

**Joint Center for Housing Studies  
Harvard University**

**Assessing Households and Household Growth Estimates with  
Census Bureau Surveys**

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**Abstract:** Once every ten years the decennial census provides a definitive count of people, households and housing units in the United States. During the intervening years, trends in these fundamental measures are provided by three major Census Bureau surveys: the Current Population Survey's Annual Social and Economic Supplement, the quarterly Housing Vacancy Survey, and the annual American Community Survey. However, each survey gives significantly different estimates of the number of households and housing units, which confounds the ability of housing researchers to measure changes in housing demand in the years between decennial census surveys. The release of the 2010 census provided an updated perspective as to the accuracy of the Census Bureau surveys, but many questions remain as to which survey provides the best tracking of housing demand going forward until the next decennial census is conducted. In this paper we describe the differences in various data sources' measurements of households and household growth, and we assess the main reasons for these differences. We then present what conclusions we can about the relative reliability of each annual inter-census survey for gauging trends in households and housing demand going forward. We discuss the impact of the surveys' different household counts on assumptions about headship rates, which are a key component in the Joint Center's household growth projections, and we assess the relative importance of change in headship rates as a driver of household growth. Lastly, we discuss the sensitivity of household growth projections to the alternative measures of headship rates; we find that those projections are much less sensitive to alternative measures of headship rates than to differing assumptions about future population growth and immigration.

## **Introduction**

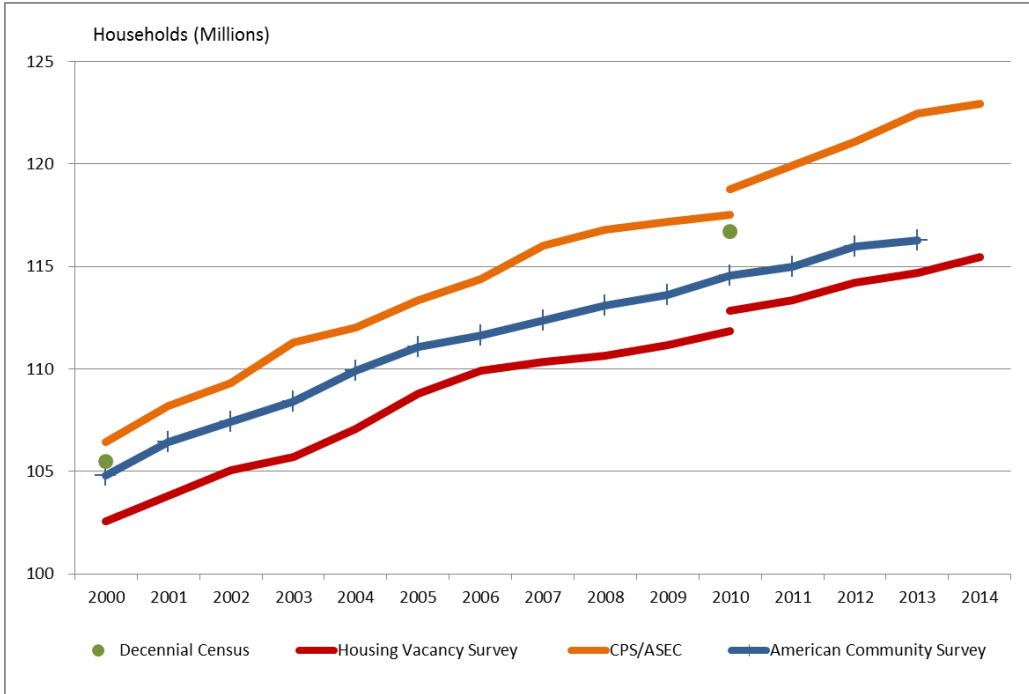
For such a basic and fundamental measure, the number of households in the US is largely a mystery. Every ten years, the decennial census provides the most reliable and accepted count, but for those who need to know counts more frequently, three major annual surveys from the Census Bureau – the American Community Survey (ACS), the Current Population Survey Annual Social and Economic Supplement (CPS/ASEC), and the Housing Vacancy Survey (HVS) – each publish very different estimates of the number of households in the US. They also show different trends in household growth. Some of these differences are understandable, but reasons for other differences are hard to identify. In addition, since none of the annual surveys' household counts are benchmarked to the decennial census, they differ even from that count. For housing analysts and other professionals, the discrepancies among the three annual surveys are a major problem. This paper addresses the problem by laying out simply what we do know about these survey counts and why they are so different. As fellow swimmers in this whirlpool of data, we cannot offer completely certain guidance. However, we do hope to help our readers understand more about these annual surveys, and about the rationale for our judgments of their strengths and weaknesses for sizing the housing market and gauging trends in household growth between decennial census surveys.

### **Section 1: Assessing Factors Contributing to Variations in Survey Estimates of Households and Vacant Housing Units**

Prior to the April 1, 2010 decennial census count, the actual number of occupied housing units was shrouded in uncertainty. The Census Bureau's three annual surveys each reported vastly different estimates. In 2010, the number of households in these surveys ranged from a high of 117.5 million in the CPS/ASEC, to a significantly lower 114.6 million in the ACS, to an even lower 112.9 million in the HVS. This range of difference, nearly 5 million households between the high and low estimates, is significant, and such differences among the annual surveys have been persistent (**Figure 1**). The 2010 decennial census did not resolve these differences as hoped. However, it does allow us to see which annual survey was best at approximating decennial census

counts. Although the CPS/ASEC stands out from other inter-census surveys with its consistently high estimate of households, its 2010 estimate was actually closest to the 2010 decennial census 100-percent count of 116.7 million occupied households (within 1 percent), giving the CPS/ASEC a boost in credibility.<sup>1</sup>

**Figure 1: Differences in household counts among annual Census Bureau surveys are both significant and persistent**



Source: JCHS tabulations of US Census Bureau data.

In fact, household counts from the CPS/ASEC and HVS were revised upward by similar amounts upon the introduction of new weights derived from the 2010 census.<sup>2</sup> This benchmarking did not much change the magnitude of the differences between the

<sup>1</sup> Furthermore, the very next year the survey was re-benchmarked so that its underlying weighting control totals were based on the then-new results of the 2010 census. The new benchmark resulted in an upwards adjustment – by 1.2 million households, or 1.05 percent – of the survey’s already high household counts. Extrapolating back a year and inflating the 2010 CPS/ASEC household count by 1.05 percent would push the CPS/ASEC household counts for 2010 further above the decennial census count and up to approximately 118.8 million. Still, this would put the CPS/ASEC counts no further above the census counts than the ACS was below, and would place the CPS/ASEC still closer than the HVS.

<sup>2</sup> Unlike CPS/ASEC and HVS, the 2010 ACS counts already used weighting controls from the 2010 census and therefore were not revised, so we cannot isolate the effect on that survey of the switch from 2000- to 2010-based controls. However, ACS did report the highest annual household growth of any survey for 2009-2010, consistent with an upwards adjustment associated with the re-benchmarking.

annual surveys; while the re-benchmarked HVS count became closer to the census result, it was still almost 4 million less than the revised CPS/ASEC estimate for 2010, which was pushed to 2 million higher than the census after its re-benchmarking.

It is critical for housing market analysts to know which of these annual survey counts will be most accurate during the coming decade. Although the CPS/ASEC came in closest to the decennial census count in 2010, it has shortcomings as a small, volatile survey representing just a single month of survey responses.

