Supporting Statement

B.   Collection of Information Employing Statistical Methods

1.   **Sampling Method**

The Consumer Expenditure (CE) Survey is a nationwide household survey conducted jointly by the U.S. Bureau of Labor Statistics and the U.S. Census Bureau to find out how Americans spend their money. Its data are collected from a representative sample of households drawn in a two-stage sampling design. In the first stage a representative sample of counties from around the United States is selected for the survey. In the second stage a representative sample of households is selected from those counties. This two-stage sampling process is designed to generate a sample of households in which every wealth level is well-represented in the survey. The rest of this section describes these two sampling stages in more detail.

For more details, please refer to the paper by Danielle Neiman et. al., "Review of the 2010 Sample Redesign of the Consumer Expenditure Survey" (Attachment V); or the "Selecting a Sample of Households for the Consumer Expenditure Survey" by Susan King (Attachment P).

Consumer Units
A consumer unit (CU) is the unit from which the CE seeks expenditure reports. It consists of all household members in a particular housing unit or other type of living quarters who are related by blood, marriage, adoption, or some other legal arrangement. For unrelated persons it is based on their financial dependence in three expenditure categories: shelter, food, and all other expenses. Unrelated persons are considered to be part of the same CU if they live in the same housing unit and share expenses for at least two of these categories, and they are considered to be separate CUs if they live in the same housing unit but are responsible for paying their own expenses for at least two of these categories. There are approximately 127 million CUs in the CE survey's universe.[1] Approximately 97 percent of all occupied living quarters are occupied by a single CU.

The following table shows estimated numbers of CUs in all 91 strata from which CE's PSUs were selected.[2] Please see Section 2 below entitled "Primary Sampling Units (PSUs)" for more information.

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[11] The number of CUs comes from dividing the Census Bureau's 2014 estimate of the number of people in the civilian non-institutional population (317.5 million) by the average number of people per CU (2.5).
[2] The number of CUs per stratum comes from allocating the nationwide total of 127 million CUs by each stratum's proportion of the nationwide population in the 2010 Census.

Estimated Number of CUs in CE's 91 Strata

Stratum Code	Estimated Number of CUs in the Stratum
S11A	1,872,594
S12A	8,048,897
S12B	2,453,796
S23A	3,891,750
S23B	1,767,228
S24A	1,377,526
S24B	1,146,698
S35A	2,318,419
S35B	2,288,968
S35C	2,174,653
S35D	1,144,865
S35E	1,114,938
S37A	2,643,372
S37B	2,435,316
S48A	1,724,710
S48B	1,046,241
S49A	5,277,039
S49B	1,783,328
S49C	1,737,859
S49D	1,414,938
S49E	1,273,232
S49F	559,549
S49G	215,195
N11B	2,059,093
N11C	1,741,591
N12C	1,672,466
N12D	1,432,776
N12E	1,614,648
N12F	1,465,337
N23C	1,396,857
N23D	1,340,133
N23E	1,546,033
N23F	1,339,533
N23G	1,614,238
N23H	1,608,836
N23I	1,540,528
N23J	1,409,819
N24C	1,223,338
N24D	1,169,351

Stratum Code	Estimated Number of CUs in the Stratum
N24E	1,352,623
N24F	1,212,596
N35F	1,248,484
N35G	1,087,153
N35H	1,245,484
N35I	1,048,583
N35J	1,272,905
N35K	1,084,743
N35L	1,271,521
N35M	1,056,632
N35N	1,198,297
N35O	1,125,564
N35P	1,275,409
N35Q	1,054,310
N36A	1,040,541
N36B	1,021,611
N36C	1,077,961
N36D	1,152,333
N36E	1,049,090
N36F	986,115
N37C	1,002,068
N37D	1,157,084
N37E	1,046,294
N37F	1,005,664
N37G	1,061,689
N37H	1,133,707
N37I	1,078,126
N37J	1,173,124
N48C	1,327,795
N48D	1,531,949
N48E	1,579,842
N48F	1,319,075
N49H	2,142,420
N49I	2,124,034
N49J	1,901,773
N49K	1,794,963
R11D	268,501
R12G	339,715
R23K	660,486
R23L	555,911
R24G	756,077
R24H	636,676
R35R	634,709

