

BUILDING QUALITY IN CENSUS 2000

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ABSTRACT

Several key strategies contributed to the success of the United States' Census 2000. The paper describes the strategy for the Address Building Process which incorporated numerous address list updating activities. The Field Interview Process required that we fill close to 900,000 jobs. Two key strategies to achieve this are described. The Formal Quality Control Process established principles to guide the QA programs. These, and examples of their implementation are presented. The Coverage Measurement and Correction Process was a program to increase census accuracy through the use of statistical methods. The steps taken to ensure A.C.E. accuracy and quality are described. Preliminary estimates of the undercount are reported

1. INTRODUCTION

Census 2000 was a good census, perhaps a very good census. Because of statistics concerns and late planning changes in 1999, the census was once officially labeled "high risk". What happened? This success was the product not of a single "breakthrough" technique or program, but rather a broad base commitment of adequate resources, effectively employed. Contributing to the statistical success of Census 2000 was strong financial backing from Congress. This financial support enabled the Census Bureau to implement several key strategies. These efforts took myriad forms. However, this paper is restricted to four processes:

- The Address Building Process
- The Field Interview Process
- The Formal Quality Control Process
- The Coverage Measurement and Correction Process.

Each of these processes used different techniques with the common goal of producing the best possible census results. Each was adequately funded and intelligently implemented.

2. HOUSEING UNIT ADDRESS LIST DEVELOPMENT FOR CENSUS 2000

The Census Bureau partitioned the geographic land mass of the United States into approximately 7.2 million blocks. For Census 2000, we assigned each block to one of five Enumeration Areas. The enumeration areas were designed depending on the address types in the block, the need for special enumeration procedures and/or the method for delivering the Census questionnaire. The five enumeration areas are Mailout/Mailback, Update/Leave, Urban Update/Leave, Update/Enumerate and List/Enumerate.

In Mailout/Mailback areas, the majority of addresses are city style, e.g., 801 Main Street. In addition, the address list is primarily developed prior to Census Day, April 1, 2000. The Census Bureau mails the questionnaires to each address using the United States Postal Service. Of the 7.2 million blocks, 52.7 percent are Mailout/Mailback areas.

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In Update/Leave areas, addresses consist of both city and non-city style. An example of a non-city style address is Rural Route 7, Box 4. While the address list is developed prior to Census Day, it is also updated during the delivery of the Census questionnaire. During March of 2000, Census Bureau field staff canvassed the Update/Leave blocks, updating both the address list and the maps, and delivering questionnaires. Of the 7.2 million blocks, 41.7 percent are Update/Leave areas.

Urban Update/Leave areas were originally Mailout/Mailback which were converted to an Update/Leave enumeration methodology. Of the 7.2 million blocks, 0.2 percent are Urban Update/Leave areas.

Update/Enumerate areas were originally Mailout/Mailback or Update/Leave which were converted to this enumeration area. From March to May of 2000, Census Bureau field staff canvassed the Update/Enumerate blocks updating both the address list and maps, and enumerating the housing units. Of the 7.2 million blocks, 2.3 percent are Update/Enumerate areas.

Finally, List/Enumerate areas contain mostly non-city style addresses. These areas of the country are geographically remote with a low housing unit density. From February to May of 2000, Census Bureau field staff canvassed the ground creating the address list, updating maps and enumerating the housing units. Of the 7.2 million blocks, 3.1 percent are List/Enumerate areas.

The address list development operations were developed based on these five enumeration areas. The operations consisted of use of selected address files, field operations, and updating from local and tribal governments. The operations can be categorized based on their timing relative to Census Day, i.e., Pre-Census Day, Census Day and Post-Census Day operations.

In Mailout/Mailback areas, the Census Bureau started with the computer address list that was developed for the 1990 Census. The 1990 Census address list was updated with the United States Postal Service's computer address list file at three points in time before Census Day: November 1997, September 1998 and November 1999.