Because the annual HVS estimates are based on the average of results from monthly surveys conducted throughout the year, it offers a less volatile household count number than the CPS/ASEC. However, its household counts have been very low relative to census counts. The ACS is the largest annual Census Bureau survey to offer a household count, but it too estimated significantly fewer households than the decennial census. Additionally, the ACS has a limited history by which it can be judged, and unique methodological and definitional issues affect its household counts.

To gauge the reliability of these various estimates, we examine which methodological differences between the surveys may account for differences in their household counts, and then in their estimates of household growth. Lastly, because household counts are a critical input in the JCHS household growth projections, we look at the sensitivity of these projections to different household estimates derived from these surveys.

### **The Major Source of Difference in Household Counts among Census Bureau Surveys**

There are many potential causes for the annual surveys' disparate household counts: sampling methods, definitions of occupancy or vacancy status, time periods covered in the survey, and other factors. The most significant source of difference, however, appears to be weighting methodology. To estimate the total number of households based on a limited sample, each survey must rely on a control total, an external

estimate of the size of the whole of which the survey's sample is a part. This control total can be either a count of housing units in the national housing stock or a population count. For the three annual surveys, the choice between stock- and population-based weighting methods has a greater effect than any other choice on the survey's final counts.

The HVS and ACS both use a stock-based weighting methodology. They also take account of various aspects of sampling methodology in assigning weight to each unit in a sample. Ultimately, though, the weighted total number of housing units in each survey is forced to equal an independent estimate of the total number of units in the US housing stock. That estimate is produced by the Population Estimates Program (PEP), a separate department at the Census Bureau. The number of occupied units – and so the number of households – is essentially derived by applying the survey's estimated vacancy rate to the PEP's estimate of the total housing stock. As a result, the estimate of the housing stock is itself a key component of the estimated number of households. In contrast, the CPS/ASEC calculates its count of households based on a count of the population, not of the housing stock. The CPS/ASEC attaches weights to each person in the survey such that the weighted sum of people equals an independent estimate, also by the PEP, of the total population. CPS/ASEC then derives its household count from the weighted total number of adults in the survey who report being a head of a household. Unfortunately, stock- and population-based approaches to survey weighting produce vastly different counts for the total number of households in the US. The effect of different weighting methodologies is suggested with particular force by a comparison of the HVS and CPS/ASEC counts: the HVS is based on supplemental questions asked of the CPS sample, so both surveys derive their household estimates from the same respondents. Their different weighting methodologies must therefore account in large part for their different counts.

Particularly clear examples of the effect of weighting methodology also arise when a survey switches from one methodology to the other, as both the HVS and the ACS have done in recent years. In 2003, when the HVS explicitly switched from population-based to stock-based weighting, its estimate for the total number of households dropped by 3.8 million, or fully 3.5 percent (**Figure 2**).

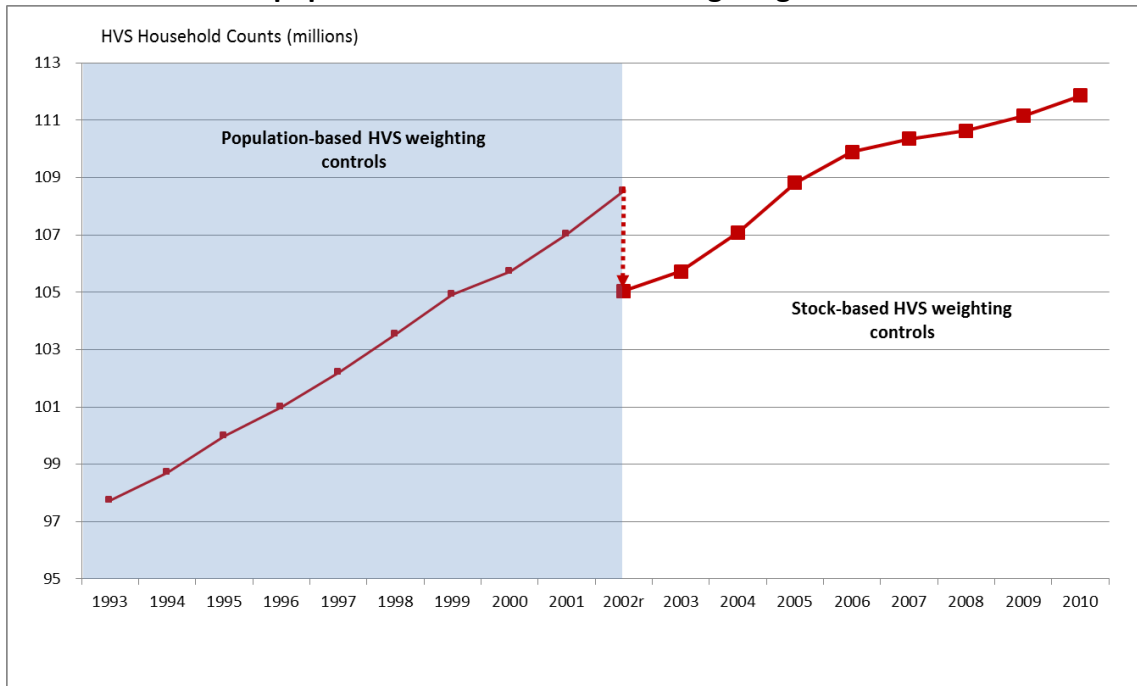
Across survey years 2005–2007, the ACS similarly but less explicitly revised its weighting methodology to force down the number of householders (heads of household) to match a stock-based estimate of total households. Prior to this shift, the ACS data included both person-weighted counts of householders in its population tables and stock-weighted counts of occupied households in its household tables, and these counts did not match. In 2005, for instance, the ACS reported 3.7 million more householders than occupied housing units.<sup>3</sup> It is likely that this de facto shift from population-based to stock-based weighting accounts in large part for the ACS’s unusually low household growth measures for the 2000–2010 decade (discussed further below). Household estimates in the HVS and, since 2007, the ACS are each benchmarked to the same independent estimate of the total housing units in the country, and they are virtually identical (within 0.1 percent). Both surveys also provide the lowest estimates of occupied housing units – well below those of the CPS/ASEC or the decennial census.

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<sup>3</sup> See Mark E. Asiala, “Weighting and Estimation Research Methodology and Results from the American Community Survey Family Equalization Project,” US Census Bureau, Washington DC.



**Figure 2: Historical HVS household counts from the early 2000s demonstrate the difference between population- and stock-based weighting controls**



Source: US Census Bureau Housing Vacancy Survey.

We cannot know for sure whether population-based or stock-based weighting provides the best estimate of the actual number of households in the US. However, the decennial census provides a reasonably good measure by which to evaluate the results of the annual surveys. The census results suggested that lower counts from the annual surveys using stock-based weighting might be less accurate. The post-enumeration evaluation of the 2010 census strengthens this suggestion. That evaluation found no evidence of over- or undercount of the number of occupied units, but did find that vacant units were likely undercounted.<sup>4</sup> These findings indicate that the census vacancy rate is lower than it should be, but also that the census estimate of the total housing stock must be too low; they therefore cast further doubt on the stock-based surveys' low counts, while lending further credibility to the higher, population-based count from CPS/ASEC.

<sup>4</sup>See [http://www.census.gov/newsroom/releases/archives/2010\\_census/cb12-95.html](http://www.census.gov/newsroom/releases/archives/2010_census/cb12-95.html) and [http://www.census.gov/coverage\\_measurement/post-enumeration\\_surveys/](http://www.census.gov/coverage_measurement/post-enumeration_surveys/).