Stratum Code	Estimated Number of CUs in the Stratum
R35S	762,506
R36G	644,874
R36H	578,747
R37K	541,078
R37L	653,190
R48G	198,127
R48H	164,266
R48I	184,030
R49L	293,861
Total	**127,000,000**

Response Rates

The following table shows expected annual sample sizes in 2016 for the Quarterly Interview Survey (CEQ) and the Diary Survey (CED). In 2016, the sample for the CEQ will include 48,000 addresses, and the sample for the CED will include 12,000 addresses. From these addresses 13% are expected to be "Type B/C" noninterviews, which are sample addresses that are not occupied housing units (they are nonexistent, nonresidential, vacant, demolished, etc.); and the other 87% are occupied housing units. Of those occupied housing units, approximately 34% are expected to be "Type A" noninterviews, which are occupied housing units that do not participate in the survey; and the other approximately 66% are expected to be housing units with completed interviews. This is expected to yield approximately 27,600 completed interviews in the CEQ and approximately 13,800 (= 6,900 × 2) weekly diaries in the CED.

The response rates shown below are the CEQ's and CED's actual response rates over the past five years (2009-2013) 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.

The sample sizes shown below for 2016 are the annual number of quarterly interviews for CEQ, and the annual number of bi-weekly diaries for CED.

Category	Quarterly Interview	Diary
Total Sample Size (addresses)	48,000	12,000
Type B and C Noninterviews (vacant, demolished, etc.)		
Number	6,240	1,560
Percent of Total Sample	13.0	13.0
Eligible Units (occupied housing units)		
Number	41,760	10,440
Percent of Total Sample	87.0	87.0
Type A Noninterviews		
Number	14,160	3,540
Percent of Eligible Units	34.0	34.0
Completed Interviews		
Number	27,600	6,900
Percent of Eligible Units (Response Rate)	66.0	66.0

Starting in 2015 the CEQ and CED began drawing their samples of addresses from a new sampling frame called the Master Address File (MAF), which is basically a list of all addresses from the 2010 census and is updated twice per year with information from the U.S. Postal Service's Delivery Sequence File. The CEQ and CED do not have much experience with the MAF, but the ACS has more experience, and the Type B/C rate of 13% comes from ACS's experience.

For more information on the calculation of response rates, see the memorandum from Sharon Krieger and David Swanson on "Response Rates in the Consumer Expenditure Survey" (2015) (Attachment Q).

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. Their 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." For more information, see "Assessing Nonresponse Bias in the Consumer Expenditure Interview Survey" (Attachment R).

2. **Collection Methods**

Under contract with BLS, field representatives from the U.S. Census Bureau personally visit the households in the Diary and Interview surveys' samples to collect the data. Prior to the first household visit, respondents are sent an advanced letter informing them that they have been selected for the survey and asking for their cooperation. For subsequent household visits in the Interview survey, respondents are sent an advanced letter reminding them that is has been 3 months since they last participated in the survey and asking for their cooperation again.

For the Diary survey, field representatives visit each household in the sample three 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 a diary in which the household members are asked to record all their expenditures for a 1-week period. On the second visit, the field representatives pick up the first week's diary, ask whether there are any questions, and leave another diary for the second week. On the third visit, the field representatives pick up the second week's diary 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.

For the Interview survey, field representatives visit each household in the sample every 3 months for 4 consecutive quarters to collect information on the expenditures

they made during the previous 3 months. In those interviews field representatives ask household members about their expenditures and enter their 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 Interview survey are on a rotating schedule, with approximately one-fourth of the households in the sample being new to the survey each quarter.

