

Supporting Statement

**B. Collection of Information Employing Statistical Methods**

**1. Sampling Method**

The Consumer Expenditure (CE) Survey is a nationwide household survey conducted by the U.S. Bureau of Labor Statistics to find out how Americans spend their money. The CE Survey actually consists of two sub-surveys, a Quarterly Interview Survey (CEQ), and a two-week Diary Survey (CED). The Quarterly Interview Survey collects detailed information on large expenditures such as property, automobiles, and major appliances, as well as on recurring expenditures such as rent, utilities, and insurance premiums. By contrast, the Diary Survey collects detailed information on small, frequently purchased items such as food and apparel. The data from the two surveys are then combined to provide a complete picture of consumer expenditures in the United States.

The data for both surveys are collected from a representative sample of households around the country. Both surveys have the same sample design, which is a two-stage sampling process. In the first stage a representative sample of counties from around the United States is selected for the survey. And in the second stage a representative sample of households from those counties is selected for the survey. This two-stage process is designed to generate a sample of households in which every wealth level and every demographic group is well-represented in the survey. The rest of this section describes these two sampling processes in more detail.

**Primary Sampling Units (PSUs)**

In the first stage of sampling, all 3,143 counties or county equivalents in the United States are partitioned into small geographic clusters called “primary sampling units” (PSUs) from which a representative sample of 91 of them are randomly selected for the survey. The clusters are the “core-based statistical areas” defined by the Office of Management and Budget (OMB), and they range in size from 1 to 29 counties with the average size being 5 counties. The same sample of 91 PSUs is used in both the CEQ and CED surveys. The 91 PSUs fall into three categories:

<b>PSU “size class”</b>	<b>Number of PSUs</b>	<b>Description</b>
S	23	Large Metropolitan Core Based Statistical Areas (self-representing PSUs)
N	52	Small Metropolitan Core Based Statistical Areas and Micropolitan Core Based Statistical Areas (non-self-representing “urban” PSUs)
R	16	Non-Core Based Statistical Areas (non-self-representing “rural” PSUs)

BLS selected these PSUs from a stratified sample design in which all 23 “S” PSUs were selected for the survey with certainty, while all the non-self-representing PSUs (the N and R PSUs) were stratified into 68 strata using a 4-variable model whose independent variables were latitude, longitude, median household income, and median household property value. Then one PSU was

randomly selected from each stratum with its probability of selection being proportional to its population.

All 91 PSUs are used by the CE survey. However, one of CE's major customers is the Consumer Price Index (CPI), which uses CE data for its expenditure weights. Because the CPI is an urban survey, not a national survey, only the 75 urban PSUs (the 23 "S" PSUs and the 52 "N" PSUs) are used by the CPI.

#### Sampling Households Within PSUs

After selecting a sample of PSUs, a sample of households was then selected from the civilian non-institutional portion of their populations. This includes people living in houses, condominiums, and apartments, as well as people living in group quarters such as college dormitories or boarding houses. However, it excludes the non-civilian and institutional portions of the population, such as military personnel living on base, nursing home residents, and prison inmates.

Addresses for the CEQ and CED surveys are selected from two sampling frames maintained by the Census Bureau: the Unit frame and the Group Quarters (GQ) frame. Both frames are derived from the Master Address File (MAF), which is a list of all residential addresses identified in the 2010 census and is updated twice per year with information from the U.S. Postal Service. The Unit frame is the larger of the two frames and it contains both existing housing units and newly constructed housing units. It has approximately 99% of the MAF's civilian non-institutional addresses and is updated twice per year. The GQ frame is also derived from the MAF but it is much smaller; it has the remaining 1% of the MAF's civilian non-institutional addresses and it is updated every three years.

In each PSU, a "systematic sample" of households is selected from the two frames. The first step in the selection process is sorting the households by variables that are correlated with their expenditures. The purpose of this is to ensure that households of every wealth level are well-represented in the sample. In the systematic sampling process the first household in the sample is selected from the sorted list using a random number generator. Then after the initial household is selected every k-th household down the list is selected where "k" is the PSU's sampling interval. The Unit and GQ frames have different sorting variables, but they have the same sampling interval.

Table 1 below shows how the households are sorted in the Unit frame. It has codes ranging from 10 to 99 with the lower codes being for low-wealth households, and the higher codes being for high-wealth households. For the Unit frame, the sorting or "stratification" variable is created from the number of occupants in each household, their housing tenure (owner/renter), and the market value of their home (for owners) or the rental value of their apartment or home (for renters). These variables are used because they are correlated with expenditures: households with more people tend to be wealthier than those with fewer people; homeowners tend to be wealthier than renters; and people living in high-price housing units tend to be wealthier than people living in low-price housing units.

