

# STATE INFLATION TRACKER: METHODOLOGY

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This project quantifies the inflation costs that American households are facing in the high inflationary environment that began in early 2021. We define monthly inflation costs as the additional expenditures in a given month required for a household to attain the same standard of living it achieved in the baseline month, January 2021.

Estimating inflation costs for the average household in each state consists of three main steps: (1) estimating average monthly household spending by state, (2) approximating inflation rates by state, each relative to January 2021, and (3) applying the inflation rates to monthly household spending to estimate state-level inflation costs. For each state, we estimate overall monthly household inflation costs as well as inflation costs within four spending categories: food, shelter, transportation, and energy.

We proceed by first explaining why we choose January 2021 as the baseline month for calculating inflation costs, and then describing in detail each of the three main steps mentioned above.

## WHY CALCULATE INFLATION COSTS RELATIVE TO JANUARY 2021?

Whereas the Bureau of Labor Statistics (BLS) reports annual inflation rates (i.e., the percent increase in prices in the current month relative to prices 12 months ago), this project aims to capture added costs from inflation since January 2021. In other words: how much more must the average household pay today to maintain the same standard of living it achieved in January 2021?

We use January 2021 as the baseline month for measuring inflation costs because prices were not yet rising rapidly—the annual inflation rate in January was within recent historical norms at 1.4 percent. But soon after, consumers' COVID-related hesitancy subsided and demand picked up, fueled in part by the American Rescue Plan Act signed into law in March 2021. Personal consumption expenditures exceeded pre-pandemic levels beginning in January 2021, stoking annual inflation rates of 2.6 percent in March and 4.2 percent in April.<sup>1</sup> Because January

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<sup>1</sup> Inflation rates are retrieved from: Bureau of Labor Statistics. Databases, Tables, & Calculators by Subject. Inflation & Prices, All Urban Consumers (Current Series). <https://www.bls.gov/data/home.htm>.

2021 predated these changes in economic conditions, it serves as a relevant baseline month for assessing price increases during this period of high inflation. In addition, January 2021 conveniently represents the beginning of a calendar year and marks a changing of presidential administrations and congressional leadership with new policy priorities, some of which put upward pressure on inflation.

Unlike BLS, we do not change the baseline month over time because we seek to measure total household inflation costs imposed since the beginning of the high inflationary environment that took effect at the beginning of 2021. Using annual inflation rates understates total inflation costs over this period by accounting only for price increases over the past 12 months, rather than all months since January 2021. Measuring inflation costs relative to January 2021 acknowledges that American households will continue to face higher prices every month, relative to what they would have otherwise been, even if the inflation rate reverts to normal levels. Yet, calculating inflation costs in this way does not account for the expected 1 percent to 2 percent inflation that would likely have transpired in the absence of the pandemic and resulting policy response, and that is true regardless of whether our inflation measure is used or the BLS's.

## **ESTIMATING HOUSEHOLD SPENDING BY STATE**

The most common source used to measure household spending is the BLS Consumer Expenditure Survey (CE). Unfortunately, the CE does not measure household spending at the state level, so our analysis instead relies on state-level personal consumption expenditures (PCE) reported by the Bureau of Economic Analysis (BEA).

While the CE and PCE both measure spending, the spending levels they report are considerably different; PCE consistently suggests higher aggregate spending levels than the CE, and these differences have been widening over time.<sup>2</sup> The disparities stem from the fact that the CE is a survey of households while PCE is derived using government surveys of businesses, and the two sources have differences in their coverage, definitions, and measurements.<sup>3</sup> For instance, PCE includes spending by the institutionalized population and military personnel while the CE does not, PCE includes spending by the government and employers on behalf of households while the CE does not, and

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<sup>2</sup> William Passero, Thesia I. Garner, Clinton McCully, "Understanding the Relationship: CE Survey and PCE" in *Improving the Measurement of Consumer Expenditures*, ed. Christopher D. Carroll, Thomas F. Crossley, and John Sabelhaus (University of Chicago Press, 2015), 181-203

<sup>3</sup> Ibid.

consumer units in the CE often underreport their spending levels because of difficulties recalling their spending habits. Because the spending categories in the CE better align with the market basket upon which the BLS price index we use is based, our analysis adjusts PCE to better match CE consumer unit spending levels.

