NOT BLACK ALONE	17,146	17,976	-830	-4.6
NOT BLACK ALONE OR IN COMBINATION	16,544	17,268	-724	-4.2
HISPANIC	5,114	5,528	-414	-7.5
NOT HISPANIC	15,087	15,643	-556	-3.6
NOT BLACK ALONE OR HISPANIC	12,032	12,448	-416	-3.3
NOT BLACK ALONE OR IN COMBINATION AND NOT HISPANIC	11,429	11,738	-309	-2.6

Source: Based on Revised DA estimates released May 2012, except for data on Hispanics which is from Middle Series of December 2010 DA release.

Note: The "Not Black Alone or in Combination and Not Hispanic" category is not a category used by the Census Bureau. The racial categories used here are the Modified Race Categories where people who marked "some other race" in the Census are assigned to one of the major race groups.

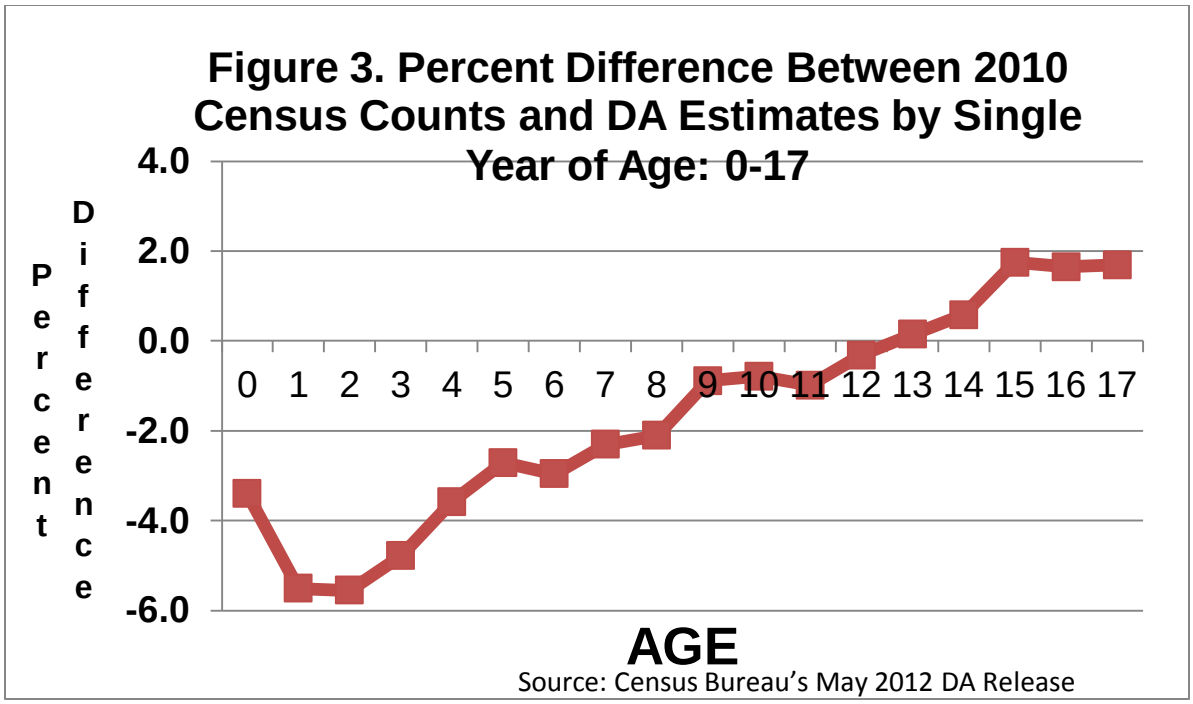


Figure 3. Percent Difference Between 2010 Census Counts and DA Estimates by Single Year of Age: 0-17
Percent Difference
4.0
2.0
0.0
-2.0
-4.0
-6.0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
AGE
Source: Census Bureau's May 2012 DA Release