### Additional Sources of Difference in Household Counts between Surveys

While a significant factor, control totals are not the only reason for the differences in household counts between surveys. Indeed, even though they both use stock-based weighting approaches, the HVS and ACS report significant differences in household counts (**Table 1**). Between these two surveys, much of the difference in the counts of households (or occupied units) boils down to differences in their estimated vacancy rates. As shown in Table 1, the 14.3 percent rate for 2010 in the HVS was higher than the 13.1 percent rate in the 2010 ACS (although closer to the 14.1 percent rate from the 2009 American Housing Survey). Both rates were substantially higher than the 11.4 percent vacancy rate in the 2010 census.

**Table 1: Comparison of Survey Household Counts and Vacancy Rates for Year 2010**

	2010 Census	ACS	HVS	CPS/ASEC
Housing Units (millions)	131.7	131.8	131.8	na
Occupied Units (millions)	116.7	114.6	112.9	117.6
Vacant Units (millions)	15.0	17.2	18.9	na
Vacancy Rate (percent)	11.4%	13.1%	14.3%	na

Source: JCHS tabulations of US Census Bureau data.

The reasons for the differences in vacancy rates between the ACS and HVS are not clear and deserve further study by the Census Bureau. Such questions have proven difficult to resolve. The Census Bureau has, for example, studied reasons for the differences between the 2010 ACS and 2010 decennial census, but without finding clear answers.<sup>5</sup> This research has, however, pointed to several possible methodological reasons for the decennial census/ACS differences, some of which may also explain why the ACS's

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<sup>5</sup> See "Evaluation of Gross Vacancy Rates From the 2010 Census Versus Current Surveys: Early Findings from Comparisons with the 2010 Census and the 2010 ACS 1-Year Estimates" (<http://www.census.gov/housing/files/FCSM%20paper.pdf>). See also "Comparing 2010 American Community Survey 1-Year Estimates of Occupancy Status, Vacancy Status, and Household Size with the 2010 Census - Preliminary Results" ([http://www.census.gov/acs/www/Downloads/library/2011/2011\\_Griffin\\_03.pdf](http://www.census.gov/acs/www/Downloads/library/2011/2011_Griffin_03.pdf)).

vacancy rate differs from that of the HVS. The list includes the following potential sources of difference:

- Criteria for residency. Unlike the census and the HVS, which determine residency by asking if a person's usual residence is elsewhere, the ACS determines residency by asking if a person has been or intends to be in a unit for two or more months. Using this latter question to determine residency increases the chance of a temporary or seasonal resident being misclassified as a year-round household, and can thus lead to double-counting of occupied housing units. Consider, for example, the case of a household that spends three months each year in one home and the remainder in another. The ACS would count the household as resident in their temporary home if it were surveyed while residing there, but could also count their primary home as a residence. The ACS might therefore count as an occupied residence a unit that would be considered seasonally vacant in the HVS.
- Reference periods. Though people may fill out their surveys on different days, the decennial census asks about characteristics as of April 1. In contrast, the CPS/ASEC, HVS and ACS refer more loosely to the week or month when the resident fills out a survey or when a field representative visits the unit across a collection period that may last several weeks. Surveys with collection periods rather than fixed reference dates can report lower vacancy rates because the extended period makes it possible for respondents to be in units that are vacant during other parts of the period. Additionally, the dates for the collection period also differ between surveys: the decennial census is conducted in April, and CPS/ASEC in March, while the HVS and ACS are both rolling surveys that collect data throughout the year.
- Procedures for initial declarations of vacancy. Within the data collection periods, surveys go to different lengths to follow up on non-responses before determining that a unit is vacant. In the ACS, most units are not declared vacant until a personal visit has taken place in the third month after two months of

failed attempts at data collection by mail and telephone. As a result, a three-month span of vacancy may be needed before a unit is concluded to be vacant in the ACS. The CPS and HVS do not allow for such a long span of vacancy before declaring a unit vacant, but do have vacant unit follow-ups on all units if a telephone interview is not obtained.

- Quality control measures after initial vacancy declarations. In addition to vacant unit follow-ups, surveys take other quality control measures to double check results. The Census Bureau's study found these measures (called non-response follow-ups and vacancy delete checks) to be the most important source of difference between the decennial census's and the ACS's vacancy rates. The major difference is that while the ACS double-checks for accuracy only a small sample of units initially classified as vacant, the decennial census has since 1970 —when misclassification of occupied units as vacant was found to be a major cause of population undercounts — re-visited all units initially determined to be vacant. The result has been that in each census, a significant share of units originally marked vacant has been re-classified as occupied.
- Address lists. Each of these Census surveys use the Census Bureau's Master Address File as a master address list, but not necessarily the same version of that list, which is constantly being updated in response to a changing housing stock. Therefore, the degree to which a survey's list is outdated is another source of difference. The process of updating the master list of all housing units in the country is a continuous task of the Census Bureau, but it receives particular attention in the year leading up to the decennial census. In fact, the starting point for the decennial census is an identification of every housing unit in existence as of April 1 of the census year. Therefore, the decennial census benefits from efforts to update the list that go beyond what is done on an annual basis for the other surveys.

According to the Census Bureau, these factors collectively do not adequately explain the large differences in vacancy rates between the 2010 ACS and the 2010 decennial census. Indeed, two factors that seem likely to account for substantial differences between the decennial census and the ACS — the criteria for residency and the lack of a specific reference date — would both suggest that the ACS should have a lower vacancy rate than the decennial census, but the ACS estimate is actually higher.<sup>6</sup> Clearly there is much more work to be done at the Census Bureau to more clearly isolate, identify, and gauge the magnitude of effect of these difference factors in reference to vacancy rates and household counts in the ACS and the decennial census. Hopefully such efforts can be extended to explain and eventually rectify the differences in household counts in all of the census surveys including the HVS and CPS/ASEC.

### **Conclusions on Annual Household Count Differences**

Given the effort and resources devoted to ensuring its accuracy, we feel justified in assuming that the decennial census count of households is the most reliable available measure of US households. It seems, therefore, that none of the annual surveys from the Census Bureau offer an equally reliable estimate of the number of households in the US; estimates across the three main surveys differ by more than 6 million year to year. While an assortment of methodological differences in the determinations of occupancy and vacancy have been identified as potential sources of difference in household counts between surveys, it appears that the largest difference originates from whether the survey's weighting methodology is stock- or population-based. The census results suggest that the population-based approach is preferable, and that the stock-based approach produces counts that are much too low.

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<sup>6</sup> See <http://www.census.gov/housing/files/FCSM%20paper.pdf>. Indeed, despite the ACS three month reference period a Census Bureau 2012 'match cases' analysis of units that were sampled in both the April 2010 ACS and the 2010 decennial census found more units designated vacant in the ACS but occupied in the decennial census than were found occupied in the ACS but vacant in the decennial census.

Indeed, the CPS/ASEC, the only annual survey with population-based weighting, has been tracking decennial census household counts closely for decades and came much closer to the 2010 decennial census count of 116.7 million than HVS and ACS, which use stock-based methodologies. HVS is the most purely stock-based survey, and its 2010 household count of 112.9 million was furthest from the census count – some 3.8 million below it. The ACS, even with its more lenient occupancy rules and more generous count of occupied housing units, reported 2 million fewer households than the decennial census in 2010 due to its stock-based weighting approach.

