



Catalogue no. 11-522-XIE

**Statistics Canada International Symposium  
Series - Proceedings**

**Symposium 2003: Challenges  
in Survey Taking for the Next  
Decade**

2003



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Proceedings of Statistics Canada Symposium  
Challenges in Survey Taking for the Next Decade

## THE COVERAGE OF POPULATION IN CENSUS 2000: CHALLENGES IN MEASUREMENT

J. Gregory Robinson, and Donna L. Kostanich<sup>1</sup>

### ABSTRACT

The Census Bureau has a long history of evaluating population coverage in decennial censuses. Two principal methods are used to measure the undercount in censuses. One method derives coverage estimates from post-enumeration surveys using dual system estimation. The other coverage measurement program is called Demographic Analysis. Demographic Analysis (DA) represents a macro-level approach, where population estimates are developed for the census date by aggregating various types of demographic data. In this paper we discuss the measurement problems that affected the DA and survey estimates, describe the revisions in more detail, and suggest future directions of research to improve the reliability of the estimates of coverage for the 2010 census.

KEYWORDS: Accuracy and Coverage Evaluation; Demographic Analysis; Measurement Error; Population Coverage.

### 1. INTRODUCTION

The Census Bureau has a long history of evaluating population coverage in decennial censuses. Formal evaluations began with the 1940 census. Almost everything we know about the size of the undercount, trends in census coverage and differences among subgroups of the population comes from the Census Bureau's own evaluation programs.

The Census Bureau has used two principal methods to measure the undercount in censuses. One method derives coverage estimates from post-enumeration surveys and dual system estimation. This approach involves case-by-case matching of persons in an independent survey with persons in the census to determine who was missed or counted in error. The survey-based coverage measurement program associated with the 1980 Census was called the Post-Enumeration Program (PEP); in the 1990 Census it was called the Post-Enumeration Survey (PES); for Census 2000 it is known as the Accuracy and Coverage Evaluation (A.C.E.). All three programs used a sample survey and the dual system estimation methodology to estimate net coverage error.

The Census Bureau has another coverage measurement and evaluation program: Demographic Analysis. Demographic Analysis (DA) represents a macro-level approach, where analytic estimates of net undercount are derived by comparing aggregate sets of data or counts. The traditional DA population benchmarks are developed for the census date by aggregating various types of demographic data. Examples are administrative statistics on births, deaths, legal international migration, and Medicare data, as well as estimates of emigration and unauthorized immigration. The difference between the DA benchmarks and the census count provides an estimate of the net census undercount.

In the Census 2000 evaluation, both coverage programs encountered measurement problems that brought to attention the particular strengths and weaknesses of each program. Thus, an integrated system that draws from the unique strengths of each program and other data sources needs to be developed to improve the reliability of coverage estimates.

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<sup>1</sup>J. Gregory Robinson, Population Division, and Donna Kostanich, Decennial Statistical Studies Division, U.S. Bureau of the Census, Washington, D.C. 20233

## 2. DEMOGRAPHIC ANALYSIS OF CENSUS 2000 COVERAGE

Demographic Analysis (DA) estimates serve two principal purposes in census evaluation:

1) DA estimates provide an essentially independent benchmark to assess completeness of coverage in the current census and document changes in coverage from previous censuses. DA represents a macro-level approach for estimating the net undercount by comparing aggregate sets of data or counts. The demographic method differs fundamentally from the survey-based method (A.C.E.). The traditional DA population estimates are developed for the census date by analyzing various types of demographic data, such as administrative statistics on births, deaths, legal international migration, and Medicare enrollments, as well as estimates of legal emigration and unauthorized immigration. The difference between the DA estimate and the census count provides an estimate of the net census undercount. Dividing the net undercount by the DA estimate provides an estimate of the net undercount rate.