We start with aggregate state-level household expenditures reported by BEA as a component of PCE.<sup>4</sup> Then, we find the CE/PCE ratio for each Census division<sup>5</sup>—the most disaggregated geography for which CE reports consumer unit spending—and multiply the appropriate Census division ratio by the state-level PCE to find CE-adjusted spending by state. The ratios are calculated using 2019-2020 averages of aggregate CE and PCE spending, as BLS exclusively reports Census division-level spending in the CE as two-year spending averages. Table 1 shows the CE/PCE ratio for 2019-2020 among each Census Division.

Table 1: Ratio of Consumer Expenditure Survey (CE) Spending to Personal Consumption Expenditures (PCE) by Census Division, 2019-2020

Census Division	CE-PCE Ratio
East North Central	0.59
East South Central	0.63
Middle Atlantic	0.58
Mountain	0.60
New England	0.64
Pacific	0.59
South Atlantic	0.59
West North Central	0.67
West South Central	0.56

Source: CE spending is retrieved from the Consumer Expenditure Survey from the Bureau of Labor Statistics; PCE spending is retrieved from the Bureau of Economic Analysis.

Notes: The CE-PCE ratio is the 2019/2020 average of nationwide consumer unit expenditures reported in the CE divided by the 2019/2020 average of nationwide household expenditures, which is a component of PCE. The fact that the ratio is less than one reflects that PCE's measure of spending is significantly higher than CE's spending measure.

<sup>4</sup> PCE is retrieved from: Bureau of Economic Analysis. Regional Data. GDP and Personal Income. Personal consumption expenditures by function (SAPCE4). Household consumption expenditures. <https://apps.bea.gov/itable/itable.cfm?ReqID=70&step=1>.

<sup>5</sup> CE is retrieved from: Bureau of Labor Statistics. Consumer Expenditure Surveys. CE Tables. Division of Residence. <https://www.bls.gov/cex/tables.htm#geo>.

PCE is retrieved from: Bureau of Economic Analysis. Regional Data. GDP and Personal Income. Personal consumption expenditures by function (SAPCE4). Household consumption expenditures. <https://apps.bea.gov/itable/itable.cfm?ReqID=70&step=1>.

After estimating aggregate consumer unit spending at the state level, the next step is to estimate the number of households in each state, which is reported by the Census Bureau's American Community Survey (ACS).<sup>6</sup> Using households as the unit of measurement, however, would render this analysis incomparable with the CE, which reports average spending by consumer unit. Whereas a household is defined as all people who live together in a single housing unit regardless of whether they pool resources, a consumer unit is defined as one or more persons living together who make joint spending decisions. Naturally, there are more consumer units than households, so using household as the unit of measurement would overstate average spending by consumer units.

Therefore, to adequately replicate the CE's reporting of expenditures at the consumer unit level, we adjust the ACS estimate of households upward to better reflect the larger number of consumer units. Table 2 reports the ratio of consumer units to households in each Census division,<sup>7</sup> which we then multiply by the number of households in each state (depending on the Census division in which the state is located) to impute the number of consumer units in each state. Census was unable to report a 2020 ACS-based estimate of households by state due to COVID-19 impacts on data collection.<sup>8</sup> Therefore, the ratio is calculated using 2019 household estimates.

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<sup>6</sup> United States Census Bureau. American Community Survey. DP02: Selected Social Characteristics in the United States. 2019: ACS 1-Year Estimates Data Profiles.

<https://data.census.gov/cedsci/table?q=Household%20and%20Family&tid=ACSDPIY2019.DP02>.

<sup>7</sup> Consumer Units are retrieved from: Bureau of Labor Statistics. Consumer Expenditure Surveys. CE Tables. Division of Residence. <https://www.bls.gov/cex/tables.htm#geo>.

Households are retrieved from: United States Census Bureau. American Community Survey. DP02: Selected Social Characteristics in the United States. 2019: ACS 1-Year Estimates Data Profiles.

<https://data.census.gov/cedsci/table?q=Household%20and%20Family&tid=ACSDPIY2019.DP02>.

<sup>8</sup> "Census Bureau Announces Changes for 2020 American Community Survey 1-Year Estimates," *United States Census Bureau*, July 29, 2021, <https://www.census.gov/newsroom/press-releases/2021/changes-2020-ac-s-1-year.html>.