All the renters are at one end of the stratification and all the owners are at the other end of the stratification. The renters and owners are further subdivided into quartiles based on monthly rental and property values in order to ensure that households of every wealth level are well represented in the survey. Vacant housing units are put in the middle column for the number of household occupants because although they were vacant at the time of the decennial census, when CE’s field representatives visit them most will be occupied and they could be in any of the four non-zero categories. Thus the middle column is their “expected” location.

Table 1. CE Unit Frame Stratification Code Values

Renter/Owner Quartile	Number of Occupants				
	1 person	2 persons	Vacant	3 persons	4+ persons
Renters 1 <sup>st</sup> Quartile	10	11	12	13	14
Renters 2 <sup>nd</sup> Quartile	25	24	23	22	21
Renters 3 <sup>rd</sup> Quartile	30	31	32	33	34
Renters 4 <sup>th</sup> Quartile	45	44	43	42	41
Owners 1 <sup>st</sup> Quartile	50	51	52	53	54
Owners 2 <sup>nd</sup> Quartile	65	64	63	62	61
Owners 3 <sup>rd</sup> Quartile	70	71	72	73	74
Owners 4 <sup>th</sup> Quartile	85	84	83	82	81
Other			99		

To draw a systematic sample from the Unit frame, the addresses are sorted first by PSU, then by State FIPS code, County FIPS code, the CE stratification variable described above, Census Tract code, Census Block code, Street name, Street number, and MAFID code.

To draw a systematic sample from the GQ frame, the addresses are sorted first by PSU, then by State FIPS code, County FIPS code, Census Tract code, CHPCT (the percent of people in the tract living in college housing), and Census Block code. CHPCT is used because people living in college housing units are very different than the rest of the people in the GQ frame, so using it as a stratification variable helps produce a more representative sample.

For more information on the sample design in general, please see the paper by Susan King on “Selecting a Sample of Households for the Consumer Expenditure Survey” (Attachment P); or the paper by Danielle Neiman et al., “Review of the 2010 Sample Redesign of the Consumer Expenditure Survey” (Attachment V). For more information on the geographic portion of CE’s sample design, please see the memorandum from Jay Ryan to Richard Schwartz on “PSUs for the Consumer Expenditure Survey’s 2010 Census-Based Sample Design,” December 18, 2012 (Attachment T).

### Consumer Units

A consumer unit (CU) is the unit from which the CE seeks to collect its detailed expenditure information. It is basically the same thing as a “household,” although there are some technical differences between them. A CU is a group of people living together in a housing unit (1) who are related by blood, marriage, adoption, or some other legal arrangement such as foster children; (2) who are unrelated but pool their incomes to make joint expenditure decisions; or (3) is a

person living alone or sharing a housing unit with other people but who is financially independent of the other people.<sup>1</sup> In most cases, CUs and households are identical so the terms are often used interchangeably. Approximately 99 percent of all occupied housing units are occupied by one CU, and there are approximately 130 million CUs in the United States. The following table shows the estimated number of CUs in all 91 strata from which CE's sample of 91 PSUs was selected.<sup>2</sup>