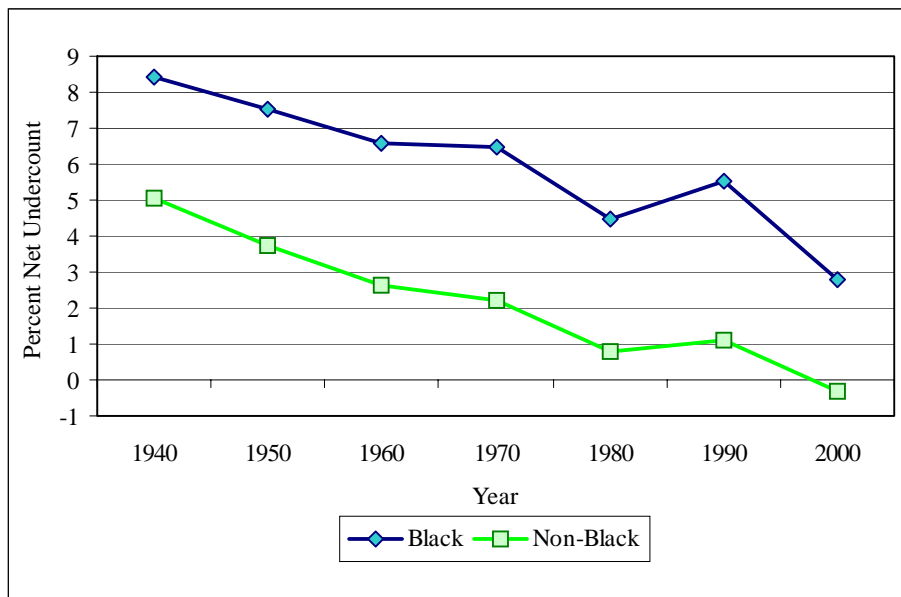
2) The independence and internal consistency of the DA estimation process allow us to check the survey-based A.C.E. coverage estimates; in particular, we can assess the consistency of the age-sex results. As noted above, DA and A.C.E. use entirely different methodologies. Because the sources and patterns of errors in the two estimates are sufficiently different, any disagreement in the results is important to understand.

### 2.1 DA Estimates of Coverage

#### 2.1.1 Historical Estimates

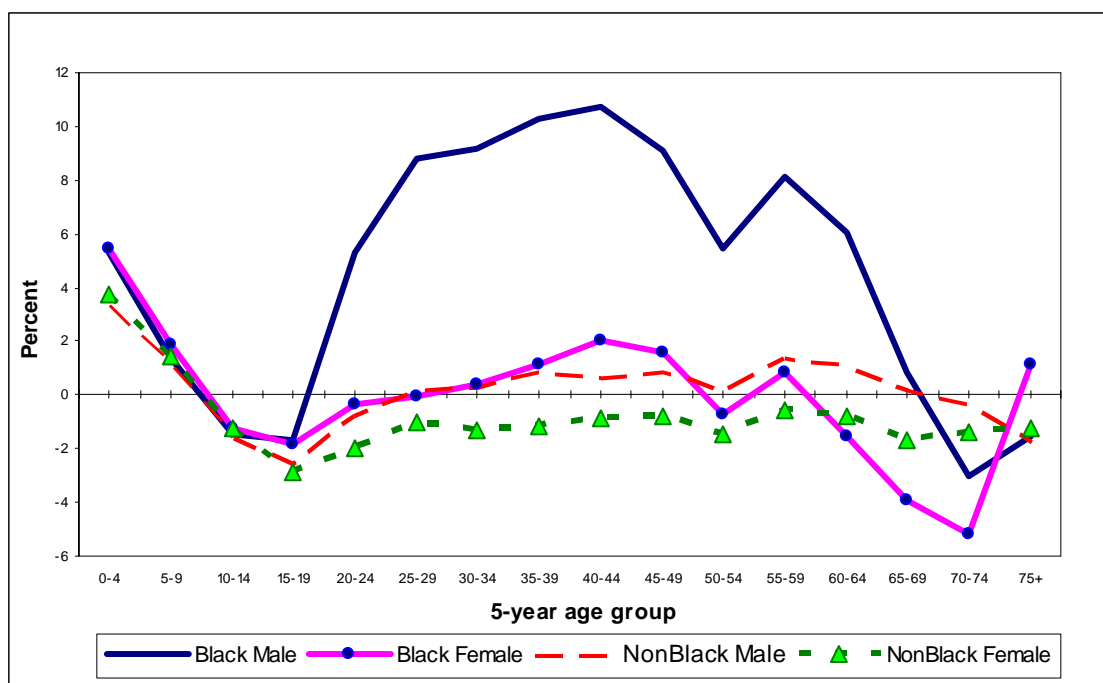
Demographic Analysis has been extensively used at the Census Bureau to measure coverage of the nation in every census since 1960 (see Siegel and Zelnik, 1966; U.S. Bureau of the Census, 1974, 1988; and Robinson et al, 1993 for the basic demographic evaluations of the 1960 - 1990 censuses). Over time the national DA benchmarks have become the standard for measuring national coverage trends and differences by age, sex, and race (Blacks, Nonblacks). The benchmarks have allowed us to document and follow the trend in net coverage over the last 60 years. The DA net undercount estimate for the total population in Census 2000 (0.1 percent, or 0.3 million) was well below the estimated 5.4 percent in 1940. The undercount has declined for both Blacks and Nonblacks; however, the higher undercount rate for Blacks than the rate for Nonblacks has persisted during the entire period. This persistent differential in the rates is illustrated in Figure 1.