But while the stock-based annual Census surveys may be biased too low, the CPS/ASEC may actually have an upward bias in its household count. Indeed, while the 2010 CPS/ASEC came in closest to the census counts, it was still about 1 million higher. Furthermore, that figure is based on CPS/ASEC counts still benchmarked to the 2000 census. After incorporating the 2010 census re-benchmarkings that were made in 2011, the revised 2010 CPS/ASEC household count moved further away from that of the census to more than 2 million higher. Although still closer than the other surveys, CPS/ASEC counts may err on the high side just as the others err on the low side. As the only annual survey with population-based weighting, the CPS/ASEC produces household counts that appear preferable to those of the other annual surveys. It also has the advantage of a longer history, allowing it to better support analysis of long-term demographic trends. But even this survey should be used with caution. There are two caveats in particular. The first is the upward bias mentioned above. The second caveat is that the CPS/ASEC is a relatively small survey, and is therefore volatile and subject to more sampling variation than either the ACS or the HVS. Indeed, although it tracks the decennial censuses well over the decades, CPS/ASEC counts for any one specific year lack precision, which limits the CPS/ASEC's usefulness as an annual estimate of household trends. However, all is not lost as some of this volatility can be reduced by using multi-year averages of CPS/ASEC estimates as we will discuss further below.

## Section 2: Assessing Estimates of Household Growth Over the Short and Long Run

With total household counts differing so much between the Census Bureau surveys, it is not surprising that household growth estimates also differ. The differences can be substantial in any given year but are relatively modest over longer periods of time. For the last decade as a whole, household growth estimates in the major annual surveys ranged from a low of 9.3 million in the HVS to a high of 12.0 million in the rebenchmarked CPS/ASEC data— all different from the 11.2 million growth suggested by the decennial census, which if we factor in the estimated 0.5 percent overestimate of households in the 2000 census as originally published, appears to have itself underestimated household growth in 2000–2010 by about 500,000 (**Table 2**).<sup>7</sup>

**Table 2: Comparison of Household Growth, 2000 – 2010**

SURVEY	Household Growth, 2000-2010 (millions)	Difference from decennial Census (thousands)
Housing Vacancy Survey (2000 Census weights)	9.3	-1,936
American Community Survey	9.7	-1,488
Housing Vacancy Survey (post-2010 vintage weights)	10.3	-943
Current Population Survey/ASEC (unrevised w/2000 census weights)	11.1	-132
Decennial Census (without post-enumeration adjustments)	11.2	.
Decennial Census (JCHS estimate of post-enumeration adjustments)	11.75 (e)	+514
Current Population Survey/ASEC (revised w/2010 census weights)	12.0	+901

Source: JCHS tabulations of US Census Bureau data.

A further challenge in using any particular survey to track annual household growth is a general lack of long stretches of internal consistency within surveys. This has been a particular issue for the ACS because of the several significant changes made to that survey in its brief history. For instance, in 2005 the ACS expanded significantly as it

<sup>7</sup> According to the Census Bureau’s A.C.E. Revision II analysis, the 2000 decennial census is estimated to have overcounted population by 0.49 percent. This revised population overcount estimate was not carried through to make a household overcount estimate. Since much of the population overcount came from duplicate records that were identified by an elaborate matching process, it is likely that households were similarly overcounted. Adjusting the 2000 household estimates downward by 0.49 percent thus results in a greater actual growth in households for 2000-2010.

entered into full implementation and its annual sample increased from 800,000 addresses to 3 million. Then, in 2006, the survey expanded again to include group-quarters population. Also, in 2006 and then again in 2007, the ACS's weighting methodology was modified to achieve consistency between estimates of occupied housing units, households, and householders in the survey, and this modification in effect depressed the number of occupied housing units in these years relative to what would have resulted from using the 2005 methodology.<sup>8</sup> With all of these changes, the only periods with a consistent basis for estimating household growth so far in the ACS are 2007–09 and 2011–13.<sup>9</sup>

Relative to the ACS, both the CPS/ASEC and HVS have a much longer history of data from which to obtain consistent measures of households and household growth, but internal consistency remains an issue due to changes over time. Some inconsistencies in the surveys are expected. Every ten years, for instance, when a new decennial census is released, these surveys are re-benchmarked to new underlying control totals. Other adjustments, corrections, and changes to methodologies also occur from time to time and create breaks in the surveys across which household growth measures are unreliable. In 2003, for instance, CPS/ASEC changed how people were identified by race (to allow for multiple race identification for an individual); this change necessitated adjustments to the survey's weighting, so that post-2003 data are not fully comparable to pre-2003 data.<sup>10</sup> More recently, in 2014, the CPS/ASEC tested a new set of income

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<sup>8</sup> See Asiala, "Weighting and Estimation Research Methodology."

<sup>9</sup> While sampling and weighting methodologies have been consistent since 2007, in 2010 the control totals used in weighting the ACS were re-benchmarked to 2010 decennial census results, rendering spurious much of the annual growth observed in the ACS for 2009-10.

<sup>10</sup> In 2003 the survey switched its population benchmark from the 1990- to the 2000-census-based estimates. The switch was not seamless, because the 2000 census population estimates used new race and Hispanic origin categories that didn't transfer directly from the old categories under which 2000-02 CPS/ASEC data were collected. Although there was an attempt to adjust 2000-02 data according to the 2000 estimates, the CPS/ASEC household data was not fully able to match the Census weighting methodology until survey year 2003. The conflicting definitions of race and ethnicity in those earlier CPS/ASEC surveys simply did not allow for a complete and accurate re-mapping, and therefore the 2003 re-benchmark creates a break in the survey. In addition, in 2003 the Census Bureau introduced another large upward adjustment (increasing immigration estimates) to the population controls as part of its annual update of population estimates. This latter adjustment was not used to readjust the 2000-02 reweighted



questions on approximately three-eighths of the ASEC sample and released data only for households interviewed using the old income questions; the survey's sample size was thus reduced from approximately 98,000 addresses to about 68,000.<sup>11</sup> This smaller sample size increases the standard error in the 2014 counts and introduces a greater likelihood of random variability in the household growth numbers for 2013-14.

The HVS is the only survey that attempts to introduce long-run consistency in its household estimates by releasing what it refers to as "consistent-vintage" historical series of data, which provide a time series that relies on a consistent method for estimating the housing-unit control totals over time. This series provides consistent-vintage annual data under constant 2010 decennial census (stock-based) weighting controls back to year 2000. A further advantage of the HVS is that it is available on a timelier basis than other surveys, with estimates released quarterly approximately one month after the end of the quarter. In contrast, the CPS/ASEC is generally released in September of the year it is conducted, while the ACS is not released until September of the year following the survey year.

While the HVS consistent-vintage data for annual household counts across the 2000s provides the most internally consistent series of any Census survey, this series still has major shortcomings. One shortcoming is its underestimate of household growth in the 2000s relative to census data. Prior to being re-benchmarked to the 2010 census results, the HVS estimate for household growth in 2000–2010 was fully 21 percent below that of the decennial census. Even after the re-benchmarking, which revised 2010 household counts upwards by fully 1.0 million, the HVS growth estimate was still 12 percent below that of the census. Since its survey methodology has not changed recently, it seems

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data. Ultimately, the breaks in the CPS/ASEC that carry over into the HVS do not disqualify the usefulness of these surveys as measures of household growth. Indeed, reliable estimates can be determined by examining longer-term trends and using them to adjust to the data for years where there is a break in the series.