In 1998, the Census Bureau canvassed each block in Mailout/Mailback areas in order to update the address list. This operation was Block Canvassing. During Block Canvassing, Census Bureau field staff verified the existence of addresses, made corrections to the address information, added and deleted addresses, identified when an address was a duplicate of another address on the file, and identified addresses that were either nonresidential or uninhabitable.

The Census Bureau established a program to work with local and tribal governments to update the address list in advance of the Census. This operation was called Local Update of Census Addresses (LUCA). For functioning governments, the Census Bureau provided local officials with the opportunity to verify the address list for their political jurisdiction. Local governments in Mailout/Mailback areas received address lists on which they made corrections to the address information, added missed addresses and deleted nonexistent addresses. This operation occurred in 1998 and was called LUCA 98. Addresses with inconsistencies between the updates from Block Canvassing and LUCA 98 were sent to a field operation called LUCA 98 Field Verification.

In 1998 and 1999 the Census Bureau started developing the address list for Group Quarters and Special Places during an operation called the Facility Questionnaire Operation. A Group Quarter is a living situation of non-related persons, such as a college dorm, convent, or prison dorm. A Special Place is the larger entity that contains Group Quarters such as a college, university or prison complex. Addresses for housing units embedded with Group Quarters and free standing housing units on the grounds of Special Places were added to the housing unit address list. Finally, the Census 2000 Dress Rehearsal was an additional source of address updates.

In Update/Leave areas, the Census Bureau canvassed each block in Update/Leave areas to develop the initial address list. In 1998, Census Bureau field staff canvassed the ground, creating the address list, updating maps, and collecting the householder's name and telephone number. In 1999, the Census Bureau conducted a LUCA operation called LUCA 99. The Census Bureau provided local officials with the opportunity to verify the count of addresses in their political jurisdiction. They could challenge the housing unit count for a block, which was then visited during a operation similar to Block Canvassing called LUCA 99 Recanvass. Finally, the Facility Questionnaire operation and the Census 2000 Dress Rehearsal operation also provided the opportunity to update the address list in Update/Leave areas.

In Urban Update/Leave areas, the pre-Census Day address list development operations are the same as those used to develop and update the address list for Mailout/Mailback areas.

In Update/Enumerate areas, the pre-Census Day address list development operations described for Mailout/Mailback and Update/Leave areas were the operations used to develop the address list.

In List/Enumerate areas, there are no pre-Census Day address list development operations.

In Mailout/Mailback areas, there are no Census Day address list development operations. In Update/Leave and Urban Update/Leave areas, Census Bureau field staff delivered the questionnaires during March of 2000. The address list was updated at the time of questionnaire delivery. In Update/Enumerate areas, Census Bureau field staff enumerated the people at the housing units from March to May of 2000. The address list was updated at the time of enumeration. In List/Enumerate areas, Census Bureau field staff enumerated the housing units from February to May of 2000. The address list was created at the time of enumeration.

In Mailout/Mailback areas, Census questionnaires were delivered by mail. There were two additional updates from the United States Postal Service to the address list for Mailout/Mailback areas, in February 2000 and April 2000. Some of the addresses from the February 2000 file made it into the mailout. Other addresses from the February 2000 file and addresses from the April 2000 file that were incorporated into the Census address list were included in the workload for enumeration during later followup operations. The first followup operation was Nonresponse Followup, during which respondents who did not complete and return their questionnaires by April 18, 2000 were enumerated. Census Bureau field staff could also add housing units that were missing from the address list, make corrections to addresses and delete addresses during this followup operation. There was a second followup operation, called Coverage Improvement Followup, for the purposes of enumeration at the later adds to the address list and of checking the status of certain housing units. Census Bureau field staff could also add housing units that were missing from the address list, make corrections to addresses and delete addresses during this operation.