**Figure 1. Estimated Percent Net Undercount Based on Demographic Analysis: 1940 to 2000 (a minus sign indicates a net overcount)**



The differential undercount has been most pronounced for adult Black men and Black children regardless of sex (Hogan and Robinson, 1993). The most notable pattern has been the high level of undercount of Black men between ages 20 to 64, where the estimated national undercount exceeded 10 percent in every census from 1940 to 1990. Figure 2 illustrates the disproportionate net undercount among children (ages 0-4) and adults (ages 20 - 64) for Black males, compared with the net undercount for other age-sex-race groups in 2000. Age-sex-race patterns of undercount rate are similar in previous censuses, with the overall net undercount levels and differentials between groups dropping in 2000.

**Figure 2. Estimated Percent Net Census Undercount by Race, Sex and Age: Revised 2000 DA (a minus sign indicates a net overcount)**



### 2.1.2 Alternative DA Estimates for 2000

In the course of evaluating population coverage of Census 2000, three sets of DA estimates were produced (referred to as Base, Alternative, and Revised). The Revised DA estimates are used in Figures 1 and 2.

The initial (Base) set of DA estimates were developed and compared to the Census 2000 counts in a March 2001 evaluation (Robinson, 2001a). The Census 2000 count of 281.4 million was 1.8 million higher than the Base DA estimate of 279.6 million. The difference implied a net census overcount of 0.65 percent. This net coverage is dramatically different from that in the 1990 or any previous census, which had substantial net undercounts.

The initial DA result for 2000, which fell below the census total, was unexpected. When we examined the detailed DA estimates by age and sex, we realized that underestimation of immigration, particularly unauthorized migration, could be a reason for these unexpected results. We conducted a systematic analysis that led to alternative assumptions about the growth of the migrant population, in particular, about the increase in the number of unauthorized migrants. A set of revised DA estimates was prepared in March 2001 to account for the probable understatement of immigration. It is referred to as “Alternative” DA. The Alternative DA estimate of 282.3 million was 0.9 million above the Census 2000 count, implying a net census undercount of 0.32 percent.

Both DA sets—the Base DA or Alternative DA—were below the March 2001 A.C.E. estimate of 284.7 million, and implied a much greater reduction in net undercount from 1990. The inconsistency of the DA and initial A.C.E. estimates of population was a concern and was one of the reasons that the Census Bureau issued the March 2001 recommendation of the Executive Steering Committee for A.C.E. Policy (ESCAP) that the Census 2000 Redistricting Data not be adjusted

for net census undercount based on data from the A.C.E.

Between March and October of 2001, we conducted an extensive review of the components of population change used to construct the DA estimates. The research activities were concentrated in two areas: (1) analysis of the administrative records used in the DA estimates (births, deaths, legal international migration, Medicare data), and (2) recalibration of the international migration components (in particular, those components that are least well measured: unauthorized migration, emigration, and temporary migration). The major data set enabling this review was an early tabulation from Census 2000 on the foreign-born population, which was not available in March 2001.