Table 2: Ratio of Consumer Units (2019-2020) to Households (2019) by Census Division

Census Division	Consumer Unit - Household Ratio
East North Central	1.01
East South Central	1.09
Middle Atlantic	1.06
Mountain	1.02
New England	1.09
Pacific	1.11
South Atlantic	1.10
West North Central	1.08
West South Central	1.09

Source: Consumer Unit counts are retrieved from the Consumer Expenditure Survey from the Bureau of Labor Statistics; Household counts are retrieved from the American Community Survey from the Census Bureau.

Notes: The consumer unit-household ratio is the 2019/2020 average number of consumer units reported in the CE divided by the 2019 number of households found in the ACS. The fact that the ratio is more than one reflects that there are more consumer units than households.

To estimate average consumer unit spending by state, the next step is to divide our estimate of CE-adjusted household spending in each state by our estimate of consumer units in each state. Those values are then divided by 12 to calculate average monthly consumer unit spending in each state. Thus, we create a two-year estimate of average consumer unit spending in the years 2019 and 2020.

Because January 2021 is the baseline month for our calculation of inflation costs, it is important that our measure of consumer unit spending reflects spending in January 2021. Due to data availability, it is impossible to recreate the above analysis with January 2021 spending data. However, our estimate of 2019-2020 consumer unit spending can be adjusted to better reflect consumer unit spending in January 2021.

As of this writing, the only publicly available data reflecting consumer spending in January 2021 is national-level PCE reported by BEA. To adjust our estimate of consumer unit spending by state to January 2021 levels, we assume that consumer unit spending in each state grew at the same rate as national PCE, which increased approximately 4.4 percent from its 2019-2020 average to the annualized value BEA reported for January 2021.<sup>9</sup>

After these adjustments, we obtain the final spending estimates to be used in the analysis, which are displayed in Table 3. While these estimates reflect spending made by consumer units, we colloquially refer to them as “household spending” in the State Inflation Tracker.

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<sup>9</sup> The 2019-2020 average of national PCE is \$14.2 trillion and the January 2021 annualized PCE is \$14.9 trillion.

The 2019-2020 average of national PCE is calculating using data from: Bureau of Economic Analysis. Personal Income and Outlays. Table 2.3.5. Personal Consumption Expenditures by Major Type of Product (A) (Q).

January 2021 annualized PCE is retrieved from: Bureau of Economic Analysis. Personal Income and Outlays. Table 2.8.5. Personal Consumption Expenditures by Major Type of Product, Monthly (M). <https://apps.bea.gov/iTable/iTable.cfm?reqid=19&step=2#reqid=19&step=2&isuri=1&1921=survey>.

Table 3: Average Monthly Consumer Unit Spending by State, January 2021

State	Average Monthly Consumer Unit Spending	State	Average Monthly Consumer Unit Spending
United States	\$5,408	Missouri	\$5,325
Alabama	\$4,585	Montana	\$5,131
Alaska	\$6,345	Nebraska	\$5,444
Arizona	\$5,415	Nevada	\$5,401
Arkansas	\$3,859	New Hampshire	\$6,414
California	\$6,373	New Jersey	\$6,193
Colorado	\$6,092	New Mexico	\$4,677
Connecticut	\$6,443	New York	\$6,084
Delaware	\$5,461	North Carolina	\$4,678
District of Columbia	\$7,447	North Dakota	\$5,490
Florida	\$5,632	Ohio	\$4,802
Georgia	\$4,944	Oklahoma	\$4,013
Hawaii	\$6,161	Oregon	\$4,847
Idaho	\$4,959	Pennsylvania	\$5,212
Illinois	\$5,583	Rhode Island	\$5,539
Indiana	\$4,870	South Carolina	\$4,546
Iowa	\$4,866	South Dakota	\$5,481
Kansas	\$5,273	Tennessee	\$4,807
Kentucky	\$4,547	Texas	\$5,055
Louisiana	\$4,341	Utah	\$5,911
Maine	\$5,196	Vermont	\$5,479
Maryland	\$5,562	Virginia	\$5,323
Massachusetts	\$6,784	Washington	\$5,433
Michigan	\$5,036	West Virginia	\$4,087
Minnesota	\$6,003	Wisconsin	\$4,890
Mississippi	\$4,271	Wyoming	\$5,276

Source: JEC Calculations using: household expenditures, a component of the Bureau of Economic Analysis' personal consumption expenditures; consumer unit spending from the Bureau of Labor Statistics' Consumer Expenditure Survey; consumer unit counts from the Bureau of Labor Statistics' Consumer Expenditure Survey; and household counts from the Census Bureau's American Community Survey.

