

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 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 then in the second stage a representative sample of households from those counties is selected for the survey. This two-stage sampling process is designed to generate a sample of households in which every demographic group and every wealth level is well-represented in the survey. The rest of this section describes the 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, and the 91 PSUs fall into three categories:

PSU “size class”	Number of PSUs	Description
S	23	Large Metropolitan Core Based Statistical Areas. These are CBSAs with over 2.5 million people, and they are self-representing PSUs.
N	52	Small Metropolitan Core Based Statistical Areas, and Micropolitan Core Based Statistical Areas. These are CBSAs with under 2.5 million people, and they are non-self-representing PSUs.
R	16	Non-Core Based Statistical Areas. These are small clusters of counties in “rural” areas created by CE staff, and they are non-self-representing PSUs.

BLS selected its sample of 91 PSUs from a stratified sample design in which all 23 self-representing PSUs (the 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 (=52+16) strata using a 4-variable model whose independent variables were latitude, longitude, median household income,

38 and median household property value. Then one PSU was randomly selected from each stratum
39 with its probability of selection being proportional to its population.

40

41 All 91 PSUs are used by the CE survey. However, one of CE's major customers is the
42 Consumer Price Index (CPI) which is an urban survey, not a national survey, that uses CE's data
43 for its expenditure weights, so CPI uses only the 75 (=23+52) urban PSUs in its survey.

44

45 Sampling Households Within PSUs

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

52

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

62

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

71

72 Table 1 below shows how the households are sorted in the Unit frame. It has codes ranging from
73 10 to 99 with the lower codes being for low-wealth households, and the higher codes being for
74 high-wealth households. For the Unit frame, the sorting or "stratification" variable is created
75 from the number of occupants in each household, their housing tenure (owner/renter), and the
76 market value of their home (for owners) or the rental value of their apartment or home (for
77 renters). These variables are used because they are correlated with expenditures: households
78 with more people tend to be wealthier than those with fewer people; homeowners tend to be
79 wealthier than renters; and people living in high-price housing units tend to be wealthier than
80 people living in low-price housing units.

81

82 All the renters are at one end of the stratification and all the owners are at the other end of the
83 stratification. The renters and owners are further subdivided into quartiles based on monthly

84 rental and property values in order to ensure that households of every wealth level are well
85 represented in the survey. Vacant housing units are put in the middle column for the number of
86 household occupants because although they were vacant at the time of the decennial census,
87 when CE’s field representatives visit them most will be occupied and they could be in any of the
88 four non-zero categories. Thus the middle column is their “expected” location.

89
90 Table 1. CE Unit Frame Stratification Code Values
91

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

92
93 To draw a systematic sample from the Unit frame, the addresses are sorted first by PSU, then by
94 State FIPS code, County FIPS code, the CE stratification variable described above, Census Tract
95 code, Census Block code, Street name, Street number, and MAFID code.

96
97 To draw a systematic sample from the GQ frame, the addresses are sorted first by PSU, then by
98 State FIPS code, County FIPS code, Census Tract code, CHPCT (the percent of people in the
99 tract living in college housing), and Census Block code. CHPCT is used because people living
100 in college housing units are very different than the rest of the people in the GQ frame, so using it
101 as a stratification variable helps produce a more representative sample.

102
103 For more information on the sample design in general, please see the paper by Susan King on
104 “Selecting a Sample of Households for the Consumer Expenditure Survey” (Attachment R); or
105 the paper by Danielle Neiman et. al., “Review of the 2010 Sample Redesign of the Consumer
106 Expenditure Survey” (Attachment S). For more information on the geographic portion of CE’s
107 sample design, please see the memorandum from Jay Ryan to Richard Schwartz on “PSUs for
108 the Consumer Expenditure Survey’s 2010 Census-Based Sample Design,” December 18, 2012
109 (Attachment T).