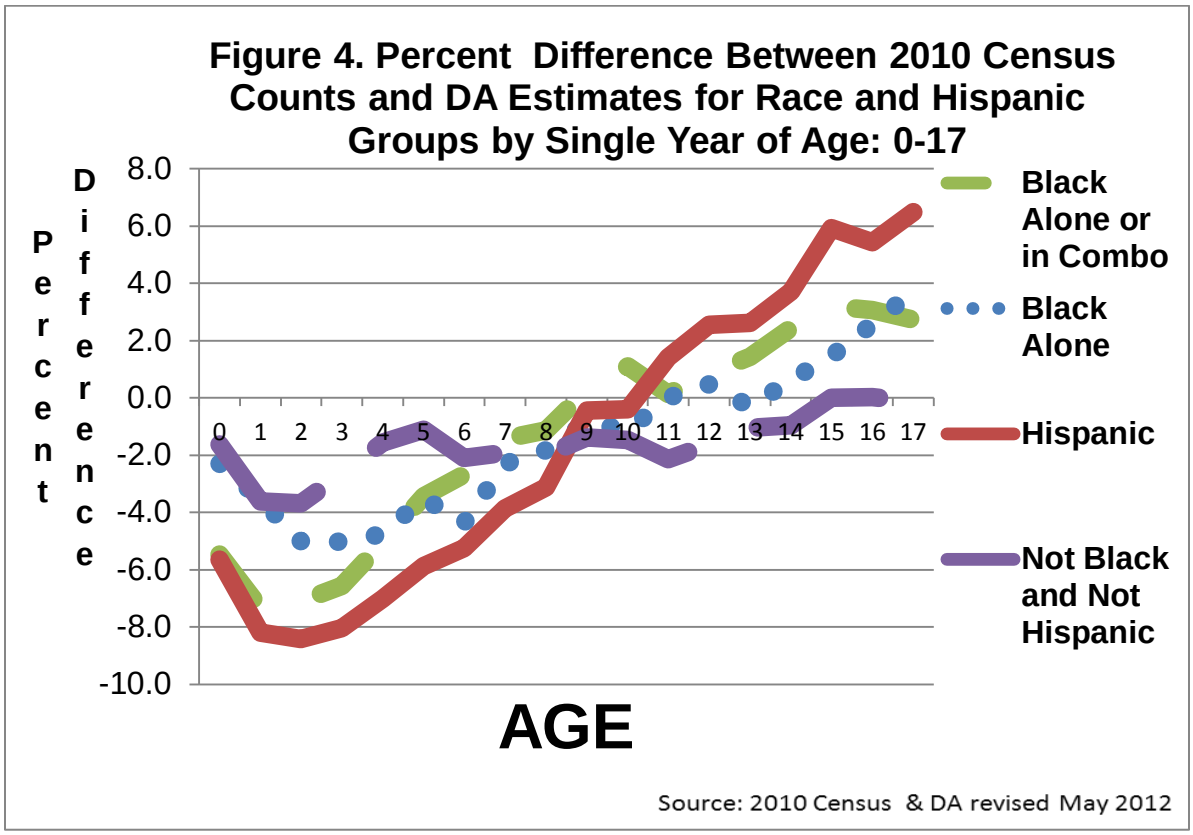
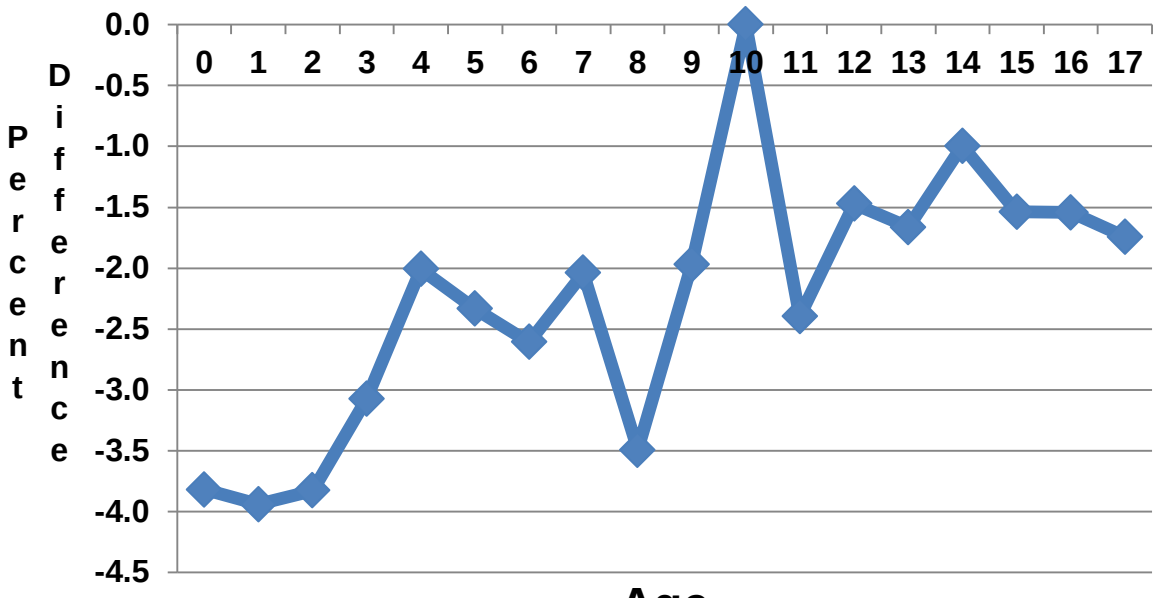


