# Comparison of Income Items from the CPS and ACS

Bruce Webster Jr.
U.S. Census Bureau

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Abstract

The Census Bureau conducts several surveys that collect income data. Each of these surveys gives slightly different results. This paper compares income responses given from the same household for the same time period on two separate surveys, the 2005 American Community Survey (ACS) and the 2005 Current Population Survey (CPS) Annual Social and Economic supplement (ASEC). To evaluate the sources of the differences in responses to the two surveys, the Census Bureau created a dataset that contains sample addresses that were in both surveys. This paper tries to isolate the reporting differences between the surveys and provide possible reasons why those differences occurred.

KEY WORDS: CPS ASEC, ACS, Response Errors

## 1. Introduction

This paper compares answers from two different surveys (the 2005 Current Population Survey (CPS) Annual Social Economic Supplement (ASEC) and the 2005 American Community Survey) that collected information from the same respondent households. These surveys were chosen because they were both administered to households in the calendar year 2005. In both surveys, the respondents were asked questions about the receipt of different sources of income and the amounts received. This study evaluates how well the income responses from the two surveys compare, and explores why the answers might differ systematically.

The reason for this comparison is readily evident when estimates published from these surveys are compared. The adjusted estimate for the 2005 CPS ASEC was $57,179, while the estimate from the ACS was $55,832. The 2005 CPS ASEC estimates are 2004 calendar year estimates inflation adjusted to 2005 dollars for comparability to the 2005 ACS estimate. National median nonfamily income was estimated to be $27,129 from the adjusted 2005 CPS ASEC, while the ACS estimated it to be $28,050. Finally, the national median earnings for male, full-time, year-round workers was estimated to be $42,160 in the adjusted 2005 CPS ASEC, while in the ACS, it was estimated to be $41,965. In all of these cases, the CPS ASEC estimate is significantly different from the corresponding ACS estimate. These estimates should theoretically be the same across the two surveys, so these differences are worth further exploration.

This paper will start with a brief overview of the two surveys that are being compared. Following that will be a look at some relevant previous literature on reporting differences. Next will be a discussion of the methodology used to compare the responses from these two surveys. Then the comparison of the income estimates from the two surveys will be presented. Finally, there will be a discussion of the results.

## 2. Previous Research

This research is similar in scope to a previous study that matched income records from Census 2000 and the 2000 CPS ASEC. That study found that, in general, responses did not match across those two surveys. With the ACS collecting data using a format similar to the Census long-form, there is some expectation that the differences seen between Census 2000 and the 2000 CPS ASEC (due to factors such as the number of questions asked in each survey) should also be seen in responses between the ACS and CPS ASEC.

However, there are further differences to note between the previous CPS ASEC/Census study and this CPS ASEC/ACS study, namely, the American Community Survey is conducted year round, while Census 2000 was conducted at one time. The reference period for both the Census 2000 income questions and the CPS ASEC

income questions in the previous study were the same, calendar year (1999), while, due to the fact that the ACS is collected year-round, the reference periods for the ACS income questions consisted of multiple 12-month periods. Only ACS interviews conducted in January 2005, with a previous 12-month reference period of January to December of 2004 would be the same as the 2005 CPS ASEC. Unfortunately, for reasons that will be discussed later, no ACS households had an interview in the month of January that matched to a 2005 ASEC household, so a comparison with matching reference periods was not possible.

With CPS ASEC reference period always being January to December, this study is looking at responses from different reference periods, and this will have an effect on the responses to the income questions. This effect is not equal for every income source. As one might expect, some sources of income change over the course of a year, such as wages and salary and interest, while others, such as retirement and social security, are more constant. In general, however, the use of different reference periods in these surveys makes it more likely that income responses from the two surveys will not agree. In the previous study, non-matching income responses had the implication that one or both of the responses were incorrect, but with different reference periods in this study, a respondent could report two different amounts of income for a single source on the two surveys, and both of their responses could be correct.

The effect of asking one question on a topic versus asking a collection of questions designed to look at that same topic discussed in the previous paper also applies in this research, since the income questions in the 2005 American Community Survey are the same as the questions in Census 2000, and the questions in the CPS ASEC have also not changed.