<sup>11</sup> See Semega, Jessica, Edward Welniak Jr, and Income Statistics Branch. "The Effects of Changes to the Current Population Survey, Annual Social and Economic Supplement (ASEC) Estimates of Income." (2015).

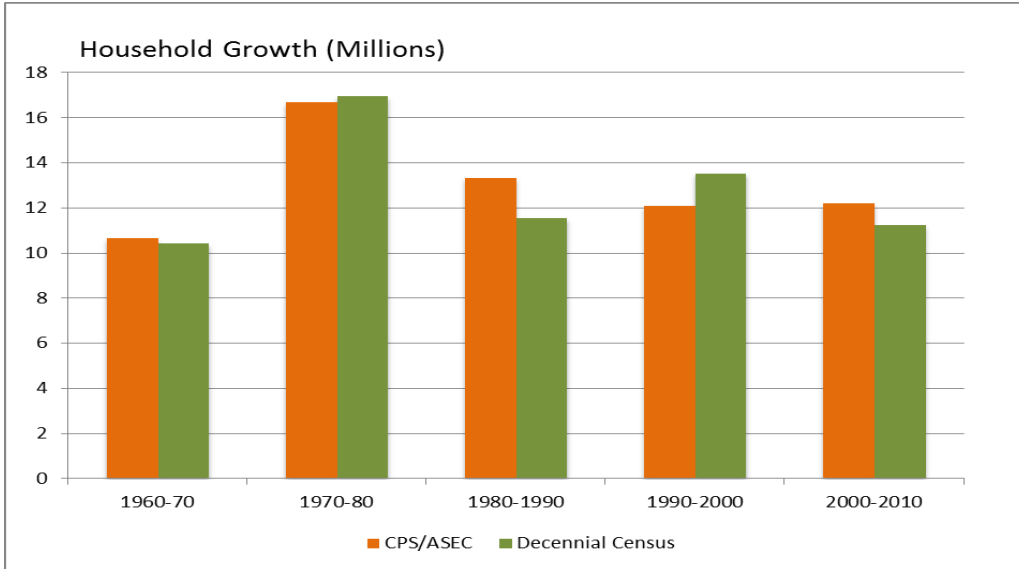
likely that the HVS continues to systematically underestimate annual household growth.<sup>12</sup>

Given the ACS's relatively short history and the HVS's persistent undercounts, the CPS/ASEC may be the best choice for measuring household growth in-between censuses. With annual counts of households dating back to the 1960s, the CPS/ASEC has the longest history annual household growth measurements. Its track record is also good in that historically, average household growth from the CPS/ASEC and decennial censuses have tracked closely (**Figure 3**). During the 1960s and the 1970s, the census and CPS growth numbers were very similar. In the 1980s, the CPS/ASEC estimated higher growth than the census —but then census was found to have a significant undercount of households in 1990, which cut into the difference. Then in the 1990s, CPS/ASEC estimated lower growth than the census — but this time census was found to have a significant overestimate of households in 2000 which also cut into the difference. In the 2000s, CPS/ASEC came closer than any other annual survey to the household growth measured in the decennial censuses. These gaps in estimates across all decades are further narrowed after adjustments based on post-enumeration evaluations are made to account for over- and undercounts in the decennial censuses (**see Appendix A**).

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<sup>12</sup> Another significant shortcoming of the HVS that limits its usefulness relative to the other annual surveys is that it offers far less detailed demographic information about households. It is also not available in a microdata format that would allow for custom tabulations and further use.

**Figure 3: The CPS/ASEC Has Tracked the Decennial Census Closely over the Decades**

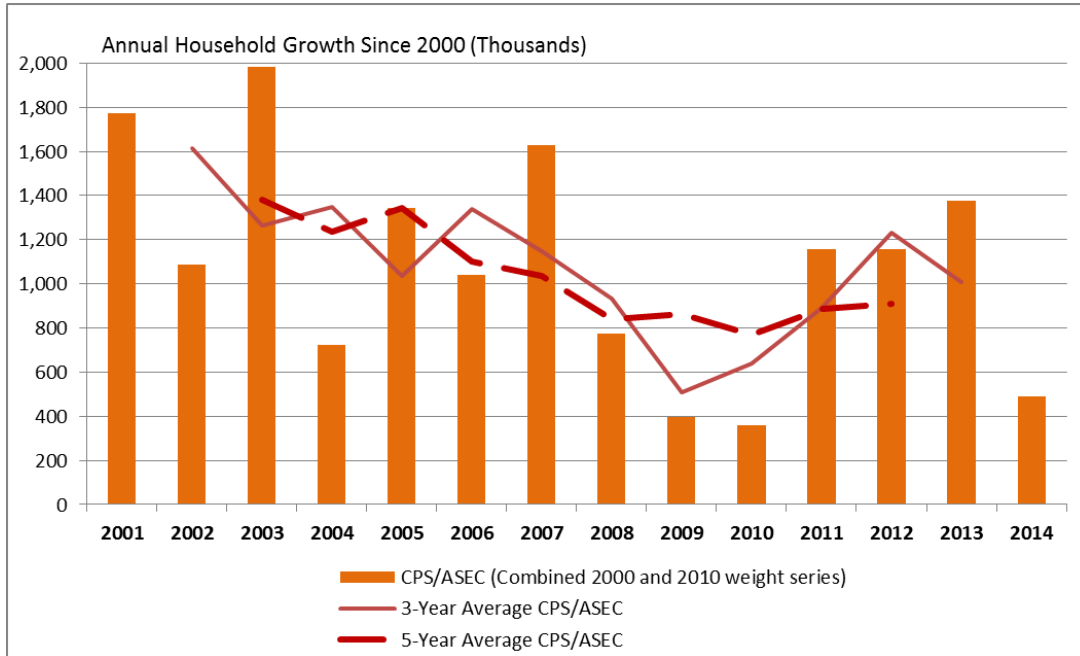


Note: Data are 3-year rolling averages to reduce volatility.

Source: JCHS tabulations of US Census data.

While the CPS/ASEC has tracked decennial census household growth well, the high volatility and wide margins of error, caused by its small sample size and constrained reference period, make it a problematic survey with which to track year-to-year household growth. Indeed, the CPS/ASEC’s measure of annual household growth reflects March-to-March growth, and is therefore not as robust as the measures used by HVS and ACS, which are based on averaging twelve months of estimates. Using such a small sample of data to determine a year or a decade of household growth can introduce big errors. However, these errors often balance out over the course of a few years (**Figure 4**). For example, CPS/ASEC household growth estimates in 2000 and 2002 and 2004 were noticeably below trend, while 2001 and 2003 were above. This suggests that the effects of random variability inherent in the CPS/ASEC can be mitigated somewhat by smoothing the data into three-year moving averages. However, the need for three years of data limits the CPC/ASEC’s value for analyzing trends in the two years prior to the most recent survey.

**Figure 4: Multi-year averages of CPS/ASEC provide for less volatile, but also less timely measures of annual household growth.**



Source: JCHS tabulations of US Census Bureau, CPS/ASEC data.

### Conclusions on Survey Measures of Annual Household Growth

Each of the annual surveys from the decennial census produces a different estimate of household growth. Compared over the 2000–2010 decade, household growth measures between these surveys range from a low of 9.3 million (HVS) to a high of 12.0 million (CPS/ASEC), all of which differ from the decennial census’s 11.2 million, as well as the post-enumeration adjusted census measure of 11.75 million.