The DA estimates for 2000 that resulted from the analysis of various administrative records and the recalibration of the international migration components are referred to as the "Revised" DA (see Robinson, 2001b). Although the various analyses led to changes in the estimated components of births, deaths, and international migration, the total DA population and demographic composition of the revised DA estimates were not significantly different from the Alternative DA estimates of March 2001.

Compared to the Census 2000 count of 281.4 million, the Revised DA estimate of 281.8 million implies a net census undercount of 0.12 percent. The net census undercount in 2000 remains dramatically different from our most current DA estimates of net undercount in the 1990 census. In 1990, the revised net undercount was 4.2 million, or 1.65 percent.

In a later section, the Revised DA estimates are used to assess agreement with the A.C.E. Revision II coverage estimates. The examination of the A.C.E. methodology and revision of the estimates will be described in the following section.

### **3. ACCURACY AND COVERAGE EVALUATION OF CENSUS 2000**

#### **3.1 Background**

The U.S. Census Bureau conducted the Accuracy and Coverage Evaluation (A.C.E.) Survey to measure the coverage of the population in Census 2000 and to allow for the possibility of correcting the census results for the measured undercount. The A.C.E. estimates of Census 2000 coverage produced in March 2001 were not acceptable because A.C.E. was found to contain a significant amount of measurement error. Thus, Census 2000 data products were not corrected for potential coverage error. However the Census Bureau was still concerned about coverage errors in the census and they thought that possible improvements could be made to the post-censal population estimates. This was one of the Bureau's motivations for correcting errors in the A.C.E. data and developing improved estimates of the net undercount. We refer to these as A.C.E. Revision II estimates.

As it turned out the A.C.E. Revision II results were not used to adjust intercensal estimates. The Bureau considered but rejected this adjustment because of methodological uncertainties. The details concerning this decision can be found in the document at the web site <http://www.census.gov/dmd/www/dipe.html> Also see the *Technical Assessment of A.C.E. Revision II* and other detailed information on methodology, limitations, and results at <http://www.census.gov/dmd/www/ace2.html>. In general, the A.C.E. Revision II findings are dramatically different from and substantially superior to the March 2001 A.C.E. results. They also represent our most detailed estimates of Census 2000 coverage error.

#### **3.2 A.C.E. Methodology**

The A.C.E. obtains a roster from a sample of block clusters independently of the census. The independent roster (P Sample) is matched to the census to measure census omissions. A sample of census enumerations from the A.C.E block clusters (E Sample) is used to measure census correct enumerations. The results of matching and followup interviewing are used to determine which enumerations are the same person and which census enumerations are correct. After adjusting for missing data, Dual System Estimates(DSE) are calculated within population subgroups called post-strata. The DSE uses capture/recapture methods to estimate the true population. The DSE is the product of the number of census data-defined persons eligible and available for A.C.E. matching and the estimated proportion of correctly enumerated persons in the census (E-sample) divided by the estimated match rate from the A.C.E (P-Sample). Post-stratum DSE estimates are then used to determine coverage correction factors applied to all people counted in the census

according to their specific post-stratum.

### 3.3 A.C.E. Revision II Methodology

The major objective of A.C.E. Revision II was to produce improved estimates of net coverage error in Census 2000. It was imperative that the revised methodology carefully account for both overcounts and undercounts. This meant obtaining better estimates of erroneous census enumerations from the E-Sample and obtaining better estimates of census omissions from the P-Sample.

There were no new field operations associated with the A.C.E. Revision II process. Because of the late date, it was not feasible (or practical) to revisit households for additional data collection. Consequently, the revisions were based on data that had already been collected. One aspect of the strategy for revising the coverage estimates involved correcting measurement errors using information from the A.C.E. evaluation data. This is referred to as the measurement correction study. Another aspect of these corrections involved conducting a more extensive duplicate study to provide results for correcting measurement error due to duplication that was not detected by the A.C.E. evaluations. This study is referred to as the Further Study of Person Duplication (FSPD) (Mule 2002). The revised estimates incorporate separate post-strata for estimating census omissions and erroneous census enumerations because the factors related to each of these were likely to be different. The A.C.E. Revision II DSEs also include an adjustment for correlation bias for adult males. Correlation bias exists if (within P-Sample post-strata) people missed in the census were more likely (or less likely) to also be missed in the A.C.E. In the "more likely to be missed" scenario, correlation bias has a downward effect on estimates. The estimation method, discussed more fully in Kostanich (2003), is designed to handle overlap of errors detected by both of these studies and avoid overcorrecting for measurement error.