**Estimated Number of CUs in CE's 91 Strata**

<b>Stratum Code</b>	<b>Estimated Number of CUs in the Stratum</b>				
S11A	1,916,829	N12D	1,466,621	N36D	1,179,553
S12A	8,239,029	N12E	1,652,789	N36E	1,073,872
S12B	2,511,760	N12F	1,499,951	N36F	1,009,410
S23A	3,983,681	N23C	1,429,854	N37C	1,025,739
S23B	1,808,974	N23D	1,371,790	N37D	1,184,416
S24A	1,410,066	N23E	1,582,553	N37E	1,071,009
S24B	1,173,786	N23F	1,371,175	N37F	1,029,420
S35A	2,373,185	N23G	1,652,369	N37G	1,086,768
S35B	2,343,038	N23H	1,646,840	N37H	1,160,487
S35C	2,226,023	N23I	1,576,918	N37I	1,103,594
S35D	1,171,909	N23J	1,443,122	N37J	1,200,835
S35E	1,141,275	N24C	1,252,236	N48C	1,359,161
S37A	2,705,813	N24D	1,196,973	N48D	1,568,137
S37B	2,492,843	N24E	1,384,575	N48E	1,617,161
S48A	1,765,452	N24F	1,241,240	N48F	1,350,234
S48B	1,070,955	N35F	1,277,976	N49H	2,193,028
S49A	5,401,694	N35G	1,112,833	N49I	2,174,208
S49B	1,825,454	N35H	1,274,905	N49J	1,946,697
S49C	1,778,910	N35I	1,073,353	N49K	1,837,364
S49D	1,448,362	N35J	1,302,974	R11D	274,844
S49E	1,303,309	N35K	1,110,367	R12G	347,740
S49F	572,767	N35L	1,301,557	R23K	676,088
S49G	220,279	N35M	1,081,592	R23L	569,043
N11B	2,107,733	N35N	1,226,603	R24G	773,937
N11C	1,782,731	N35O	1,152,152	R24H	651,715
N12C	1,711,973	N35P	1,305,536	R35R	649,702
		N35Q	1,079,215	R35S	780,518
		N36A	1,065,120	R36G	660,108
		N36B	1,045,744	R36H	592,418
		N36C	1,103,424	R37K	553,860

<sup>1</sup> Unrelated people who share a housing unit are considered to be separate CUs if they are responsible for paying their own expenses in at least two of these three categories: food, shelter, and all other expenses. Likewise college students living away from home are considered to be separate CUs from their parents if they are responsible for paying their own expenses in at least two of these three categories.

<sup>2</sup> The number of CUs comes from combining information about the total number of housing units in the Census Bureau's sampling frames (i.e., the MAF) with observations made by CE's field representatives about the number of CUs living in those housing units. CE's observations in the field show the average number of CUs per occupied housing unit is approximately 1.015. The number of CUs per stratum shown in the table above comes from allocating the nationwide total of 130 million CUs by the number of people living in each stratum according to the 2010 census.

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1220-0050  
June 2019

R37L	668,619
R48G	202,807
R48H	168,146
R48I	188,377
R49L	300,802
<b>Total</b>	<b>130,000,000</b>

Sample Size and Response Rates

The table below shows the expected annual sample sizes and response rates for the CEQ and CED surveys in 2020-2022. The sample sizes will increase from their current levels due to the CPI program changing its source of outlet frame information from the Telephone Point of Purchase Survey (TPOPS) to the CEQ and CED surveys. The CPI program relied on TPOPS as its source of outlet sampling frame information since 1998, but due to the TPOPS survey's decreasing response rate (which is currently around 30 percent), the duty of providing that information to the CPI program is being transferred to the CE program.

CPI's target population is the urban portion of the U.S. rather than the whole U.S., so CE's sample sizes in the urban ("S" and "N") PSUs are being increased by 11 percent in the CEQ survey and by 53 percent in the CED survey, while the sample sizes in the rural ("R") PSUs are remaining unchanged. The resulting overall increase is 48% in CED and 10% in CEQ. The CED's sample size is being increased more than the CEQ's sample size because internal CPI research indicates that the CED survey is more effective at collecting outlet information than the CEQ survey.

Category	Quarterly Interview Survey			Diary Survey		
	2019	2020	2021	2019	2020	2021
Total Sample Size (addresses)	48,000	51,500	52,700	12,000	17,800	17,800
Type B and C Noninterviews (vacant, demolished, etc.)						
Number	8,160	8,755	8,959	2,040	3,026	3,026
Percent of Total Sample	17.0	17.0	17.0	17.0	17.0	17.0
Eligible Units (occupied housing units)						
Number	39,840	42,745	43,741	9,960	14,774	14,774
Percent of Total Sample	83.0	83.0	83.0	83.0	83.0	83.0
Type A Noninterviews						
Number	16,334	18,381	18,809	4,482	6,782	6,782
Percent of Eligible Units	41.0	43.0	43.0	45.0	46.0	46.0
Completed Interviews						
Number	23,508	24,364	24,932	5,478	7,962	7,962

Percent of Eligible Units (Response Rate)	59.0	57.0	57.0	55.0	54.0	54.0
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The CEQ’s nationwide sample size is currently 48,000 addresses per year, but it will increase to 52,700 addresses per year. The CEQ’s new sample size will begin in April 2020, which means in that year one-fourth of the year will use the old sample size and three-fourths of the year will use the new sample size, and then starting in 2021 the whole year will use the new sample size. Thus CEQ’s old sample size is being used in 2019, its new sample size will be used in 2021, and 2020 will be a transitional year.