During the LUCA program, functioning governments provided addresses they felt should be included in the address list. If the Census Bureau could not verify during either Block Canvassing or LUCA 98 Field Verification that an address uniquely existed, the address was not included in the address list. Functioning governments could register an appeal to the Office of Management and Budget. If the governments supplied documentation of the unique existence of the appealed addresses they would be added to the address list. This operation was called LUCA Appeals.

In response to concerns that housing units constructed between January 2000 and April 1, 2000 would not be included in the Census the Census Bureau instituted the New Construction program. Governmental partners were enlisted again to identify missing addresses, including newly constructed housing units.

The Census Bureau distributed unaddressed Be Counted questionnaires at targeted locations in the community. The Be Counted questionnaire asked for the respondent's address. If the address was not already on the Census address list, Census Bureau field staff checked the status of the address. Addresses determined to exist as a unique housing unit on the list were added to the address list.

The Census Bureau provided a Telephone Questionnaire Assistance Program to assist respondents in completing the Census questionnaire. Given the respondent met certain conditions, a computer assisted telephone interview was administered. Respondents provided their address information during the interview. If the address was not already on the Census address list, Census Bureau field staff checked the status of the address. Addresses determined to exist as a unique housing unit on the list were added to the address list.

In the summer of 2000, the Census Bureau detected evidence of significant duplication in the census, especially person duplication due to duplicate listing of housing units on the address file. It was able to detect these duplicates because, for the first time, names were data captured throughout the country. To alleviate the problem, the Census Bureau conducted the Housing Unit Duplication Operation.

Using a combination of person, household and address matching, 2.4 million units were selected for initial review. Of these 1.4 million housing units, including 3.6 million person records were permanently deleted. The remaining one million units with these 2.3 million persons records were reinstated. As will be made clear in Section 6, if this unduplication operation had not been conducted, the census would certainly have ended with a significant net overcount.

In Update/Leave areas, the post-Census Day address list development operations are the Nonresponse Followup operation, the LUCA Appeals program, the Coverage Improvement Followup operation, the Be Counted Program, the Telephone Questionnaire Assistance Program and the Housing Unit Duplication Operation.

In Urban Update/Leave areas, the post-Census Day address list development operations are the Nonresponse Followup operation, February 2000 and April 2000 United States Postal Service files, the LUCA Appeals program, the New Construction operation, the Coverage Improvement Followup operation, the Be Counted Program, the Telephone Questionnaire Assistance Program and the Housing Unit Duplication Operation.

In Update/Enumerate areas, the post-Census Day address list development operations are the LUCA Appeals program, the New Construction operation, the Be Counted Program, the Telephone Questionnaire Assistance Program and the Housing Unit Duplication Operation.

In List/Enumerate Enumeration areas, the post-Census Day address list development operations are the Be Counted Program, the Telephone Questionnaire Assistance Program and the Housing Unit Duplication Operation.

3. STAFFING THE NATIONS LARGEST DATE COLLECTION WORKFORCE

Because of adequate funding, the Census was able to use two key strategies which greatly improved the quality of the field work.

- Locality based competitive pay
- Increased number of positions and front-loading

Census 2000 was conducted during a period marked by a thriving economy with low unemployment. The economy helped attract increasing immigration and growing diversity in the population and labor force. The Bureau of Labor Statistics estimates that approximately 10 percent of the labor force is Hispanic and 11 percent is African American. The foreign born U.S. population is estimated at over 24 million, or about 1 in 10 people (in 2000.) The unemployment rate in 2000 was about 4 percent nationally and average hourly wages were over \$13.00 per hour.

This was a daunting employment situation, given that Census 2000 needed to recruit over 3 million applicants to fill close to 900,000 jobs. The General Accounting Office (GAO), an investigatory arm of the Congress, cast doubt on the Census Bureau's readiness to conduct the census and criticized its staffing strategies. In February 1997, it placed Census 2000 as number one on its list of high risk government programs. In reports in March 1998 and December 1999 GAO questioned the Census Bureau's ability to staff its largest field operation, Nonresponse Follow-up. But by the time the census was over, the Census Bureau had recruited and tested over 3.7 million applicants for short-term temporary jobs and hired over 800,000 in Fiscal Year 2000 alone, and over 960,000 over the course of Census 2000. In January, 2001 the GAO removed the census from its "high risk" list, and stated in a letter to Commerce Secretary Mineta that the Census Bureau's success in recruiting the hundreds of thousands of staff needed for peak operations was both noteworthy and commendable. This noteworthy accomplishment took place in a year of historic economic prosperity and record low unemployment across the nation.