With its measure of household growth in 2000-2010 (like its household count for 2010) coming in closest to that of the decennial census, the CPS/ASEC still appears to track that survey fairly closely as it has over the past five decades. However, despite the fact that the CPS/ASEC provides annual estimates, its usefulness as an annual indicator is limited by variability induced by its small sample size, which requires taking multi-year averages to mitigate the volatility in any single year of data. In this regard, the HVS may provide more accurate information on recent trends. But relative to the decennial census the HVS vastly underestimated household growth over the longer, 2000-2010 period, suggesting its year-to-year counts similarly and perhaps systematically

underestimate growth. Even when its weighting is adjusted in light of the decennial census results, its growth is still 1.4 million below the census figure. Lastly, the ACS holds promise as another important benchmark. Given its large sample size, it may become increasingly valuable as it develops a longer history without additional major changes to its methodology. But the ACS remains the least timely of annual surveys, and questions remain as to why its household counts and growth estimates do not match the decennial census more closely. Indeed, the ACS also underestimated household growth in 2000-2010.

Overall, if anything, this analysis has shown that none of these annual surveys are perfect, and when compared over a decade, none matches the household growth reported in the decennial census. CPS/ASEC has consistently tracked census well over the decades, but is too volatile for measuring short-term growth trends. Analysts tracking household growth year to year may be best served by combining insights from each of the available surveys, but unfortunately no one survey offers a definitive reporting of the latest year-to-year household growth trends between censuses that can be taken at face value.

### **Section 3: Long- and Short-Term Drivers of Household Growth**

Annual Census Bureau surveys provide the ability to analyze trends in headship rates – the rates at which adults live independently as heads of individual households—among different population segments, which is a key component of household growth projections. The following section explores the relative importance of headship rates as a component of household growth historically as compared to the other major components.

Household growth is driven by three major components: changes in the size of the adult population (since children do not form their own households); the age distribution of the adult population; and headship rates, which can also be described as the ratio of

households to people, of the adult population. In general, growth in the adult population will increase the number of households. However, the distribution of adults across different age spans is also important because rates of housing independence vary by age. Indeed, headship rates rise throughout adulthood, beginning sharply from young adulthood into middle age and then more gradually thereafter, but consistently and not stopping until the very oldest age groups when the likelihood of living as dependents or in group situations increases. Therefore, adult population growth concentrated among the youngest age groups with the lowest headship rates would have a smaller effect on total household growth than would population growth concentrated among older adults. In addition, headship rates within age groups can change over time due to factors such as changing employment rates, marriage patterns, mortality rates, the racial/ethnic composition of the population, and general preferences for group or solitary living.

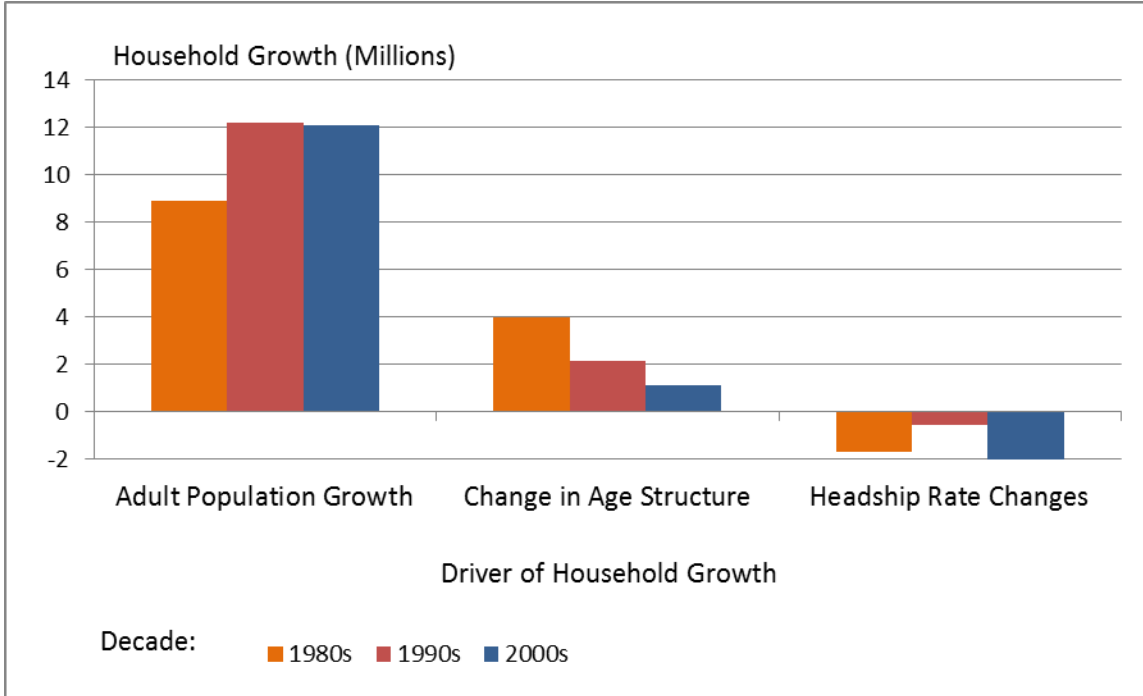
Estimating the relative contribution to household growth from each of these three components – changes in the adult population, in its age distribution, and in headship rates – by a fairly straightforward sequence of calculations,<sup>13</sup> we find that between 1980 and 2010, adult population growth has been the primary driver of household growth (**Figure 5**). The contribution of population growth to household was lowest in the 1980s as the baby bust (or Gen X) generation reached adulthood, but it then increased during the 1990s with an increase in immigration, and it increased further in the 2000s as the large Millennial generation entered into the 15-24 age group. Adult population growth alone contributed some 12.2 million households during the 1990s and 12.1 million in

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<sup>13</sup> Specifically, if we hold constant the total adult headship rate at the start of a period and multiply it by the total adult population growth during the period, the result will be the contribution of population growth alone to household growth. The difference between this value and actual household growth can be attributed to the combined effects of changes in age distribution and in headship rates. Similarly, we can isolate the contribution of changing age distribution by holding age-specific headship rates from the beginning of a period constant, and then multiplying these rates by the change in population for each five-year age group. If we add the resulting totals and then subtract the contribution of population growth alone (i.e., without regard to aging), the difference will show the contribution to household growth of changes in age distribution. Finally, the difference between actual household growth over the period and the sum of the contributions from these first two factors will show the contribution from changes in age-specific headship rates.

the 2000s.

**Figure 5: Adult population growth has been the primary driver of household growth over the past decades**



Source: JCHS tabulations of US Census Bureau, 1980-2010 decennial census surveys.

While the adult population has grown over the last three decades, the aging of the population also contributed to household growth as larger shares of adults have entered the older age groups with higher headship rates. However, as shown in figure 5, the boost to household growth from the changing age distribution declined during this period after the Baby Boom generation finished aging through years where headship rates increase most. During the 1980s, the younger and larger half of the Baby Boom generation (born 1956–1965) were age 25–34, the period of life when headship rates rise most sharply – rising from about one household for every four persons to approximately one for every two. In the 1990s these youngest Baby Boomers entered into the 35–44 age group, where headship rates continue to rise but only marginally. In the 2000s, the net contribution of changing age distribution to total household growth declined even further as the baby boom (now aged 45-64) was no longer shifting into

age groups with significantly higher headship rates, while at the same time the large Millennial cohort was now boosting the share of the population in the 15–24 age group, which has the lowest headship rates among adults.