## 3. Methods

### 3.1 Survey Descriptions

The two surveys used in this research are the 2005 CPS ASEC and the 2005 ACS. For both surveys, the minimum age to be asked the income questions is 15. The primary goal of the CPS is to collect information on the labor force characteristics of the population of the United States. In 2005, the survey was conducted in about 50,000 households per month. Included in the survey each spring is the ASEC containing questions covering over 50 income sources, such as earnings, property income, transfer payments, and retirement. Household-level questions are used to screen respondents for receipt of income from about 50 sources followed by person-level questions on recipiency and amounts. Household screener questions are used to reduce respondent burden.

The ACS publishes estimates of basic information about the U.S. population every year, and was designed to collect data previously collected by the Census long-form. The 2005 American Community Survey included eight questions about different sources of income and a question about total income. These questions were asked for each person aged 15 years or older in the household, so for large households, the number of questions asked for the ACS would be closer to the number asked for the CPS ASEC.

The eight income questions in the ACS each had two parts. The first part asked whether a specific type of income was received during the past 12 months; the second part asked how much was received. This was repeated for all eight income questions – 1) wages and salary income; 2) self-employment income; 3) interest; dividends, rental, and royalty income; 4) social security income; 5) supplemental security income; 6) public assistance income; 7) retirement income; and 8) any other income. Again, these questions were asked of every individual aged 15 years or older in the household.

The CPS ASEC used a series of questions designed to identify over 50 income sources, to assist the respondent recalling correct information. Questions such as “What is the easiest way for you tell us your (specified income source); monthly, quarterly or yearly?”, “How much did you receive (chosen timeframe) in (specified income source) in 1999?”, and “For how many (chosen timeframe) did you receive (specified income source) in 1999?” are used to assist in more accurate reporting. Using one or more repetitions of these questions, the ASEC portion of the CPS questionnaire devotes whole sections (in some cases more than one) to covering each individual income component. Initial screener questions are asked once for the entire household to identify receipt of the various income sources, followed by questions to

identify which persons received the source and how much they received. Table 1 lists the eight ACS income components and the number of questions CPS ASEC used to ask about each one. When the CPS ASEC responses is summed up to conceptually match the ACS set, the totals should theoretically be equal.

For example, the wages and salary section of the CPS ASEC uses seven questions split into three groups whereas the ACS uses a single question. The self-employment section of the CPS ASEC has two questions that collect the same information as one in the ACS. The property income section is broken up into three components on the CPS ASEC questionnaire (interest, dividends, and a catchall for royalties, rent, and trusts), each of which gets its own set of questions, for a total of 18 questions that collect the same information as one question in the ACS. The information for Social Security income is gathered in a unique way in the CPS ASEC, as it encompasses its own section in the questionnaire and then there are separate questions for receipt of disability, survivor or retirement pensions, in addition to asking about receipt on behalf of children. The combined total of questions that gather Social Security income in the CPS ASEC is 12, while there is a single question in the ACS on the same topic. Supplemental Security income is gathered in its own individual section with five questions in the CPS ASEC questionnaire, and is covered with a single question in the ACS. Public Assistance is gathered in a single section with three questions in the CPS ASEC to match the one question in the ACS. Pension has three individual sections in the CPS ASEC (survivor benefits, disability, and retirement income), and there are 12 questions in these sections to match the one question in the ACS. The CPS ASEC equivalent to the single "Other" income question on the ACS includes state and federal unemployment compensation, supplemental unemployment compensation, union unemployment and strike benefits, worker's compensation, Veteran's assistance, educational assistance, child support payments, alimony, regular financial assistance from friends and relatives, income from hobbies, and a separate other category with severance pay, foster child care payments, welfare, emergency assistance and other money income. The total number of questions in all of the CPS ASEC individual sections is 41. Lastly, the CPS ASEC uses a final set of questions that asks for any other income source the respondent can remember, and how much income was received from that source. These last questions can provide a final source of income that can be classified as almost any ACS income category. Appendix 1 in the previously published study presents how income components in the CPS ASEC are combined to form equivalent income components in the ACS.

