Issues Related to Adding Sub-Annual Estimates to the Data Products Available from the American Community Survey

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The American Community Survey (ACS) is a rolling monthly survey, which collects population and housing unit data historically collected by the Decennial Census Long Form. The ACS went into full implementation in 2005 with roughly 250,000 housing unit addresses are contacted each month. Annual data products are released yearly for areas greater than or equal to 65,000 persons. Three-year estimates products are released for areas greater than or equal to 20,000 persons and five-year products for all areas.

These three sets of period estimates approximate the average characteristic over twelve, thirty-six or sixty months, respectively. The shortest time period the ACS was designed to produce estimates is the calendar year. However, data users that study characteristics with potentially large seasonal fluctuations have identified a need for and have requested sub-annul estimates, i.e., monthly or quarterly estimates. For example, requests have come from service providers who need to estimate utility usage on and off peak season. The ACS has a policy of not publishing estimates for periods shorter than a calendar year due to concerns with interpretation and data quality.

Research has been developed and implemented to determine if there are estimates that are a reasonable approximation of what is happening in the population for shorter time periods using the current ACS design and estimation methodology. This talk will describe some results of this research, point out factors that may contribute to what we see in the results, and our plans for future research.

Keywords: American Community Survey, Estimate reliability, Data Products

I. Introduction

This study examines whether reasonable and consistent sub-annual estimates can be produced from the American Community Survey (ACS) without changes to the existing weighting methodology and, by extension, whether it would be advisable to include variables for month or quarter of interview on the ACS Public Use Microdata Sample (PUMS) files.

The ACS was fully implemented for housing units in 2005 and for the total population, including the group quarters (GQ) population, in 2006. The ACS is a continuous monthly survey with an annual sample of roughly 3 million addresses, approximately 250,000 addresses per month, resulting in about 2 million annual interviews. Twelve months of sample interviews are then cumulated to produce an annual 1-year period estimate. Similarly, 36 and 60 months of sample interviews are cumulated to produce 3- and 5-year period estimates, respectively. The first 3-year period estimates, for 2005 through 2007, were released in 2008. The first 5-year period estimates, for 2005 through 2009, will be released in late 2010.

A number of users have approached the Census Bureau to request sub-annual estimates through the ACS Custom Tabulation Program. Others have requested information on month or quarter of interview be added to the ACS PUMS. With a few exceptions, the Census Bureau has declined requests pending the results from research designed to understand the consistency and properties of sub-annual estimates using ACS data.

There are some concerns about the potential impact of certain aspects of the current ACS design on estimates of sub-annual periods. One is the ACS multi-mode data collection operation. The sample selected for a given month can be interviewed at any time over three consecutive months by one of three possible collection modes (mail, telephone, or personal visit). This introduces subtle differences in the number of respondents and the distribution of their characteristics between months. Another is the current ACS weighting methodology. The weighting/estimation process produces weighted estimates for twelve-month periods, i.e., one or more calendar year. The process is not designed to produce weighted estimates for shorter periods, i.e., monthly, quarterly, or biannual. These design components will be discussed further in this document.

The focus of this research is on two questions:

A. How do monthly ACS estimates for race, sex, and Hispanic origin compare to monthly estimates from the Census Bureau's Population Estimates Program (PEP)?

B. Do ACS sub-annual estimates behave in a demographically logical and consistent way over time using the current weighting methodology?

The content of this document is a follows:

II. Impact of Data Collection and Weighting Methodology

A general review of how the ACS develops its annual estimates will help the reader better understand the results of this research seen later. Two key operations impact the tabulation of sub-annual estimates - data collection and weighting.

A. Data Collection

After sampling, all ACS sample addresses are systematically assigned to one of twelve sample months to spread data collection over the calendar year. Assignment is based on geography alone with no auxiliary data about the characteristics of the individual addresses and their inhabitants. Data collection for a particular sample month can spread over three months with mail out/mail back responses collected in the first month, Computer Assisted Telephone Interviewing (CATI) used in the second, and Computer Assisted Personal Interviewing (CAPI) in the third. Specifically:

Month 1: Addresses in sample that are determined to be mailable are sent a questionnaire via the U.S. Postal Service.
Month 2: All mail non-responding addresses with an available phone number are sent to CATI.
Month 3: A sample of mail non-responses without a phone number, CATI non-responses, and unmailable addresses are selected and sent to CAPI.

For example, data collection for addresses assigned to sample month March 2006 begins in March with a mailed form and ends in May with CAPI follow-up. (See the Mar – 06 column in Figure A.)

Figure A. ACS Data Collection Structure

	Sample Month					
		Jan - 06	Feb - 06	Mar - 06	Apr - 06	May - 06
Interview Month	Jan - 06	Mail				
	Feb – 06	CATI	Mail			
	Mar – 06	CAPI	CATI	Mail		
	Apr – 06		CAPI	CATI	Mail	
	May - 06			CAPI	CATI	Mail

This lag between the initial mailing and CAPI follow-up attempts to maximize the benefits of the slow but cheap mode of data collection (mail out/mail back) and minimize the most costly mode of data collection (CAPI).

As a result, the sample month assigned to an address may not coincide with the interview month, when the address' response is actually collected. For example, the interview month March 2006 contains the CAPI responses of addresses originally

assigned to the January 2006 sample month, the CATI response of those assigned to the sample month February 2006, and the mail responses from the current sample month March 2006. (See the Mar – 06 row in Figure A.)

Carrying over non-responding addresses from one month to another for resolution can be viewed as a "replacement procedure". A replacement procedure is described roughly as a mixing of non-response addresses from an earlier survey (having a similar sample design) with new addresses being introduced for the first time in a new survey.[1] Any interviews obtained from these previously non-responding addresses become the replacements for new non-responding addresses in the new survey.

In the ACS, it is regularly found that about half of the addresses introduced in each sample month will not be resolved by mail in the current month and will be carried over to the next two month's data collection to be resolved. Carried over addresses from the two previous sample months act as replacements for the half left unresolved in the current sample month.

However, the replacements are not a perfect match because of differences in the mean responses between one monthly sample and another. The aim of replacement in the ACS is to reduce the effect of non-response in data collection; not eliminate it.

However with replacement, some months have more responses than expected and others have less. For each month to contribute equally to the annual weighted total, an adjustment is carried out on the monthly weighted total of responding mail, CATI, and CAPI cases equal to the initial weighted total of addresses originally assigned to the month for mailing. (See details below.) The adjustment is done independently for each month and every case responding in a particular month receives the same factor.

Unfortunately the adjustment described above does not adjust for the subtle differences in the characteristics of respondents by mode within the month. For example, Remote Alaska addresses are assigned to one of two data collection periods January – April or September – December and all data collection is done by CAPI. It would be expected that some characteristics of respondents from this area would be different from the characteristics of respondents collected in other areas by other modes for these months. ACS overcomes these variations between months and modes by pooling the data collected over the twelve months. This pooling reunites the mail, CATI, and CAPI components for most of the sample months in a year.

B. Weighting Methodology

The ACS uses a raking ratio estimation procedure that results in the assignment of two sets of weights: one set for each responding sample person and another set for to each responding sample housing unit. Estimates of person characteristics are based on the person's final weight. Estimates of family, household, and housing unit characteristics are based on the housing unit's final weight. For any given area, a characteristic total is estimated by summing the weights assigned to the persons, households, families or housing units possessing the characteristic in the area. Each sample person or housing unit record is assigned one final weight and eighty replicate weights to be used to produce estimates of all characteristics and their associated margins of error. For example, if the final weight given to a sample person or housing unit has a value 40, all characteristics of that person or housing unit are tabulated with the weight of 40.

The weighting is conducted annually in two main operations: a group quarters (GQ) person weighting operation and a housing unit and household person weighting operation which assigns weights both to housing units and to persons within housing units. The GQ person weighting operation is conducted first. The household person weighting is dependent on the group quarters person weighting because estimates for total population, which include both GQ and household populations, are controlled to the Census Bureau's official total resident population estimates.

1. **GQ Population Weighting**. The operation used to assign the weights is performed independently within state and the seven major group types.[2] There are three components of each weight.

[1] Kish, L. [1965], *Survey Sampling,* 2nd Ed., New York: John Wiley and Sons

[2] The major type groups are Correctional Institutions, Juvenile Detention Facilities, Nursing Homes, Other Long-Term Care Facilities, College Dorms, Military Facilities, and Other Non-Institutional Facilities.

a. Initial weight. It is the inverse of the product of the initial sampling rate and the second phase of sampling that may occur at the time of data collection.

b. Non-response adjustment. It is done to account for non-responding GQ persons including those in whole non-responding GQs.

c. Post-stratification adjustment for GQ population. It is done so the weighted sample total matches the independent population estimates of major type group by the Population Estimate Program (PEP) at the state level. Because of collapsing of groups when doing this adjustment, only GQ total population is assured of agreeing with the official PEP total.

2. **The Housing Unit and Household Person Weighting**. The process uses weighting areas built from groups of whole counties. Census 2000 data are used to group counties of similar demographic and social characteristics. The characteristics considered in the formation include percent in poverty, percent renting, percent in rural areas, and race, ethnicity, age, and sex distributions. Each weighting area is also required to meet a threshold of 400 expected person interviews in the ACS for that calendar year.

a. Initial weight. The housing unit estimation procedure begins with the basic sampling weight for each selected housing unit address based on its inverse of the probability of selection. The sampling weight is the product of the base weight, the inverse of the block sampling rate used to select the address, and an adjustment to reflect the results of CAPI sub-sampling.

b. Variation by mode adjustment. As mentioned earlier, the replacement procedure used in data collection can cause the weighted estimate of housing units to differ each month. The adjustment to reduce the variation in monthly response by mode makes the monthly weighted total of Mail, CATI, and CAPI (including non-respondent) cases equal to the initial weighted total of all addresses originally assigned to that month. For all cases, the adjustment factor is computed for each weighting area within a given interview month and the weight of every housing unit is adjusted with the appropriate factor.

c. Non-response adjustment. Despite all the attempts made, some occupied housing units do not respond. A series of ratio adjustments is done to compensate for non-response and it has three components. The result is the weighted total of responding occupied housing units will equal the sum of the weighted total of responding and non-responding occupied housing units. Following these adjustments, all non-responding housing units are given a weight of zero and dropped from further processing. Vacant units, although considered responding, are excluded from the non-response adjustment process.