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

Primary Sampling Units (PSUs)
The primary sampling units (PSUs) used in the CEQ and CED are small clusters of counties. The number of counties in the PSUs selected for the sample ranges from 1 to 29 with the average number being 5. The set of sample PSUs used in the two CE surveys consist of 91 PSUs, 75 of which are also used in the Consumer Price Index (CPI). The 91 PSUs fall into three categories:

PSU "size class"	Number of PSUs	Description
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 PSUs)
R	16	Non- Core Based Statistical Areas (non-self-representing PSUs)

The BLS selected these PSUs from a stratified sampling design in which the non-self-representing PSUs (the N and R PSUs) were stratified 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. For more information on the stratification, please see the paper from Susan King on "Selecting a Sample of Households for the Consumer Expenditure Survey" (Attachment P). Also, for an overview of the CE sample design and the CU selection process, please refer to the memorandum from Jay Ryan on "PSUs for the Consumer Expenditure Survey's 2010 Census-Based Sample Design" (Attachment T).

Sampling Within PSUs
CE selects its sample from the U.S. civilian non-institutional population, which includes people living in houses, condominiums, apartments, and people living in group quarters such as college dormitories or boarding houses. However, CE's sample excludes military personnel living on base, nursing home residents, and prison inmates. Addresses for the CEQ and CED are selected from two sampling frames maintained by the Census Bureau: the Unit and Group Quarters (GQ) frame.

Both frames are derived from the Master Address File (MAF), which is basically 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. It contains an accurate, up-to-date inventory of all known living quarters in the United States. The Unit frame is the larger of the two frames and it contains both existing housing units and new 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 civilian non-institutional addresses and is updated less frequently, every three years.

A "systematic sample" of households is selected from the two frames in each PSU. The first step in the selection process is sorting the households by variables that are correlated with their expenditures. The purpose of the sort is to ensure that households of every wealth level are well-represented in the sample. The first household in the systematic 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 frame have different sorting variables, but they have the same sampling interval.

For the Unit frame, the sorting variable is a stratification variable created from the number of occupants in each household, their housing tenure (owner/renter), and the market value of their homes (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 those living in low-price housing units.

In Table 1 below, 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. Each cell is assigned a stratification code value, and all addresses in the Unit frame fall into one of these cells. The stratification code is a surrogate for sorting by expenditures.

Table 1. CE Unit Frame Stratification Code Values

Renter/Owner Quartile	Number of Occupants				
	1 person	2 persons	Vacant	3 persons	4+ persons
Renters 1st Quartile	10	11	12	13	14
Renters 2nd Quartile	25	24	23	22	21

Renters 3rd Quartile	30	31	32	33	34
Renters 4th Quartile	45	44	43	42	41
Owners 1st Quartile	50	51	52	53	54
Owners 2nd Quartile	65	64	63	62	61
Owners 3rd Quartile	70	71	72	73	74
Owners 4th Quartile	85	84	83	82	81
Other			99		

To draw a systematic sample in the Unit frame, the addresses are sorted by PSU, Federal Information Processing Standards (FIPS) State code, FIPS County code, CE stratification variable (described above), Census Tract code, Census Block code, Street name, Street number, and MAFID code.

To draw a systematic sample in the Group Quarters frame, the addresses are sorted by PSU, FIPS State code, FIPS County code, Census Tract code, CHPCT, and Census Block code, where CHPCT is the "percent of college housing." Research on the college housing population shows that it is very different than the rest of the civilian non-institutional population in the GQ frame, so using it as a stratification variable produces a more representative systematic sample of GQ housing.

For more information on sampling within PSUs for the CE Surveys, refer to the paper from Susan King on "Selecting a Sample of Households for the Consumer Expenditure Survey" (Attachment P).

Non-institutional GQs
CE interviews consumers who live in non-institutional group quarters, and does not interview consumers who live in institutional group quarters. Institutional group quarters are primarily correctional facilities or nursing homes, whose residents are formally classified as "inmates or patients." Typically, these people stay involuntarily and cannot come and go without permission and are generally under the supervision of a trained staff.