Other evidence that Census recruiting and staffing strategies were successful include the following comparison to the 1990 Census peak Field operation, Non-Response Followup.

	1990	2000
Workload (Housing Units)	34,278,233	42,382,432
Duration (Weeks)	13	9
Staff	350,000	550,000
States complete by June 27	19	50 + DC

Setting very competitive, locally based pay was believed by the Census Bureau to be the most important strategy. Field managers who had been through the 1990 Census and experienced first hand its staffing problems, believed that pay was the key to success. It was important to be competitive locally and therefore to be able to hire locally so that census workers would work close to home in areas they were familiar with, and where their presence would likely be accepted by the community. Luckily for the Census Bureau, which is untrue for most other Federal agencies, the authority for setting pay and establishing the number of temporary positions needed for the Census is spelled out in Title 13, United States Code, Sub-chapter II Section 23.

"The Secretary (of Commerce) may establish, at rates of compensation to be fixed by him without regard to the Classification Act of 1949, as many temporary positions as may be necessary to meet the requirements of the work provided for by law."

Therefore, the Census did not have to deal with a significant constraint that most other federal government agencies and programs struggle with; the federal pay schedule. This primary strategy, therefore, was to pay competitively for the local economy and to over-hire up front to compensate for expected turnover and low hours worked by part-time staff. It was critical to compensate for part time hours as preliminary data showed that on average a Census 2000 enumerator worked about four days each week, for about five hours each day, resulting in a total of 22 hours each week.

To develop a pay strategy, the Census Bureau contracted with WESTAT, a large statistical research company, and its senior labor economist, Dr. Louis Jacobson, to study pay problems with the 1990 census and develop a model for setting competitive locality-based pay for Census 2000. (Jacobson, 1999)

The research led to the conclusion that Census wages should be paid at a ratio relative to the prevailing

average wage at the county level (as measured by the Bureau of Labor Statistics). As a result, 32 different wage rates were established and enumerator wages for Census 2000 operations were set at approximately 75 percent of the prevailing average wage for the county or multi-county area.

Enumerator hourly wages varied between \$8.25 in places such as rural Arkansas and Oklahoma to \$18.50 in New York City. The enumerators who worked on the A.C.E. were paid one dollar more than the Nonresponse Follow-up enumerators because their job was more complex and required computer skills, thus they were paid between \$9.25 and \$19.50.

There were a total of 32 different pay rates across the county. In comparison, 1990 rates ranged between \$5.00 and \$8.00 per hour, there were only eight different pay rates, and a bonus system was in place. The Census Bureau revisited and tested a bonus pay system for 2000 but rejected it as being too complex and unnecessary. The basic highly competitive hourly rate was believed to be sufficient based on the recruiting and staffing results of the dress rehearsal census in 1998.

The locality based pay strategy to support the goal of hiring and assigning workers close to their homes seems to be supported by results of the WESTAT survey of 10,000 census workers. Eighty-one percent of workers reported that they had some work assignments within 10 minutes of their home.

The expected number of positions needed was calculated based on past experience with high turnover and workers primarily working part-time. The Census Bureau coined the term “Frontloading” to describe its staffing strategy which was to over-hire up front to accommodate turnover and part-time hours, a phenomenon that brings down total productivity unless accounted for by increased staffing. For FY 2000 it was estimated that 860,000 positions would be created in 520 Local Census Offices (enumerators and crew leaders). To support this level of hiring it was estimated that 3 million applicants would need to be recruited and tested. In addition 5,000 managerial, technical, and support positions were established and filled.