There are other differences between the data collection methods used in the CPS ASEC and the ACS. The CPS ASEC collects data using computer assisted telephone interviews (CATI) and computer assisted personal interviews (CAPI) exclusively conducted by highly trained field representatives, while the ACS has an initial mail mode with CATI and CAPI used for nonresponse follow-up. The differences in data collection method should be considered when comparing the two questionnaires; for example, if only CAPI were used to administer the ACS survey, the questionnaire design could change to take advantage of the complex skip patterns and design a computer instrument might offer.

### 3.2 Data Linking

To compare results from the two surveys, the datasets had to be matched. This was accomplished through the use of the master address file IDs (MAFIDs) for addresses that were in sample for the ACS and other Census Bureau surveys. This file was used to change the month in survey for the ACS so not to overburden a respondent by administering two surveys within too small a timeframe. In the case of households in both the ACS and CPS ASEC, all of the ACS interviews were moved later in the calendar year. This file was used to identify households interviewed in both surveys. Step one of the matching process was taking this file and identifying CPS ASEC records interviewed in February, March, or April.

Step two was taking these records and matching the ACS data and the CPS ASEC data using MAFIDs. The CPS ASEC data was restricted to fully reported (no imputations) records and the ACS records were unedited. The output from the second step was a dataset with ACS and CPS ASEC data where the same address was included in both surveys. The matching was done across all combinations of people within each household; to make sure that the order each member of the household was discussed in each survey was not a factor.

Step three required taking these matched households and ensuring that the people interviewed in the ACS and the people interviewed in the CPS ASEC for one address were the same people. The variables used to make these determinations were age, birth month, race, gender, educational attainment and marital status. First, any combination of people where the difference in ages was more than one year (to allow for birthdays between the two surveys) was discarded. The other variables used for this initial check included birth month, race, and gender. If a potential match was within one year on the age for the two surveys, and the birth month, race and gender were all equal for the two surveys the potential match was counted as an actual match. This accounted for 281 actual matches. If one or more of the initial match variables was missing or refused, then variables for educational attainment and marital status were included, and the person records were judged on a case-by-case basis. This resulted in 17 additional matches, for a total matched dataset of 298 people, from 170 households.

Also, any respondent below the age of 15 in either survey was discarded at this point, since neither survey collected income from the under 15 population.

### 3.3 Analysis

As mentioned before, once the amounts to the individual CPS ASEC income components are mapped and summed to ACS income components, they should conceptually match the responses given to the ACS for the same person. However, there are likely to be cases where responses were rounded for one survey and not for the other or cases in either survey in which there was a small data entry error, which could lead to the response not being exactly equal but close to each other. Rounding and data entry errors would not represent a conceptual difference in respondent answers, while differences due to a change in economic circumstance in a different reference period would represent a change in the amount reported. The smaller differences usually seen in rounding and data entry are therefore a separate issue from changes in income for a respondent due to a change in economic circumstance. To allow for these small differences, this analysis examines both exact and near matches. The first two sections discussing results considers exact matches, followed by a discussion where slight differences are treated as matches. The tolerance allowed to count as a match was five percent of the larger absolute value of the response from either survey. Five percent was chosen over a discrete dollar value because the various income components can have such a large range of values, and choosing a fixed dollar value might be appropriate for one income component (wages, for example), which could equate to a one percent difference, while for another income component (such as interest) the same dollar value would result in a ten to twenty percent difference and still be considered as a match.

