The American Community Survey:
Quality of Response by Mode of Data Collection in the Bronx Test Site

Joseph J. Salvo and Arun Peter Lobo
Population Division
New York City Department of City Planning

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Abstract

The ultimate success of the American Community Survey (ACS) will rest on its capacity to provide users with reliable data for small areas more than once a decade. Given the complex demography of its population and its abundance of hard-to-enumerate groups, the Bronx, NY test site poses formidable challenges for the ACS. Differences in overall response and item imputation by mode of data collection (mail versus enumerator response) highlight major differences between the ACS and the decennial census. An understanding of these differences is essential as data users attempt to assess the ramifications of eliminating the 2010 census long-form and replacing it with a continuous ACS. Furthermore, this research attempts to inform future assessments of the ACS, as operational data from the 2000 Census become available for small areas throughout the nation.

Background and Research Question

Despite an abundance of surveys that measure all facets of American life, the fact remains that the decennial census is the only source of small area data for the nation. Obtaining socioeconomic information from a sample of households was first pursued in the 1940 and 1950 censuses, with the 1960 Census being the first to employ different forms for items that were collected on a 100 percent basis and those that were collected for a sample of respondents (Citro, 2000). Multiple long-forms were employed in 1970, in what was the first full-scale mailout/mailback census. By 1980, the Census Bureau adopted a single long-form, which has collected important information on education, migration, labor force, income, housing costs and a host of other items for a sample of American households ever since. Urban and rural planners, policy analysts and other officials throughout the nation use these data to document needs, monitor trends, and develop strategies for addressing everything from the public transportation problems of inner city residents to the needs of elderly homeowners in small rural communities.

The development of surveys to provide intercensal updates for the nation and its regions has blossomed since the 1930s, when the nation pressed for greater monitoring of the economic state of the country after the Depression. Since then, the evolution of sampling as a scientific enterprise has fostered the development of myriad surveys for monitoring the state of the nation's population and housing, the most well-known of which is the Current Population Survey or CPS. These surveys, however, do not address the need for intercensal data at the state level or for sub-state areas. By the 1970s, local data users strongly advocated proposals for a mid-decade census, but these plans were ultimately scrapped because the initiative never received adequate funding. Programs were developed in the early 1970s to create annual sub-state population estimates to drive revenue sharing for local governments, but these data were of little use to those who were interested in the population characteristics of small areas, such as census tracts.

In the late 1980s, proposals for continuous measurement of the nation's social and economic characteristics for all areas – large and small – first received serious consideration at the Census Bureau (Herriot et al, 1989). With increasing demands placed on local data disseminators for more timely information, especially in high-growth areas, the decennial cycle of census data was

increasingly seen as inadequate. This pressure, along with congressional misgivings over the cost-effectiveness and lackluster response in the 1990 census, combined to produce a demand for better data collection tools (Prewitt, 2000). In response, the Census Bureau started a plan to pilot test a continuous measurement program in 1994 (Alexander, 2000).

In 1996, the Census Bureau first field-tested the ACS in four counties. Today, the number of test sites has grown to 30 and an operational feasibility test of the ACS, called the Census 2000 Supplementary Survey (C2SS), was conducted nationally in 700,000 households. The ACS is scheduled to go nationwide in all counties starting in 2003. The plan is to create estimates of long-form characteristics on a continuous basis, in lieu of the 2010 Census long-form.[1] Annual estimates will be created for areas having populations of at least 65,000. For census tracts and block groups, sufficient sample size will be achieved over a five-year period to support new estimates beginning in 2008. Plans are to "refresh" numbers each year, which should allow local planners to monitor large shifts in population characteristics over time.

Like the census, the ACS has three distinct phases for the enumeration of population in housing units: create an address list; mail out questionnaires to households on the list; then follow-up on those households that fail to respond. The ACS enumeration for each sample panel takes place over a three-month period. During the first month, a pre-notice letter is sent, followed by a questionnaire, followed by a reminder card and, if necessary, a second questionnaire the third week of the month (Love and Diffendal, 1998). For those who fail to respond six weeks after the initial mailout, Computer Assisted Telephone Interviewing (CATI) is employed. Finally, those households that fail to respond after two months are placed into a pool and a one-in-three sample is selected for Computer Assisted Personal Interviews (CAPI).[2]

The ACS represents a significant departure from the decennial census in the methods used for collection of long-form data. To begin with, the ACS does not use the "usual residence" concept employed in the census (people living in a unit "most of the time"), but a concept of "current residence." Members of the household eligible for the ACS had to reside in the household at the time of interview; if they claimed to live some other place, they needed to reside in the household for at least two months around the point of contact. Second, while the ACS uses what is essentially the census long-form to collect data on nativity, language, migration, education, occupation, income and other characteristics, estimates are derived from successive monthly samples collected over time, as opposed to data collected using a single point-in-time reference. This means that items like income represent averages taken over a period, which may influence the conceptual basis for the measure.[3] Finally, the form and scale of the data collection are very different. The current plan is for the ACS to contact about 3 million housing units annually (250,000 per month) starting in 2003, with a one-in-three personal visit followup on units not responding by mail or CATI. Monthly samples are accumulated to produce sufficient sample size for smaller areas. In contrast, the 1990 census was done in almost 92 million households over a period lasting about six months (using an April 1 reference point), where follow-up was done on all non-responding households using a huge group of temporary workers.[4]

Data users have become concerned about the effects these differences may have on the form and quality of small area data, especially given the lack of substantive research. This study seeks to

help fill this void by examining the quality of data in one of the ACS test sites relative to data from the 1990 Census. Comparisons are made with the 1990 Census because the operational data are available and understood. Such is not yet the case with the 2000 Census operational data.

Data Accuracy: Nonresponse Issues in the ACS and Census

The definition of survey accuracy relates to errors associated with sampling and nonsampling issues (Office of Information and Regulatory Affairs, 2001:1-2). Sampling error is quantifiable and represents the variance associated with creating estimates from a sample rather than from the full universe of respondents. Less quantifiable but equally formidable is non-sampling error, which refers to errors of coverage, measurement, nonresponse, data capture and processing. In every survey, tradeoffs occur between different forms of error. In the ACS, the most salient tradeoff is the acceptance of slightly higher levels of sampling variability in exchange for more timely data for small areas (U.S. Census Bureau, 2002:27-29).

A major form of non-sampling error is nonresponse, which refers to an unsuccessful attempt to obtain information from respondents and is frequently considered a proxy for data quality (Office of Information and Regulatory Affairs, 2001:4-1). Nonresponse error can be subdivided into a complete failure to obtain information from sample units such as households and nonresponse associated with individual items in a survey. Drawing distinctions between unit and item nonresponse can be difficult because their definitions are not exact (Madow et al, 1983:18-20; Groves and Couper, 1998). Questionnaires in surveys may contain some responses, but be deemed "unusable" because they fail to attain an acceptable threshold, as determined by those managing the survey. Similarly, responses to individual items in a survey may be unusable. However they are defined, these measures provide researchers with an indication of survey quality.

In general, data released for counties included in the ACS test sites indicate that the percentage of households mailing back their questionnaires (i.e., mail return rate) is uniformly lower in the ACS relative to the 1990 Census, with one of the lowest ACS mail return rates in Bronx County, New York, 36.4 percent (Table 1). The mail return rate in Bronx County was more than 19 percentage points lower in the ACS than in the 1990 decennial census. The Bronx and Harris County, Texas displayed the largest differences between the ACS and the census, among the group of very large counties, those with at least 50,000 occupied housing units in 1990; differences in excess of 15 percentage points could also be found in Broward (FL), Franklin (OH), and Rockland (NY). What made the Bronx different was the low mail return rate, which could only be matched by a handful of small jurisdictions, such as Starr and Zapata Counties in Texas. The lower overall mail return rates in the ACS were not unexpected given the scale and publicity of the ACS relative to the decennial Census.[5] Moreover, other research has shown that mail response levels in the C2SS varied significantly by race and Hispanic origin, as with the decennial census (U.S. Census Bureau, 2002).

Since ACS mail return rates vary substantially from one area to another in the U.S., large differences are apparent in the percentage of completed interviews obtained via CATI and CAPI.

Many hard-to-enumerate places with low mail return rates, especially those with large numbers of Black and/or Hispanic residents, had far greater shares of their responses obtained in CAPI. Given the one-in-three follow-up, this translated into higher levels of sampling variability associated with estimates for these groups, especially for smaller areas. Therefore, differences in mail response levels between the census and the ACS portend large disparities in the role of non-response follow-up as a mode of data collection. This has major ramifications for the ACS, from an operational, budgetary and estimates standpoint. More emphasis on the CATI and CAPI phases of the ACS translates into more cases for follow-up, placing a higher burden on the collection system, increasing sampling variability, and pressuring already tight budgets.[6]

In the decennial census, however, problems associated with non-response follow-up may be even more formidable. Since non-response follow-up is conducted on all non-responding households, lower mailback rates pose significant challenges for containing costs, as in 1990 when the Census Bureau went to the Congress for an emergency appropriation to cover additional follow-up associated with a lower-than-expected mailback rate (Choldin, 1994:88). Even more serious for data users, however, were the costs associated with compromised data quality because of "last resort" collection methods, those special procedures that enumerators defaulted to in desperation as they succumbed to the pressures associated with closing out the decennial census.[7] Low mail return rates in many areas of New York City in 1990 produced high levels of last resort enumeration, which were associated with high levels of item and whole household imputation (Ericksen et. al., 1991:1-9). Unlike with the census, the ACS requires that all interviews be conducted with a member of the household; proxy responses from neighbors or other "knowledgeable" persons are not permitted (U.S. Census Bureau, 2002:16-17). Professionally trained interviewers, like those employed in the Census Bureau's current surveys program, represent a major advance over the temporary workers in the decennial census who are sometimes forced to operate under severe time constraints with only minimal training.

Another gauge of census accuracy, item nonresponse, refers to the absence of useful information for specific items in a survey (Office of Information and Regulatory Affairs, 2001:4-2; Madow, et al, 1983:15-28). Rates of nonresponse are higher for more sensitive items on questionnaires, such as those relating to income (Edmonston and Schultze, 1995:384-7). Item nonresponse is usually corrected through the use of imputation, the level of which is frequently used as a gauge of data quality. Current research on levels of imputation in the ACS is sparse. Work in Rockland County, New York and in rural Fulton County, Pennsylvania suggest that imputation for key long-form items in the 1996 ACS was generally lower than in the 1990 Census (Salvo and Lobo, 1997; McLaughlin et al, 2000). Most recently, the Census Bureau has issued its first data on imputation from the C2SS, confirming that imputation rates were lower in the ACS than in the 2000 Census; however, comparisons were done just for five 100 percent data items (relationship, gender, age, Hispanic origin and race), which historically have low rates of missing data (U.S. Census Bureau, 2002).

Measures Used in this Study and Study Area

This study focuses on three measures of non-response: the *mail return rate, minimal*

questionnaire completeness (a form of unit nonresponse) and *item imputation*. Following the Census Bureau definition, the *mail return rate* is the percent of all occupied housing units mailed or delivered questionnaires that responded by mail (self-response). This rate is different from the mail response rate in that vacant housing units were removed from the denominator, making it the best measure of public response to the census.[8] *Minimal questionnaire completeness* is gauged by an "acceptability index" that has been created for the American Community Survey and adapted to the 1990 Census for purposes of comparison. It provides a minimal standard, based on 100 percent questions, above which an interview has been deemed to occur. In addition, questionnaire completeness was examined using the 1990 standard called "sample data-defined," where a threshold is established based on both 100 percent and sample count questions. Finally, the *item imputation rate* is defined as the number of allocated responses for an item as a percent of the total population eligible to report that item (U.S. Census Bureau, 2002:19).

The Bronx, the study area for this analysis and one of five counties (i.e., boroughs) comprising the City of New York, is one of the most populated urban counties in the nation, with more than 1.3 million persons and 491,000 housing units in 2000. The Bronx contains some of the hardest-to-enumerate places in the nation. Moreover, the Bronx contains variations in race, ethnicity, nativity, tenure and language that run the gamut. The Bronx has neighborhoods that are among the poorest in the nation as well as wealthy estate areas; neighborhoods with a preponderance of new immigrants and those composed almost exclusively of native born ethnics of every race; areas that are all rental housing and areas with virtually all homeowners; places with nothing but high density multi-story buildings and places exclusively composed of one-, two- and three-family houses. Add to this significant language issues, fear of authority among undocumented immigrants and hard-to-find housing, and what we have is a serious challenge for data collection efforts. In an effort to get a handle on these differences, the analysis subdivides the Bronx into 10 subareas using the Public Use Microdata Area (PUMA) boundaries from the 1990 Census (Map 1)[9].