### 3.4 A.C.E. and A.C.E. Revision II Results

The A.C.E. Revision II DSE can be thought of as incorporating the following enhancements to a traditional DSE:

- New post-stratification to reflect different factors related to erroneous inclusions and omissions.
- Corrections to the "correct enumeration rate" from the Further Study of Person Duplication.
- Corrections to the "correct enumeration rate" from the A.C.E. Revision II Measurement Correction Study.
- Corrections to the match rate from the Further Study of Person Duplication.
- Corrections to the match rate from the A.C.E. Revision II Measurement Correction Study.
- Adjustment for correlation bias.

The impact of these revisions can best be seen by looking at the numerical effects of incorporating one change at a time to the DSE. Consider Table 1 below which shows the impact of each change relative to the March 2001 A.C.E. estimate of national net undercount.

This table starts with the March 2001 A.C.E. estimate of a national net undercount of just under 3.3 million persons. Each row shows the effect on the net undercount estimate of making one of the specific revisions. Using only the new post-stratification and not making any other corrections would increase the estimated net undercount to 3.3 million, an increase of less than 39,000. Though the effect of the new post-stratification is small at the national level, it has considerably more impact on subnational estimates, particularly for small areas. When corrections are made to the correct enumeration rate, we see that if we first correct for those identified by the person duplication study, the estimated net undercount is reduced by 2.8 million. Next, adding in the corrections identified by the measurement correction study reduces the estimated net undercount by another 2.4 million, resulting in an estimated net overcount of 1.9 million. Next we incorporate corrections into the match rate. First, adding in the corrections based on the person duplication study reduces the estimated net undercount by another 1.1 million. Adding in the corrections from the measurement correction study causes the estimated net undercount to increase by only 11,000. Making the final correction for correlation bias increases the estimated net undercount by 1.7 million, yielding the A.C.E. Revision II estimate of a 1.3 million net overcount. See Mule (2003) for further information on how these revisions impact race/ethnic groups.

**Table 1. Change in Estimated Net Undercount (Household Population in millions)**

	Net Undercount	Change* Undercount	Cumulative Undercount
March 2001 A.C.E. Estimate	3.26		
New Post-Stratification		+0.04	3.30
E Sample: Person Duplication Study		-2.81	0.49
Measurement Correction Study		-2.43	-1.94
P Sample: Person Duplication Study		-1.10	-3.04
Measurement Correction Study		+0.01	-3.03
Correlation Bias		+1.70	-1.33
A.C.E. Revision II Estimate	-1.33	-4.59	

\* Shows the effect of adding in one revision at a time. A different ordering of the revisions would result in slightly different intermediate effects, but yield the same overall net undercount estimate. Estimated change in the net undercount is not the same as estimated additional erroneous enumerations or additional census omissions.

Table 2 shows A.C.E. Revision II estimates of percent net undercount in Census 2000 for the total household population and major demographic groups. For comparison, Table 2 also shows results from the March 2001 A.C.E. estimates, as well as estimates of 1990 census coverage from the 1990 PES. In examining Table 2 pay attention to the footnotes about comparability between the sets of results.

There are also methodological differences between the different sets of estimates that affect their comparability. As noted above, the A.C.E. Revision II estimates improve on the March 2001 A.C.E. estimates by including corrections for undetected duplicates, data corrections that affect estimates of erroneous enumerations and census omissions, and adjustments for correlation bias for adult males. In fact, the March 2001 A.C.E. estimates are shown in Table 2 primarily so that comparing them to the A.C.E. Revision II estimates shows the effects of these corrections on the national estimates. The 1990 PES estimates do not include corrections analogous to those of the A.C.E. Revision II, although the extent to which the 1990 PES estimates may have been affected by undetected duplicates and measurement error is unknown. Estimates of the bias for individual error components for the 1990 PES are contained in Table 1 of the paper by Mulry and Spencer (1993). However, there is evidence of correlation bias in the 1990 PES estimates (Bell 1993).