### 3.4 Limitations

The smaller overall sample size in the ACS as compared to Census 2000 means that the number of matched cases that made up the research sample was greatly reduced as compared to the previous study. This study was initiated to see how income reporting using rolling 12-month reference periods compared to a fixed 12-month calendar year reference period, but the fact that ACS month of interviews for all of the matched cases were only available from cases sampled at the end of the year (as the ACS interview was moved in order to reduce respondent burden, by not asking for one household to participate in two surveys in a short time span) ultimately negated the ability of this study to look at this topic. Another limitation is the fact that data on who was the respondent in a particular household was unavailable, which means it is likely that one person in a household responded to the ACS, while a different person responded to the CPS ASEC, and their responses may not be the same for each question, depending on how much each respondent knows about the full economic circumstance of the household. Finally, the fact that the ACS is looking at the past 12 months, while the CPS ASEC looked at a calendar year, combined with the ACS being administered in the later part of the year means that the reference periods for the questions were not equivalent, and certain life events may have occurred that would make differences in reporting understandable and correct, leading to the hypothesis that responses on the two surveys most likely would not agree.

## 4. Results

### 4.1 Overall

The matching process linked 298 people 15 years and older. Of these cases, 174 had none of their data from any income question imputed in the CPS ASEC. In those nonimputed CPS cases, only 20 cases (11%) had equal total incomes in both surveys, and of those equal cases, 15 cases (75%) had zero total income. That means that a total of 5 cases showed the same nonzero total income in both surveys. This indicates that there are many instances where the estimates for a separate income source from each survey did not agree. Looking at those cases that were unequal, 91 (59%) reported higher incomes in the CPS ASEC, and 63 (41%) reported higher incomes in the ACS.

Looking at individual income sources in Table 2, one can see that the proportions of cases with equal amounts (including zero amounts) on the ACS and the CPS ASEC ranged from about 36 percent (wages and salary) to about 98 percent (public assistance) of unallocated, matched respondents. Four of the income sources – self-employment income, supplemental security income, public assistance income, and retirement income – had equal amounts for more than 90 percent of cases. Social Security income and other income are almost at that level, with equal amounts about 86 percent and 85 percent of the time, respectively, while interest income dropped off to about 66 percent.

Allowing near matches does affect the match rate for some of the components, as shown in Table 3. However, wages and salary (which increased from about 36 percent to about 44 percent), Social Security income (which increased from about 86 percent to about 90 percent), and retirement income (which increased from about 92 percent to about 94 percent) had increases of more than one percentage point from exact matches to near matches. The other five income categories did not have any change in income match rate. The proportions of cases with near matches ranges from about 44 percent (wages and salary) to about 98 percent (public assistance income).

### 4.2 Excluding Zeroes

The previous discussion only tells some of the story, as the percentages of matching amounts include those people who received none of the given source of income in each survey. It is obviously easier for a respondent to give the correct answer to a question or set of questions about an amount of income when the person did not receive that type of income. When people who did not receive an income source on both the CPS ASEC and the ACS are excluded from the analysis, the match rates drop sharply (see Table 4). After excluding zeroes, three of the eight income components (self employment income, Social Security income, and Supplemental Security income) had absolutely no matches. The matching rates of the other five components range from about 11 percent (other income) to about 33 percent (public assistance income).

When we look at near matches (see Table 5), an increase occurs for seven of the eight income components, the exception being public assistance income. The percentage point increases from exact matches to near matches for the other seven income components ranged from about four points for interest income to about 50 points for retirement income. The percentages of near matches for the income components that ranged from about 18 percent (interest income) to about 75 percent for retirement income. However, even with the relaxed matching standards, retirement income was the only component where nonzero responses matched more than half the time.

### 4.3 Non-matching Zeroes

Table 6 shows the percentage of respondents who showed a zero response to one survey and a nonzero response to the other survey for each income component. Considering that there should be no respondents who have a zero amount of income for a specific component in one survey and a nonzero amount in the other survey, the fact that for wages and salary, interest and other income the proportions of respondents in this category is over nine percent is noteworthy. In comparison, the other five sources all have proportions in this category of six percent or less.

### 4.4 Equal Total Income, Unequal Components

This study only had five cases where total income matched across the two surveys, and in all five cases all of the income components

matched as well. Each of these five cases were respondents who only earned wages and salary income, and they all worked in one of the following occupations; food and beverages service, repair technician, and construction support staff. Unless these people were given raises between the times the surveys were conducted, we would expect to see the same amount of income on each survey, so these cases are understandable. Considering the tiny sample size, this paper will draw no conclusions from this finding.