Gauging Nonresponse in the ACS and the Census

Mail Return Rates

The first measure of nonresponse used in this study was the mail return rate or the percent of occupied housing units receiving a long-form that responded by mail.[10] The overall 1990 Census mail return rate for long-forms in the Bronx was 55.8 percent, significantly higher than the rate from the 2000 ACS of 36.4 percent.[11] Mail return rates are shown separately for the 10 PUMA subareas in Figure 1.[12] These subareas have large populations, encompass many neighborhoods each, and vary substantially in their socioeconomic status, housing and race and ethnic composition (Table A-1). The most critical of these differences, for the purposes of this study, is socioeconomic level. In order to independently gauge socioeconomic differences, a measure was created using local administrative data on public assistance recipiency for October of 2000. This measure uses the broadest definition, namely persons who were receiving public assistance, were Medicaid-eligible or who were receiving Supplemental Security Income (SSI) benefits.

Expressed as a percentage of 2000 population, this statistic was used in the analysis to rank order the PUMAs. The large variation, from 46 percent in the case of PUMA 502 to just 11 percent for PUMA 508, is indicative of the wide variation in socioeconomic status within the borough (Map 1). Thus, the subareas in Figure 1 are sorted to reflect the level of poverty, as gauged by administrative data, with subareas to the left having higher levels of public assistance recipiency per unit of population than subareas to the right.[13]

As expected, mail return rates rise as poverty level declines for both the census and ACS. Although mail return rates rise in lower poverty subareas, the differences between the 1990 Census and the ACS are largely maintained across the poverty spectrum. PUMA 502 in south central Bronx has the highest level of poverty in the borough as measured by the administrative data (46 percent). According to the ACS, it is primarily a Hispanic (59 percent) and Black nonhispanic (36 percent) subarea, consisting heavily of Puerto Rican and African-American residents (Table A-1). Only 9 percent of the population lives in owner-occupied housing, with most of the rental units in large multi-story buildings. The mail return rate in 1990 was 51 percent compared to 29 percent in the 2000 ACS, a difference of 22 percentage points. According to the administrative data, PUMA 508 has the lowest poverty level in the borough, 11 percent. It is located in the eastern section of the borough and, based on the 2000 ACS, about half of its population is either black or Hispanic. The largest Hispanic group is Puerto Rican and the Black population is heavily African-American; 45 percent of residents own their own homes. In 1990, 68 percent of households mailed back their census questionnaires, compared to 48 percent in the ACS, a difference of 20 percentage points. Clearly, mail return rates were lower in the 2000 ACS relative to the 1990 Census, irrespective of poverty level.

Minimal Questionnaire Completeness

Another measure focuses on minimal questionnaire completeness or the dividing line established by the Census Bureau between questionnaires that are usable or minimally acceptable and those that contain so little information that they are akin to blank questionnaires. The minimal completeness threshold for 1990 was defined as two completed 100 percent items and two completed sample count items for at least one person in the census household. Households with at least one person who met these minimum thresholds were labeled as “sample data-defined,” (hereafter referred to as SDD), and were included by the Census Bureau in the long-form sample and subject to the weighting and edit processes that include imputation of long-form items where required. Cases Not SDD were dropped from the sample because they were considered to be “too far gone” for any form of sample data imputation.

In an effort to derive a more comprehensive measure for the ACS, the Census Bureau created a minimal completeness concept in the form of an “acceptability index.” This measure examines responses for all persons in the household and creates a composite index that rates the level of information present. Unlike the 1990 census measure, which required one person within a household of any size to meet the minimum data requirement, the “acceptability index” is calculated at the household level by adding up the number of 100 percent data items and dividing by the number of persons in the household. An index of 2.5 or more is considered by the Census Bureau to constitute an interview; any household that fails to make this threshold is deemed a

"non-interview" and is adjusted for in the weighting as if the ACS had not received a questionnaire.

Acceptability indices for both the 1990 Census and the 2000 ACS were constructed using special data compiled by the ACS staff at the Census Bureau for the Bronx test site. The percent of households responding by mail that failed to achieve acceptability was small for both the 2000 ACS and the 1990 Census, 1.7 and 0.3 percent respectively (Figure 2a). A large difference, however, was apparent for households enumerated in non-response follow-up, with unacceptable returns constituting 4 percent of census households versus more than 14 percent for households in the ACS. Given the fact that the acceptability index is based on just 100 percent items, it is not surprising that the 1990 Census achieved a higher level of minimal completeness relative to the ACS in follow-up. The primary goal of the decennial census is to achieve the most complete count of population possible, a focus that seeks to maximize response to the 100 percent questions.

Turning to the SDD criteria of minimal completeness, which includes sample data, a very different picture emerges (Figure 2b). As with the acceptability index, the large majority of self-response households met the SDD requirements (two 100 percent and two sample count items for at least one household member). For enumerator returns, however, a much larger portion of households failed to meet the SDD threshold in the 1990 census compared to the 2000 ACS. More than 49 percent of households enumerated in nonresponse follow-up (NRFU) in the census failed the SDD test, compared to just 14 percent for the ACS, a huge difference that reflects both the census's emphasis on the 100 percent data items and the high quality of non-response follow-up in the ACS. The Census is, first and foremost, an enumeration of the population, where priority is given to obtaining responses to the 100 percent questions. When an enumerator seeks to obtain information from a long-form household that failed to respond by mail and repeated attempts to obtain an enumeration fail, last resort measures are employed that focus on obtaining information for the 100 percent items, frequently from neighbors or other knowledgeable individuals (National Research Council, 2001:168-9). The ACS, on the other hand, does not incorporate these distinctions into its data collection process. There is no prioritization of content in CAPI and proxy responses are not permitted in the ACS. While the "count" is important to ensure the coverage necessary to maintain the integrity of the sample, the entire questionnaire is incorporated as a single entity in the ACS, which explains why the percent not "acceptable" and the percent not SDD were virtually identical for 2000 ACS households. It also explains why, for the 100 percent data, the ACS is indeed not a substitute for the "short-form" decennial census.

The differences in the ACS and census process become apparent when all long-forms are examined by mode of data collection and minimal completeness, using the SDD measure (Figure 2c). In the chart, the red areas represent the percentage of households enumerated in the mailout-mailback phase of census and ACS operations in the Bronx; note the much higher mail-return rate in the 1990 Census and the fact that virtually all of the households that mailed-back their questionnaires were SDD for both the census and the ACS. The blue areas of the chart show all households that were enumerated via follow-up and illustrate the higher reliance on this operation in the ACS. Most important was the much higher percentage of households in follow-

up that were not SDD in the census, 22 percent of all long-forms compared to just 8 percent in the ACS. Thus, more than one of every five long-form questionnaires from the 1990 Census in the Bronx was unusable because of ineffective nonresponse follow-up.

Extending this analysis of minimal completeness to hard-to-enumerate PUMAs, Figure 2d presents the percent of households in the census and ACS that were SDD in subareas with high and low poverty. Poverty is gauged by the administrative data on public assistance recipiency.[14] As seen earlier, those subareas with high levels of poverty had lower mail return rates, in the census and ACS, thus increasing the contribution of nonresponse follow-up to the total data collection effort. For the Bronx, less than one-half of all occupied housing units in high poverty subareas mailed back their census questionnaires in 1990, compared to 62 percent in subareas with low poverty. In the 2000 ACS, high poverty subareas had a mail return rate of just 30 percent compared to 46 percent for low poverty subareas. The degree of questionnaire completeness among mail returns varied little by poverty level, with the large majority of questionnaires from the census and ACS meeting or exceeding the SDD threshold. Therefore, for mail returns, differences between high and low poverty subareas were evident in the levels of mail response and not in the degree of completeness of those responses.

About one-half of both high poverty and low poverty households enumerated via nonresponse follow-up were SDD in the 1990 Census. Since mail return rates were much lower in high poverty households, this translates into a larger deficit of SDD long-forms in high poverty subareas, 24 percent, compared to 17 percent in low poverty subareas. As was the case overall, a much higher percentage of ACS households enumerated in nonresponse follow-up met or exceeded the SDD threshold irrespective of poverty level. This results in a much smaller percentage of ACS households that failed to meet the SDD standard; 8 percent in high poverty subareas and 7 percent in those designated as low poverty.

While thresholds for minimal completeness provide one picture of differences in data quality, the final statement about data quality rests with the level of item-specific imputation. Regardless of mode of collection or type of survey, the proclivity of respondents to answer survey questionnaire items can vary dramatically. Therefore, the final portion of our study turns to an examination of allocation rates for selected variables.

Item Imputation

Another measure of survey quality is the percent of an item's data values that was allocated, using known values from completed responses to impute values for missing items. Table 2 presents allocation rates for selected variables from 1990 Census long-forms and compares these rates to those calculated from the 2000 ACS.[15] This includes several social background variables, including birthplace of the foreign born (birthplace); English language proficiency of those persons 5 years and over who spoke a language other than English at home (English); and place of residence – five years ago from the census and one year ago from the ACS (mobility). Economic variables that ask about occupation (occupation), income from wages and salaries (wages), and income from public assistance (PA) are included.[16] Finally, two 100 percent items were included, units in structure (units) and contract rent (rent). Regardless of differences, the

100 percent items have low levels of allocation, which is indicative of their relatively high levels of response.

Overall, imputation levels were significantly higher in the 1990 Census compared to the 2000 ACS for seven of the eight items (Table 2). Among the items examined, the economic variables displayed the highest allocation rates in the 1990 Census – occupation (22 percent), wages (19 percent), and public assistance income (18 percent). Differences were marked for occupation and public assistance, but not for wages, which had the highest allocation rate of the items examined in the 2000 ACS.[17] Only for contract rent was allocation significantly higher in the ACS than in the Census, but the difference, while significant, was less than two percentage points.

While the overall allocation rates provide a general idea of differences in data quality between the ACS and the 1990 Census, examining data by mode of collection is key to understanding why rates differ. Table 2 shows that the picture of differences varies dramatically by mode of data collection. For questionnaires that were obtained via self-response, allocation rates were actually higher in the ACS than in the census. For example, for self-response households, the income source question on public assistance had an allocation rate of 14 percent in the 1990 Census compared to a rate of 23 percent in the ACS. Allocation for self-response households in the 2000 ACS for occupation (21 percent), wages (20 percent), mobility and English proficiency (11 percent) were all significantly higher than in the 1990 Census.

In contrast, for data obtained via enumerator response, allocation rates were much lower in the ACS than in the census. One-third of the occupation data elicited via enumerator-response in the 1990 Census was allocated, compared to less than 10 percent in the ACS. Double-digit differences also occurred for wages, public assistance, birthplace, mobility and English proficiency. Only for units in structure and for contract rent – the two 100 percent items – were differences small.

Figures 3 through 8 examine allocation levels for selected variables across Bronx PUMAS. In all of the charts, PUMAS are sorted by poverty level using administrative data on public assistance recipiency. The analysis by subarea focused on the sample items. For those questionnaires obtained via self-response in both the ACS and the census, allocation rates were lower in low poverty subareas, on all six variables – occupation, wages, public assistance, birthplace, mobility, and English proficiency. In contrast, the pattern of allocation by poverty level was fairly flat in most cases for enumerator-response questionnaires. For example, the monotonic decline in allocation rates so evident with declines in poverty among self-response returns for occupation fails to appear with enumerator-based responses (Figures 3a and 3b). Among enumerator-responses, the highest level of ACS allocation for all six variables was in PUMA 507, an area in the east Bronx with only a moderate level of public assistance recipiency. Similarly, despite its status as a lower poverty area, PUMA 510 had the highest census allocation rates for four of the six items examined.