At the end of FY 2000 a total of 893,278 staff had been hired. For the entire decennial cycle (1997-2000), 965,312 had been hired. This compared roughly to 553,778 hires for the 1990 cycle (8/1989-2/1991). The result is a 60 percent increase in the number of hires as compared to 1990. The Census 2000 workforce was also quite diverse, meeting or exceeding the benchmark figures contained in the Civilian Labor Force Profile (for non-whites.)

A number of other important strategies were developed and implemented for recruiting and staffing Census 2000. These are described in more detail in a paper by Janet Cummings (2001).

4. QUALITY ASSURANCE PROGRAMS

A key aspect to building quality into the census was developing a formal QA program. The Census 2000 operations were more innovative and complicated than those of previous censuses. We made use of many technological advances and used contractor support to a much larger degree than ever before. The new technology and larger contracted workforce created many new challenges for designing and implementing a QA plan.

The QA philosophy for Census 2000 followed W. Edward Deming’s approach of stressing process improvement rather than inspection. The objective of process improvement is to build quality into the system to reduce or eliminate the amount of rework to correct errors. For this philosophy to be successful, it was necessary to have full management involvement and commitment to the quality improvement process. Our QA mission was threefold:

- to minimize significant performance errors
- to prevent clustering of significant performance errors, and

- to promote continuous improvement.

We carried this philosophy through all of our formal QA programs. The Census 2000 QA program was the most comprehensive ever—providing QA coverage for all aspects of census operations from pre-census activities through data capture of the final census questionnaires.

The pre-census activities included listing approximately 126 million addresses in the U.S. to which we would have to deliver census questionnaires. We also had to print the millions of forms to be mailed or delivered to every U.S. household. These forms included questionnaires as well as advance letters and requests for foreign language questionnaires.

We implemented several different operations with the final goal of obtaining as comprehensive a list of U.S. household addresses as possible. These operations consisted of having enumerators list addresses in the field, forming partnerships with local governments to validate existing lists, and collaborating with the United States Postal Service to obtain updated lists. For all field work, our QA plan was to ensure not only a high-quality list of U.S. addresses, but also to ensure that the enumerators conducting the listing activities were performing up to the Census Bureau's high standards.

The QA program double-checked a sample of listings to verify the existence and accuracy of addresses being added, deleted, or changed. This program allowed us to not only monitor lister performance and provide feedback, but also to have real-time access to quality measures for the listing operations.

Prior to mailout of the Census 2000 forms, we had to complete the enormous task of getting all the forms printed. This task was contracted out to several contractors in several locations throughout the U.S. The QA plan for printing operations sought to ensure the quality of the final product so that it was functional, user-friendly, and aesthetically pleasing. We worked very closely with all contractors to develop QA programs that would ensure the quality of the outgoing forms. We established teams that worked together to monitor and perform quality checks on the printing operations at all of the different sites. Using the internet, we were able to monitor the quality of all printing activities from headquarters with little or no delay.

Because not all U.S. residents chose to or were able to respond by mail or the other response options available to them (e.g., internet, telephone centers), we implemented several enumeration operations. These operations involved sending enumerators to households to collect the census data in person. As with the address listing operations, our QA plan for the enumeration activities had to not only ensure that we were collecting accurate data, but also that the enumerators were performing satisfactorily.

For all enumeration operations, we implemented a QA program where we reinterviewed a sample of households to ensure the enumerators were accurately collecting the required information. In addition, the field supervisors performed questionnaire reviews to make sure the questionnaires being submitted were filled out completely and accurately.

As data collection was completed, we had to capture the census data from the millions of census questionnaires. Because of the size of the job of capturing the data, we again obtained contractor support. We contracted with Lockheed-Martin to develop and implement a data capture system making use of current technology – optical mark recognition (OMR), optical character recognition (OCR), Key from Image (KFI), and Key from Paper (KFP). The QA plan for data capture was simple -- ensure as few errors as possible in the final data product. Because of the contracting and new technology, implementing the QA plan was somewhat more challenging.