- The first component is a ratio adjustment that assigns a factor to each responding occupied housing unit based on its weighting area, building type, and tract summed across the twelve interview months.

- A second component is a ratio adjustment that assigns a factor to each responding occupied housing unit based on its weighting area and building type independently by interview month.

- One thing not accounted for by the two previous components is the systematic differences that exist between the characteristics of households that return mail forms and those that do not, i.e., a possible mode-related non-response bias. The adjustment focuses on the non-response detected in the CAPI mode. The factor is assigned to occupied CAPI housing units based on its weighting area, tenure (owner or renter), and marital status of the householder (married/widowed or single) independently by interview month.

It should be noted that the variation by mode adjustment and two out of the three adjustments for non-response are done independently by interview month. However, this will end with the next adjustment. From this point on, the weighting adjustment is based on the sum of weighted monthly totals.

d. Post-stratification for Housing Units. Another form of bias not addressed up until now is under or over coverage. Issues with coverage occur when some housing unit addresses have no chance of being in sample while others have

multiple chances. Post-stratification adjustments are designed to reduce this bias by forcing consistency between ACS weighted estimates of the housing unit population and independent PEP estimates from the Census Bureau. It is also done to reduce the variability of the housing unit and person estimates.

These independent estimates are for a specific point in time. The ACS uses a reference date of July 1st of the calendar year. This means that the twelve weighted monthly totals are added together and controlled to the official housing unit estimate as of the mid point of the calendar year.

Once this adjustment is made, the weight for each housing unit is assigned to every person residing in the unit becoming the person's initial weight, and the household person level weighting begins. From this point on person weights are individually adjusted based on each person's characteristics.

e. Post-stratification for Persons. Beginning in 2006, the person weighting is done in a series of three steps, which are repeated until a stopping criterion is met. These three steps form a raking ratio or raking process.
   - The first step is the spouse equalization adjustment, which is applied to individuals based on their status of being in a married-couple or unmarried-partner household. The goal of this step is to produce more consistent estimates of spouses or unmarried partners and married-couple and unmarried-partner households.

   - The second is the householder equalization adjustment applied to individuals based on their householder/non-householder status. The goal of this step is to produce more consistent estimates of householders, occupied housing units, and households.

   - The demographic adjustment is the third step and is applied to individuals based on their age, race, sex and Hispanic origin. It adjusts the person weights so that the weighted annual sample total equals the July 1st independent PEP estimates by age, race, sex, and Hispanic origin at the weighting area level. Because of collapsing of small cells in doing this adjustment, only total population is assured of agreeing with the official July 1st intercensal population estimates at the weighting area level.

   These three steps are repeated several times until the estimates at the national level achieve their optimal consistency with regard to the spouse and householder equalization. The unrounded person weight is equal to the product of these three adjustment factors from all iterations times the initial weight.

f. Last Steps in the Weighting. At the end of the process, the household weight is adjusted to equal the person weight of the householder. The weight of a vacant unit remains unchanged since there is no householder for this type of unit. And finally the housing unit weights and person weights are rounded to an integer.

III. Research Methodology

The evaluation began with creating ACS monthly estimates for 2005, 2006 and 2007 calendar years. The data used in this analysis were obtained from the final weighted and edited datasets for each of the years. Monthly estimates were created using the month of interview (IMO) variable, i.e. the month a response was obtained by any of the data collection modes. The ACS weights used to calculate the monthly estimates are those derived in the current ACS weighting methodology described in Section II. We multiplied the final weight and the eighty replicate weights (used for calculating margin of error) by twelve to make the monthly weighted estimates representative of the full population. Standard errors and margins of errors were produced using the adjusted replicate weights to determine the statistical significance of the differences. Differences were tested at 90 percent confidence level.

A similar process was used for creating ACS quarterly estimates. Three months of ACS data were pooled to form quarterly estimates. Cases with IMO of January, February and March were tabulated together to form first quarter estimates, April through June cases making up the second quarter, and so forth. Again, the weights used were derived using the current weighting methodology, but this time multiplied by four to make the weighted quarterly estimates representative of the full population.

The study looked at both population totals and distribution (or percent) estimates at the national level. If national estimates proved well behaved then additional analysis would be undertaken for states and other sub-national geographies. It was planned to look at the state or lower levels of geography as well. The assumption was national estimates would be the better behaved and show the most promise; smaller geographies would show more variability.

Analysis of a particular variable was first done for the total population. This was followed by analysis of the same variable by Hispanic origin status, and the six non-Hispanic race groups (White, Black, American Indian and Alaska Native, Asian, Native Hawaiian and Other Pacific Islander, and some other race). The Hispanic variable (HIS) and the final race group variable (RCGP) were used to determine Hispanic origin status and race status respectively. For household estimates, the characteristics of the householder were used. Gender and age were also used in some of the analysis of person level estimates.

Four statistics were selected for the initial evaluation.

- Monthly ACS estimates of total population by age, sex, and race compared to monthly estimates from the Census Bureau's PEP.
- Quarterly estimates of percent of families with own children under 18 years of age.
- Quarterly estimates of percent of owner-occupied housing units.
- Monthly poverty rate estimates.

The assumption was that estimates correlated with one of these variables would likely behave in a similar manner.

The first phase of the analysis compares monthly ACS total population estimates with their corresponding PEP estimates. Comparisons were also done by sex and Hispanic/non-Hispanic categories and sex by non-Hispanic race categories. The ACS current weighting methodology uses the July 1st PEP estimates to control the ACS data. If there were noticeable differences, sub-annual estimates correlated with these basic characteristics may experience increased variation.

The study also compares the patterns of monthly change within each set (PEP and ACS) of estimates and calendar year, notes patterns of change, and tests the differences for statistical significance. Comparisons were made systematically, one month apart (comparing January to February, February to March, etc), two months apart (comparing January to March, February to April, etc), and so forth.

The second phase of the analysis examines the stability of quarterly estimates of families with own children under 18 year of age and the housing units that are owner-occupied. We examined quarterly estimates in hopes that this would reduce variability in the estimates between periods.

The third phase of the analysis examines the stability of monthly poverty estimates. Some analysis was carried out for poverty rates to identify trends and points of interest.

Three criteria were used to evaluate the reasonableness of the estimates: (1) the stability of the pattern of change by month or quarter within a calendar year (2007, 2006, 2005), (2) the stability of the change between years, and (3) the consistency of the ACS pattern of sub-annual change with independent estimates (done for the resident population estimates only). The results from the statistical testing and the judgment of subject matter specialists were used together to determine the reasonableness of the estimates.

Finally, if ACS quarterly estimates were determined to be reasonable, analysis of PUMS quarterly estimates would be undertaken. The assumption was that the ACS sub-annual estimates would be better behaved than the PUMS sub-annual estimates due to the increased variability associated with a smaller sample size.

IV. Limitations

Estimates from January and February 2005 were excluded from the analysis because the ACS did not have the full level of CAPI interviewing in these months and did not have the full level of CATI interviewing in the month of

January. Note that this also inflates somewhat the weights of CATI and CAPI interviews in the remaining months of 2005

ACS did not interview in Group Quarters (GQ) in 2005. This affects any estimates that include GQ persons.

ACS is subject to both sampling and non-sampling errors. Sampling errors can be estimated effectively by the replicate weighting method used in this study. Non-sampling errors are difficult to estimate and any changes in the patterns of non-sampling errors could affect our results. This may particularly affect the 2005 estimates, as that was the first year that ACS had a national sample.

ACS uses a current residence rule in data collection, where the residents are interviewed if they are occupying the residence for two months or more. Where as, the PEP estimates are census based which uses the usual residence rule. The effect of this difference in residence rules is not addressed in the paper.

ACS weighting procedure uses updated population controls each year. The change in population controls can affect year-to-year comparisons, especially comparisons between the end of one year and the beginning of the next year

The weights used for our research are the ACS final weights used for production. These weights are designed for annual estimates. It is possible that using weights designed for sub-annual estimates would produce different results.

The analysis was performed for only a subset of the ACS estimates. Using other estimates may have produced different results. These estimates were selected because they represent basic characteristics and are expected to be stable within a calendar year.

V. Results

In this section, we examine the implied monthly or quarterly patterns in four variables—the United States resident population, the percent of families with own children under 18 years of age, the percent of housing units that are owner-occupied, and poverty rates. As mentioned earlier, we use three criteria to evaluate the reasonableness of the results: (1) the stability of the pattern of change by month or quarter within a calendar year (2007, 2006, 2005), (2) the stability of the change between years, and (3) the consistency of the ACS pattern of sub-annual change with independent estimates (done for the resident population estimates only).

A. United States resident population

Monthly estimates based on the PEP

The Census Bureau has developed monthly estimates of the U.S. population for many years. These estimates are based on the updating of the population with components of change—births, deaths, and net international migration. The monthly birth and death data are based on vital statistics and are known to show slight seasonal patterns, for example, more births occur in July-September than in January-March (the total number of births in 2007 was 4.1 million). More deaths occur in the winter months than summer months (the total number of deaths in 2007 was 2.2 million). For net international migration (estimated at 0.9 million in 2007), only annual estimates are available and the monthly estimates are interpolated. Given the relative size of the components, it can be seen that the births and deaths "drive" the monthly change in the PEP population estimates.

The monthly PEP population estimates for 2006 and 2007 are displayed in column 4 of Table 1. The annual monthly change in 2007 varies from a high of 278,000 in September to a low of 181,000 in February—reflecting the seasonality noted in births and deaths. But this range is relatively narrow given the size of the resident population (e.g., 301.6 million in July 2007). The regularity of the momentum of growth at the national level leads to the very stable pattern of monthly percent change in the population—slightly less than one tenth of one percent per month (see col. 6). Since the components have not changed much, the pattern of growth in 2006 is very similar to 2007.

1. **Comparison to monthly total estimates based on the ACS.** As stated throughout this document, the ACS program was not designed to provide monthly estimates— for collection cost reasons the survey is conducted every month and the results are pooled over the 12 months of each year to form an annual average. The pooled weighted total is then controlled to the PEP population estimate for July 1st of each year. As mentioned in Section II, the current weighting methodology does not separately control individual months.