The higher ACS allocation rates for questionnaires obtained via self-response are largely maintained across PUMAS (Figures 3a – 8a). In virtually all of these comparisons, ACS

allocation rates were the same or higher than those from the 1990 Census, irrespective of poverty level. Among enumerator-responses, the large gap between ACS and Census is maintained across PUMAS, with the census displaying higher levels of allocation, irrespective of poverty level. While the differences between ACS and census were still statistically significant, the smallest disparities were for the reporting of wages, mostly due to elevated allocation rates in the ACS. Moreover, the level of allocation for wages was virtually identical for the highest poverty PUMA (502) and the one with the lowest poverty level (508). Clearly, the ACS has a substantial advantage over the decennial census in the quality of information derived in non-response follow-up, an advantage that does not diminish in high poverty subareas.

Conclusions

The Federal Committee on Statistical Methodology reminds researchers that the concept of survey accuracy goes well beyond the measurement and reporting of sampling error, encompassing a broad spectrum of errors associated with non-sampling issues, such as nonresponse (Office of Information and Regulatory Affairs, 2001). The shift from the decennial census to the American Community Survey as *the* single source of small area socioeconomic data for the nation involves a series of complex tradeoffs that only become apparent when operational data from the two surveys are examined by mode of data collection.

The decennial census depends on high mail return rates to keep nonresponse errors in check because of the high level of error associated with sample items in nonresponse follow-up. Of all the 1990 Census long-forms in the Bronx, more than one-quarter of those in high poverty subareas failed to meet the sample data-defined threshold for minimal completeness, rendering them useless for the estimation of characteristics. Thus, the emphasis in the decennial census nonresponse follow-up operation is not on the sample items, but on the 100 percent questions, a result of the priority given to the count (as opposed to characteristics) and testimony to the difficulties encountered in obtaining responses to sample count questions during the final stages of the census enumeration.

The primary objective of the ACS is to estimate characteristics. The reluctance of respondents to provide information is addressed through the use of intensive follow-up using professional interviewers for a sub-sample of households. With fewer households to cover and a greater emphasis on eliciting responses for the entire questionnaire, the ACS operational data showed higher levels of sample data-defined households and lower levels of item allocation. Moreover, this advantage was maintained in more difficult-to-enumerate subareas. The quality of nonresponse follow-up is key to the success of the ACS, especially since its mail return rates, thus far, have been well below levels found in the decennial census.

The ACS dependence on nonresponse follow-up has its pitfalls, however. While the quality of nonresponse follow-up has been shown in this study to be relatively high in the ACS, too much follow-up can make small area estimates overly dependent upon the one-in-three CAPI sub-sample. The dependence of the ACS on relatively high levels of nonresponse follow-up, especially for hard-to-enumerate areas raises concerns regarding the reliability of estimates.

This has prompted data users to express fears that future budget constraints may force cuts in sample size that will seriously degrade the sample base for small area estimates (Hernandez, 2001; 3-4). The Census Bureau needs to provide data users with more information about the reliability trade-off between mail returns and CAPI, especially in hard-to-enumerate areas. The Bureau needs to help data users identify that point where the balance of mail returns and CAPI interviews becomes unfavorable and seriously compromises estimates. Of course, the ideal situation would be to increase the visibility of the ACS, thereby fostering civic involvement and a rise in mail return rates, making the survey less CAPI dependent.

There is little doubt that the situation with the long-form decennial census process has gotten more difficult since 1990, as indicated by the national decline in long-form mail returns. In an era when the Census has done a better job of counting Bronx residents, evidence from the 2000 Census indicates that an improvement has not occurred in the Census's capacity to estimate their long-form characteristics. Counting more Bronx residents poses new dilemmas for modern census taking, in the form of obtaining accurate information on characteristics from the hardest-to-enumerate populations. There are always limits to what respondents will report, especially in an era when the issue of personal privacy is in the headlines on a daily basis. Sampling variability issues notwithstanding, the higher level of data quality inherent in better ACS nonresponse follow-up represents a major advance over the increasing degradation of long-form census response.

Future work in the Bronx needs to focus on non-response errors in the 2000 Census, once the operational data become available. Further, with multiple years of data from the ACS, larger sample sizes will permit the unit of analysis to move from the PUMA to the census tract level, making it possible to examine data for neighborhoods. Only by working at a more detailed geographic level will it be possible to explain some of the patterns found in this study at the PUMA level. With 355 census tracts in 2000 and large demographic, social and economic disparities, the Bronx has the potential to become an even more fruitful source for evaluating nonresponse error in the ACS.

ENDNOTES

[1] It is important to emphasize that the decennial census short-form, which is mandated by the Constitution for the purposes of Congressional Reapportionment, will still be used in 2010. The ACS is not a replacement for the short-form census.

[2] Given that the ACS personal visits (CAPI) are only done on a 1 in 3 subsample, the data in this analysis have been weighted to reflect this. Furthermore, those housing units that failed to respond to mail and to CATI and were not selected for follow-up were dropped from the analysis.

[3] Income, for example, is based on the "previous 12 months" as opposed to the "previous calendar year" in the census; migration is based on place of residence "one year prior to the interview" as opposed to "five years prior" to census day. The Census Bureau is evaluating how moving averages compare with point-in-time census measures, using 1999-2001 data for the ACS test sites and data from the 2000 census.

[4] The ACS actively employed computer-assisted telephone follow-up using vendor-supplied telephone numbers associated with sample addresses. The 1990 Census employed telephone follow-up from field offices to fill gaps in questionnaire content, in addition to personal visits to non-responding households.

[5] In Fulton, data on "mail returns" were not strictly comparable, since questionnaires were delivered to households using an "update/leave" procedure, where the Census Bureau delivered questionnaires to households with a request that they be mailed back.

[6] There were approximately 15,500 questionnaires mailed in the Bronx ACS over the course of 2000, about 5,000 of which were returned via the mail. Of the approximately 10,600 that remained, some 700 were enumerated via CATI. One-third or 3,300 of the remaining 9,900 questionnaires were part of the CAPI sub-sample. Therefore, unweighted, CAPI cases constituted more than four-fifths of all cases in non-response follow-up, some 3,300 out of almost 4,000 cases.

[7] "Last resort" in the 1990 Census refers to the collection of data from neighbors, apartment managers, and post office employees among other sources, when a response from a resident could not be obtained (National Research Council, 2001:168-9).

[8] ACS self-response households include all households that mailed-back their questionnaires plus a very small number of respondent-initiated interviews that took place over the telephone. These interviews were initiated by respondents as a result of calling in with questions about completing the survey.

[9] The sample size of 3 percent for 2000 was insufficient to conduct an analysis at the census tract level using one year of data. The Bronx had 355 census tracts in 2000.

[10] The operational data in this analysis are for 1990 Census long-forms only. Therefore, reference to "100 percent" questions is for long-forms only (i.e., the questions that appeared at the beginning of the long-form questionnaire).

[11] We are calculating the mail return rate not as an operational unweighted type measure, but as a measure of public cooperation that indicates how much data are the result of self-response. Given that the ACS personal visits (CAPI) are only done on a 1 in 3 subsample, the data used in this analysis have been weighted to reflect this. Mail return rates from the 1990 Census were calculated taking into account differences in census tract level sampling rates, which in the Bronx were either one in six or one in eight.

[12] Given the large sample size of the ACS in the Bronx and in the 10 PUMA subareas, differences in excess of one percentage point were statistically significant unless otherwise noted. The analysis, however, focuses primarily on

patterns that are *substantively* meaningful at the subarea level.

[13] Several administrative measures of poverty were considered, including persons and households receiving public assistance only. These measures resulted in the same PUMA ranking that occurred with the more inclusive administrative data measure used in the analysis (persons receiving public assistance, SSI, plus those who were Medicaid eligible). In general, all of the measures considered for this analysis produced the same PUMA ranking, including families below poverty and persons receiving public assistance from the ACS. The percent of families below the poverty line from the 2000 ACS is compared with administrative data at the PUMA level in Table A-1. While most of the figures from administrative data are outside of the ACS confidence limits, differences were not large, given the very different nature of these data sources.

[14] For this portion of the analysis, PUMAS were combined into two groups: Those with the highest percent of recipients – 501 (44.6); 502 (45.9); 503 (43.0); 504 (40.9) and those with the lowest levels of recipients – 506 (15.9); 508 (10.9) and 509 (17.4).

[15] These allocation rates utilize initial weighting (i.e., the probability of sample selection only) and not the final weighting, which takes into account a host of other factors (e.g., coverage issues). It is important to keep in mind that item imputation occurred only for questionnaires that exceeded the acceptability thresholds established for the survey. As described earlier, those questionnaires deemed unacceptable were dropped from the survey as non-interviews and adjusted for in the weighting.

[16] The 1990 Census question on income received from public assistance included Supplemental Security Income. The 2000 ACS asked separate questions for each income source. Therefore, the allocation rate for the 2000 ACS used for comparison with the 1990 Census is a combined rate, based on both the public assistance and Supplemental Security Income questions. While not strictly comparable, the separate questions in the 2000 ACS did have similar levels of allocation and do provide a reasonable basis for comparison.

[17] A problem with the telephone edit follow-up instrument used in the 2000 ACS may have led to higher levels of allocation for some income sources.

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Table 1
Mail Return Rates for ACS Test Site Counties*
1990 Census and 2000 American Community Survey

County Name and State	Mail Return Rates**			1990 Census Occupied Housing Units
	2000 ACS	1990 Census	ACS-Census	
Harris Co. TX	47.8	67.0	-19.20	1,026,448
Broward Co. FL	55.3	70.7	-15.45	528,442
Bronx Co. NY	36.4	55.8	-19.40	424,112
Franklin Co. OH	62.1	77.5	-15.45	378,723
San Francisco Co. CA	57.0	67.9	-10.88	305,584
Pima Co. AZ	60.0	71.8	-11.82	246,011
Multnomah Co. OR	64.6	68.8	-4.25	242,140
Lake Co. IL	64.9	76.2	-11.30	173,966
Hampden Co. MA	60.0	72.2	-12.21	169,906
Douglas Co. NE	64.6	75.9	-11.34	161,113
Tulare Co. CA	48.2	62.1	-13.92	97,861
Rockland Co. NY	56.3	72.1	-15.76	84,874
Fort Bend Co. TX	55.3	69.7	-14.41	70,424
Yakima Co. WA	53.9	66.7	-12.81	65,985
Schuylkill Co. PA	69.3	84.0	-14.75	60,773
Black Hawk Co. IA	70.2	79.7	-9.44	46,932
Jefferson Co. AR	47.6	64.2	-16.59	30,001
Ohio Co. WV	68.0	76.2	-8.23	20,646
Flathead Co. MT	59.6	69.8	-10.24	19,838
Sevier Co. TN	56.1	75.0	-18.84	19,520
Madison Co. MS	49.3	58.8	-9.53	19,276
Calvert Co. MD	62.0	65.4	-3.44	16,986
Petersburg City VA	48.7	60.1	-11.36	14,730
Miami Co. IN	57.3	77.8	-20.55	13,484
Starr Co. TX	23.0	67.2	-44.25	10,331
Otero Co. NM	56.5	70.9	-14.37	10,019
Upson Co. GA	55.2	71.0	-15.85	9,911
De Soto Parish LA	46.8	69.8	-23.07	9,129
Washington Co. MO	40.4	74.1	-33.64	6,982
Fulton Co. PA	56.9	80.8	-23.83	5,139
Iron Co. MO	52.7	77.2	-24.52	3,995
Zapata Co. TX	25.6	74.8	-49.17	2,862
Reynolds Co. MO	40.8	81.0	-40.24	2,542
Overall	55.9	69.6	-13.72	

* Excludes Lake County, MT and Oneida and Vilas Counties in Wisconsin.