A.C.E. Revision II estimates a negative net undercount, or overcount, of the Census 2000 household population. The estimated percent net undercount of -0.49 with a standard error of 0.20 is significantly different from zero at the 10-percent significance level. This differs sharply from the March 2001 A.C.E. estimate of a 1.18 percent net undercount (standard error of 0.13), an estimate which was corrupted by undetected duplicates and other measurement errors. The A.C.E. Revision II estimate of Census 2000 coverage also differs dramatically from the 1990 PES estimate of a 1.61 percent net undercount (standard error of 0.20) in the 1990 census.

Among the A.C.E. Revision II coverage estimates by race/Hispanic origin domains, only those for the Non-Hispanic White and Non-Hispanic Black domains show estimated net undercounts that differ significantly from zero. The Non-Hispanic White domain has a negative estimated net undercount of -1.13 percent, reflecting an overcount, while the Non-Hispanic Black domain has an estimated net undercount of 1.84 percent.

The 1990 PES estimated very similar net undercount rates for the Non-Hispanic Blacks and Hispanics. The A.C.E. Revision II estimate for the Hispanic domain is a net undercount of 0.71 percent, which is not as similar to the Non-Hispanic Black estimate as it was in 1990. This may be due partly to sampling variation. However, the A.C.E. Revision II net undercount estimates for the Non-Hispanic Black and Hispanic domains are not significantly different from one another. Differences in the estimates for these two domains are also affected by the correlation bias adjustment present in the A.C.E. Revision II estimates (and not present in the 1990 PES estimates). The A.C.E. Revision II estimates for Non-Hispanic Blacks are more strongly affected by the correlation bias adjustment than are the estimates for the

NonBlack race domains, including Hispanics.

The A.C.E. Revision II estimates show coverage differentials by age and sex. In particular, statistically significant net overcounts were estimated for children age 10-17 and for adult females 18-29, 30-49, and 50 and over, as well as for males 50 and over. In contrast, statistically significant net undercounts were estimated for males 18-29 and 30-49, and the net undercount estimate for children 0-9 was not significantly different from zero. The coverage differences by sex are affected by the correlation bias adjustments that increase the undercount estimates for adult males. This makes comparisons with the 1990 PES results somewhat difficult. The main thing in common to the two sets of estimates for age-sex groups appears to be the much lower undercount estimates (in fact, overcount estimates in all cases) for age 50 and over compared to the other adult age groups, a pattern that shows up for both males and females. One notable difference in estimated coverage occurs for children. The 1990 PES estimated a large net undercount for children 0-17 of 3.18 percent, a larger undercount point estimate than for any other group except 18-29 males. In contrast, the A.C.E. Revision II estimated a net overcount of 1.32 percent for children 10-17. The coverage estimate for children 0-9 was not significantly different from zero. This comparison is affected partly by the correlation bias adjustments that increase the A.C.E. Revision II estimates for adult males. The comparisons to estimates for adult females are not affected by the correlation bias adjustments.

The March 2001 A.C.E. and the 1990 PES both estimate net undercount for children ages 0-17. The A.C.E. Revision II separates children into two age groups: 0-9 and 10-17. The 0-9 year olds have an estimated net overcount of 0.46 percent, which is not significantly different from zero. This estimated percent net overcount for 0-9 year olds is not consistent with Demographic Analysis. In contrast, the 10-17 year olds have a net overcount of 1.32 percent, which is significantly different from zero. In contrast to the 0-9 age group, the estimated percent net overcount for 10-17 year olds is consistent with Demographic Analysis.