Notes: These spending values represent average monthly spending per consumer unit per month, based on 2019-2020 averages that were updated to January 2021 levels.

## INFLATION COST CALCULATION

Inflation is calculated using the Consumer Price Index (CPI) for all urban consumers.<sup>10</sup> For each month, inflation costs are calculated according to the formula below, where  $CPI_{i,t}$  represents the CPI for the state  $i$  and month  $t$  in which inflation costs are calculated, and  $CPI_{i,Jan2021}$  represents the base level (January 2021) CPI for state  $i$ .

$MonthlySpending_{Jan2021}$  refers to the average monthly household spending from Table 3, which varies by state.

$$\begin{aligned} InflationCost_{i,t} &= \frac{CPI_{i,t}}{CPI_{i,Jan2021}} \times MonthlySpending_{i,Jan2021} \\ &\quad - MonthlySpending_{i,Jan2021} \end{aligned}$$

BLS does not report CPI by state, however it does report CPI for each of the nine Census divisions. For the purposes of this analysis, a state's CPI is assumed to be equal to the CPI of the Census division in which it is located. We use the same baseline spending amount regardless of month  $t$  because the inflation cost represents the extra cost to afford the same standard of living achieved in the baseline month.

Annualized inflation costs are found by multiplying monthly inflation costs by 12. Because we calculate inflation costs relative to January 2021, this calculation can be interpreted as the inflation costs borne by American households over the subsequent year if monthly inflation were to drop to zero in the following month.

## ESTIMATING CATEGORY-SPECIFIC MONTHLY HOUSEHOLD SPENDING AND INFLATION COSTS

To estimate inflation costs for food, shelter, energy, and transportation by state, this same calculation is repeated using category-specific CPIs and average monthly household spending estimates for each category.

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<sup>10</sup> CPI is retrieved from: Bureau of Labor Statistics. Databases, Tables, & Calculators by Subject. Inflation & Prices, All Urban Consumers (Current Series). <https://www.bls.gov/data/home.htm>. Conceptually, the ideal price index would represent the higher cost of achieving a constant standard of living (or utility level) such the household is just as well off in the current month as it was in the baseline month. However, as the Bureau of Labor Statistics notes, the CPI is not a pure cost-of-living index because it does not incorporate all factors that affect well-being, and because it only partially accounts for the ability of consumers to substitute between items when prices change. Nonetheless, the Bureau of Labor Statistics assesses methodological decisions regarding the CPI-U based the goal of achieving a cost-of-living index, and improvements in recent years have moved the CPI-U closer to this ideal. Thus, we characterize the CPI and our resulting inflation cost estimates in this manner. <https://www.bls.gov/cpi/questions-and-answers.htm>.



To ensure comparability, the spending categories examined were ones that could be matched between the CPI and the CE.

Table 4 details the matched categories used in this analysis. Energy inflation costs were calculated by adding up inflation costs within three energy sub-categories that could be matched between CPI and CE.<sup>11</sup>

To estimate how much consumer units spend on each of these items, we use the CE to find the percentage of consumer unit expenditures spent on each category, by Census division, and then multiply those percentages by our estimate of consumer unit spending by state. Inflation costs are then calculated the same way as overall inflation costs, but using category specific CPI values.

Table 4: CPI-CE Category Comparison

Consumer Price Index (CPI) Categories	Consumer Expenditure Survey (CE) Categories
Food	Food
Shelter	Shelter
Transportation	Transportation
Energy	Energy
Electricity	Electricity
Utility (piped) gas service	Natural gas
Motor fuel	Gasoline, other fuels, and motor oil

Source: Bureau of Labor Statistics Consumer Price Index; Bureau of Labor Statistics Consumer Expenditure Survey.

Notes: Categories chosen by JEC to best approximate similar baskets.

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<sup>11</sup> Our definition of energy is unique; the three energy subcategories for which we choose to calculate inflation costs do not make up the entirety of “energy” as defined by either the CPI or the CE. These categories were chosen because their definitions could be matched between the CPI and the CE. A potential inconsistency could arise if BLS corrected for substitution bias within these CPI categories, making it inappropriate to sum their inflation costs. Fortunately, this is not an issue. While BLS accounts for substitution bias in its calculation of CPI—consumers’ tendencies to switch to lower-cost alternatives when faced with rising prices—this adjustment is only made within item categories, not between them. <https://www.bls.gov/opub/btn/volume-1/consumer-price-index-data-quality-how-accurate-is-the-us-cpi.htm>.