Similarly, the CED’s nationwide sample size is currently 12,000 addresses per year, and it will increase to 17,800 addresses per year. However, the CED’s new sample size will begin in January 2020 instead of April 2020, which means in that year the new sample size will be used in the whole year. CED’s old sample size is being used in 2019 and its new sample size will be used starting in 2020 with no transitional year.

As the table above shows, 83% of the sample addresses are expected to have occupied housing units, and the other 17% are expected to be “Type B/C” noninterviews, which are addresses that are not occupied housing units: they are nonexistent, nonresidential, vacant, demolished, etc. Then in the CEQ survey, 57% of the occupied housing units are expected to complete an interview, and the other 43% are expected to be “Type A” noninterviews, which are those that do not complete an interview. This is expected to yield 24,364 completed interviews in 2020 and 24,932 completed interviews in 2021 and 2022.

Similarly, in the CED survey 83% of the sample addresses are expected to have occupied housing units, and 54% of the occupied housing units are expected to fill out diaries. This is expected to yield 15,924 (7,962 × 2) weekly diaries per year in 2020-2022.

The response rates in the table above are the CEQ’s and CED’s actual response rates over the past five years (2014-2018) minus 5 percentage points. Response rates have been decreasing over time, so the 5-year historical response rates are reduced by 5 percentage points to account for the downward trend.

Finally, it should be noted that in 2020 one of the PSUs in the sample will be changing. The PSU that was randomly chosen to represent stratum “N35Q” will change from Big Stone Gap, VA to Clarksburg, WV. The request was made by the CPI program to avoid some anticipated data collection issues.

Nonresponse Bias

In 2008 CE staff conducted a nonresponse bias study to determine whether the missing data from nonrespondents generated any bias in the CEQ’s published estimates. The study was undertaken in response to an OMB directive. Results from four individual studies were synthesized, and they concluded that no bias was generated in spite of the fact that CE’s data are not “missing completely at random (MCAR).” As they said, “the results from these four studies provide a counterexample to the commonly held belief that if a survey’s data are not missing completely at

random then its estimates are subject to nonresponse bias.” In other words, CE’s nonresponse weighting adjustments are working well.

In 2018, CE staff updated the first half of the nonresponse bias study to determine whether CE’s data are MCAR, and once again they concluded that the data are not MCAR. They looked at both the CEQ and CED surveys over the ten-year period 2007-2016 and found that different demographic subgroups of the population responded to the surveys at different rates; that the rates at which they responded to the surveys changed over time; and that the demographic makeup of the respondents differed from that of the American Community Survey, which is considered to be a high quality “gold standard” survey. These three things all suggest that the CEQ’s and CED’s data are not MCAR. The CE staff who conducted the study are currently updating the second half of the study to determine whether the missing data from nonrespondents generates any bias in the CEQ’s and CED’s published estimates.

For more information on the calculation of response rates, see the memorandum from Sharon Krieger to David Swanson on “Response Rates in the Consumer Expenditure Survey” (2016) (Attachment Q). For more information on the nonresponse bias studies, see “Assessing Nonresponse Bias in the Consumer Expenditure Interview Survey” (Attachment R).

## **2. Collection Methods**

Field representatives from the U.S. Census Bureau, under contract with BLS, personally visit the households in the CEQ’s and CED’s samples to collect the data. Prior to the first household visit, respondents are sent an advance letter informing them that they have been selected for the survey and asking them for their cooperation. For subsequent household visits in the CEQ survey, respondents are sent an advance letter reminding them that it has been 3 months since they last participated in the survey and asking them for their cooperation again.

Field representatives visit each household in the CEQ’s sample every 3 months for 4 consecutive quarters to collect information on the expenditures they made during the previous 3 months. The field representatives enter the household’s responses into a laptop computer. After participating in the survey for 4 quarters, the household is dropped from the survey and replaced by another household. The households in the CEQ survey are on a rotating schedule with approximately one-fourth of the households in the sample being new to the survey each quarter.

For the CED survey, field representatives visit each household in the sample two times to collect information on the expenditures they make during a 2-week period. On the first visit the field representatives introduce themselves, explain the survey, and leave two weekly diaries, one for each week of the survey period. The household members are asked to record all their expenditures over the 2-week period in those diaries. Then on the second visit, the field representatives pick up the two diaries and thank the household for participating in the survey. After participating in the survey for two weeks, the household is dropped from the survey and replaced by another household.