**Table 2. Estimated Percent Net Undercount for Major Groups  
(a minus sign indicates a net overcount)**

Characteristic	A.C.E. Revision II		A.C.E. March 2001		1990 PES	
	Est. (%)	S.E. (%)	Est. (%)	S.E. (%)	Est. (%)	S.E. (%)
<b>Total</b>	-0.49	0.20	1.18	0.13	1.61	0.20
<b>Race/Hispanic Origin Domain</b>						
Non-Hispanic White	-1.13	0.20	0.67	0.14	0.68	0.22
Non-Hispanic Black	1.84	0.43	2.17	0.35	4.57	0.55
Hispanic	0.71	0.44	2.85	0.38	4.99	0.82
<b>Age/Sex</b>						
0 - 9*	-0.46	0.33	1.54	0.19	3.18	0.29
10 - 17*	-1.32	0.41	1.54	0.19	3.18	0.29
18 - 29 Male	1.12	0.63	3.77	0.32	3.30	0.54
18 - 29 Female	-1.39	0.52	2.23	0.29	2.83	0.47
30 - 49 Male	2.01	0.25	1.86	0.19	1.89	0.32
30 - 49 Female	-0.60	0.25	0.96	0.17	0.88	0.25
50+ Male	-0.80	0.27	-0.25	0.18	-0.59	0.34
50+ Female	-2.53	0.27	-0.79	0.17	-1.24	0.29

The A.C.E. Revision II, and the A.C.E. March 2001 net undercount are for the household population. The 1990 net undercount is for the PES universe which included noninstitutional, nonmilitary group quarters in addition to the household population.

\*For March 2001 and for the 1990 PES, the "0 - 17" Age/Sex group was a single group. Therefore, the net undercount and standard error for children "0 - 9" and "10 - 17" are identical.

#### 4. COMPARISON OF A.C.E. REVISION II AND DEMOGRAPHIC ANALYSIS

This section summarizes the comparison of the A.C.E. Revision II coverage estimates of Census 2000 to the corresponding estimates based on Demographic Analysis (DA). We examine the consistency of the DA estimates at the national level with the A.C.E. Revision II estimates with adjustment for correlation bias. The adjustment for correlation bias is made on the basis of the DA results on sex ratios for adult males (separately for Black males and NonBlack males). Robinson and Adlakha (2002) discuss the A.C.E. Revision II and DA comparisons in more detail. The Census 2000 count of 281.4 million is 0.34 million lower than the revised DA estimate of 281.8 million (Table 3). Relative to DA, the difference implies a net undercount of 0.12 percent. This net undercoverage is dramatically different from that in the 1990 or any other previous census. In 1990, the revised net undercount estimated by DA was 4.2 million or 1.65 percent. The DA results show that this improvement in coverage between 1990 and 2000 census was shared by almost all demographic groups, males and females, Blacks and NonBlacks, and broad age groups. Overall, the DA results show that for Census 2000 the net census undercount had been reduced to substantially lower levels except for the two groups--Black adult men and young children ages 0-9--for whom the net census undercount remained disproportionately high.

**Table 3. Comparison of Estimates of U.S. Resident Population: April 1, 2000  
(a minus sign indicates a net overcount)**

<b>U.S. Resident Population: April 1, 2000</b>	Count or Estimate
1. Census Count	281,421,906
2. DA Estimate	281,759,858
3. A.C.E. Revision II Estimate	280,090,250
<b>Net Census Undercount (Amount)</b>	
4. DA Estimate (=2-1)	337,952
5. A.C.E. Revision II Estimate (=3-1)	-1,331,656
<b>Net Census Undercount (Percent)</b>	
6. DA Estimate (=4/2*100)	0.12
7. A.C.E. Revision II Estimate (=5/3*100)	-0.48

**Source:** U.S. Census Bureau

**Note:** 1) A.C.E. Revision II estimate includes an allowance for correlation bias, based on the DA sex ratios for adult males. 2) DA estimate reflects revised estimate published in U.S. Bureau of the Census, 2001, ESCAP II, Report No. 1, October 13.

The A.C.E. Revision II estimates of net undercount rates with adjustment for correlation bias are broadly consistent with the DA estimates. The A.C.E. Revision II estimate with correlation bias adjustment (280.1 million) is 1.7 million below the revised DA estimate. The A.C.E. estimate implies a net census overcount of 1.3 million, or -0.48 percent, compared to the DA estimated net undercount of 0.12 percent. The A.C.E. Revision II with an adjustment for correlation bias primarily affects the undercount estimates for Black adult males and brings the measured differentials in line with DA (Table 4). This is basically a consequence of using the DA sex ratios to remove the correlation bias. The A.C.E. Revision II estimates for females (especially NonBlack females) are generally consistent with the DA estimates for ages 10 and over, even though they did not receive an adjustment for correlation bias.