Non-institutional GQs house people who stay voluntarily and are allowed to come and go without receiving permission. Many non-institutional GQs are college housing; dormitories; and fraternity and sorority housing, both on and off campus. In addition, non-institutional GQs include: hotels and motels that are used entirely or partially for persons without a usual home; shelters for the homeless with sleeping facilities.

Military quarters, with the exception of military disciplinary barracks (stockades and jails), are also categorized as non-institutional group quarters. However, only the non-institutional civilian population as opposed to military personnel is eligible to participate in the CE survey. Therefore, military non-institutional group quarters can be listed if and only if the GQ includes non-institutional, non-military units.

Estimation

The estimation procedure for both the CED and CEQ 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); a weight adjustment to account for noninterviews; and a calibration adjustment 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 for a CU in the CEQ 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 the sample design and estimation methodology used in the CE surveys, refer to "Chapter 16, Consumer Expenditures and Income" in the *BLS Handbook of Methods* (Attachment S); Jay Ryan's memo to Richard Schwartz, "PSUs for the Consumer Expenditure Survey's 2010 Census-Based Sample Design," December 18, 2012 (Attachment T); and Ruth Ann Killion's memo to Jay Ryan, "Consumer Expenditure Surveys Sample Allocation for Interview Year 2016," February 11, 2015 (Attachment U).

3. **Methods to Maximize Response Rates**

In the CE Surveys, keeping the noninterview rate at a low level requires special efforts, particularly from the Census Bureau Field staff. For each refusal case, the regional office sends a special letter to the address and assigns the case for follow-up by the program supervisor, supervisory field representative, or senior interviewer, taking into account time and cost considerations.

To adjust for those noninterviews that the field staff cannot convert to interviews, the sample design provides for a noninterview adjustment in the estimation procedure. The computer processing employs special techniques in the CEQ to reference data provided in the previous interview, to keep recall problems and interview time to a minimum.

4. **Testing Plans**

Subject to resource availability, CE plans to conduct the following studies (prior to the expiration of the clearance). Ideally these studies will utilize non-production sample, but funding may necessitate the use of production sample for some tests. A Non-Substantive Change Request (NCR) will be submitted for all of the proposed studies should funding and resources become available.

Test	Survey	Description

Optimal Contact Threshold Field Test (Census)	Interview	This test builds on a 2015 analysis of the optimal threshold number of contact attempts. The evaluation criteria included cost savings, indicators of reporting quality, and response rates. The findings confirmed earlier results suggesting seven as the optimal threshold for contact attempts. That is, attempting contact for sample units beyond that threshold was costly; did not substantively impact sample characteristics; did not improve measurement error as assessed by reporting quality indicators; and increased response rates but without improving sample composition with respect to household size, urbanicity, and homeownership status (and worsened sample composition if sample units' reluctance/concerns about survey participation was included as another characteristic of interest). The purpose of this project is to evaluate the cost savings, reporting quality, and response rate impact of implementing a seven contact attempt threshold, in a large sample size field test setting, for difficult-to-interview consumer units that display doorstep concerns related to hostility.
Web Diary Implementation	Diary	The purpose of this project is to contract with Westat to test CE's electronic diary under predetermined protocol conditions in advance of a potential phased (e.g., less than 10 percent), screened, and optionally-offered implementation alongside the redesigned paper diary in the 2018 production survey. CE will base its 2019 production survey implementation decision on the test results.
Large Scale Outlets Field Test	Interview and Diary	The purpose of this outlet questions test in production sample, as a follow-up to the 2016 exercise, is to evaluate completion rates, comprehensiveness, and data quality for an add-on last purchase module, in a large sample size setting.

5. **Statistical Contacts**

The Census Bureau will collect the data. Within the Census Bureau, you may consult the following individuals regarding their area of expertise for further information.

Sample Design: Stephen Ash   (301) 763-4294

Data Collection: Jennifer Epps   (301) 763-5342