Unlike the other two factors, the effect of changing headship rates on household growth has not shown a consistent trend, but has generally had the least impact of the three components on the overall level of household growth. In the 1980s, headship rates had a negative effect on total household growth, as rates for young adults fell. During the 1990s, young adult headship rates stabilized and even increased slightly for the two youngest age groups, before resuming their decline in the 2000s. In the 1980s and 1990s, changes in the age distribution had a larger impact on household formation than shifts in headship rates. In the 2000s, these two factors each had a relatively small impact on household growth, similar in magnitude but in opposite directions. Overall, headship rates within each age group have remained relatively stable over the past decades and over the long term the effects that past changes have had on household growth have been far overshadowed by those resulting from the substantial growth and aging of the adult population.

### **Analyzing the Components of Household Growth across the Recession**

Drivers of household growth can be analyzed across shorter periods of time by applying the same calculations to annual household survey data. Given that the CPS/ASEC comes closest to matching the household counts from the decennial census, we feel that it gives the most reliable annual estimates. To mitigate the effects of random variation due to the survey's small sample size, we prefer to rely on three-year running averages of household counts. In addition, we derive headship rates by using national resident population estimates from the Census Bureau by age and race/ethnicity rather than population estimates from CPS/ASEC as the survey does not include individuals residing



in group quarters.<sup>14</sup>

Using the CPS/ASEC and revised inter-census population estimates based on 2010 census counts, it is possible to determine how much of the decline in household growth in the aftermath of the Great Recession is due to trends in each of the three components.

As it has been over the past three decades, adult population growth was also the principal driver of household growth leading up to, during, and directly after the Great Recession (**Table 3**). Comparing household growth across three periods (2004–2007, 2007–2010, and 2010–2013) shows that population growth formed a tailwind of annual growth of over 1 million households per year. However, the contribution from adult population growth declined over the three periods examined, largely due to declines in immigration that offset increases from the Millennial generation’s entry into adulthood. This immigration-driven slowdown in population growth during 2004–2007 and 2010–2013 is consistent with a decline in the rate of annual immigration of about 600,000–800,000 per year.

**Table 3: Decomposition of CPS/ASEC Household Growth by Source**

Source of Household Growth	Average Annual Household Growth		
	2004-07	2007-10	2010-13
Growth in the Adult Population	1,353,171	1,208,218	1,107,490
Change in Age Structure of the Adult Population	110,790	187,055	213,287
Headship Rate Changes	-247,101	-593,206	-354,859
<b>Total</b>	<b>1,216,859</b>	<b>802,066</b>	<b>965,918</b>

Source: Joint Center calculations based on 3-year moving averages of CPS/ASEC household counts and revised intercensal population estimates.

<sup>14</sup> See McCue (2014) *Baseline Household Projections for the Next Decade and Beyond*. ([http://www.jchs.harvard.edu/sites/jchs.harvard.edu/files/w14-1\\_mccue\\_0.pdf](http://www.jchs.harvard.edu/sites/jchs.harvard.edu/files/w14-1_mccue_0.pdf)) for more on the methodology behind the JCHS household growth projections.

Changes in age distribution had a modest, but still-positive effect on household growth over this period, contributing approximately 200,000 additional households per year during 2010–2013. That the effect of changing age distribution on household growth was still positive is noteworthy given that this was a time where Millennials were inflating the number of adults in the youngest, lowest headship rate adult age groups. As more Millennials age into older, higher-headship rate age groups, the downward pull of this generation on headship rates due to their youth should subside and therefore age distribution changes should provide ever larger positive contributions to total household growth in future years.

Changes in age-specific headship rates exerted a large negative effect on household growth during the Great Recession. In fact, falling headship rates were already a negative influence on household growth as early as 2004–2007, but the negative impact accelerated in 2007–2010. In those years, declining headship rates reduced annual household growth by 593,000 households; in 2010–2013, they reduced household growth by an additional 350,000. The majority of these headship rate-driven declines in household growth occurred among young adults. Indeed, there is general agreement among the CPS/ASEC, ACS, and HVS that headship rates for the 15–24 and 25–34 age groups declined significantly after 2007.

### **Summary of the Relative Importance of the Components of Household Growth**

Over the last three decades, the most important factor driving household growth has been growth in the adult population, which has accounted for approximately 1.1-1.4 million new households per year. The second largest factor has been change in the age distribution of adults, which has contributed an additional 100,000–200,000 households per year. Because they depend largely on the number of births from 15 or more years ago, which we know with near-certainty, and on mortality rates, which change only slowly, the growth and aging of the adult population are reasonably predictable. The

greatest uncertainty in projections about these two factors comes from the level of net immigration, which can be significant on the margins.

Interestingly, while Table 3 shows that declining headship rates have recently had a significant negative impact on household growth, trends in headship rates by age have been the least important factor affecting household growth over the longer term. Over the three decades from 1980 to 2010, changes in headship rates have caused an average annual variation of less than 200,000 households.

In recent years, however, declines in headship rates have been a more significant factor concentrated among the youngest adults. If these lower headship rates were to persist as these young adults age, there would be a significant drag on future household growth. In contrast, headship rates among adults over age 40 have been remarkably stable. If the experience of past generations provides any clue about future trends, we might suppose that household formations among these younger adults have simply been delayed, and will recover as these cohorts age – and as their economic prospects continue to improve with the broader economic recovery.

#### **Section 4: Sensitivity of JCHS Household Growth Projections to Headship Rate Assumptions**

As discussed in section 3, headship rate estimates matter to the Joint Center because they are a key input into our projections of household growth. In this section we outline our projection methodology and our rationale for assuming constant headship rates. Additionally, given the differences in headship rates that result from very different household counts between surveys such as the ACS and CPS, we examine the sensitivity of our household growth projections to headship rate estimates from different sources.

To summarize the methodology briefly: The JCHS projects the future number of households by multiplying Census Bureau projections of the population by headship rates by age and race/Hispanic origin. These headship rates are estimated by dividing

CPS/ASEC household counts for a given group by population totals for that group from the Census Bureau's Population Estimates Program (PEP) series. (JCHS uses the PEP population count rather than CPS/ASEC's because the latter excludes persons living in institutional housing, and is therefore not compatible with the Census Bureau's population estimates and projections.) Headship rates are then averaged across the three most recent years of household and population data to minimize the effects of random variation.<sup>15</sup>

As described above, declining headship rates among young adults have been the greatest factor behind the slowdown in household growth since the mid-2000s. In part, this decline reflects the significant impact of the Great Recession on household formation rates. But it also reflects the fact that over short periods of time there are only relatively small changes in the size and age distribution of the adult population. Over longer periods, these latter two factors become more important, while changes in age-specific headship rates become less so. For this reason, and because changes in age-specific headship rates are largely driven by fluctuations in economic conditions that are difficult to forecast with accuracy, the JCHS household projections hold age-specific headship rates constant at current levels. The assumption of constant rates might conservatively bias projections downwards, since headship rates might be expected to increase as the economy recovers. However, we might expect a countervailing upward bias as well: indeed, the assumption that today's 20-year-olds will achieve the same headship rates as today's 30-year-olds may be too optimistic. However, absent any indication that there has been a decline in the desire among young adults to live independently, our assumption that headship rates will neither decline nor rebound above current levels seems reasonable and conservative.