   The monthly ACS population estimates for 2006 and 2007 are shown in column 1 of Table 1[3]. Compared to the very stable change measured by the PEP estimates (see also Figure 1), the monthly change implied by the ACS estimates is very erratic. The monthly ACS-based resident population declines by millions in some months (e.g., January to February, May to June) and increases by millions in other months (e.g., March to April, June to July). At the extreme, the ACS resident population declined by 9.8 million from 306.9 million in April 2007 to 297.1 million in June 2007, whereas the PEP component-based estimates show the population increasing by 0.4 million (from 300.9 to 301.3 million). These contradictory trends cause the ACS and PEP estimates of population to differ widely for given months (see col. 7 and 8)—the ACS estimate was as much as 2 percent higher (April 2007) and 1.4 percent lower (June 2007) than the corresponding PEP estimate. Averaged over the year the two estimates are in agreement (see last row for each year)—this reflects the fact that pooled weighted population totals for the 12 months of ACS are controlled to the PEP estimate.

   The variability in the month-to-month change is summarized by the average absolute change, shown in the last row for each year. The average monthly change is 1.1 percent for the ACS estimates, with some months exhibiting positive growth and other months exhibiting negative growth compared to 0.08 percent for the PEP estimates where all months exhibit positive growth. These volatile patterns of monthly change in the ACS estimates are exhibited in the estimates for males and females, and the wide swings are repeated for each year (e.g., the sharp decline in population from January to February and upturn from June to July).

   Using the PEP population estimates as the standard, these results clearly indicate that the ACS estimates are not suitable for producing monthly estimates of population. Inspecting the month-to-month changes in column 2 of Table 1 reveals that even quarterly estimates would yield patterns of change that are inconsistent with the PEP estimates. One reason why the ACS estimates exhibit greater variability than the PEP estimates is that the ACS does not benefit from the longitudinal dimension that under pin the PEP component- based population estimates. These results help explain why sample-based ACS estimates produce demographically implausible results on a month-to-month basis.

   2. Estimates for Race Groups. An important role of the ACS is to update the demographic and socioeconomic profile of the population, so we also examined the consistency of the sub-annual (monthly) population estimates for selected race categories and compare these to available PEP population estimates. The ACS and PEP race estimates are compared in Figure 2, and the differences are summarized by the average absolute change in Table 2.

   Not surprisingly, the variability in the monthly ACS estimates found for the total population is repeated for the population classified by race. The PEP estimates continue to show consistent patterns of change, which is traced to the stability of the components of change used to produce the estimates. As indicated by the average absolute changes, the monthly ACS estimates for American Indians-Alaskan Natives and Native Hawaiian-Pacific Islanders are most problematic—this reflects in large part the much smaller sample size for these populations (see relative population size in column 1). The largest average absolute difference in Table 2 (13.3 in 2006, 11.6 in 2007) is found for the population with the smallest size--Native Hawaiian-Pacific Islanders, and the smallest differences (0.89 in 2006, 1.11 in 2007) are seen for the much larger White alone population. In contrast, the average absolute differences for the PEP estimates do not vary widely according to population size; the larger differences for Native Hawaiian-Pacific Islanders and Asians represent higher overall growth rates rather than monthly variability.

B. Percent of families with own children under 18 years of age

[3] The 2005 ACS population estimates are not used because the ACS universe was the household population—the monthly PEP population estimates are not available for the household universe

We now evaluate a social characteristic, the percent of families with own children under 18 years of age. Annual and experimental quarterly estimates - are shown in Table 3 for all families and for families classified by Hispanic origin of household head and in Table 4 for families for selected race categories. The change in the estimates from year to year (e.g., 2006 to 2007) by quarter is shown in columns 4-5 and the change between quarters within each calendar year is given in columns 6-8. To help identify similar patterns, negative changes are bolded in red. An asterisk denotes changes that are statistically significant.

Given the instability in the monthly ACS estimates of the resident population, we narrowed the focus to quarterly estimates in the hopes of reducing the variability in the results. We also shift from examining ACS estimates of totals to estimates of characteristic distributions. While the population totals exhibited much variability from month-to-month, this will have less impact on distributions or percents if the variability affects the numerator (e.g., children under 18 in families) and denominator (all families) to about the same extent.

Looking at all families (first bank of numbers in Table 3, columns 4-5), we see a small decline (0.3 percentage points, from 47.2 in 2005 to 46.9 in 2006 to 46.6 in 2007) in the percent of families with children in the household based on the published annual ACS estimates. This downward drift is also captured by the quarterly estimates—the year-to-year change is negative and statistically significant for all quarters (Quarter 1 estimates are not used given problems with the ACS data collection in January and February of 2005). The parallel lines in Figure 3 for each year denote the uniformity of the change between years.

Now we examine the tempo of change within each year—the major focus of this study. A consistent pattern is seen in the quarterly change for the percent of all families with children under 18. As seen in the first row (col. 6-8), the percents increase slightly from Quarter 4 of the previous year to Quarter 1 (e.g., +0.2 percentage point from 2006 to 2007), though this change is not statistically significant. The estimates decline from Quarter 1 to Quarter 2 in both 2006 (-0.3) and 2007 (-0.2), and increase from Quarter 2 to Quarter 3 in both years (+0.3 and +0.2). These quarterly changes are statistically significant for 2006 but not for 2007. Finally, the change in the percentage of families with children present is most noticeable in the last quarter of the year—the decline (-0.5 to –0.6 percentage points) is statistically significant in all three years.

These findings of consistent patterns in the ACS sub-annual data for families with children are stark contrast to the erratic pattern of change found in ACS population estimates. The collapsing from the monthly detail to quarterly estimates helps, as does likely the shift in focus from totals to distributions. However, the identification of a trend in the sub-annual data does not make it "real" unless we can explain it. Unfortunately, we do not have a ready answer as to why the percents systematically drop in some periods (Quarter 1 to Quarter 2 and Quarter 3 to Quarter 4) and increase in another (Quarter 2 to Quarter 3). Work to explain this trend would be a possible future project.

Are the quarterly changes in family groups classified by Hispanic origin and race consistent with the results for all families, where some distinct patterns appear to be identified? Will this additional data help us validate the results? Unfortunately, here the issue of sampling variability clouds the findings. Except for Non-Hispanic families (Table 3) and Non-Hispanic White families (Table 4)—which comprise the large share of all families and display the same patterns—the quarterly and year-to-year changes are often not statistically significant. So while the estimates for Hispanics and Non-Hispanic Blacks also show the consistent Quarter 4 decline in the percent of families with children under 18, the results lack standing. As do the opposing quarterly patterns revealed in the data for some groups—the percents consistently increase in Quarter 4 for Non-Hispanic Asians and American Indian-Alaskan Natives and the percents for Hispanics increase (instead of decline) between Quarter 2 and Quarter 3. And there are several instances where the quarterly pattern of change is not the same from one year to the next (such as for Native Hawaiians and Pacific Islanders). But the "real" patterns might be masked by the inherent unreliability of the sample-based data when "cut" in this degree of detail (demographic groups, sub-annual observations). So sampling variability is a serious issue that compromises the viability of producing sub-annual estimates for demographic classifications of the ACS data.

C. Percent of housing units that are owner-occupied

The third variable examined is a key housing characteristic—the percent of owner-occupied units.

The estimates of percent ownership—including annual and quarterly estimates—are shown in Table 5 for housing units classified by Hispanic origin of household head and in Table 6 for units by selected race categories. (Also see Figure 4) The change in the estimates from year to year (e.g., 2006 to 2007) by quarter is shown in columns 4-5 and the change between quarters within each calendar year is given in columns 6-8. To help identify patterns, negative changes are bolded in red. An asterisk denotes changes that are statistically significant.

Following the same approach as before, we first examine the patterns in the home ownership rates for all households and then look at demographic cross-classifications. As seen in the first row of Table 5, the national rate rose from 66.9 in 2005 to 67.3 in 2006; the change from 2006 to 2007 is not statistically significant. According to these experimental ACS estimates, the quarterly data indicate that the 2005 to 2006 increase (col. 4) is concentrated in the 3rd and 4th quarters (see statistically significant increases of +0.8 and +0.5 percentage points in col. 4). The actual source of the increase is the 0.4 percentage point rise (col. 6) in the ownership rate from Quarter 3 (66.5 percent) to Quarter 4 (66.9) in 2005 and the same 0.4 point increase to Quarter 1 in 2006 (67.3).

The lack of statistical significance in the quarterly changes cited above is problematic - none of the quarter-to-quarter changes within calendar years from 2005 to 2007 (col. 6-8) are significant (for the "all households" category). Once again, there is no easy explanation for the observed patterns of change. Consider the rise in the ownership rate in Quarter 4 of 2005 (+0.4 percentage points) preceded by an equal fall in the rate (-0.4 points). Even if these changes were statistically significant, can we attribute the reason for this pattern? Would these reasons be consistent with the finding of very little movement in the ownership rate for any period in 2006 or 2007?

Do the estimates for owner-occupied units for race and origin groups shed some light? As was found for the variable on families with children, very few of the change measures are statistically significant, so we can't really tell a story. But we can see some of the instability in the estimates that may emerge at this level of detail (parsing the annual estimates into quarters). For example, examine the estimates for Hispanic homeowners. The drop in the ownership rate from the 2nd to 3rd quarter in 2005 (-1.1 percentage points) and increase in the 4th quarter (+1.2 points) is especially pronounced--and statistically significant. If this change were real, we would desire an explanation. But could the particular pattern be attributable to a "bad" estimate in Quarter 3 of 2005? The 3rd quarter owner-occupied estimate of 47.9 percent certainly appears low relative to the preceding Quarter 2 (49.0) and succeeding Quarter 4 (49.1) and all other rates in the time series. Can ownership rates change this much at the national level? The effects of unmeasured non-sampling error will always be a problem in interpreting the results.

The ownership rates for race groups also present a mixed picture regarding the viability of the quarterly ACS estimates. The patterns of quarter-to-quarter change are relatively small and generally in a similar direction for Non-Hispanic Whites and Blacks—the two groups of the five shown with the largest populations. But few of the changes are statistically significant. And the quarterly estimates exhibit considerable variability for the smallest category, Native Hawaiian and Pacific Islanders, as attested by the relatively large average absolute quarterly change. At the extreme, the ownership rate jumps from 45.4 percent in Quarter 2 of 2007 to 53.2 percent in Quarter 3, and then falls back to 43.8 percent by Quarter 4. Even though this last change (-9.4 percentage points) is statistically significant, a change of this magnitude can be questioned--non-sampling error may be lurking in the background.