## 5. Discussion and Conclusions

This analysis leads to some basic conclusions. First, looking at the full set of respondents' answers to the income questions on the CPS ASEC and the ACS, there is some evidence that suggests that the amounts match reasonably well for some of the income components. Four of the eight components had matching responses in over 90 percent of the cases, six of eight if the cutoff is dropped to 85 percent. Including near matches only marginally increases the match rates for most of the income components, and does not change the number of components with percentages over 85 percent. Only one income component (wages and salary income) had matching responses in less than half the cases, regardless of which standard of matching was used. With this in mind, it seems the majority of the income components seem to have responses that agree most of the time.

After looking at the percentage of matching responses across the two surveys, it is important to look at only the nonzero responses, as these are the ones that will affect the means and aggregate totals for income components. No single income component had exact matching nonzero response rates of greater than 33 percent, and three of the eight income components had an exact match rate of 0 percent. Even when near matches are included, only one income component had a match rate above 50 percent. The two issues with these matching rates is that most of the income components had a small number of nonzero cases, and with the difference in reference periods, it seems understandable to have differences in some of the reported incomes. It does appear that, in general, nonzero amounts reported on the two surveys do not agree.

The existence of a subset of respondents who had a nonzero amount of an individual income component in only one of the surveys further supports the claim that these responses are not equivalent. For three of the income components (interest income, other income, and wages and salary income), this represents at least nine percent of the populations, but for the other components this represents six percent or less of the population. Again, it should be noted that with different reference periods, it is possible that a respondent reporting no income for a component on one survey, and a nonzero amount of income for the same component on a different survey could be reporting correctly.

Looking at all of this data, it must be concluded that these responses do not match across the two surveys. Of course, this does not mean that respondents are reporting incorrectly on these surveys. However, this does mean that any income comparison from one survey to the other would be subject to survey design differences (due to differences in reference period and questionnaire design) in addition to the expected errors (sampling, nonresponse, etc.) and therefore those comparisons would be less reliable. If these estimates were meant to be directly comparable, one or both of the surveys would have had to be changed to improve matching response rates.

**Table 1. Number of ASEC Questions Used to Define ACS Income Components**

| ACS Income Components | Number of ASEC Questions |
|---|---|
| Wages | 7 |
| Self-employment | 2 |
| Interest | 18 |
| Social Security | 12 |
| Supplemental Security | 5 |
| Public Assistance | 3 |
| Retirement | 12 |
| Other | 41 |

**Table 2. Exact Match Reporting Differences Between Surveys and by Income Component**

| Income Sources | ACS = CPS | % | ACS < CPS | % | ACS > CPS | % |
|---|---|---|---|---|---|---|
| Wages/Salary | 62 | 35.6% | 54 | 31.1% | 58 | 33.3% |
| Self Employment | 159 | 91.4% | 10 | 5.7% | 5 | 2.8% |
| Interest | 114 | 65.5% | 42 | 24.1% | 18 | 10.3% |
| Social Security | 149 | 85.6% | 18 | 10.3% | 7 | 4.0% |
| Supplemental Security | 166 | 95.4% | 2 | 1.1% | 6 | 3.4% |
| Public Assistance | 170 | 97.7% | 2 | 1.1% | 2 | 1.1% |
| Retirement | 161 | 92.5% | 5 | 2.9% | 8 | 4.5% |
| Other | 150 | 86.2% | 18 | 10.4% | 6 | 3.4% |

N = 174

**Table 3. Near Match Reporting Differences Between Surveys and by Income Component**

| Income Sources | ACS = CPS | % | ACS < CPS | % | ACS > CPS | % |
|---|---|---|---|---|---|---|
| Wages/Salary | 76 | 43.7% | 47 | 27.0% | 51 | 29.3% |
| Self Employment | 160 | 92.0% | 10 | 5.7% | 4 | 2.3% |
| Interest | 115 | 66.1% | 41 | 23.6% | 18 | 10.3% |
| Social Security | 156 | 89.7% | 15 | 8.6% | 3 | 1.7% |
| Supplemental Security | 168 | 96.6% | 2 | 1.1% | 4 | 2.3% |
| Public Assistance | 170 | 97.7% | 2 | 1.1% | 2 | 1.1% |
| Retirement | 165 | 94.8% | 2 | 1.1% | 7 | 4.0% |
| Other | 152 | 87.4% | 16 | 9.2% | 6 | 3.4% |