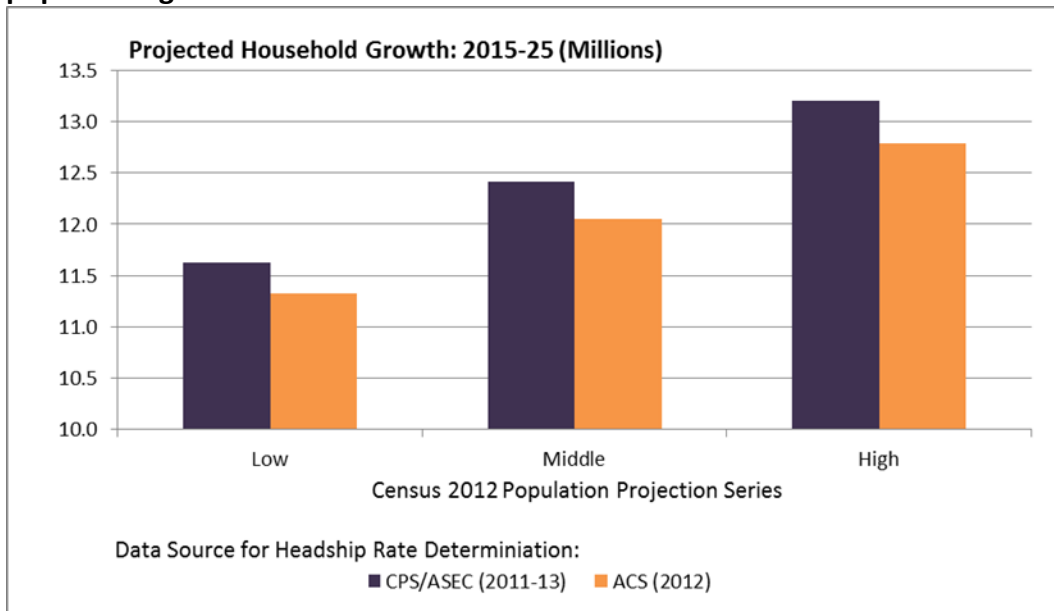
Because the JCHS must choose among alternative sources for our headship rate

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<sup>15</sup> See McCue (2014) Baseline Household Projections for the Next Decade and Beyond. ([http://www.jchs.harvard.edu/sites/jchs.harvard.edu/files/w14-1\\_mccue\\_0.pdf](http://www.jchs.harvard.edu/sites/jchs.harvard.edu/files/w14-1_mccue_0.pdf)) for more on the methodology behind the JCHS household growth projections.

estimate, we wish to know how consequential that choice is: how sensitive are the Joint Center’s household projections to alternative measures of headship rates? **Figure 6** compares household projections based on two different sources for a headship rate estimate: the CPS/ASEC household estimates averaged from 2011–2013, and the much lower ACS household estimates from 2012. (These are the two most recent data sets that allow for household tabulations by 5-year age groups and race/ethnicity.) The differences between these two household projections are much smaller than those resulting from different population estimates. (The low, middle, and high population estimates from the Census Bureau largely reflect different assumptions about the level of net immigration.) When CPS/ASEC-based headship rates are held constant, switching the population growth estimate from the 2012 low-series to the high-series population projection increases household growth projections by 1.6 million households over ten years, or 13.6 percent for 2015-25. In contrast, when the 2012 middle-series population projection is held constant, switching from CPS/ASEC-based headship rates to ACS-based rates reduces household growth projections by just 360,000 households over ten years, or 3.0 percent for 2015–2025.

**Figure 6: Household growth projections are most sensitive to assumptions about population growth**



Source: JCHS tabulations of US Census Bureau data and JCHS 2013 household growth projections.

## **Section 5: Summary and Conclusions**

Until the next decennial census, annual measures of households and household growth will be available from three different surveys from the Census Bureau. But significant discrepancies between these surveys make it difficult to assess trends in these critical measures of housing demand. The most important factor behind these discrepancies appears to be whether a survey's weighting methodology is population-based or housing stock-based. Population-based weighting uses an independent estimate of population as its control total – that is, as the whole in relation to which the survey judges the proportional size of its sample. Stock-based weighting uses as its control total an independent estimate of the total number of households. Different ways of identifying and defining a vacant housing unit are an additional source of divergence between surveys.

That population-based methodologies arrive at household counts that are three or more million households higher than stock-based counts is unsettling. Because the CPS/ASEC's population-based estimates for both household count and growth have come in closest to decennial census figures over the past several decades, it would seem to provide the most accurate interim approximations. Because of volatility due to its small sample size and constrained reference period, however, the CPC/ASEC's estimates should be used to measure year-to-year changes only with great caution. CPS/ASEC household counts may be biased too high, but other surveys appear to be biased too low to an even greater degree. Overall, CPS/ASEC appears to provide the closest available annual approximations to decennial census counts.

Over the past decade, the three main surveys have not differed as greatly about household growth levels as they have about household counts. Here, too, CPS/ASEC has tracked the decennial census most closely over long stretches of time. But over shorter periods, particularly in measuring household growth across any single year, no survey offers one much confidence. If CPS/ASEC growth measures are averaged over several

years, however, they can offer an acceptable though lagging indicator of household growth trends between decennial census surveys.

Over the next two decades, growth of the adult population will continue to be the principal driver of household growth, while changes to age distribution will provide additional support. Growth in the adult population will be driven largely by the aging of Millennials into adulthood and by immigration. Projecting the aging of today's children into adulthood is fairly straightforward, but future levels of immigration are much more uncertain and so represent the biggest wildcard in projecting future household growth. Also difficult to predict, though not as significant to long-run projections, are headship rate changes. Over the shorter term, if the economy rebounds and releases demand for household formation that was pent up during the Great Recession, particularly among young adults, rising headship rates could boost household growth. Alternatively, if the currently low headship rates among young adults persist as they age, household growth could be lower than projected. In either case, though, shifts in headship rates will have a smaller impact than changes in the size and age distribution of the adult population.

## **Appendix A: Note on the Decennial Census Counts as Benchmarks**

Although the decennial census is considered the most accurate measure of households and household growth, it also has known errors (called over- and undercounts) that have been identified in post-survey evaluations. In the past, accounting for these adjustments has often put the decennial census and CPS/ASEC growth levels more closely in line.

For example, the 1980 and 1990 censuses were both found to underestimate the population, but the undercount in 1990 was larger (1.6 percent vs. 1.2 percent), suggesting household growth in the 1980s was slightly higher than originally reported and closer to the CPS/ASEC estimate for household growth for that period. Following the 1990 undercount, there was an overcount of population in the 2000 Census of 0.49 percent, and adjusting for both corrections would mean household growth from 1990 to 2000 was less than that originally published in the census, and again closer to the growth level CPS/ASEC data show for that period. The next post-enumeration evaluation of the 2010 count revealed virtually no over- or undercount of population, which given the known overcount in 2000 means the actual 2000–2010 population growth level – and by extension the household growth level – was higher than that calculated from unrevised decennial census counts and again more in line with that shown in the CPS/ASEC.

The post-enumeration analysis that found the overcount of population in 2000 did not provide an estimate for the impact on household count for that year, but assuming the magnitude of the overcount of population in 2000 translated into a corresponding overcount of households, actual household growth 2000–2010 would measure around 550,000 higher than originally reported after adjusting for them. Truly, small changes to over- or under-estimates in any census can have a significant effect on household growth measurements.