As noted earlier, the A.C.E. Revision II and the DA estimates remain inconsistent with regard to coverage rates for children aged 0-9. In contrast to DA results which show a relative large undercount of children (both Black and NonBlack), the A.C.E. Revision II estimates show a net overcount of NonBlack children and small net undercount of Black children (Table 4 and Figure 4). We need to do further research into the causes of the inconsistency of the DA and A.C.E. Revision II results for young children.

For ages 50 and over, a smaller but systematic gap is observed between the DA estimate and A.C.E. Revision II estimate for each race-sex group. For Black males, the DA percent net undercount is higher than the corresponding A.C.E. Revision II estimate; for NonBlack males DA measures a small net undercount and the A.C.E. Revision II estimates a net overcount; for Black females and NonBlack females both DA and the A.C.E. Revision II measure a net overcount but the DA estimate is smaller.

**Table 4. Estimates of Percent Net Undercount: Census 2000  
(a minus sign indicates a net overcount)**

Category	DA	A.C.E. Revision II	Category	DA	A.C.E. Revision II
<b>BLACK MALE</b>			<b>NONBLACK MALE</b>		
All ages	5.15	4.19	All Ages	0.21	-0.19
0-9	3.26	0.72	0-9	2.18	-0.68
10-17	-1.88	-0.59	10-17	-2.01	-1.46
18-29	5.71	6.14	18-29	-0.63	0.19
30-49	9.87	8.29	30-49	0.63	1.05
50+	3.87	2.43	50+	0.14	-1.10
<b>BLACK FEMALE</b>			<b>NONBLACK FEMALE</b>		
All Ages	0.52	-0.61	All Ages	-0.78	-1.41
0-9	3.60	0.70	0-9	2.59	-0.68
10-17	-1.20	-0.55	10-17	-1.55	-1.44
18-29	-0.66	0.00	18-29	-1.94	-1.54
30-49	1.28	-0.40	30-49	-1.01	-0.63
50+	-1.03	-2.51	50+	-1.18	-2.42

Source and Notes: See Table 3.

## 5. IMPLICATIONS FOR 2010

Improving coverage of the 2010 census is one of the major goals of reengineering the Decennial Census Program. Based on our Census 2000 experience, the Census Bureau saw an improvement in the net coverage of persons; however we recognize that there were issues in dual-system estimation with erroneous census inclusions in the form of duplicates and with census misses. The goals for the 2010 census include maintaining a very low net coverage error for persons while making considerable reductions in the number of duplicates.

A coverage measurement program is essential for measuring the effectiveness of the 2010 census design in terms of data quality. It is necessary to produce coverage measures to determine if the goals for 2010 are met and to determine how future censuses can be improved. The coverage measurement program for 2000, particularly the results from the A.C.E. Revision II effort and Demographic Analysis, have been useful in informing the early planning for the 2010 census testing and developmental work.

The primary goal of the 2010 Census Coverage Measurement (CCM) program is to measure coverage error in the 2010 Census such that this information can be used to improve the coverage of future censuses. Other secondary goals include providing an understanding of differential coverage error in the 2010 census with respect to demographic characteristics and geography. Both the coverage measurement survey estimates (A.C.E. in 2000) and Demographic Analysis estimates will be used in these endeavors. Additionally, consideration may be given to using coverage measurement results in the benchmark populations for the postcensal population estimates.

This implies that the scope of coverage measurement will be broader and the emphasis will be different than it has been in the past. As such, the 2010 CCM objectives are to:

- begin producing measures of gross coverage error, including its components
- produce these measures of coverage error not only for demographic groups and geographic areas, but also for key census operations
- continue to provide measures of net coverage error
- expand the program that evaluates the coverage estimates

Obtaining estimates of the components of gross error is a high priority although estimates of net error will continue to be extremely important. The 2010 CCM program will include coverage errors for housing units, the population in housing units, person coverage errors by whether the housing unit was missed, and group quarters facilities. Currently there is uncertainty about what if anything can be measured for the population in group quarters facilities.

Another critical aspect of the 2010 CCM program is evaluating the quality of the coverage estimates. Because of the methodological complexities and the measurement challenges, it is imperative to include a strong evaluation component to assess the validity of the results.

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