D. Monthly ACS Poverty Estimates

Monthly ACS poverty rates for 2006 and 2007 show variability that does not correspond to changes in business cycles. Normally, during an economic expansion, one would expect to see generally falling poverty rates across months in a given year and during a recession one would expect to see generally rising poverty rates. In 2007, the 12-month ACS poverty rate was 13.0. Over the 12 months, however, poverty rates ranged from 12.6 percent to 13.5 percent, and the pattern of change was not smooth across months (see Chart 1). Perhaps the most striking difference in poverty by month occurred between August and September of 2007, when the monthly poverty rate increased from 12.7 percent to 13.5 percent. Interestingly, the same pattern occurred in 2006, when the monthly poverty rate increased from 13.2 percent in August 2006 to 13.8 percent in September. There are no obvious reasons, in terms of economic conditions, why poverty rates (which are based on previous 12-month income) would increase in September of these two years. It is clear that any user who wished to use monthly poverty rates must do so with extreme caution, given the monthly patterns of rates.

One factor that may shed at least some light on these differences in monthly poverty rates is mode of interview. In both 2006 and 2007, there were declines in the percentages of ACS interviews that were completed by mail between August and September. In 2007, the mail response rate declines from 54.2 percent in August to 49.4 percent in September and in 2006 the comparable rates declined from 53.3 percent to 50.9 percent (see Chart 2). Given that CAPI and CATI poverty rates are always higher than mail poverty rates, the increase in the percentage of interviews conducted by CAPI or CATI could explain at least some of the increase. As Chart 3 shows, poverty rates by mode appear to be more stable month-to-month than the overall poverty rates shown in Chart 1, indicating that differences in the percentage of ACS interview by mode is possibly the cause of at least some of the variability in monthly ACS poverty rates.

VI. Conclusion and Recommendation

In summary, the stability of the pattern of sub-annual changes is clearly influenced by the size of the sample from which the ACS estimates are derived. And the results appear to be especially volatile when the change is measured in terms of population totals rather than percent distributions. These findings are observed at the national level; for lower level geographic areas, the sub-annual estimates would be based on even smaller sample sizes and lead to more variability in the results—whether the measurement is for totals or distributions. For some of the variables examined, change patterns appear consistent from year to year, but the identification of a trend in the sub-annual data does not make it "real" unless we can explain it.

Based on the results presented here, this group recommends the ACS program not publish monthly or quarterly estimates using weights derived from the current weighting methodology. This would apply to requests received through the Custom Tabulation Program and to collection indicators placed on the PUMS files.

If it is determined that monthly and quarterly estimates are a priority to the ACS program, research will be needed to determine what design changes would be needed to improve these types of estimates.

VII. Future Research

The results presented here demonstrate that using the current weighting methodology, designed to produce annual estimates, is inadequate to produce sub-annual estimates. If sub-annual estimates were a priority for the ACS program, the next steps would be to research what weighting methodology changes would be needed to improve this type of estimate. The research projects would include various reweighting methodologies of the ACS data to produce reasonable sub-annual estimates.

Options considered include:

1. Weighting the data by sample month using the current weighting methodology controlling to sub-annual national and state PEP estimates. Note that sub-annual PEP estimates are not available for sub-state areas.
2. Weighting the interview month data using sub-annual national and state PEP estimates.
3. Adjusting the weighted distribution of ACS responses across modes received in an interview month to make them represent the distribution of responses across modes of the sample month.

The first and second options would be calibrating the ACS monthly or quarterly estimates to sub-annual population controls much the way that Current Population Survey uses in producing their monthly estimates. However, because there would be less sample available in each sub-annual period, the weighting areas would need to be redrawn in order to avoid an adverse impact to the variances. The third option would adjust only the weights of the CATI and CAPI cases of the interview month to make them represent the parts of the sample month that actually respond by that mode.

VIII. Reference

Kish, L. [1965], *Survey Sampling,* 2nd Ed., New York: John Wiley and Sons

National Academy of Science [2007], *Using the American Community Survey: Benefits and Challenges*, The National Academies Press, Washington D.C.

U.S. Census Bureau [2009], *Design and Methodology of The American Community Survey*, (ACS-DM1) http://www.census.gov/acs/www/Downloads/dm1.pdf

Attachments

Table 1--Comparison of Monthly Resident Population Estimates from the American Community Survey (ACS) and the Population Estimates Program (PEP): Total Population

		ACS Resident Population Estimates			PEP Resident Population Estimates			Difference, ACS - PEP	
			Monthly Change			Monthly Change			
Month	year	Estimate	Amount	Percent	Estimate	Amount	Percent	Amount	Percent
		1	2	3	4	5	6	7=1-4	8=7/4*100
2007									
January	2007	304,556,052			300,304,181			4,251,871	1.4*
February	2007	297,676,740	-6,879,312	-2.26*	300,495,104	190,923	0.06	-2,818,364	-0.9*
March	2007	300,813,612	3,136,872	1.05*	300,676,277	181,173	0.06	137,335	0.0
April	2007	306,926,796	6,113,184	2.03*	300,888,674	212,397	0.07	6,038,122	2.0*
May	2007	302,435,232	-4,491,564	-1.46*	301,111,854	223,180	0.07	1,323,378	0.4
June	2007	297,083,136	-5,352,096	-1.77*	301,349,420	237,566	0.08	-4,266,284	-1.4*
July	2007	300,480,420	3,397,284	1.14*	301,621,157	271,737	0.09	-1,140,737	-0.4
August	2007	300,777,144	296,724	0.10	301,886,972	265,815	0.09	-1,109,828	-0.4
September	2007	303,804,840	3,027,696	1.01*	302,165,444	278,472	0.09	1,639,396	0.5*
October	2007	301,049,412	-2,755,428	-0.91*	302,442,810	277,366	0.09	-1,393,398	-0.5*
November	2007	301,637,052	587,640	0.20	302,687,241	244,431	0.08	-1,050,189	-0.3
December	2007	302,213,472	576,420	0.19	302,921,426	234,185	0.08	-707,954	-0.2
Average	**Abs Avg**	301,621,159		**1.10**	301,545,880		**0.08**	75,279	**0.0**
2006									
January	2006	303,098,640			298,024,822			5,073,818	1.7*
February	2006	298,908,648	-4,189,992	-1.38*	298,233,209	208,387	0.07	675,439	0.2
March	2006	300,559,092	1,650,444	0.55	298,434,927	201,718	0.07	2,124,165	0.7*
April	2006	302,421,936	1,862,844	0.62	298,666,634	231,707	0.08	3,755,302	1.3*
May	2006	301,547,544	-874,392	-0.29	298,900,529	233,895	0.08	2,647,015	0.9*
June	2006	294,265,596	-7,281,948	-2.41*	299,142,567	242,038	0.08	-4,876,971	-1.6*
July	2006	300,941,532	6,675,936	2.27*	299,398,484	255,917	0.09	1,543,048	0.5*
August	2006	299,639,952	-1,301,580	-0.43	299,657,238	258,754	0.09	-17,286	0.0
September	2006	298,264,188	-1,375,764	-0.46	299,918,069	260,831	0.09	-1,653,881	-0.6*
October	2006	298,092,528	-171,660	-0.06	300,184,434	266,365	0.09	-2,091,906	-0.7*
November	2006	299,406,564	1,314,036	0.44	300,428,060	243,626	0.08	-1,021,496	-0.3
December	2006	295,635,600	-3,770,964	-1.26*	300,662,937	234,877	0.08	-5,027,337	-1.7*
Average	**Abs Avg**	299,398,485		**0.93**	299,304,326		**0.08**	94,159	**0.0**

Sources:

Col. 1 - ACS estimates are from unpublished tabulations
Col. 4 - PEP estimates are from Estimates page on American Factfinder:
2007 estimates from http://www.census.gov/popest/national/NA-EST2007-01.html
2006 estimates from http://www.census.gov/popest/national/NA-EST2006-01.html

Note:
An asterisk (*) indicates the difference is statistically significant at the 90-percent confidence level.
The average population (col. 1 and 4) equals the sum of the 12 monthly estimates divided by 12.
The average absolute difference (col. 4 and 6) is calculated by taking the absolute value of the 11 monthly change measures for each year and dividing by 11.

Table 2--Comparison of Monthly Resident Population Estimates from the American Community Survey (ACS) and the Population Estimates Program (PEP): Average Absolute Percent Differences

Category	PEP Population Estimate (July 2007)	Average Absolute Percent Differences ACS 2006	ACS 2007	PEP 2006	PEP 2007
Total Population					
Both Sexes	301,621,157	0.93	1.10	0.08	0.08
Male	148,658,898	0.98	1.24	0.09	0.08
Female	152,962,259	0.90	1.07	0.07	0.07
Ages 25 and older					
White	162,058,088	0.89	1.11	0.09	0.08
Black	22,943,434	1.92	1.63	0.14	0.14
American Indian-Alaskan Native	1,725,235	4.56	5.81	0.21	0.22
Asian	9,111,746	2.71	2.59	0.31	0.28
Native Hawaiian-Pacific Islander	321,388	13.26	11.60	0.30	0.26

Sources:
Col. 1 - ACS estimates are from unpublished tabulations
Col. 4 - PEP estimates for total population are from Estimates page on American Factfinder
Total Population groups--see Table 1 source
Race categories:
2007 estimates from http://www.census.gov/popest/national/asrh/2007-nat-res.html
2006 estimates from http://www.census.gov/popest/national/asrh/2006-nat-res.html

Note: The average absolute difference is calculated by taking the absolute value of the 11 monthly change measures for each year and dividing by 11.