After completing the second week of the CED survey and the fourth quarter of the CEQ survey, the households are sent a Thank You letter and a certificate of appreciation for their participation in the survey.

### Estimation

The estimation procedure for both the CEQ and CED follow well-established statistical principles. The final weight for each sample CU is the product of its base weight (which is the inverse of the CU's probability of selection); an adjustment factor to account for noninterviews; and a calibration adjustment factor that post-stratifies the weights to account for population undercoverage. A typical base weight for a CU in the CEQ is approximately 10,000, which means it represents 10,000 CUs – itself plus 9,999 other CUs that were not selected for the survey. A typical final weight is approximately 18,000, which means it represents 18,000 CUs – itself plus 17,999 other CUs that were not selected for the survey and/or did not participate in the survey.

For additional information on CE's sample design and estimation methodology, please see "Chapter 16, Consumer Expenditures and Income" in the *BLS Handbook of Methods* (Attachment S); Jay Ryan's memorandum to Richard Schwartz on "PSUs for the Consumer Expenditure Survey's 2010 Census-Based Sample Design," December 18, 2012 (Attachment T); Ruth Ann Killion's memorandum to Jay Ryan on "Consumer Expenditure Surveys Sample Allocation for Interview Year 2016," February 11, 2015 (Attachment U); and Brian Nix's memo on "Differences in Response Rates in the Consumer Expenditure Survey" (Attachment W).

### **3. Methods to Maximize Response Rates**

Keeping the CEQ's and CED's response rates as high as possible requires special efforts, particularly from the Census Bureau's field staff. The field staff are trained in a variety of techniques designed to persuade people to participate in the survey, and they are also trained in techniques for "refusal conversion" designed to change the minds of people who refuse to participate in the survey. If someone refuses to participate in the survey, the field office sends a letter trying to persuade them to participate in the survey and a senior interviewer or supervisory field representative is assigned to the case for follow-up refusal conversion efforts. Of course refusal conversion efforts take time and cost money, so regional office staff try to decide which cases to work on and how much effort to put into them based on cost-effectiveness considerations.

Special computer processing techniques are also used in the CEQ to reduce respondent burden, which in turn helps keep response rates up. For example, some data collected in one interview are carried forward to subsequent interviews, such as data on household members and their personal characteristics, along with data on their properties, mortgages, vehicles, and insurance policies. Minimizing respondent burden, including interview length, are important factors in the effort to keep response rates up.

When field staff still cannot convert noninterviews to interviews, the estimation process has a noninterview adjustment to account for them. As mentioned above, every CU in the sample has

a base weight equal to the number of CUs in the population it represents. In this process the respondent CUs have their weights increased to account for the nonrespondent CUs. The total sample of CUs (both respondents and nonrespondents) is partitioned into 192 subsets based on their region, CU size, income, and number of contact attempts.<sup>3</sup> Then within each subset the base weights of the respondents are increased by multiplying them by a factor equal to the sum of the base weights for all CUs (both respondents and nonrespondents) divided by the sum of the base weights from just the respondent CUs. This makes the final weights of the respondents add up to the total number of CUs in the population.

#### **4. Testing Plans**

CE plans to research the addition of a date of birth question, including four questions on burden. A Non-Substantive Change Request (NCR) will be submitted for the proposed study should funding and resources become available. Further details on the test can be found in Attachment Y.

#### **5. Statistical Contacts**

The sample design is a joint effort between BLS and the Census Bureau, with the two bureaus focusing on different aspects of the sample design, and the data is collected by the Census Bureau under contract with BLS. For more information on the sample design or the data collection effort, you may contact the following individuals.

Sample Design:	Stephen Ash (Census)	(301) 763-4294
	David Swanson (BLS)	(202) 691-6917
Data Collection:	Jennifer Epps (Census)	(301) 763-5342
	Janel Brattland (BLS)	(202) 691-5427

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<sup>3</sup> There are 4 regions of the country, 4 CU size classes, 3 income classes, and 4 contact attempt classes, making  $192 = 4 \times 4 \times 3 \times 4$  subsets into which the sample is partitioned. For nonrespondents the number of people in the CU is obtained from data collected in previous interviews or from talking to their neighbors. For all CUs (both respondents and nonrespondents) their income is estimated from a publicly available database from the IRS which has the average household income by zip code. In the nonresponse adjustment process every CU is assumed to have its zip code's average income value.