** The mail return rate refers to the percentage of long-forms mailed to occupied housing units that was obtained through self-response; ACS mail return rates were derived from unweighted counts of occupied housing units

Source: U.S. Census Bureau

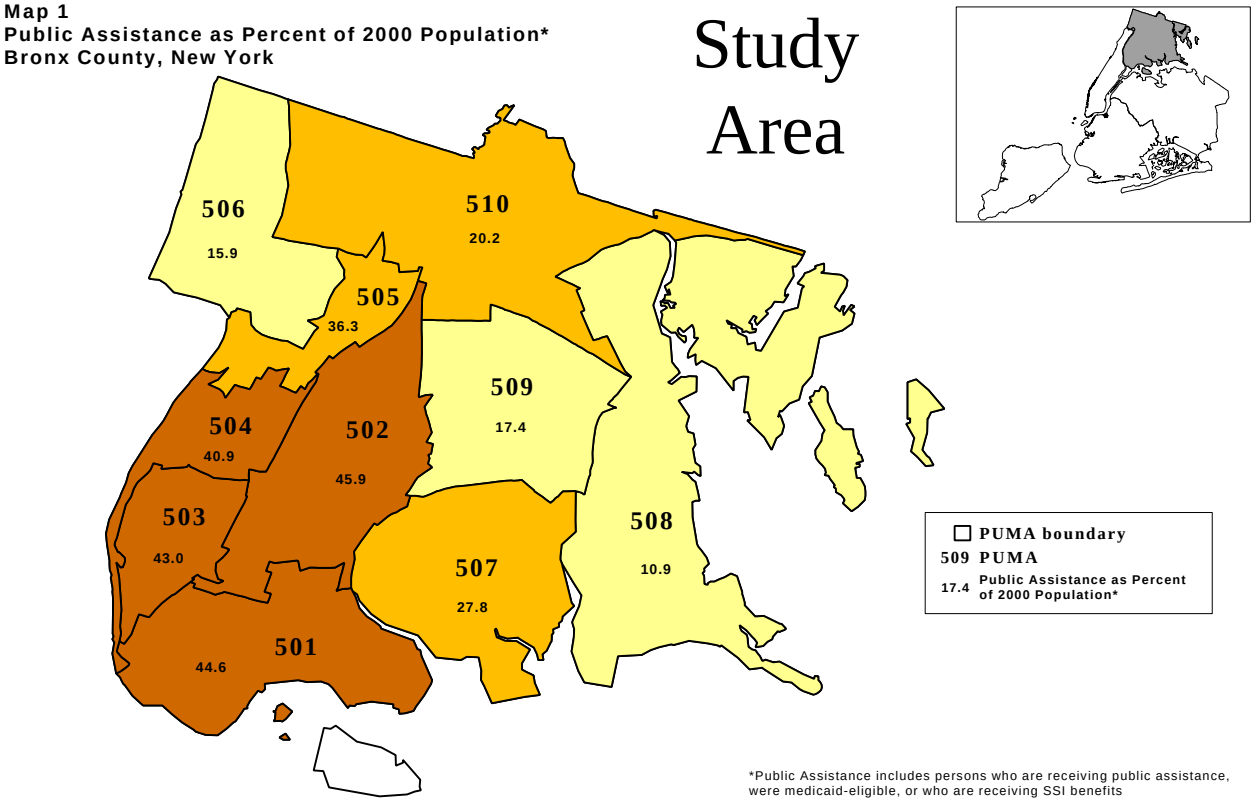

Figure 1 – Mail Return Rates

Bronx, NY PUMAS

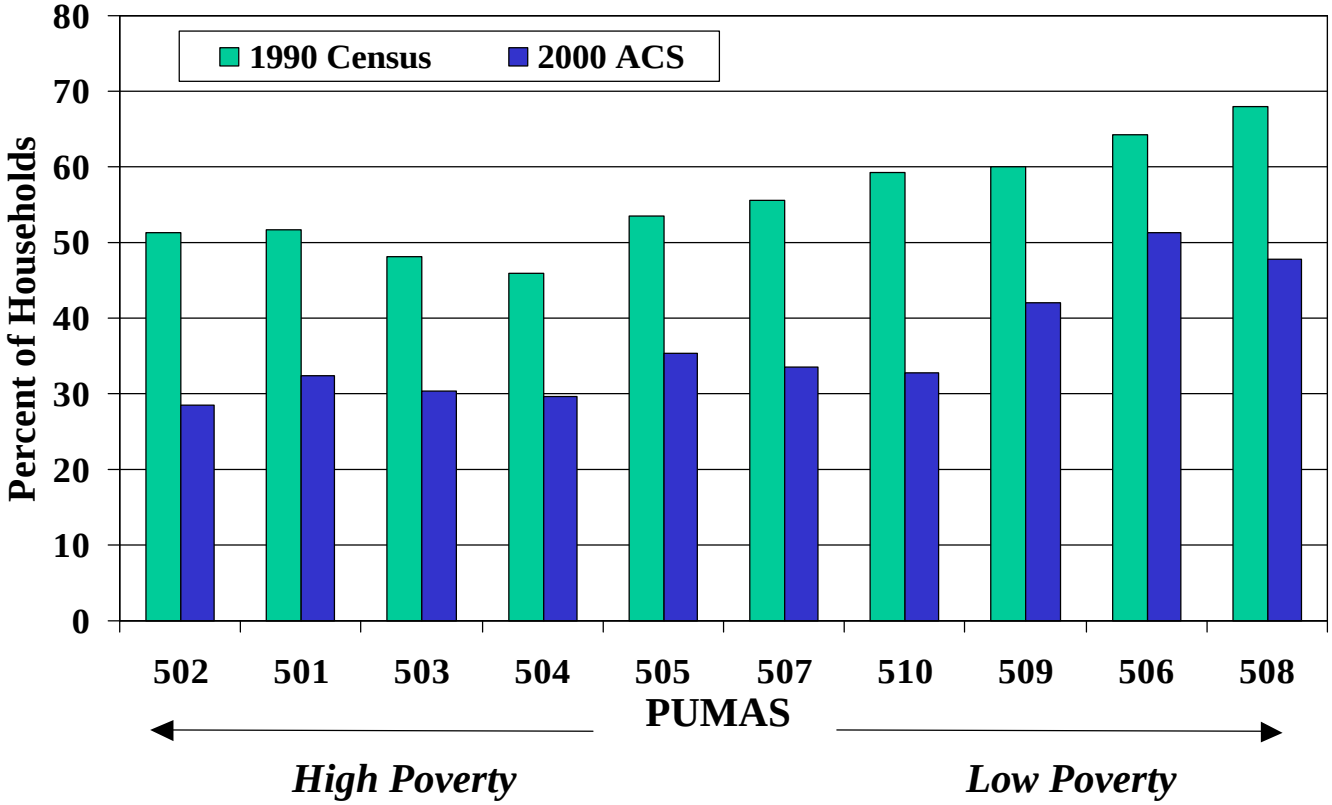

Figure 2A – Percent "Unacceptable"