Table 3-- ACS Estimates of Percent of Families with Own Children Under 18 Years of Age, by Quarter: All Families and Families by Origin of Household Head

	Estimate			Year-to-year Change		Quarter-to-quarter Change		
	2005	2006	2007	2005-06	2006-07	2005	2006	2007
	1	2	3	4=2-1	5=3-2	6	7	8
Total								
Annual	47.2	46.9	46.6	**-0.3***	**-0.3***			
Quarter 1	46.9	47.1	46.7		**-0.3***		0.1	0.2
Quarter 2	47.5	46.8	46.6	**-0.6***	**-0.3***		**-0.3***	**-0.2**
Quarter 3	47.5	47.1	46.8	**-0.3***	**-0.3***	0.0	0.3*	0.2
Quarter 4	47.0	46.5	46.3	**-0.4***	**-0.3***	**-0.5***	**-0.6***	**-0.5***
Average					**0.30**		**0.32**	**0.30**
	2005	2006	2007	2005-06	2006-07	2005	2006	2007
Non-Hispanic								
Annual	45.0	44.6	44.2	**-0.4***	**-0.4***			
Quarter 1	44.6	44.9	44.5		**-0.4***		0.1	0.4
Quarter 2	45.3	44.5	44.1	**-0.7***	**-0.4***		**-0.4***	**-0.4***
Quarter 3	45.3	44.8	44.4	**-0.4***	**-0.4***	0.0	0.3*	0.3*
Quarter 4	44.8	44.2	43.9	**-0.6***	**-0.3***	**-0.5***	**-0.7***	**-0.6***
Average					**0.35**		**0.36**	**0.40**
	2005	2006	2007	2005-06	2006-07	2005	2006	2007
Hispanic								
Annual	62.4	62.3	62.1	**-0.1**	**-0.2**			
Quarter 1	62.7	62.1	61.7		**-0.4**		0.3	**-0.6**
Quarter 2	62.6	62.4	62.3	**-0.2**	**-0.1**		0.3	0.6
Quarter 3	62.5	62.4	62.3	**-0.1**	**-0.1**	**-0.1**	**0.0**	**0.0**
Quarter 4	61.9	62.3	61.9	0.5	**-0.4**	**-0.6**	**-0.1**	**-0.4**
Average					**0.24**		**0.16**	**0.41**

Source:
Quarterly estimates are from unpublished tabulations
Annual estimates for the Total category are derived from Detailed Table B11003 at the ACS page on American Factfinder (www.census.gov)
Annual estimates for origin categories are unpublished tabulations

Note:
An asterisk (*) indicates the difference is statistically significant at the 90-percent confidence level.
The average absolute percent differences (col. 5, 7, 8) equals the absolute sum of the 4 quarterly values divided by 4.

Table 4-- ACS Estimates of Percent of Families with Own Children Under 18 Years of Age, by Quarter: All Families and Families by Race for Households with Non-Hispanic Household Head

	Estimate			Year-to-year Change		Quarter-to-quarter Change		
	2005	2006	2007	06-05	07-06	2005	2006	2007
	1	2	3	4=2-1	5=3-2	6	7	8
Total, Non-Hispanic								
Annual	47.2	46.9	46.6	**-0.3***	**-0.3***			
Quarter 1	46.9	47.1	46.7		**-0.3***		0.1	0.2
Quarter 2	47.5	46.8	46.6	**-0.6***	**-0.3***		**-0.3***	**-0.2**
Quarter 3	47.5	47.1	46.8	**-0.3***	**-0.3***	0.0	0.3*	0.2
Quarter 4	47.0	46.5	46.3	**-0.4***	**-0.3***	**-0.5***	**-0.6***	**-0.5***
Average					**0.30**		**0.32**	**0.30**
	2005	2006	2007	06-05	07-06	2005	2006	2007
Non-Hispanic White								
Annual	42.9	42.5	42.1	**-0.4***	**-0.4***			
Quarter 1	42.6	43.0	42.4		**-0.6***		0.4*	0.5*
Quarter 2	43.0	42.3	41.9	**-0.7***	**-0.4***		**-0.7***	**-0.5***
Quarter 3	43.2	42.7	42.4	**-0.5***	**-0.3***	0.2	0.4*	0.5*
Quarter 4	42.6	41.9	41.7	**-0.7***	**-0.2**	**-0.6***	**-0.8***	**-0.7***
Average					**0.38**		**0.58**	**0.55**
	2005	2006	2007	06-05	07-06	2005	2006	2007
Non-Hispanic Black								
Annual	54.5	54.1	53.9	**-0.4***	**-0.2**			
Quarter 1	53.6	53.5	54.5		1.0*		**-0.9***	0.3
Quarter 2	55.3	54.3	54.5	**-0.9***	0.1		0.8*	**0.0**
Quarter 3	54.7	54.4	53.6	**-0.3**	**-0.8**	**-0.5**	0.1	**-0.9**
Quarter 4	54.4	54.2	53.1	**-0.3**	**-1.0***	**-0.3**	**-0.3**	**-0.5**
Average					**0.73**		**0.52**	**0.41**
	2005	2006	2007	06-05	07-06	2005	2006	2007
Non-Hispanic American Indian and Alaskan Native								
Annual	50.9	50.2	49.0	**-0.7**	**-1.2**			
Quarter 1	50.9	51.1	49.1		**-2.0**		0.6	**-1.1**
Quarter 2	52.2	50.3	48.7	**-1.9**	**-1.6**		**-0.8**	**-0.4**
Quarter 3	50.1	49.2	48.8	**-0.9**	**-0.4**	**-2.1**	**-1.1**	0.1
Quarter 4	50.6	50.2	49.6	**-0.4**	**-0.6**	0.4	1.0	0.8
Average					**1.17**		**0.87**	**0.61**

Table 4-- ACS Estimates of Percent of Families with Own Children Under 18 Years of Age, by Quarter:
All Families and Families by Race for Households with Non-Hispanic Household Head

	Estimate			Year-to-year Change		Quarter-to-quarter Change		
	2005	2006	2007	06-05	07-06	2005	2006	2007
Non-Hispanic Asian								
Annual	52.8	53.2	52.9	0.4	**-0.3**			
Quarter 1	52.6	53.2	53.0		**-0.2**		0.3	**-0.2**
Quarter 2	53.2	53.8	52.8	0.6	**-0.9**		0.6	**-0.1**
Quarter 3	52.5	52.7	52.3	0.2	**-0.3**	**-0.7**	**-1.1**	**-0.5**
Quarter 4	52.8	53.1	53.4	0.3	0.3	0.4	0.4	1.0
Average					**0.43**		**0.61**	**0.45**
	2005	2006	2007	06-05	07-06	2005	2006	2007
Non-Hispanic Native Hawaiian and Pacific Islander								
Annual	55.8	56.8	56.6	1.0	**-0.2**			
Quarter 1	54.4	57.2	54.8		**-2.4**		**-4.3**	3.6
Quarter 2	54.7	56.4	56.8	1.7	0.3		**-0.7**	2.0
Quarter 3	52.2	61.5	53.4	9.3*	**-8.1***	**-2.5**	5.1	**-3.3**
Quarter 4	61.5	51.2	61.5	**-10.3***	10.3*	9.3*	**-10.4***	8.1*
Average					**5.29**		**5.12**	**4.26**

Source:
Quarterly estimates are from unpublished tabulations
Annual estimates for the Total category are derived from Detailed Table B11003 at the ACS page on American Factfinder (www.census.gov)
Annual estimates for race by origin categories are unpublished tabulations

Note:
An asterisk (*) indicates the difference is statistically significant at the 90-percent confidence level.
The average absolute percent differences (col. 5, 7, 8) equals the absolute sum of the 4 quarterly values divided by 4.

Table 5--ACS Estimates of Owner-Occupied Housing Units by Quarter and Hispanic Origin

	Estimate			Year-to-year Change		Quarter-to-quarter Change		
	2005	2006	2007	2005-06	2006-07	2005	2006	2007
	1	2	3	4=2-1	5=3-2	6	7	8
Total								
Annual	66.9	67.3	67.2	0.4*	**-0.1**			
Quarter 1	**67.3**	67.3	67.2		**0.0**		0.4	**-0.1**
Quarter 2	66.9	67.1	67.2	0.2	0.0		**-0.1**	**-0.1**
Quarter 3	66.5	67.3	67.3	0.8*	0.0	**-0.4**	0.2	0.2
Quarter 4	66.9	67.4	67.1	0.5*	**-0.3**	0.4	0.0	**-0.3**
Average					**0.09**		**0.18**	**0.16**
	2005	2006	2007	2005-06	2006-07	2005	2006	2007
Non-Hispanic								
Annual	69.1	69.4	69.3	0.3	**-0.1**			
Quarter 1	**69.5**	69.4	69.4		**-0.1**		0.4	**-0.1**
Quarter 2	69.1	69.4	69.3	0.3	**-0.1**		**-0.1**	**-0.1**
Quarter 3	68.8	69.6	69.6	0.7*	**0.0**	**-0.3**	0.2	0.2
Quarter 4	69.1	69.5	69.2	0.5*	**-0.3**	0.2	**-0.1**	**-0.3**
Average					**0.11**		**0.17**	**0.18**
	2005	2006	2007	2005-06	2006-07	2005	2006	2007
Hispanic								
Annual	48.3	49.3	49.9	1.0	0.6			
Quarter 1	**48.8**	49.4	50.1		0.6		0.3	**-0.3**
Quarter 2	49.0	49.1	50.3	0.1	1.2		**-0.3**	0.2
Quarter 3	47.9	49.7	50.2	1.8*	0.4	**-1.1***	0.6	**-0.1**
Quarter 4	49.1	50.3	50.2	1.2*	**-0.2**	1.2*	0.6	0.0
Average					**0.61**		**0.47**	**0.16**

Source:
Quarterly estimates are from unpublished tabulations
Annual estimates for the Total and origin categories are from the Selected Population Profiles Table at the ACS page on American Factfinder (www.census.gov)

Note:
An asterisk (*) indicates the difference is statistically significant at the 90-percent confidence level.
The average absolute percent differences (col. 5, 7, 8) equals the absolute sum of the 4 quarterly values divided by 4.