N = 174

**Table 4. Exact Match Reporting Differences of Nonzero Reponses Between Surveys and by Income Component**

| Income Sources | n of matched | % of matched | ACS = CPS | % of n | ACS < CPS | % of n | ACS > CPS | % of n |
|---|---|---|---|---|---|---|---|---|
| Wages/Salary | 101 | 58.1% | 12 | 11.9% | 37 | 36.6% | 52 | 51.5% |
| Self Employment | 4 | 2.2% | 0 | 0.0% | 2 | 50.0% | 2 | 50.0% |
| Interest | 22 | 10.9% | 3 | 13.6% | 8 | 36.4% | 11 | 50.0% |
| Social Security | 17 | 9.7% | 0 | 0.0% | 11 | 64.7% | 6 | 35.3% |
| Supplemental Security | 6 | 3.4% | 0 | 0.0% | 2 | 33.3% | 4 | 66.7% |
| Public Assistance | 3 | 1.1% | 1 | 33.3% | 2 | 66.7% | 0 | 0.0% |
| Retirement | 8 | 3.4% | 2 | 25.0% | 4 | 50.0% | 2 | 25.0% |
| Other | 9 | 4.6% | 1 | 11.1% | 5 | 55.5% | 3 | 33.3% |

N = 174

**Table 5. Near Match Reporting Differences of Nonzero Responses Between Surveys and by Income Component**

| Income Sources | n of matched | % of matched | ACS = CPS | % of n | ACS < CPS | % of n | ACS > CPS | % of n |
|---|---|---|---|---|---|---|---|---|
| Wages/Salary | 101 | 58.1% | 26 | 25.7% | 30 | 29.7% | 45 | 44.6% |
| Self Employment | 4 | 2.2% | 1 | 25.0% | 2 | 50.0% | 1 | 25.0% |
| Interest | 22 | 10.9% | 4 | 18.2% | 7 | 31.8% | 11 | 50.0% |
| Social Security | 17 | 9.7% | 7 | 41.2% | 8 | 47.1% | 2 | 11.8% |
| Supplemental Security | 6 | 3.4% | 2 | 33.3% | 2 | 33.3% | 2 | 33.3% |
| Public Assistance | 3 | 1.1% | 1 | 33.3% | 2 | 66.7% | 0 | 0.0% |
| Retirement | 8 | 3.4% | 6 | 75.0% | 1 | 12.5% | 1 | 12.5% |
| Other | 9 | 4.6% | 3 | 33.3% | 3 | 33.3% | 3 | 33.3% |

**Table 6. Responses of Zero in One Survey and Nonzero in the Other Survey by Income Component**

| Income Sources | n of sample without a 0 and nonzero | % of sample without a 0 and nonzero | ACS = 0, CPS NE 0 | | CPS = 0, ACS NE 0 | |
|---|---|---|---|---|---|---|
| | | | n | % of N | n | % of N |
| Wages/Salary | 151 | 86.8% | 17 | 9.8% | 6 | 3.4% |
| Self Employment | 163 | 93.7% | 8 | 4.6% | 3 | 1.7% |
| Interest | 133 | 76.5% | 34 | 19.5% | 7 | 4.0% |
| Social Security | 166 | 95.4% | 7 | 4.0% | 1 | 0.6% |
| Supplemental Security | 172 | 98.9% | 0 | 0.0% | 2 | 1.1% |
| Public Assistance | 172 | 98.9% | 0 | 0.0% | 2 | 1.1% |
| Retirement | 167 | 96.0% | 1 | 0.6% | 6 | 3.4% |
| Other | 158 | 90.8% | 13 | 7.5% | 3 | 1.7% |