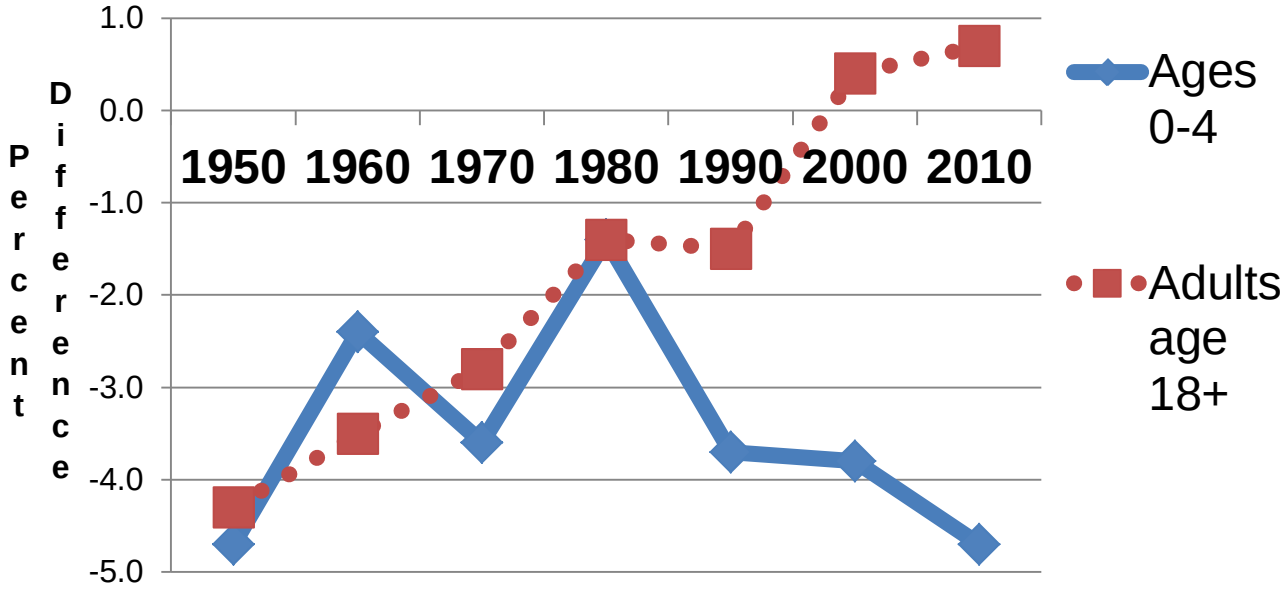
Figure 4. Percent Difference Between 2010 Census Counts and DA Estimates for Race and Hispanic Groups by Single Year of Age: 0-17
Percent Difference
8.0
6.0
4.0
2.0
0.0
-2.0
-4.0
-6.0
-8.0
-10.0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
AGE
Black Alone or in Combo
Black Alone
Hispanic
Not Black and Not Hispanic
Source: 2010 Census & DA revised May 2012

Figure 5. Average Percent Difference Between Census Counts and DA Estimates for Each Single Year of Age (0-17) Over the Seven Censuses from 1950 to 2010



Source; Census Bureau's May 2012
DA Release and Internal Census Bureau Historic file

Figure 6. Percent Difference Between Census Counts and DA Estimates for Adults and Young Children: 1950 to 2010



Source: Census Bureau's May 2012 DA Release and internal Census Bureau Historic File