The QA for data capture consisted of two programs. The first was a real-time QA that was implemented at the data capture centers. The contractors implemented QA on both the OMR/OCR capture and the keying results from KFI/KFP to measure the level of accuracy of the census data overall. The second QA program

was an independent monitoring program designed to monitor the accuracy of the census data at the field level. This program involved comparing the captured data and the images to identify discrepancies.

The address listing, printing, enumeration, and data capture activities were the largest of the census activities. However, there were many smaller scale, but important, activities that were critical to the success of Census 2000. Our QA strategy addressed all of these census operations as well.

5. THE ACCURACY AND COVERAGE EVALUATION

The A.C.E. was designed as a program to increase census accuracy through the use of statistical methods, including both sampling, dual system estimation and synthetic estimation. It was an outgrowth from an earlier program called the Quality Check. The difference was that the original Quality Check would have been applied to the state numbers used to apportion Congress. The A.C.E. was restricted to other uses. This section describes the steps taken to ensure A.C.E. accuracy and quality.

The A.C.E. sample was nearly twice as large as the 1990 coverage measurement program (in 1990), which, together with several modifications in the sample design resulted in a much smaller sample variance.

The decrease in sampling variance was due to the much larger sample size of the A.C.E. relative to the PES: 300,913 housing units in 11,303 clusters for the A.C.E., versus 165,000 housing units in approximately 5,000 clusters for the 1990 PES. Better measures of population size in the sample selection of block clusters, better subsampling methods, better methods of treating "small blocks," and a reduction in the variability of sampling weights all contributed to this reduction.

One change from 1990 was the introduction of computer assisted personal interviewing on laptop computers for the A.C.E. interview and, additionally, doing some of these interviews by telephone. The Census Bureau implemented a telephone program to enhance the efficiency and quality of the A.C.E. interview. Beginning interviewing early in a more easily controlled environment allowed the A.C.E. supervisors to gain valuable experience in conducting interviews and in operating their laptop computers before training their enumerators. The Census Bureau designed this process so that we would maintain independence between the A.C.E. and the other Census 2000 operations.

A.C.E. interviewing was an operational success. Interviewing finished on schedule by September 1, 2000, in every Local Census Office except the Hialeah office, where census Nonresponse Follow-up census interviewing also finished late (September 11, 2000) due to local difficulties. The utilization of the Computer Assisted Personal Interviewing (CAPI) instrument was a major accomplishment. The timely interviews allowed the Census Bureau to conduct a quality assurance program more efficiently than when using paper and pencil and to have an orderly completion of the interviewing operation. There were no major disruptions or delays introduced.

Twenty-nine percent of the total A.C.E. workload was completed during the telephone phase (April 24 through June 13). These A.C.E. interviews were conducted much closer to Census Day (April 1) than had been possible in 1990, thereby reducing recall bias (the phenomenon of a respondent not remembering the actual situation several months earlier).

The Census Bureau's observations and debriefings indicated that CAPI instilled the interviewers with a sense of professionalism and purpose. Observations also indicated that the use of laptop computers enhanced the respect and cooperation exhibited toward the interviewers by the respondent households, thereby leading to improved A.C.E. data quality.

Missing data rates for characteristic data were very low, ranging from 1.4 percent to 2.4 percent. Compared to the 1990 PES, the rates of characteristic missing data were slightly higher for the age and sex

characteristics and slightly lower for tenure and race. Again, this was indicative of good quality interviewing.

Matching refers to the process of determining whether an individual enumerated in the A.C.E. was the same person as an individual enumerated in the census. The matching and follow-up process also determines whether a census record in the E Sample² was complete and correct. Errors in matching can significantly affect undercount estimates; highly accurate matching and processing are an important component of A.C.E. methodology.