Table 6--ACS Estimates of Owner-Occupied Housing Units by Quarter: by Race for Occupied Units with Non-Hispanic Household Head

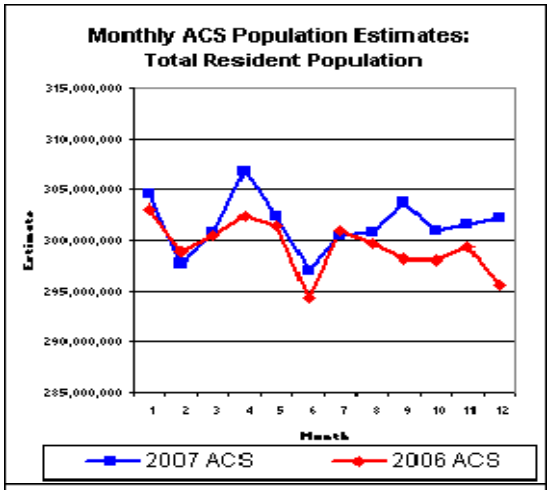
	Estimate			Year-to-year Change		Quarter-to-quarter Change		
	2005	2006	2007	2005-06	2006-07	2005	2006	2007
	1	2	3	4=2-1	5=3-2	6	7	8
Total, Non-Hispanic								
Annual	69.1	69.4	69.3	0.3	**-0.1**			
Quarter 1	**69.5**	69.4	69.4		**-0.1**		0.4	**-0.1**
Quarter 2	69.1	69.4	69.3	0.3	**-0.1**		**-0.1**	**-0.1**
Quarter 3	68.8	69.6	69.6	0.7*	**0.0**	**-0.3**	0.2	0.2
Quarter 4	69.1	69.5	69.2	0.5*	**-0.3**	0.2	**-0.1**	**-0.3**
Average					**0.11**		**0.17**	**0.18**
	2005	2006	2007	06-05	07-06	2005	2006	2007
Non-Hispanic White								
Annual	73.7	73.9	73.8	0.2	**-0.1**			
Quarter 1	73.9	73.9	73.7		**-0.1**		0.4	**-0.2**
Quarter 2	73.7	73.9	73.7	0.2	**-0.2**		0.0	**0.0**
Quarter 3	73.5	73.9	73.9	0.4*	0.0	**-0.3**	0.0	0.2
Quarter 4	73.5	73.9	73.7	0.5*	**-0.3**	0.0	0.0	**-0.2**
Average					**0.14**		**0.11**	**0.17**
	2005	2006	2007	06-05	07-06	2005	2006	2007
Non-Hispanic Black								
Annual	45.9	46.5	46.6	0.6	0.2			
Quarter 1	46.1	46.3	46.6		0.3		**0.0**	**-0.1**
Quarter 2	45.6	45.9	46.8	0.4	0.8*		**-0.4**	0.1
Quarter 3	45.5	46.9	47.0	1.4*	0.2	**-0.1**	0.9	0.3
Quarter 4	46.3	46.7	46.1	0.4	**-0.6**	0.9*	**-0.2**	**-0.9***
Average					**0.48**		**0.38**	**0.34**
	2005	2006	2007	06-05	07-06	2005	2006	2007
Non-Hispanic American Indian and Alaskan Native								
Annual	57.4	57.5	57.7	0.1	0.2			
Quarter 1	57.6	57.9	58.6		0.7		0.2	1.9
Quarter 2	57.2	57.3	56.9	0.1	**-0.5**		**-0.6**	**-1.7**
Quarter 3	57.2	58.2	57.7	1.0	**-0.5**	**0.0**	0.8	0.9
Quarter 4	57.7	56.7	57.7	**-1.0**	1.0	0.5	**-1.5**	**0.0**
Average					**0.67**		**0.78**	**1.13**

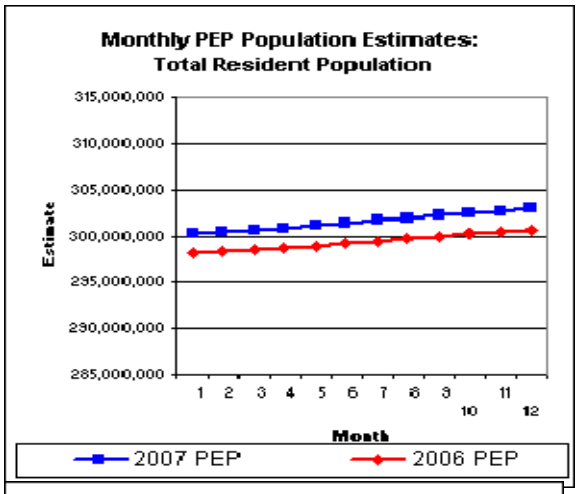
	2005	2006	2007	06-05	07-06	2005	2006	2007
Non-Hispanic Asian								
Annual	58.9	60.2	60.4	1.3	0.2			
Quarter 1	58.9	59.6	60.3		0.7		0.5	0.8
Quarter 2	58.5	60.7	60.6	2.1*	**0.0**		1.0	0.3
Quarter 3	59.1	61.0	60.8	1.9*	**-0.1**	0.5	0.3	0.2
Quarter 4	59.1	59.5	59.9	0.4	0.5	0.0	**-1.5**	**-0.9**
Average					**0.32**		**0.84**	**0.57**
	2005	2006	2007	06-05	07-06	2005	2006	2007
Non-Hispanic Native Hawaiian and Pacific Islander								
Annual	47.9	48.4	48.1	0.5	**-0.4**			
Quarter 1	44.3	43.0	49.8	**-1.3**	6.8		**-8.8**	**-2.0**
Quarter 2	48.6	48.9	45.4	0.4	**-3.5**	**4.2**	5.9	**-4.4**
Quarter 3	47.1	50.0	53.2	2.9	3.2	**-1.5**	1.0	7.8
Quarter 4	51.8	51.8	43.8	**-0.1**	**-7.9**	4.7	1.8	**-9.4***
Average					**5.35**		**4.39**	**5.87**

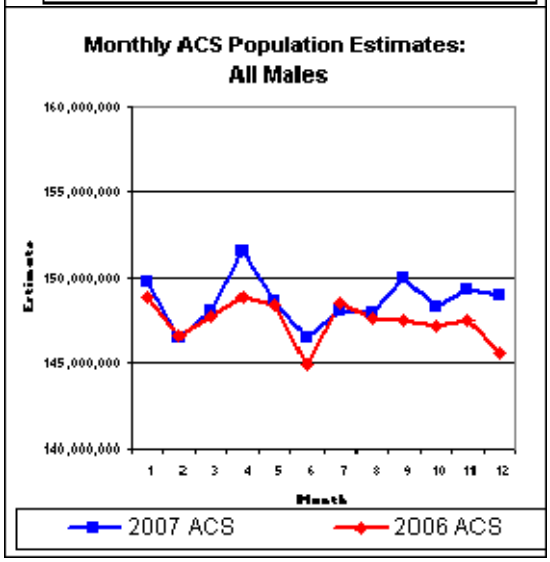
Source:
Quarterly estimates are from unpublished tabulations
Annual estimates for race by origin categories are unpublished tabulations

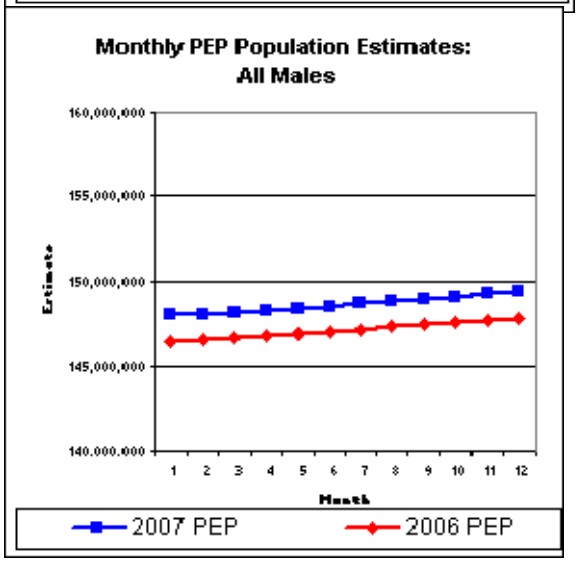
Note:
An asterisk (*) indicates the difference is statistically significant at the 90-percent confidence level.
The average absolute percent differences (col. 5, 7, 8) equals the absolute sum of the 4 quarterly values divided by 4.

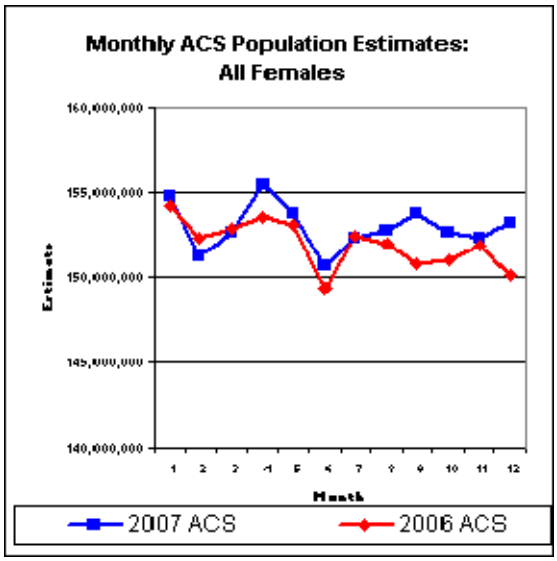
Figure 1--Comparison of Monthly Resident Population Estimates from the American Community Survey (ACS) and Population Estimates Program (PEP), 2006 and 2007: Total Population and by Sex











