10. USING DOLLAR-DENOMINATED DATA

Dollar-denominated data refer to any characteristics for which inflation adjustments are used when producing annual estimates or comparing estimates across time periods. For example, income, rent, home value, and energy costs across time periods are all dollar-denominated data.

Inflation will affect the comparability of dollar-denominated data across time periods. When American Community Survey (ACS) multiyear estimates for dollar-denominated data are generated, amounts are adjusted using national Consumer Price Index (CPI) annual averages, since a regional-based CPI is not available for the entire country.

Given the potential impact of inflation on observed differences of dollar-denominated data across time periods, ACS data users should adjust for the effects of inflation. Such an adjustment will provide comparable estimates accounting for inflation. In making adjustments, the U.S. Census Bureau recommends using factors based on the All-Items CPI-U-RS (CPI Research Series).[72] Explanations follow.

Creating Single-Year Income Values

ACS income values are reported based on the amount of income received during the 12 months preceding the interview month. This is the income reference period. Since there are 12 different income reference periods throughout an interview year, 12 different income inflation adjustments are made. Monthly CPI-U-RSs are used to inflation-adjust the 12 reference period incomes to a single reference period of January through December of the interview year. Note that there are no inflation adjustments for 1-year estimates of rent, home value, or energy cost values.

Adjusting Single-Year Estimates Over Time

When comparing 1-year income, rent, home value, and energy cost value estimates from two different years, adjustments should be made as follows:

1. Obtain the All Items CPI-U-RS Annual Averages for the 2 years being compared.
2. Calculate the inflation adjustment factor as the ratio of the CPI-U-RS from the more recent year to the CPI-U-RS from the earlier year.
3. Multiply the dollar-denominated data estimated for the earlier year by the inflation adjustment factor. You can also follow this same process to calculate the corresponding margin of error of the inflation-adjusted estimate.

The inflation-adjusted estimate for the earlier year can be expressed as:

$$\widehat{\mathrm{X}}_{\mathrm{Y1,Adj}} = \frac{\mathrm{CPI}_{\mathrm{Y2}}}{\mathrm{CPI}_{\mathrm{Y1}}} \widehat{\mathrm{X}}_{\mathrm{Y1}} \qquad (1)$$

where CPI_{Y1} is the All Items CPI-U-RS Annual Average for the earlier year (Y1); CPI_{Y2} is the All Items CPI-U-RS Annual Average for the more recent year (Y2); and $\hat{X}_{Y1}$ is the published ACS estimate for the earlier year (Y1).

The example below compares the national median value for owner-occupied mobile homes in 2014 ($38,400) and 2015 ($44,000). First adjust the 2014 median value using the 2014 All Items CPI-U-RS Annual Average (348.3) and the 2015 All Items CPI-U-RS Annual Average (348.9) as follows:

$$\widehat{\mathrm{X}}_{\mathrm{2014,Adj}} = \frac{348.9}{348.3} * \$38{,}400 = \$38{,}466$$

Thus, the comparison of the national median value for owner-occupied mobile homes in 2014 and 2015, in 2015 dollars, would be $38,466 (2014 inflation-adjusted to 2015 dollars) versus $44,000 (2015 dollars).

[72] U.S. Bureau of Labor Statistics, Consumer Price Index, CPI Research Series Using Current Methods (CPI-U-RS), <www.bls.gov/cpi/research-series/home.htm>.

Creating Values Used in Multiyear Estimates

Multiyear income, rent, home value, and energy cost values are created with inflation adjustments. The Census Bureau uses the All Items CPI-U-RS Annual Averages for each year in the multiyear time period to calculate a set of inflation adjustment factors. Adjustment factors for a time period are calculated as ratios of the CPI-U-RS Annual Average from the most recent year to the CPI-U-RS Annual Averages from each of the earlier years. The ACS values for each of the earlier years in the multiyear period are multiplied by the appropriate inflation adjustment factors to produce the inflation-adjusted values. These values are then used to create the multiyear estimates.

As an illustration, consider the time period 2014–2018, with hypothetical individual reference-year income values ranging from $15,000 in 2014 to $30,000 in 2018 (see Table 10.1).

Table 10.1. **Hypothetical Income Values Adjusted for Inflation: 2014–2018**

Reference Year	Income	CPI-U-RS Annual Averages	Inflation-Adjusted Income
2018	$30,000	369.8	$30,000
2017	$30,000	361.0	$30,731
2016	$25,000	353.4	$26,160
2015	$20,000	348.9	$21,198
2014	$15,000	348.3	$15,926

In this example, the multiyear income components are created from inflation-adjusted income values using the CPI-U-RS Annual Averages shown in the third column of the table. The inflation-adjusted 2017 value is the ratio of 369.8 to 361.0 applied to $30,000, which equals $30,731. The same calculation is applied to the income values from 2014 through 2016 to produce inflation-adjusted values for those years. These individual values are then used to create the multiyear estimate for the 2014–2018 time period.

Adjusting Multiyear Estimates Over Time

When comparing multiyear estimates from two different time periods, adjustments should be made as follows:

1. Obtain the latest available All Items CPI-U-RS Annual Averages for the two periods being compared.
2. Calculate the inflation adjustment factor as the ratio of the CPI-U-RS Annual Average in formula (1) from the most recent year to the CPI-U-RS in formula (1) from the earlier year.
3. Multiply the dollar-denominated estimate for the earlier time period by the inflation adjustment factor. You can also follow this same process to calculate the corresponding margin of error of the inflation-adjusted estimate.

The inflation-adjusted estimate for the earlier year can be expressed as:

$$\widehat{X}_{P1,Adj} = \frac{CPI_{P2}}{CPI_{P1}} \widehat{X}_{P1} \qquad (2)$$

where CPI_{P1} is the All Items CPI-U-RS Annual Average for the last year in the earlier time period (P1).

CPI_{P2} is the All Items CPI-U-RS Annual Average for the last year in the most current time period (P2).

$\widehat{X}_{P1}$ is the published ACS estimate for the earlier time period (P1).

As an illustration, consider ACS multiyear estimates for the two time periods of 2005–2009 and 2010–2014. To compare the median household income for owner-occupied mobile homes in 2005–2009 ($40,800) and

2010–2014 ($39,000), first adjust the 2005–2009 median value using the 2009 All Items CPI-U-RS Annual Averages (315.2) and the 2014 All Items CPI-U-RS Annual Averages (348.3) as follows:

$$\hat{X}_{2005-2009,\text{Adj}} = \frac{348.3}{315.2} * \$40{,}800 = \$45{,}085$$

Thus, the comparison of the national median value for owner-occupied mobile homes in 2005–2009 and 2010–2014, in 2014 dollars, would be $45,085 (2005–2009 inflation-adjusted to 2014 dollars) versus $39,000 (2010–2014, already in 2014 dollars).

Issues Associated With Inflation Adjustment

The recommended inflation adjustment uses a national-level CPI and, thus, will not reflect inflation differences that may exist across different geographic areas. In addition, since the inflation adjustment uses the All Items CPI, it will not reflect differences that may exist across characteristics such as energy and housing costs.