110
111 Consumer Units

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

118 independent of the other people.¹ In most cases, CUs and households are identical so the terms
119 are often used interchangeably. Approximately 99 percent of all occupied housing units are
120 occupied by one CU, and there are approximately 130 million CUs in the United States. The
121 following table shows the estimated number of CUs in all 91 strata from which CE's sample of
122 91 PSUs was selected.²

Estimated Number of CUs in CE's 91 Strata

Stratum Code	Estimated Number of CUs in the Stratum				
S11A	1,916,829	N12E	1,652,789	N36F	1,009,410
S12A	8,239,029	N12F	1,499,951	N37C	1,025,739
S12B	2,511,760	N23C	1,429,854	N37D	1,184,416
S23A	3,983,681	N23D	1,371,790	N37E	1,071,009
S23B	1,808,974	N23E	1,582,553	N37F	1,029,420
S24A	1,410,066	N23F	1,371,175	N37G	1,086,768
S24B	1,173,786	N23G	1,652,369	N37H	1,160,487
S35A	2,373,185	N23H	1,646,840	N37I	1,103,594
S35B	2,343,038	N23I	1,576,918	N37J	1,200,835
S35C	2,226,023	N23J	1,443,122	N48C	1,359,161
S35D	1,171,909	N24C	1,252,236	N48D	1,568,137
S35E	1,141,275	N24D	1,196,973	N48E	1,617,161
S37A	2,705,813	N24E	1,384,575	N48F	1,350,234
S37B	2,492,843	N24F	1,241,240	N49H	2,193,028
S48A	1,765,452	N35F	1,277,976	N49I	2,174,208
S48B	1,070,955	N35G	1,112,833	N49J	1,946,697
S49A	5,401,694	N35H	1,274,905	N49K	1,837,364
S49B	1,825,454	N35I	1,073,353	R11D	274,844
S49C	1,778,910	N35J	1,302,974	R12G	347,740
S49D	1,448,362	N35K	1,110,367	R23K	676,088
S49E	1,303,309	N35L	1,301,557	R23L	569,043
S49F	572,767	N35M	1,081,592	R24G	773,937
S49G	220,279	N35N	1,226,603	R24H	651,715
N11B	2,107,733	N35O	1,152,152	R35R	649,702
N11C	1,782,731	N35P	1,305,536	R35S	780,518
N12C	1,711,973	N35Q	1,079,215	R36G	660,108
N12D	1,466,621	N36A	1,065,120	R36H	592,418
		N36B	1,045,744	R37K	553,860
		N36C	1,103,424	R37L	668,619
		N36D	1,179,553	R48G	202,807
		N36E	1,073,872	R48H	168,146

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

6 ² The number of CUs comes from combining information about the total number of housing
7 units in the Census Bureau's sampling frames (i.e., the MAF) with observations made by CE's
8 field representatives about the number of CUs living in those housing units. CE's
9 observations in the field show the average number of CUs per occupied housing unit is
10 approximately 1.015. For every 1,000 occupied housing units there are approximately
11 1,015 CUs. The number of CUs per stratum shown in the table above comes from allocating
12 the nationwide total of 130 million CUs by the number of people living in each stratum
13 according to the 2010 census.

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R48I	188,377
R49L	300,802
Total	130,000,000

126

127

128

129 Sample Size and Response Rates

130 The table below shows the expected annual sample sizes and response rates for the CEQ and
131 CED surveys for 2021-2023. The sample sizes recently increased from their previous levels due
132 to the CPI program changing the source of its outlet frame information from the Telephone Point
133 of Purchase Survey (TPOPS) to the CEQ and CED surveys. The CPI program relied on TPOPS
134 as its source of outlet sampling frame information since 1998, but due to its low response rate
135 (which was around 30 percent), the duty of providing outlet information to the CPI program was
136 transferred to the CE program.

137

138 CPI's target population is the urban portion of the U.S. rather than the whole U.S., so CE's
139 sample sizes in the urban ("S" and "N") PSUs were increased by 11 percent in the CEQ survey
140 and by 53 percent in the CED survey, while the sample sizes in the rural ("R") PSUs remained
141 unchanged. The CED's sample size was increased more than the CEQ's sample size because
142 internal CPI research indicated that the CED survey is more effective at collecting outlet
143 information than the CEQ survey.