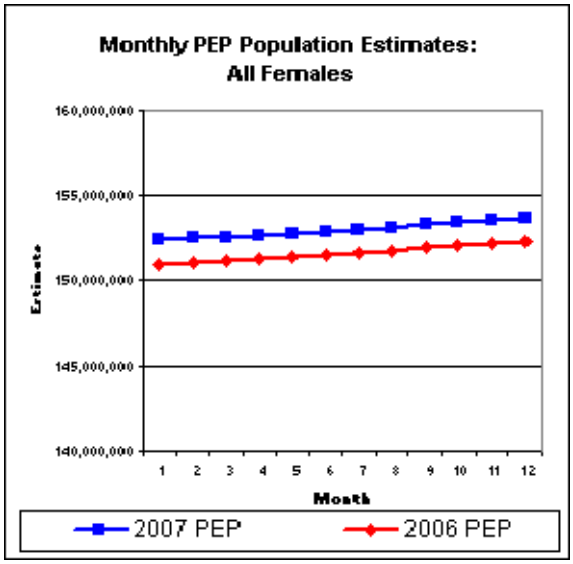
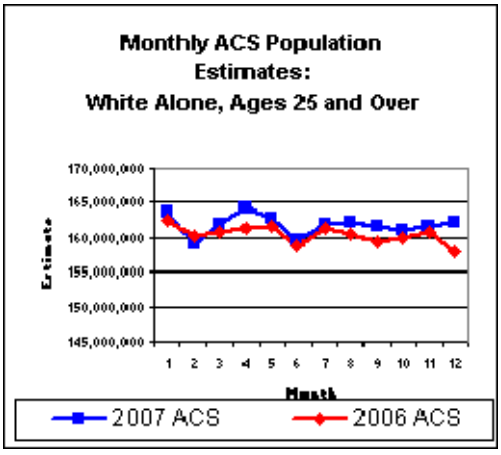
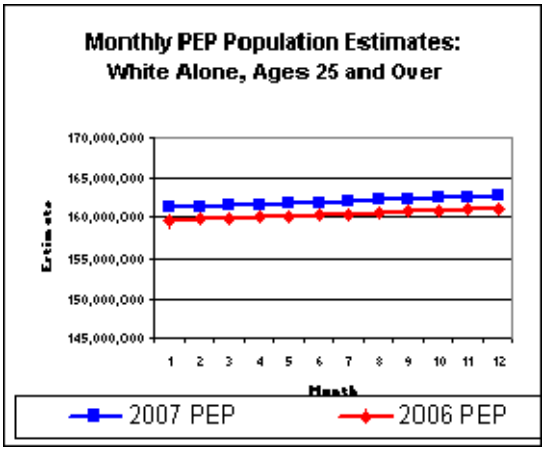
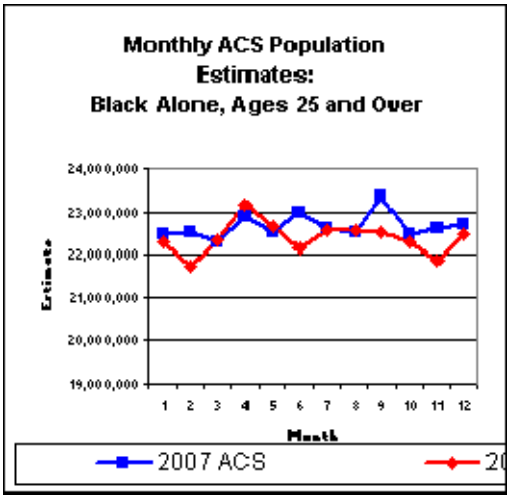
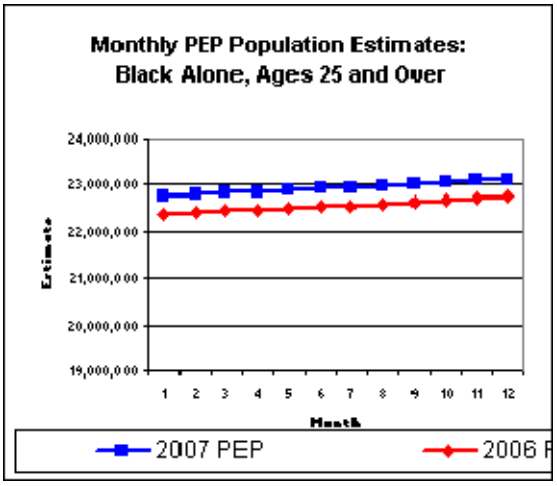


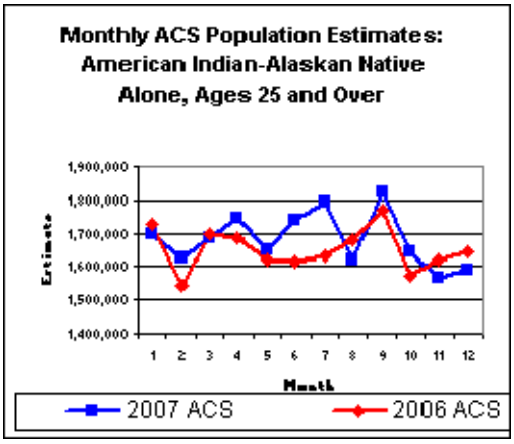
Figure 2--Comparison of Monthly Resident Population Estimates from the American Community Survey (ACS) and Population Estimates Program (PEP), 2006 and 2007: Selected Race Categories











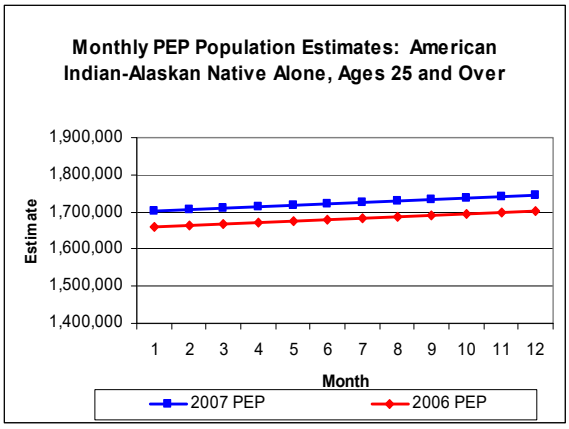
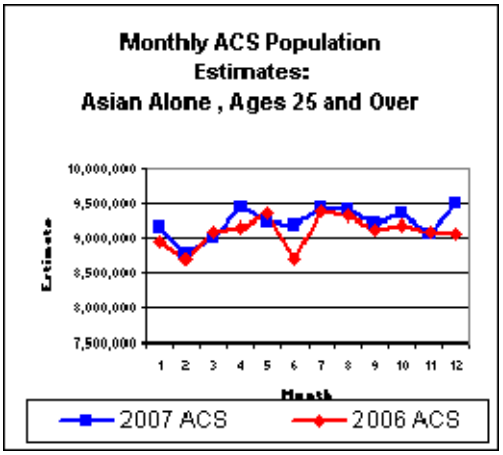
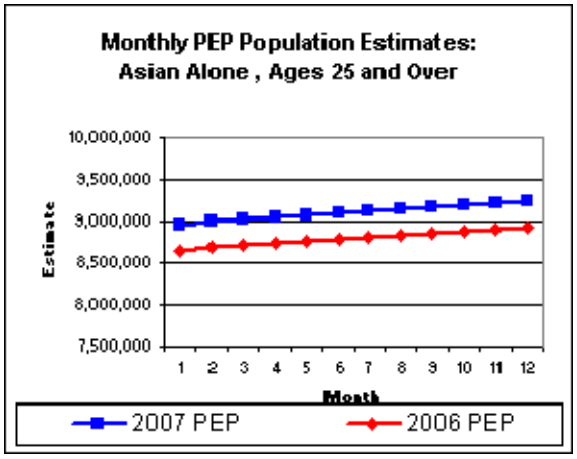
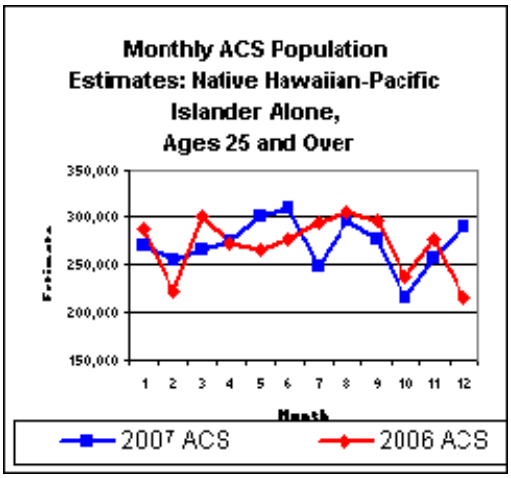


Figure 2 (Con't)--Comparison of Monthly Resident Population Estimates from the American Community Survey (ACS) and Population Estimates Program (PEP), 2006 and 2007: Selected Race Categories







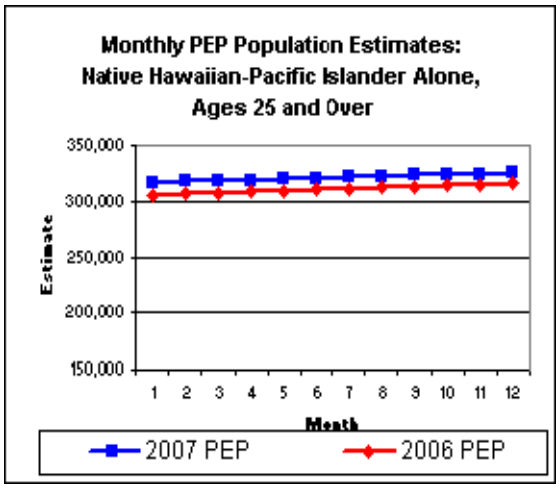
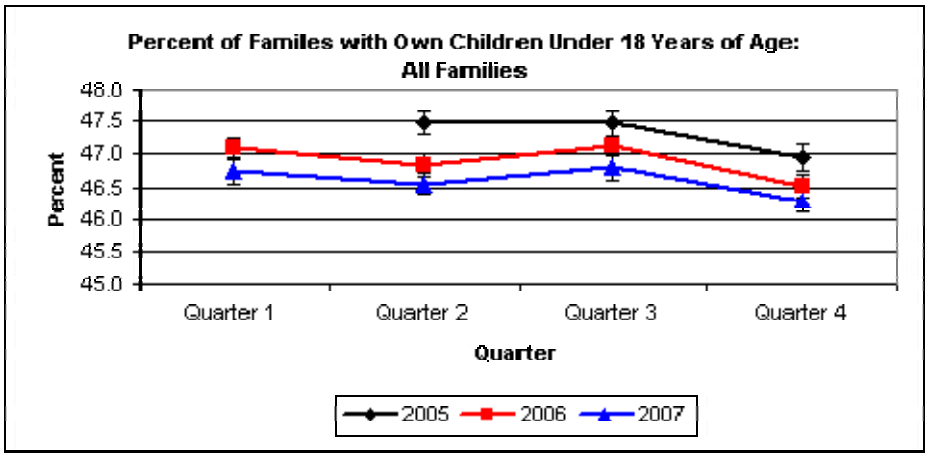
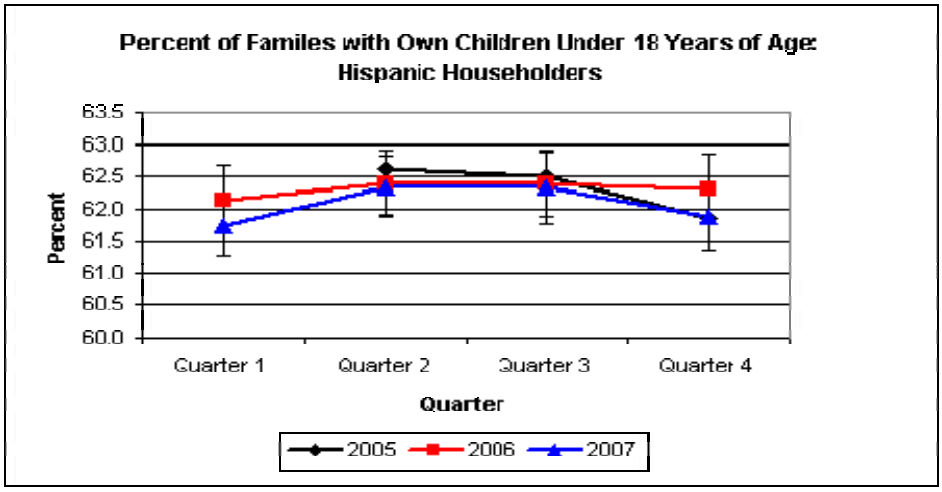