By Mode of Data Collection, Bronx, NY

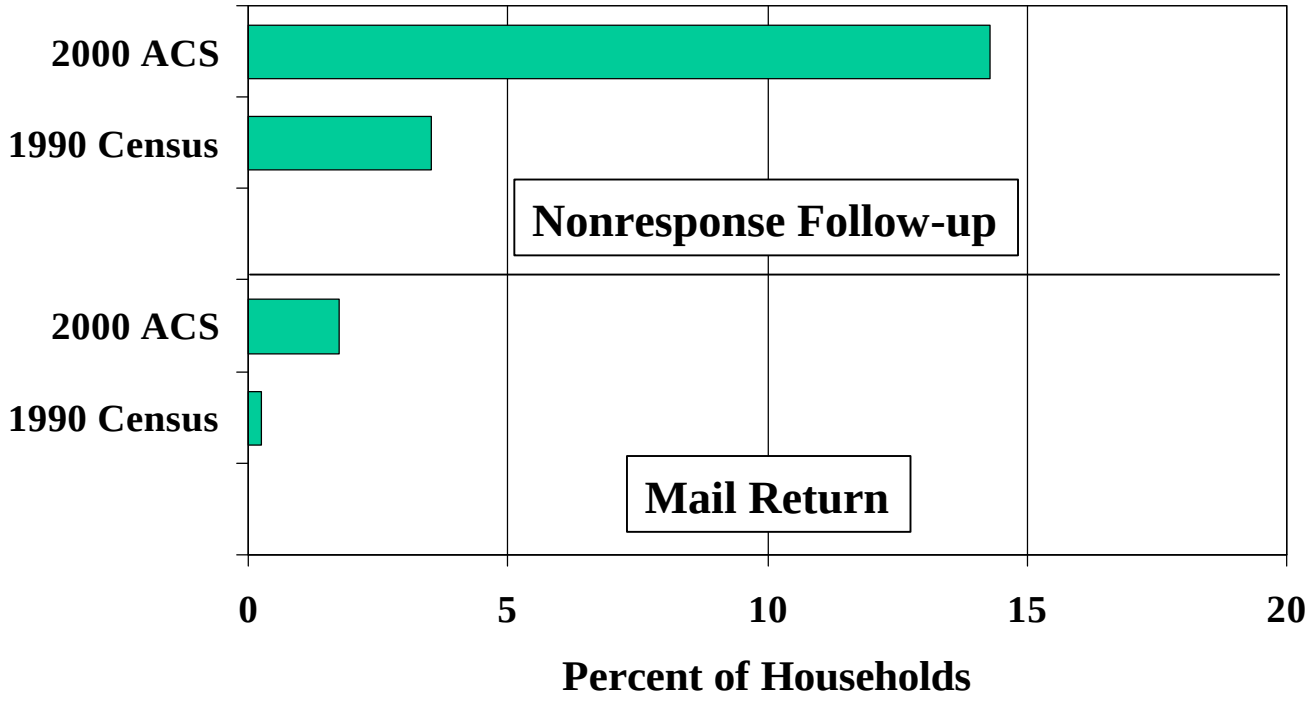

Figure 2B – Percent Not SDD

By Mode of Data Collection, Bronx, NY

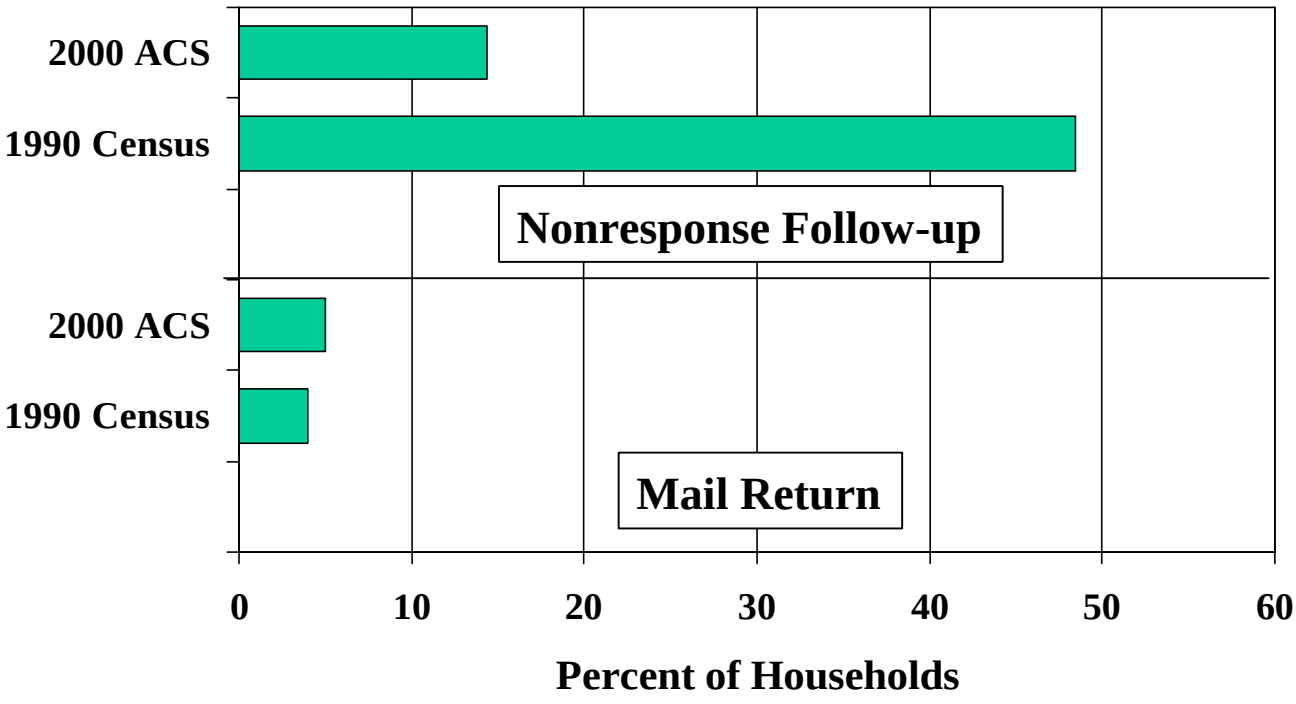

Figure 2C – Sample Data-Defined Households

By Mode of Data Collection, Bronx, NY

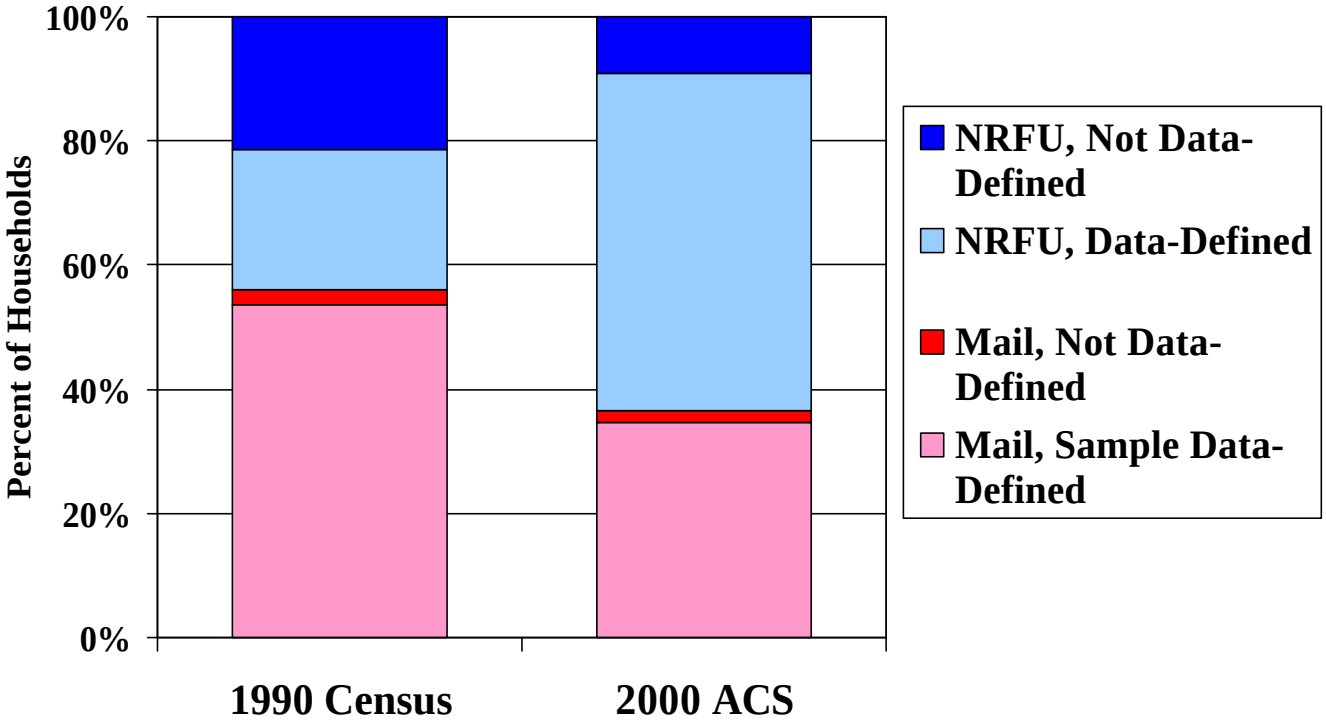

Figure 2D – Sample Data-Defined Households

By Mode and Poverty Level, Bronx, NY

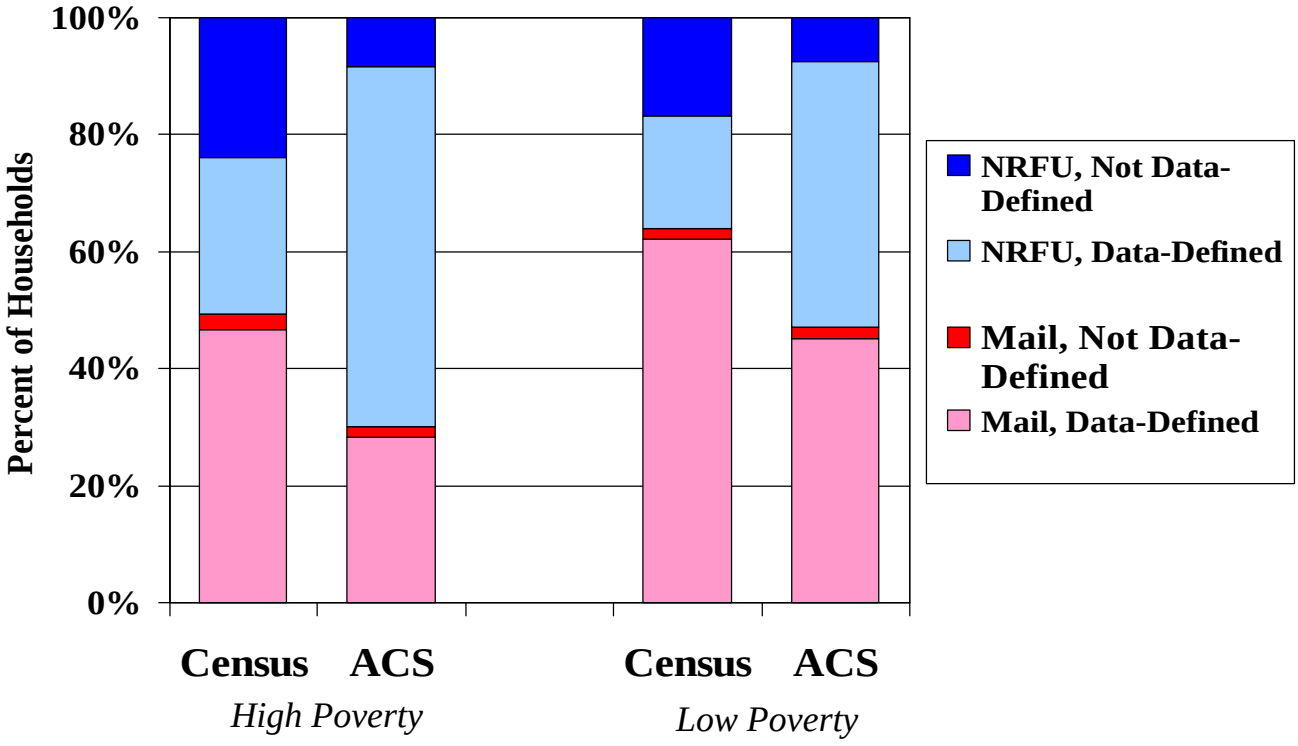

Table 2
Percent Allocated for Selected Variables by Mode of Data Collection*
Bronx, New York
1990 Census and 2000 American Community Survey (ACS)

	Total			Self-response			Enumerator Response		
	ACS	Census	ACS-Census	ACS	Census	ACS-Census	ACS	Census	ACS-Census
Occupation	14.2	21.8	-7.6	21.2	17.3	3.9	9.4	33.1	-23.6
Wages	17.9	19.2	-1.3	19.9	15.1	4.9	16.5	29.0	-12.5
Public Assistance	11.7	17.9	-6.2	22.8	13.9	8.9	4.5	27.2	-22.7
Birthplace	7.1	14.6	-7.5	11.5	10.4	1.1	4.6	23.8	-19.2
Mobility	5.7	12.8	-7.1	11.5	8.4	3.1	2.2	22.6	-20.3
English Ability	5.6	10.3	-4.7	11.4	8.1	3.3	2.5	14.8	-12.2
Units in Structure	2.3	3.7	-1.4	2.8	3.4	-0.6	1.9	4.5	-2.5
Rent	3.7	2.2	1.5	2.7	1.5	1.2	4.3	3.6	0.7

*** Data from the 1990 Census are for long-forms only.**

Source: U.S. Census Bureau
From Salvo and Lobo, "The American Community Survey: Quality of Response by Mode of Data Collection in the Bronx Test Site"

Fig. 3a - Allocation Rates on Occupation for the 1990 Census and the ACS for Bronx County PUMAS: Self-Response

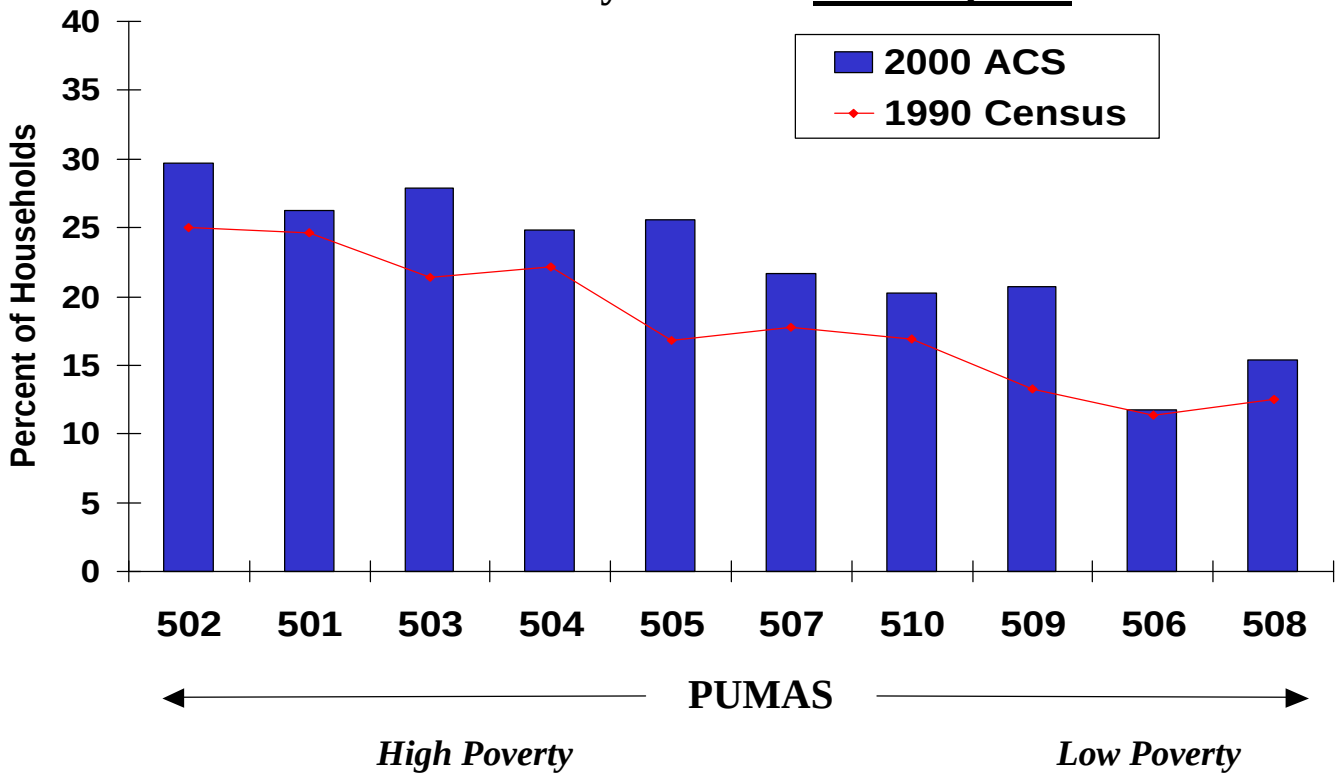

Fig. 3b - Allocation Rates on Occupation for the 1990 Census and the ACS for Bronx County PUMAS: Enumerator-Response