The clerical matching was greatly improved through the development and use of a “point-and-click” computer assisted clerical matching program. Furthermore, both the data captured information, including names, and the questionnaire image were easily accessible on screen. This allowed the clerks to concentrate on the actual matching rather than on the mechanics. It also meant virtually paperless matching a vast improvement over the 1990 matching process.

Person follow-up is also an important A.C.E. process. The follow-up resolves possible matches and, most importantly, determines which E-sample nonmatches are, nonetheless, correctly enumerated in the census. The person follow-up interviews were conducted either by permanent census field staff or by experienced decennial interviewers and the quality assurance operation was targeted at ensuring that the interview was actually conducted.

However, in spite of the seeming operational success of the A.C.E., evaluations of the results indicate a fundamental failure to accurately measure the net undercount. It is now clear that the A.C.E. failed to detect large numbers of erroneous enumerations. In an important study, the A.C.E. samples of census enumeration cases were searched and matched nationwide a much-expanded search area compared to the A.C.E. search area. A large number of individuals classified by the A.C.E. as correctly enumerated at the sample address were also found to be enumerated at another address (Feldpausch, 2001). The number of these identified duplicates greatly exceeded what should have been expected. These included college students, prisoners and others who should normally be enumerated at their group quarters. Even the number of individuals classified as correct enumerations by the A.C.E. but duplicated in two housing units greatly exceeded the roughly half correct that one would expect from a random sample of addresses. Understanding this problem will require extensive cognitive testing and rethinking the concept of “usual residence”.

6. WHAT WAS THE UNDERCOUNT?

Although no precise estimates are available from the A.C.E., preliminary indications indicate that the net undercount was very small. Fay et al (2001) indicates a net national undercount of only 0.06 percent (0.18) or less than 170 thousand people. Robinson et al put the undercount at around 0.12 percent, which is still less than 340 thousand people. Even allowing for the uncertainties in these estimates, one must conclude that the net national undercount was much lower than the approximate 1.6 percent measured in 1990.

The story for the differential undercount is somewhat more complex and considerably more clouded. Fay et al. put the Non-Hispanic Black undercount at 0.78 (0.43) or 0.72 higher than their estimate for the total population. Robinson et al. put the Black percent undercount somewhat higher at 2.78, for a differential of 2.66. Fay et al. also estimated the Hispanic undercount at 1.23 (0.34), for a differential of 1.19.

New estimates for other groups are not yet available. We can get an idea of these, though, by looking at the differential measured by the original A.C.E. estimates. Assuming that the errors in the A.C.E. are not

²The E sample refers to the sample of census data defined person records selected for inclusion in the A.C.E. The P sample refers to the independent sample of people included in the initial A.C.E. interview.

stronger differentially by race, these differentials give a perspective at Census 2000, and allow comparison with 1990. This analysis is of course, very approximate.

What each of these measures indicates is that Census 2000 was largely successful in one of its primary goals, reducing the differential undercount.

The Census Bureau plans to continue research measuring the coverage of Census 2000, and also plans an extensive evaluation program on other aspects of census-taking. However, the data and analysis now available indicate that resources, planning and implementation of Census 2000 procedures resulted in a good census.

Differential Undercount as measured by the Original A.C.E. Estimates by Race

	2000		1990	
	Rate (%)	Standard Error (%)	Rate (%)	Standard Error (%)
One Race				
White	-0.4	0.1	-0.7	0.2
Black or African American	0.9	0.3	2.8	0.5
Hispanics of any Race	1.6	0.4	3.4	0.8
American Indian or Alaska Native	2.2	0.8	2.9	1.2
Asian, Native Hawaiian or Other Pacific Islander	-0.1	0.6	0.7	1.4
Asian	-0.2	0.6		
Native Hawaiian or Other Pacific Islander	3.2	2.4		
Some Other Race	1.8	0.4		
Two or More Races	0.7	0.2		

Standard Errors are for the undercount estimates (not the differential). These provide reasonable approximations except that the standard error for whites is an overestimate.

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