144

Category	Quarterly Interview Survey			Diary Survey		
	2021	2022	2023	2021	2022	2023
Total Sample Size (addresses)	52,700	52,700	52,700	17,800	17,800	17,800
Type B and C Noninterviews (vacant, demolished, etc.)						
Number	8,959	8,959	8,959	3,026	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	43,741	43,741	43,741	14,774	14,774	14,774
Percent of Total Sample	83.0	83.0	83.0	83.0	83.0	83.0
Type A Noninterviews						
Number	19,683	19,683	19,683	7,239	7,239	7,239
Percent of Eligible Units	45.0	45.0	45.0	49.0	49.0	49.0
Completed Interviews						
Number	24,058	24,058	24,058	7,535	7,535	7,535
Percent of Eligible Units (Response Rate)	55.0	55.0	55.0	51.0	51.0	51.0

145

146 The CEQ's nationwide sample size used to be 48,000 addresses per year, but it was increased to
147 52,700 addresses per year in April 2020. Similarly, the CED's nationwide sample size used to
148 be 12,000 addresses per year, but it was increased to 17,800 addresses per year in January 2020.

149
150 As the table above shows, 83% of the sample addresses are expected to have occupied housing
151 units, and the other 17% are expected to be "Type B/C" noninterviews, which are addresses that
152 are not occupied housing units: they are nonexistent, nonresidential, vacant, demolished, etc.
153 Then in the CEQ survey, 55% of the occupied housing units are expected to complete an
154 interview, and the other 45% are expected to be "Type A" noninterviews, which are occupied
155 housing units that do not complete an interview. This is expected to yield 24,058 completed
156 interviews per year in 2021-2023.

157
158 Similarly, in the CED survey 83% of the sample addresses are expected to have occupied
159 housing units, and 51% of the occupied housing units are expected to fill out diaries. This is
160 expected to yield 15,070 ($= 7,535 \times 2$) weekly diaries per year in 2021-2023.

161
162 The response rates in the table above are the CEQ's and CED's actual response rates over the
163 past five years (2015-2019) minus 5 percentage points. Response rates have been decreasing in
164 recent years, so the 5-year historical response rates are reduced by 5 percentage points to account
165 for the downward trend.

166
167 Finally, it should be noted that in 2021 the PSU that was randomly chosen to represent stratum
168 "N24F" will change from Wahpeton, ND to Brookings, SD. The request was made by the CPI
169 program to avoid anticipated data collection issues.

170
171 Nonresponse Bias

172 In 2018 CE staff conducted a nonresponse bias study to determine whether the CEQ and CED
173 surveys' nonrespondents are "missing completely at random" (MCAR), and whether their
174 missing-ness generates any bias in the published expenditure estimates. The study was
175 undertaken in response to an OMB directive, and it concluded that the nonrespondents are not
176 MCAR, but the amount of bias they generate is small. (See Attachment V - Assessing
177 Nonresponse Bias in the Consumer Expenditure Interview Survey.)

178
179 The MCAR part of the study had four sub-studies. They found different demographic groups
180 have different response rates; respondents have different demographic characteristics than the
181 American population as a whole; respondents' demographic characteristics change over time;
182 and a mathematical model predicting response rates had parameters on many of its demographic
183 variables that were statistically significant. However, the most significant finding was that high-
184 income households have lower response rates than low-income households, which is a concern
185 because CE is an economic survey that focuses on expenditures. Nevertheless, all four sub-
186 studies indicated that CE's nonrespondents are not MCAR.

187
188 The bias part of the study also had four sub-studies. They examined four different nonresponse
189 weighting adjustment procedures to get an idea of the range of possible values the "correct"
190 nonresponse-adjusted expenditure estimates might have. All four procedures increased the
191 CEQ's expenditure estimates by about one percent from its base-weighted (i.e., unadjusted)

192 values, and all four procedures decreased the CED's expenditure estimates by about one percent
193 from its base-weighted values. Thus in both surveys, CE's expenditure estimates show about a
194 one percent bias using the nonresponse procedures. The consistency of all four weighting
195 procedures within each survey suggests that the results are robust.
196

197 So, overall, the study showed that CE's nonresponse weighting adjustment procedure is working
198 well. The nonrespondents are not MCAR, but the amount of bias they generate is small, and the
199 nonresponse weighting adjustment procedure is doing a good job compensating for the bias. The
200 study provided a counterexample to the commonly-held belief that if a survey's data are not
201 missing completely at random then its estimates are subject to nonresponse bias.
202

203 For more information on the calculation of response rates, see the memorandum from Sharon
204 Krieger to David Swanson on "Response Rates in the Consumer Expenditure Survey" (2018)
205 (Attachment U). For more information on the nonresponse bias studies, see "Assessing
206 Nonresponse Bias in the Consumer Expenditure Interview Survey" (Attachment V).
207