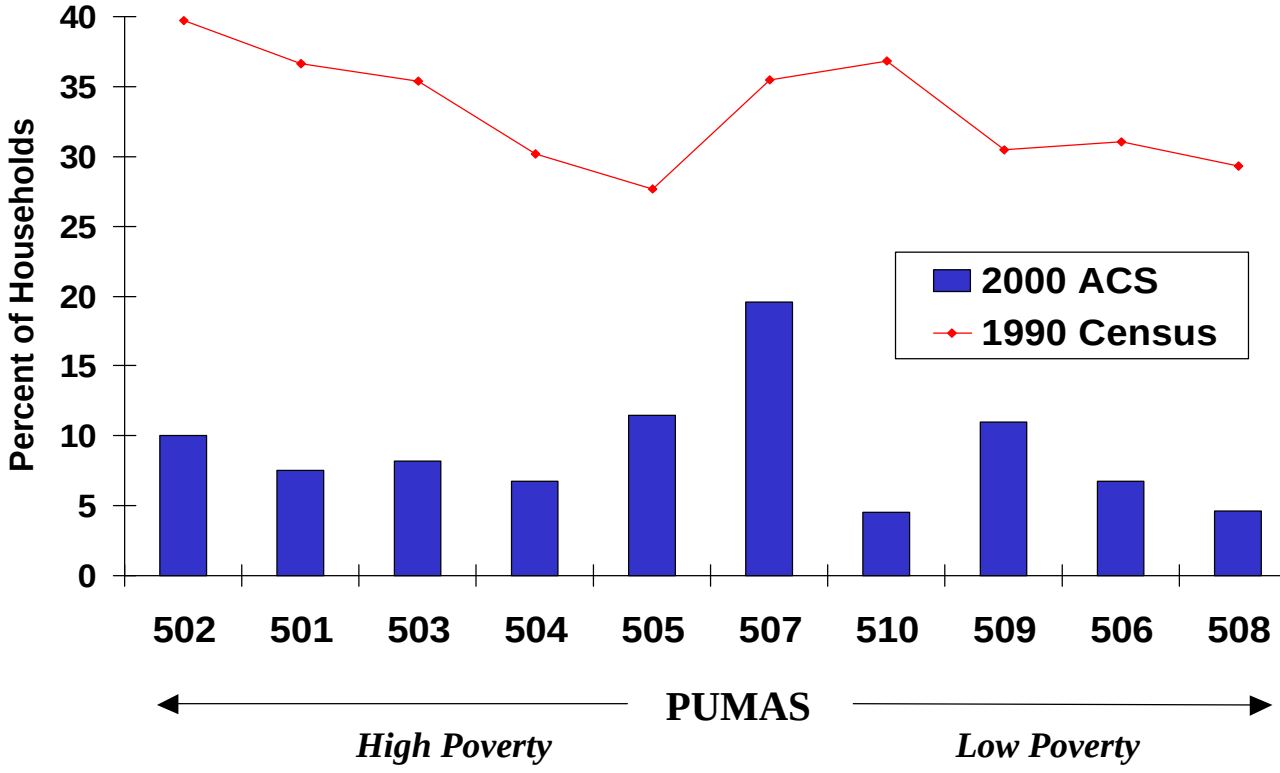

Fig. 4a - Allocation Rates on Wages for the 1990 Census and the ACS for Bronx County PUMAS: Self-Response

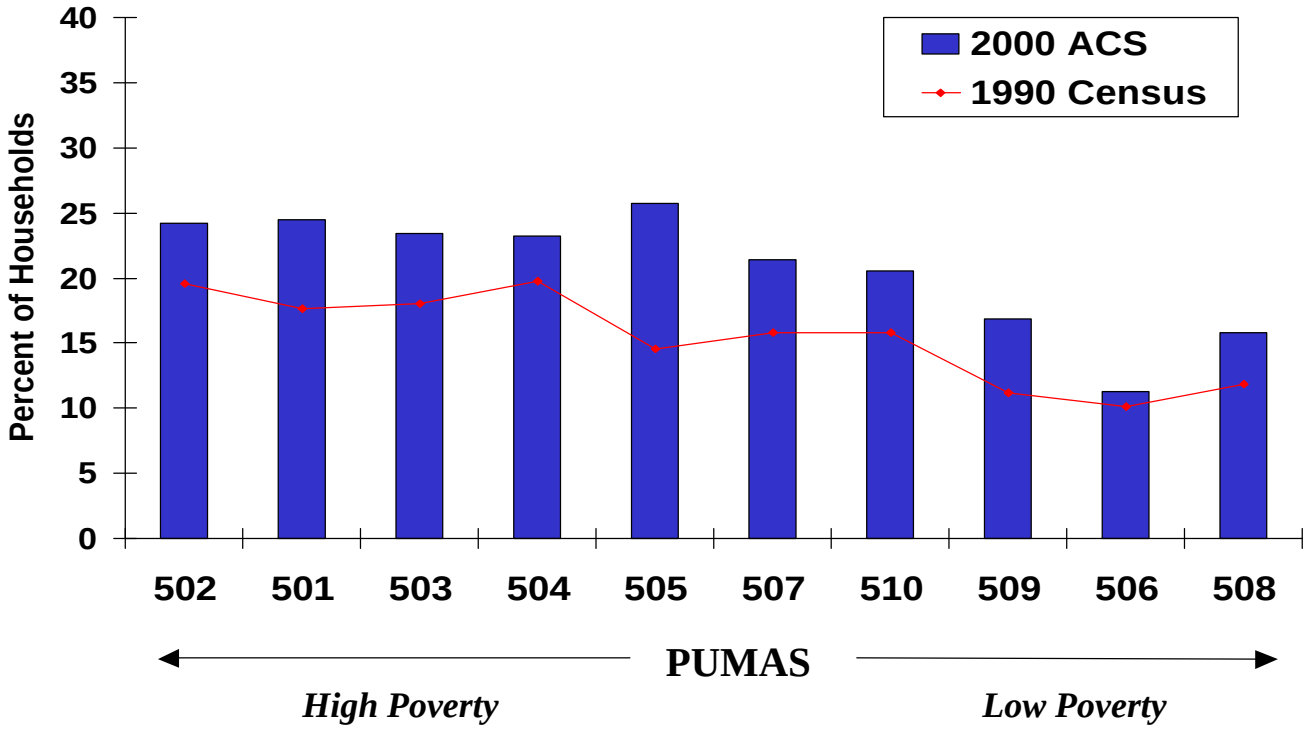

Fig. 4b - Allocation Rates on Wages for the 1990 Census and the ACS for Bronx County PUMAS: Enumerator-Response

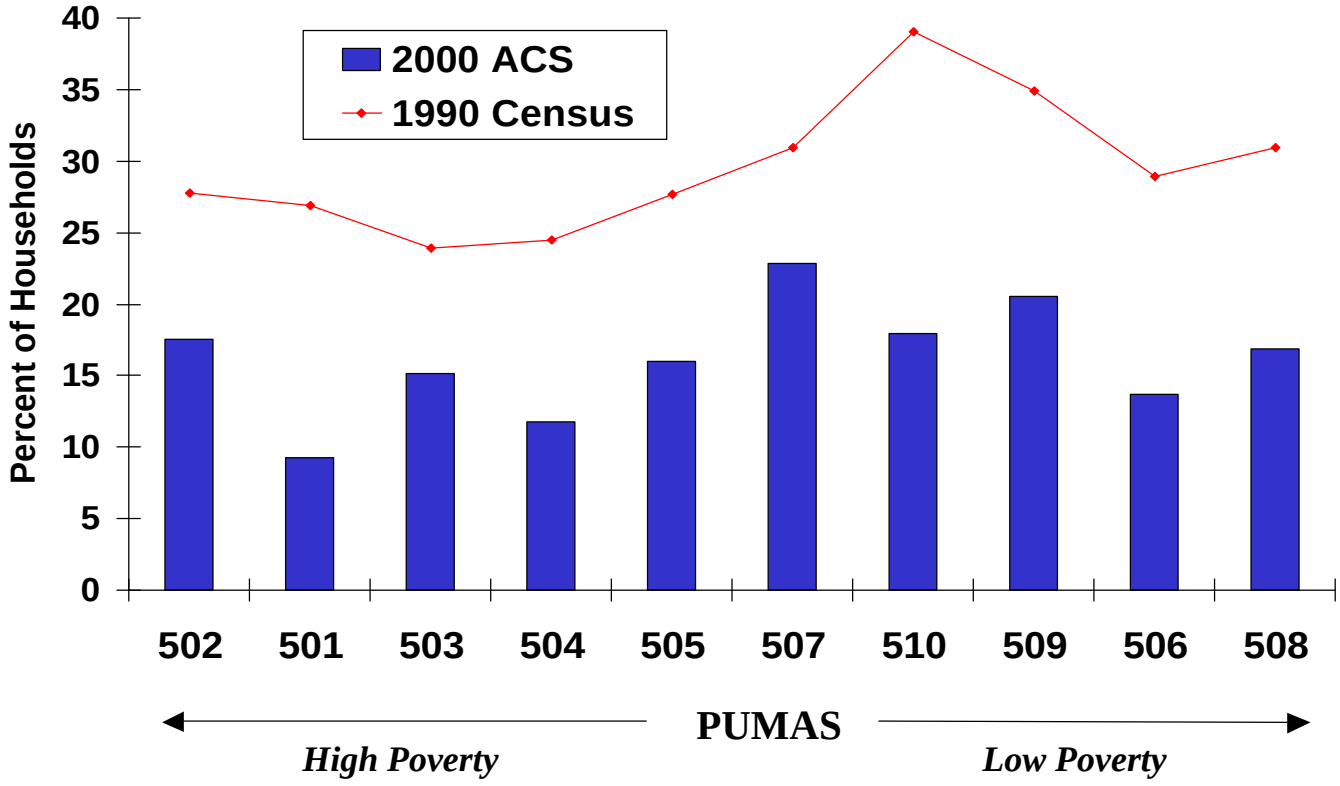

Fig. 5a - Allocation Rates on Public Assistance - the 1990 Census and the ACS for Bronx County PUMAS: Self-Response

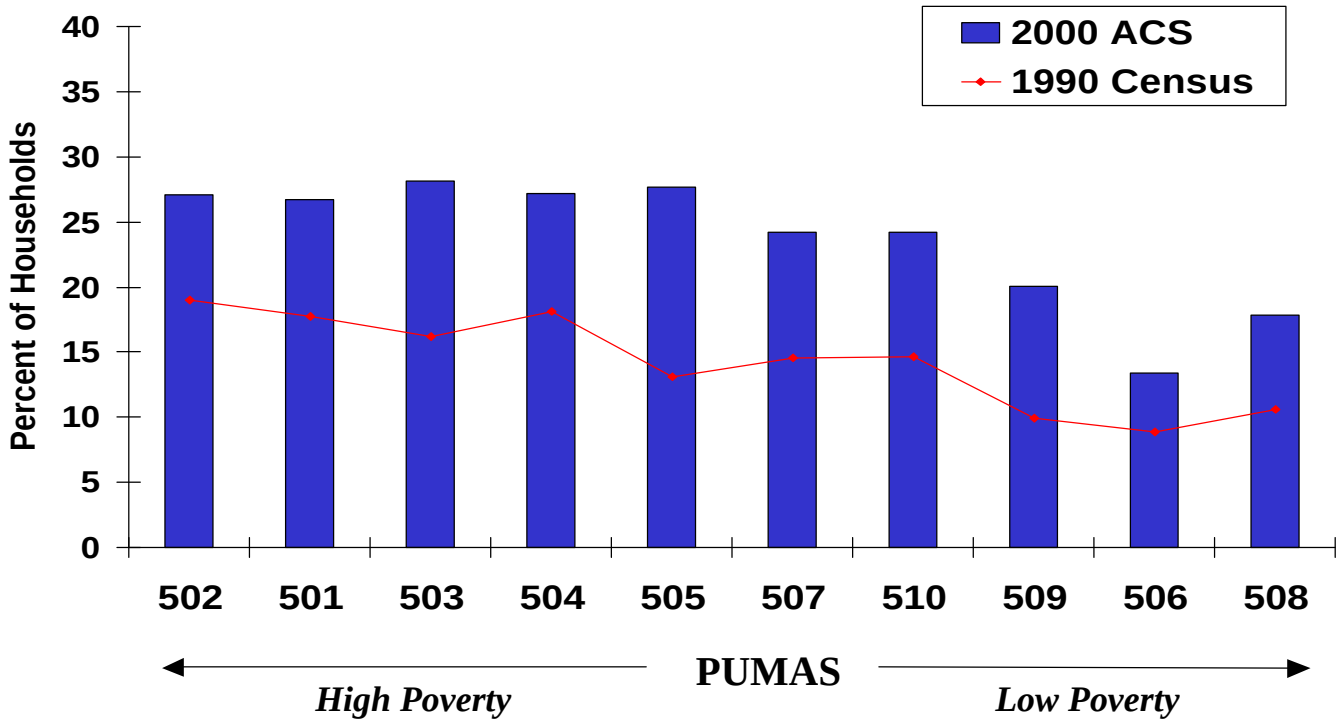

Fig. 5b - Allocation Rates on Public Assistance - the 1990 Census and the ACS for Bronx County PUMAS: Enumerator-Response