Figure 3--ACS Estimates of Families with Own Children under 18 Years of Age, by Quarter: All Families and for Families with Selected Race and Origin Householders





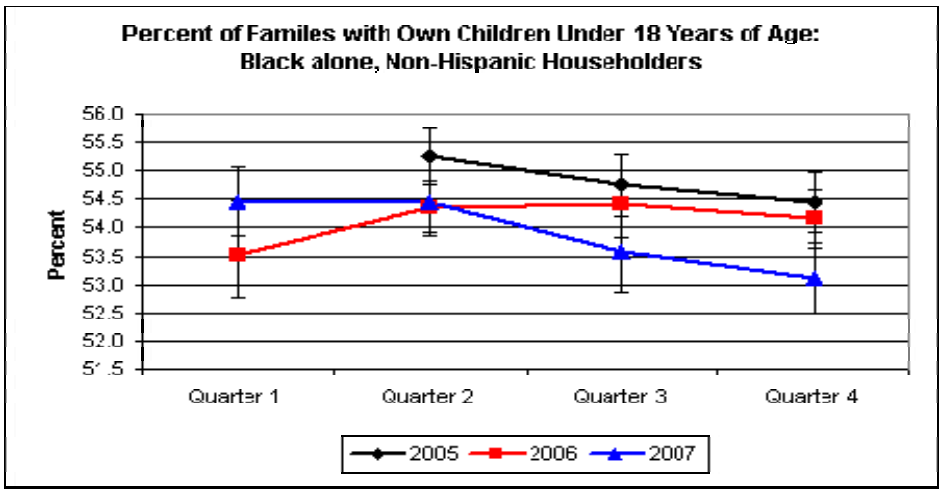
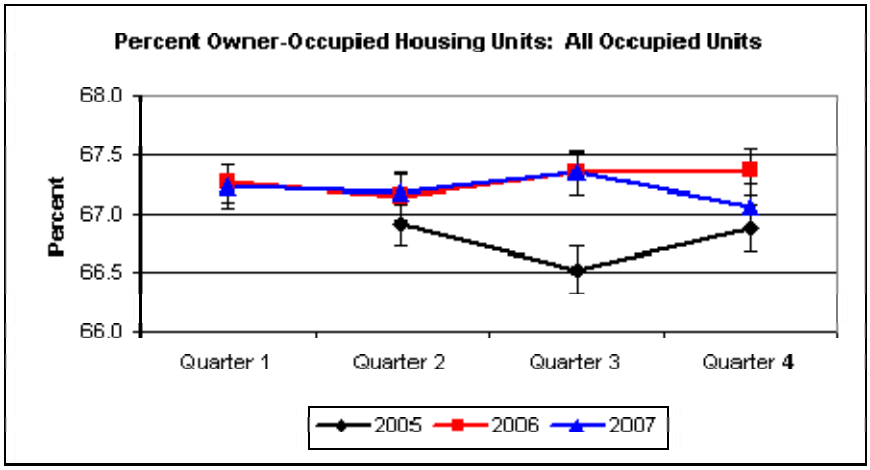
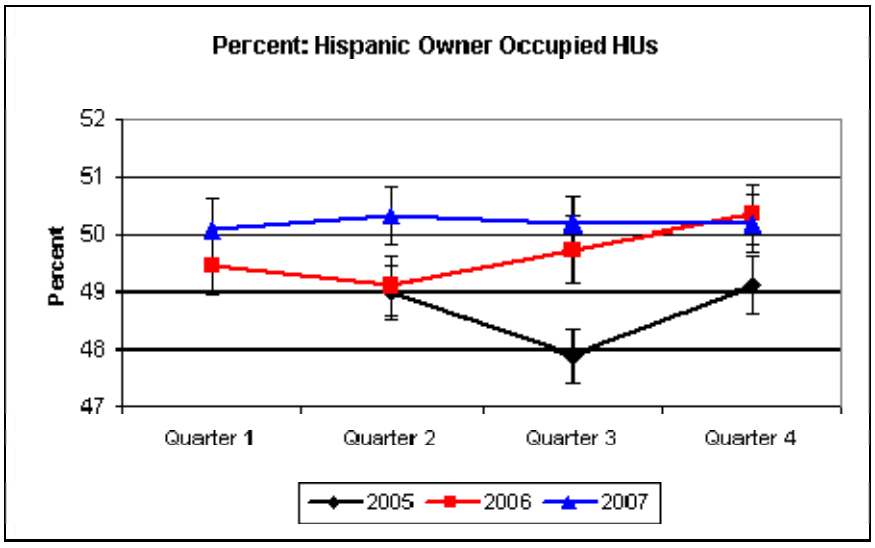


Figure 4--ACS Estimates of Owner Occupied Housing Units, by Quarter: All Occupied Units and Units with Selected Race and Origin Householders





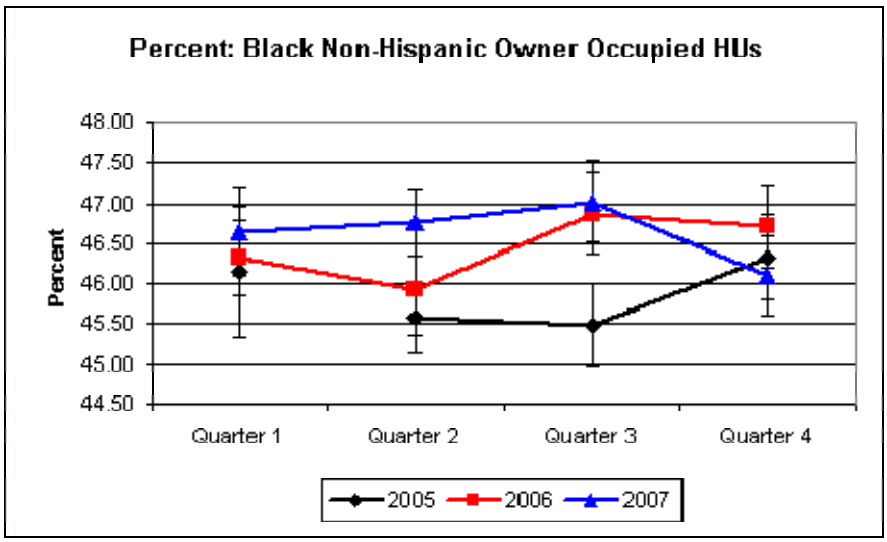


Chart 1: Poverty Rates by Month: 2006 and 2007 ACS

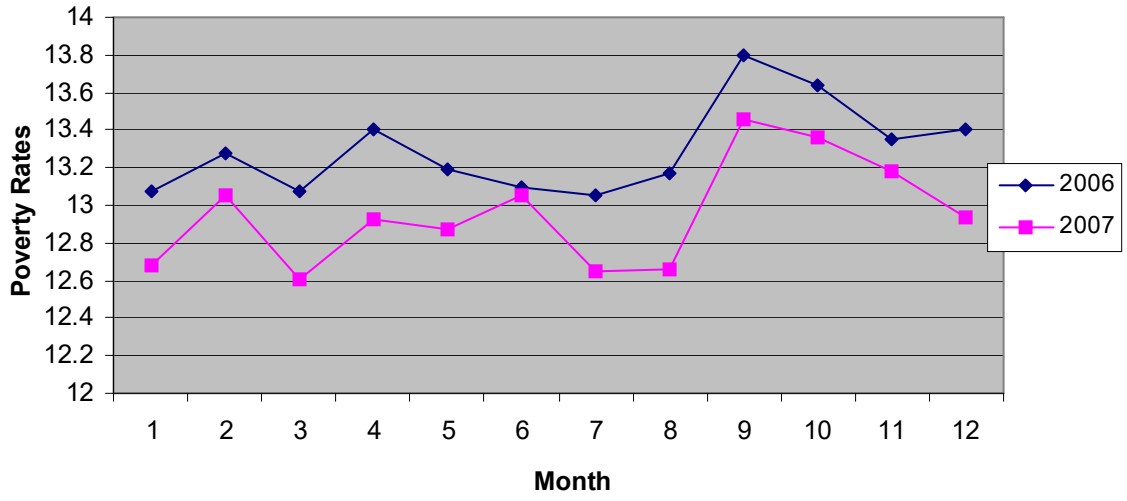


Chart 2: Percent of Interviews Conducted By Mail: 2006-2007 ACS

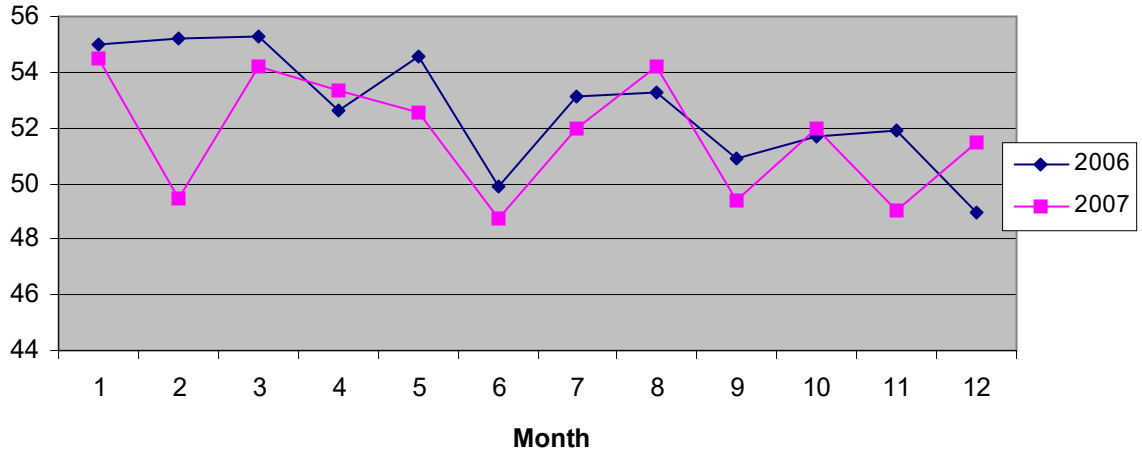


Chart 3: Monthly Poverty for People in Households by Mode: 2006 and 2007 ACS