208

209 **2. Collection Methods**

210 Field representatives from the U.S. Census Bureau, under contract with BLS, personally visit the
211 households in the CEQ's and CED's samples to collect the data. Prior to the first household visit,
212 respondents are sent an advanced letter informing them that they have been selected for the
213 survey and asking them for their cooperation. For subsequent household visits in the CEQ
214 survey, respondents are sent an advanced letter reminding them that it has been 3 months since
215 they last participated in the survey and asking them for their cooperation again.
216

217 Field representatives visit each household in the CEQ's sample every 3 months for 4 consecutive
218 quarters to collect information on the expenditures they made during the previous 3 months.
219 Though most interviews are collected by personal visit, approximately 20% of interviews are
220 collected by phone at the respondent's request or due to extenuating circumstances making a
221 personal visit impractical. The field representatives enter the household's responses into a laptop
222 computer. After participating in the survey for 4 quarters, the household is dropped from the
223 survey and replaced by another household. The households in the CEQ survey are on a rotating
224 schedule with approximately one-fourth of the households in the sample being new to the survey
225 each quarter. Due to the coronavirus pandemic, FRs can complete the CEQ by telephone as
226 needed.
227

228 For the CED survey, field representatives visit each household in the sample two times to collect
229 information on the expenditures they make during a 2-week period. On the first visit the field
230 representatives introduce themselves, explain the survey, and leave two weekly diaries, one for
231 each week of the survey period. The household members are asked to record all their
232 expenditures over the 2-week period in those diaries. Then on the second visit, the field
233 representatives pick up the two diaries and thank the household for participating in the survey.
234 After participating in the survey for two weeks, the household is dropped from the survey and
235 replaced by another household. Due to the coronavirus pandemic, procedures will be modified
236 to include contacting the respondent by telephone in lieu of personal visits, emailing a link to a
237 Diary form, telephone transcription of expenditures from the Diary, and the availability of an

238 online Diary. (See Attachment D for a detailed description of CED procedural changes resulting
239 from the coronavirus pandemic including an email template for sending the Diary electronically.)
240

241

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

245

246 Estimation

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

256

257 For additional information on CE's sample design and estimation methodology, please see
258 "Chapter 16, Consumer Expenditures and Income" in the *BLS Handbook of Methods*
259 (Attachment W); Jay Ryan's memorandum to Richard Schwartz on "PSUs for the Consumer
260 Expenditure Survey's 2010 Census-Based Sample Design," December 18, 2012 (Attachment T);
261 and Brian Nix's memo on 'Differences in Response Rates in the Consumer Expenditure Survey'
262 (Attachment X).

263

264

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

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

276

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

283

284 When field staff still cannot convert noninterviews to interviews, the estimation process has a
285 noninterview adjustment to account for them. As mentioned above, every CU in the sample has
286 a base weight equal to the number of CUs in the population it represents. In this process the
287 respondent CUs have their weights increased to account for the nonrespondent CUs. The total
288 sample of CUs (both respondents and nonrespondents) is partitioned into 192 subsets based on
289 their region, CU size, income, and number of contact attempts.³ Then within each subset the
290 base weights of the respondents are increased by multiplying them by a factor equal to the sum
291 of the base weights for all CUs (both respondents and nonrespondents) divided by the sum of the
292 base weights from just the respondent CUs. This makes the final weights of the respondents add
293 up to the total number of CUs in the population.

294
295

296 **4. Testing Plans**

297 CE does not currently have any additional plans for testing. However, in the event that additional
298 stimulus payments are sent by the government, the CE will add stimulus payment questions to
299 the CEQ CAPI Instrument and submit a nonsubstantive change request. The questions, if added,
300 will capture: 1) the receipt of the stimulus payments, 2) by which members of the Consumer Unit
301 (CU), 3) the month the CU received the stimulus, 4) the amount of the stimulus, 5) how the CU
302 received the stimulus (direct deposit or check), 6) the primary use of the stimulus and 7) whether
303 any additional stimulus checks were received by the CU.

304

305 Additionally, CE will research mailing an advance postcard to all CEQ and CED respondents
306 informing them that they will soon receive a letter inviting them to participate in the Consumer
307 Expenditure Survey. (See Attachment Y for additional information.) If CE decides to proceed
308 with this mailing, a nonsubstantive change request will be submitted.

309

310 **5. Statistical Contacts**

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

315

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

316

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