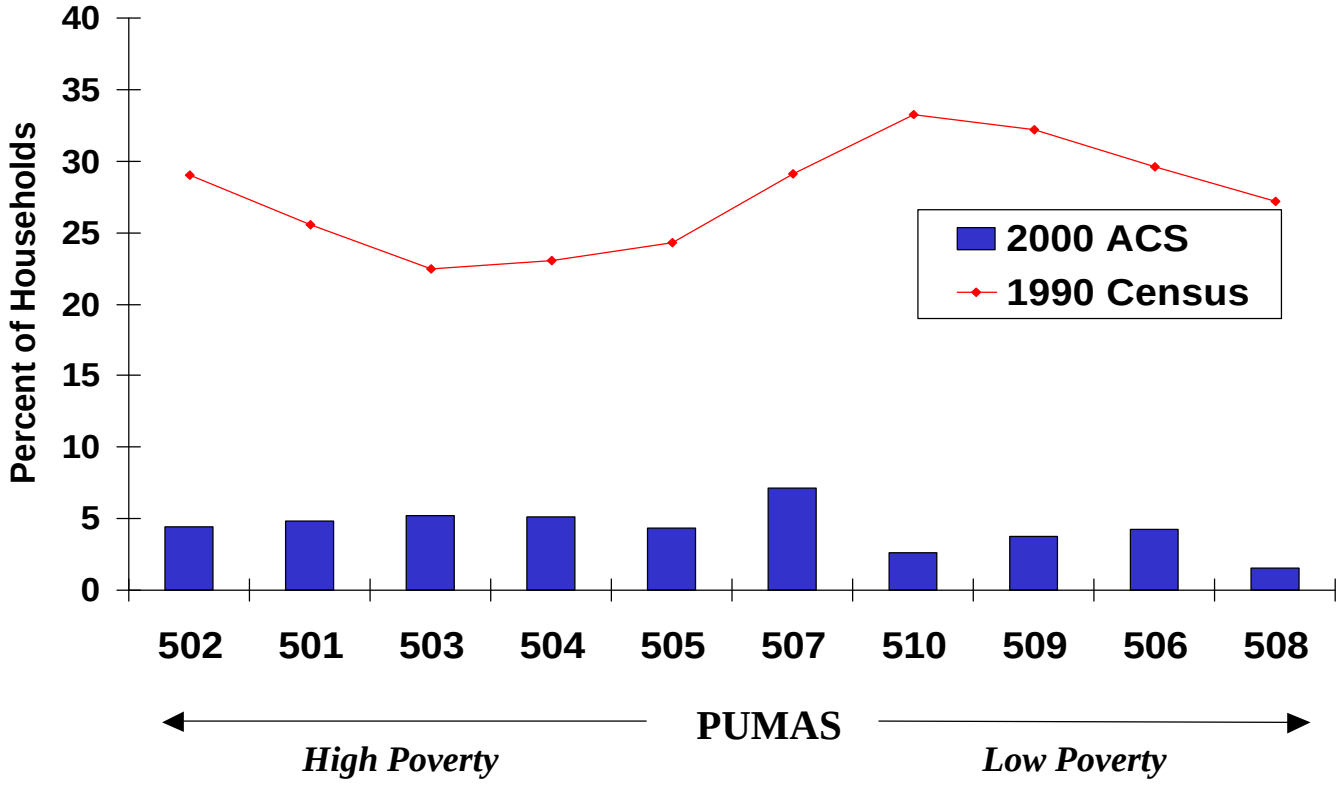

Fig. 6a - Allocation Rates on Birthplace for the 1990 Census and the ACS for Bronx County PUMAS: Self-Response

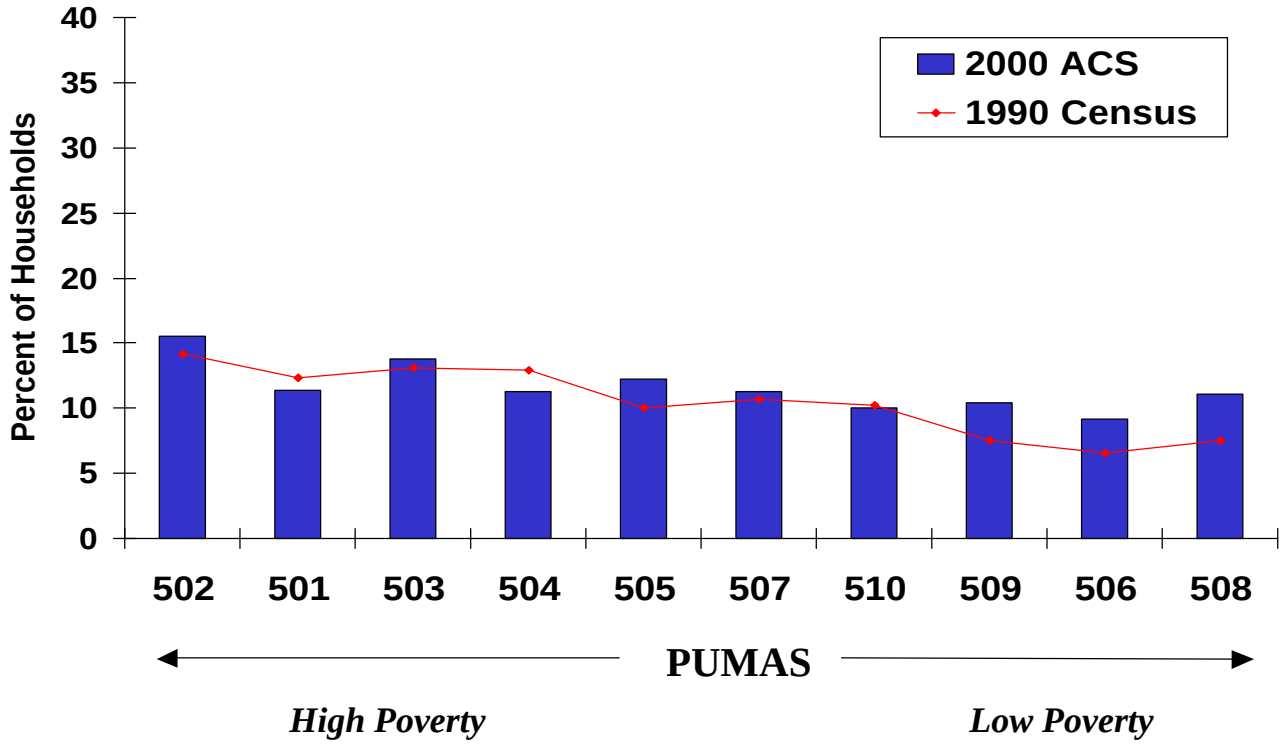

Fig. 6b - Allocation Rates on Birthplace for the 1990 Census and the ACS for Bronx County PUMAS: Enumerator-Response

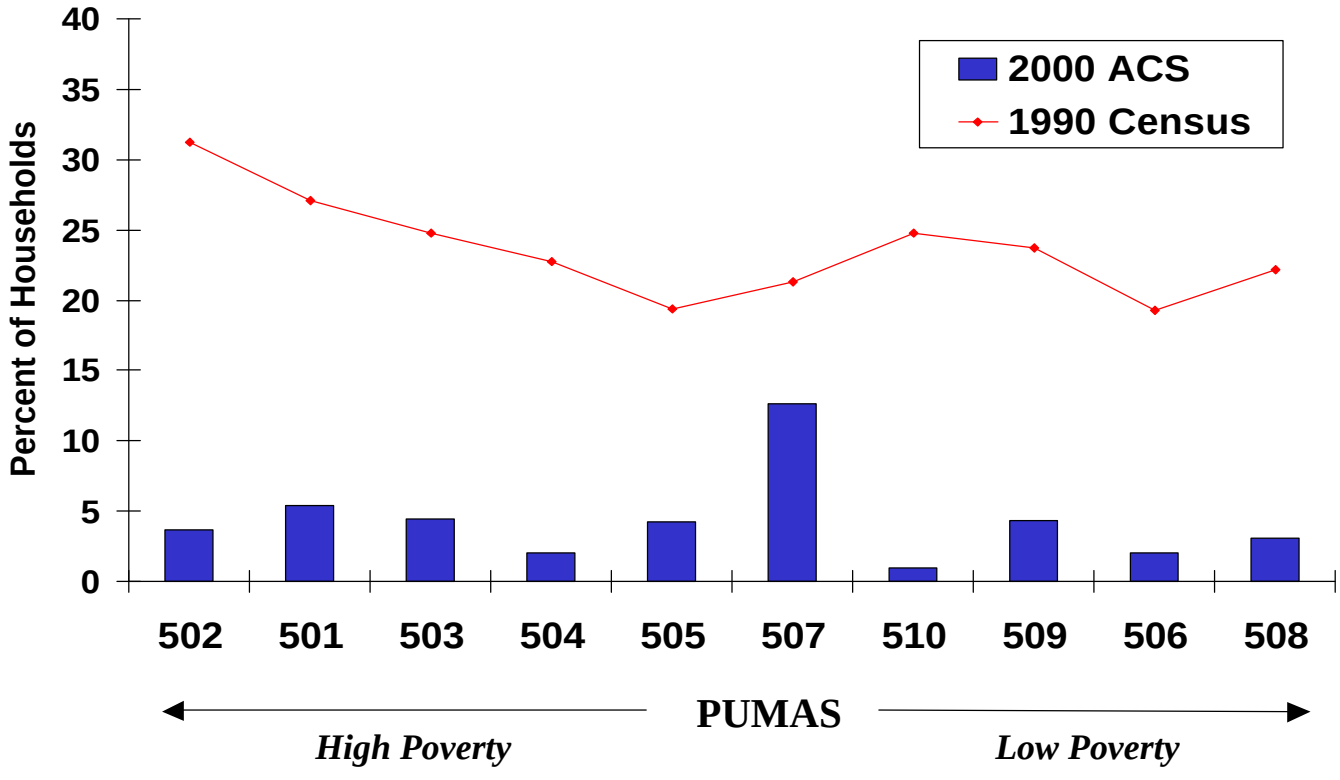

Fig. 7a - Allocation Rates on Mobility for the 1990 Census and the ACS for Bronx County PUMAS: Self-Response

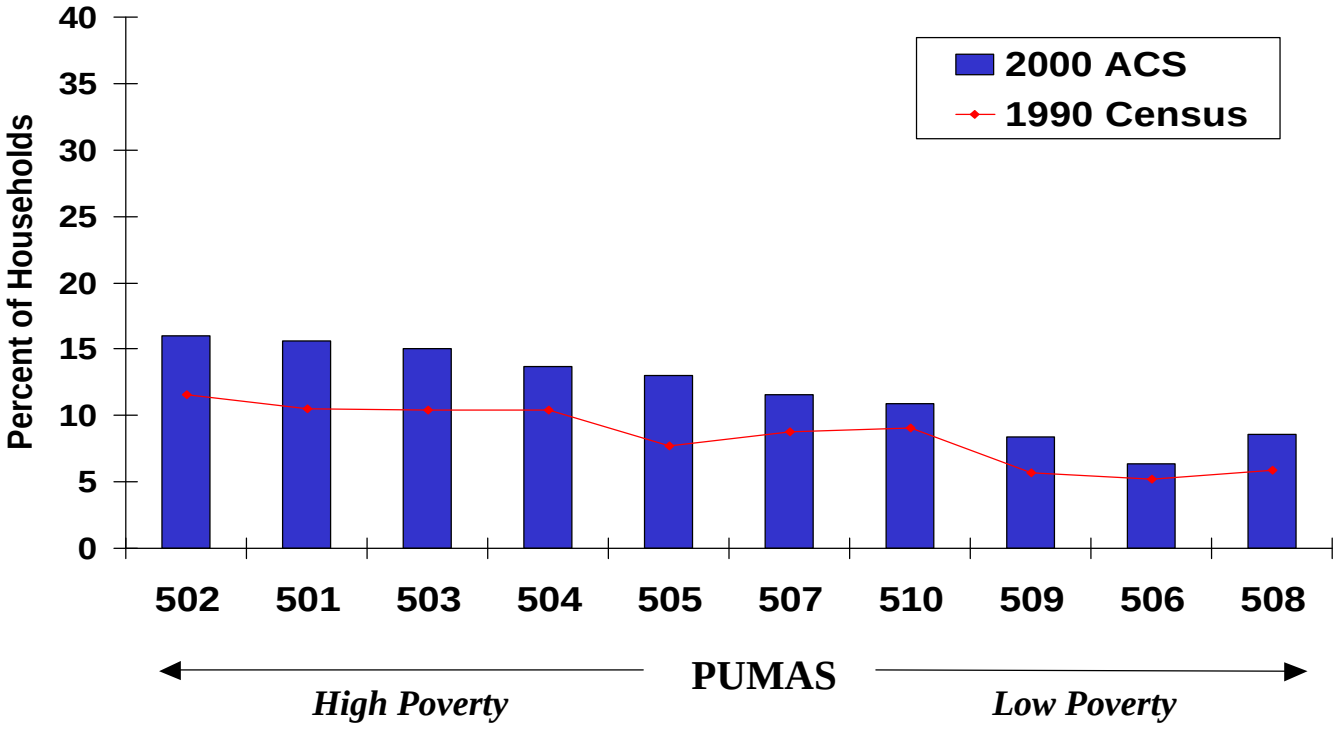

Fig. 7b - Allocation Rates on Mobility for the 1990 Census and the ACS for Bronx County PUMAS: Enumerator-Response

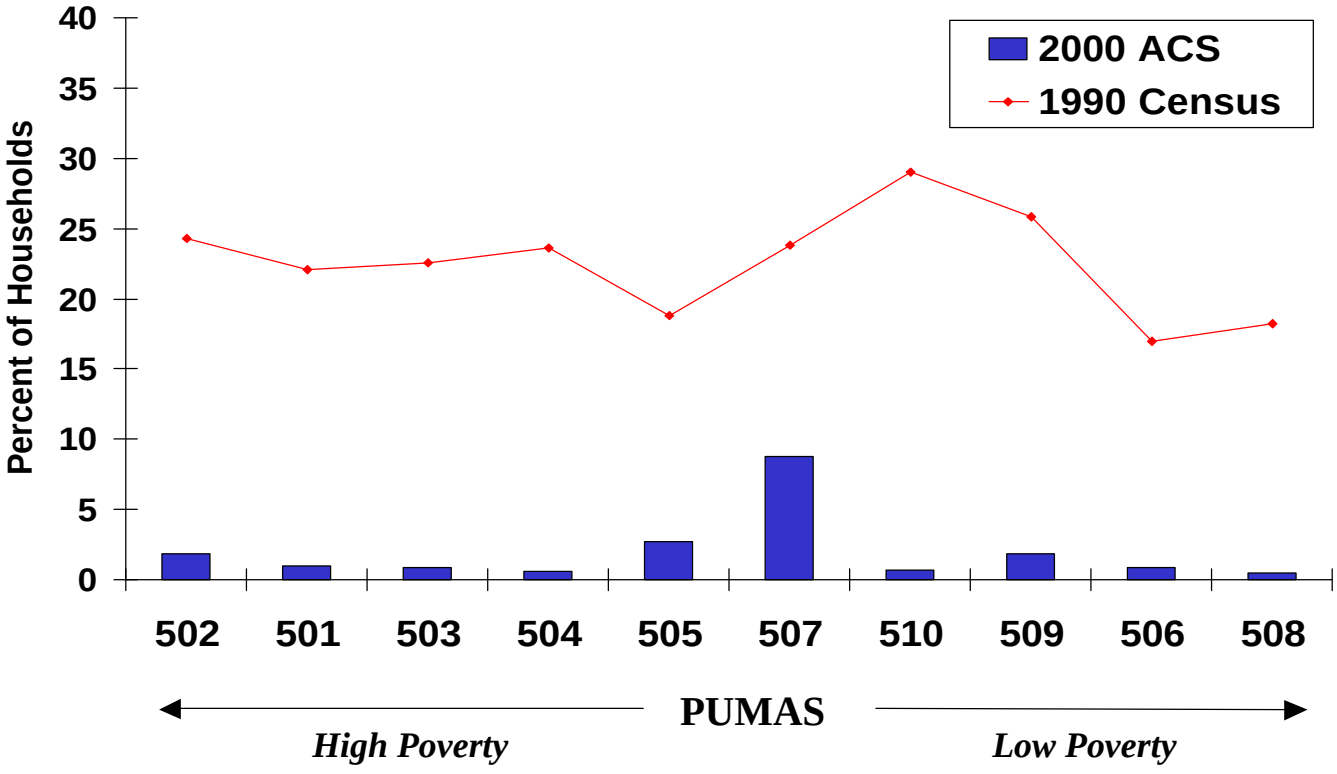

Fig. 8a - Allocation Rates on English Proficiency for the 1990 Census and the ACS for Bronx County PUMAS: Self-Response

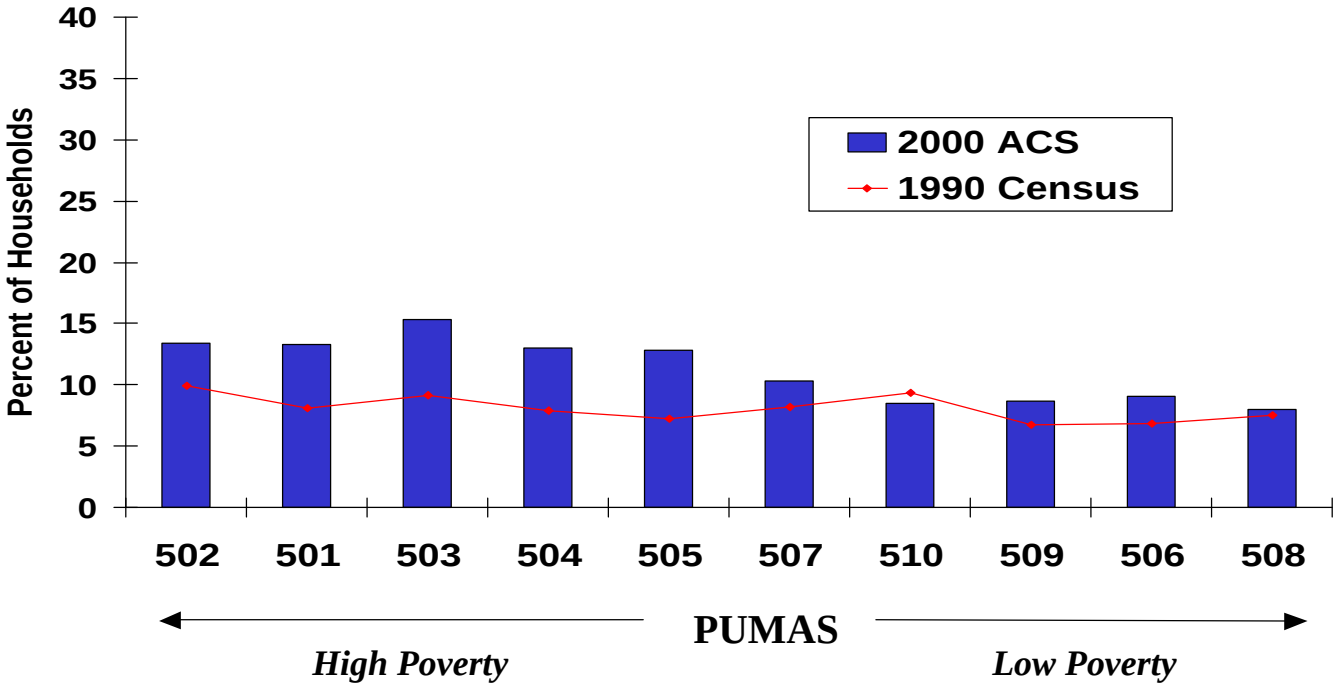

Fig. 8b - Allocation Rates on English Proficiency for the 1990 Census and the ACS for Bronx County PUMAS: Enumerator-Response

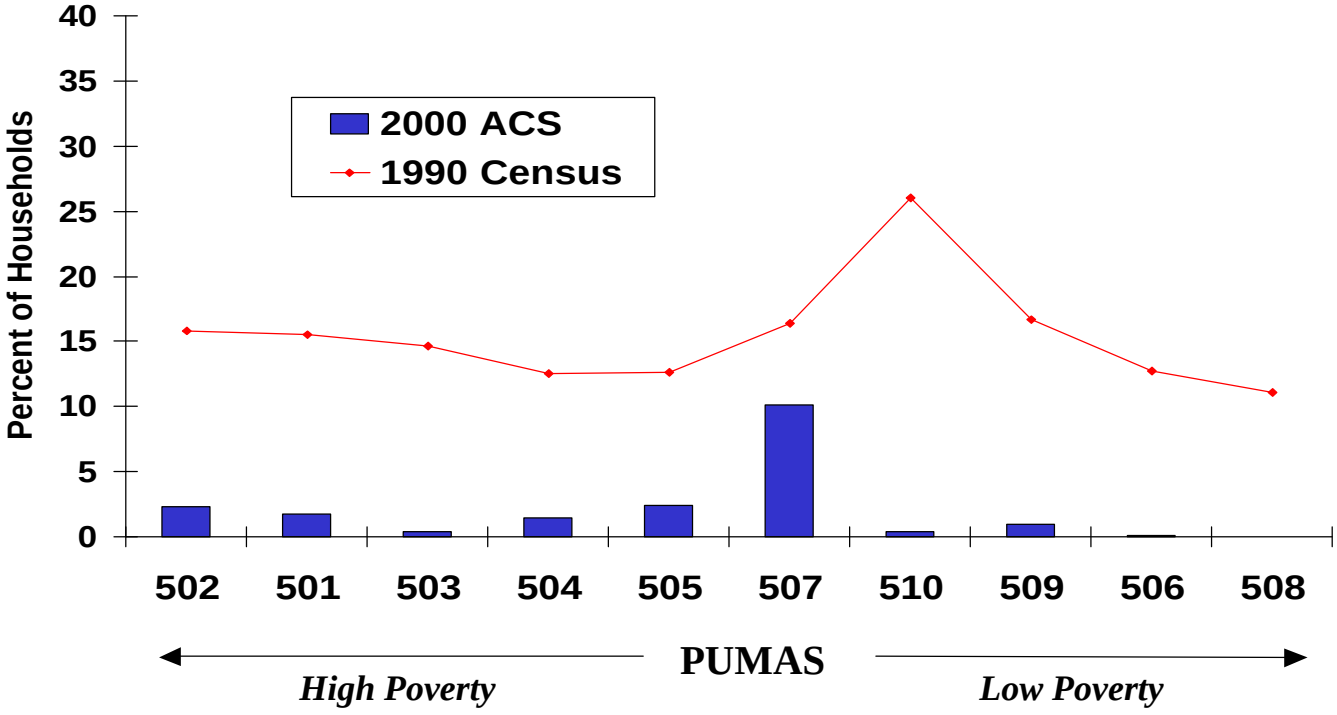

Table A-1
Selected Characteristics of Bronx PUMAS
Bronx, New York
2000 ACS and Administrative Data on Public Assistance Recipiency

	2000 ACS Data						Administrative Data
	Total Population	Percent of Population			Owner-Occupied Households	Percent of Families with Income Below Poverty Level	Percent of 2000 Population receiving PA, MA or SSI*
		Black Nonhispanic	Hispanic	Foreign Born			
Total	1,285,415	30.8	49.2	28.6	20.8	27.5	31.0
PUMA:							
501	117,625	24.4	73.1	22.0	7.3	49.3	44.6
502	125,391	35.6	59.1	20.4	9.1	38.1	45.9
503	135,890	37.4	56.3	32.9	7.5	40.3	43.0
504	120,820	30.4	65.4	34.2	5.0	43.3	40.9
505	131,476	16.6	63.7	37.2	8.5	27.3	36.3
506	93,052	13.1	34.1	32.8	28.4	11.6	15.9
507	173,880	29.8	57.4	22.9	21.2	25.5	27.8
508	122,170	25.7	26.4	14.5	45.0	10.3	10.9
509	114,967	20.0	35.7	32.1	31.2	12.9	17.4
510	150,144	63.5	19.3	37.9	37.1	16.6	20.2

* Persons receiving public assistance (PA), were medicaid-eligible (MA) or were receiving supplemental security income (SSI).

Sources:
2000 American Community Survey
New York City Human Resources Administration
New York City Department of City Planning