

The Midyear CE Data Quality Profile - 2021

April 29, 2022

Grayson Armstrong, Gray Jones, Tucker Miller, and Sharon Pham

Consumer Expenditure Surveys Program Report Series



Contents

| | |
|--|----|
| Overview..... | 1 |
| Highlights..... | 2 |
| 1. Final disposition rates of eligible sample units (Diary and Interview Surveys)..... | 3 |
| 2. Records Use (Interview Survey)..... | 9 |
| 3. Information Booklet use (Diary and Interview Surveys)..... | 11 |
| 4. Expenditure edit rates (Diary and Interview Surveys)..... | 15 |
| 5. Income imputation rates (Diary and Interview Surveys)..... | 19 |
| 6. Respondent burden (Interview Survey)..... | 23 |
| 7. Survey mode (Interview Survey)..... | 25 |
| 8. Survey Response Time (Diary and Interview Surveys)..... | 28 |
| Conclusion..... | 31 |
| References..... | 32 |

Overview

The Bureau of Labor Statistics (BLS) is committed to producing data that are of consistently high quality (i.e., accurate, objective, relevant, timely, and accessible) in accordance with Statistical Policy Directive No. 1¹. This Directive, issued by the Office of Management and Budget, affirms the fundamental responsibilities of Federal Statistical Agencies, and recognized statistical units in the design, collection, processing, editing, compilation, storage, analysis, release, and dissemination of statistical information. The BLS Consumer Expenditure Surveys (CE) program provides data users with a variety of resources to assist them in analyzing overall CE data quality. CE data users can evaluate quality on their own by utilizing the following:

- Standard errors provided for the official CE tables.
- BLS-provided CE response rates (provided for all BLS household surveys).
- Published data comparisons between CE and other household survey estimates.
- Published results of nonresponse bias studies.
- CE Public-use microdata datasets with variables and flags necessary to create quality metrics.

In addition, the Data Quality Profile (DQP) provides a comprehensive set of quality metrics that are timely, routinely updated, and accessible to users. For data users, DQP metrics are an indication of quality for both the Interview Survey and the Diary Survey. For internal stakeholders, these metrics signal areas for improvements to the surveys.

This DQP includes, for each metric, a brief description of each metric, along with the results, which are tabulated and graphed. [The DQP Reference Guide](#) (Armstrong, Jones, Miller & Pham 2022) gives detailed descriptions of the metrics, computations, and methodology.

Prior DQPs are available on the CE External Research Library Page. BLS began publishing DQPs every year beginning with the 2017 data, though prototype DQPs are available for 2013 and 2015. Midyear DQPs started with the 2020 midyear data release.

The data quality metrics are reported in quarterly format, where the quarter is the three-month period in which the survey data were collected. For example, “2021q1” refers to the surveys fielded in the months of January, February, and March of 2021. Because the respondents to the Interview Survey are asked to recall their expenditures from the prior three months, the data collected in 2021q1 correspond to expenditures made in 2020q4. In contrast, respondents to the Diary Survey report expenditures on the days they were transacted. This is the reason why the Interview Survey metrics appear to be “ahead” of the Diary Survey by a quarter (e.g., 2021q3 for the Interview Survey and 2021q2 for the Diary Survey). Where annual rates are used to describe metric trends in this report, the annual rate was computed as the average of quarterly rates from the same calendar year weighted by the number of consumer units in that quarter.

¹ The Office of Management and Budget has oversight over all Federal surveys and provides the rules under which they operate. See the [Federal Register notice](#) for more details.

Highlights

In this section, we highlight some of the metric trends from the past three years. This time frame covers the final quarters of the 2018 collection period to the first quarters of the 2021 collection period. Because the respondents to the Interview Survey are asked to recall their spending over the prior three months, data collected in one calendar quarter include some expenditures made in the prior quarter. Hence, the Interview Survey metrics in this profile cover the data collection time period of 2018q4 through 2021q3, which includes expenditures transacted from 2018q3 to 2021q3. Respondents to the Diary Survey are asked to report their spending as it occurs, so Diary Survey metrics in this profile cover the time period of 2018q3 through 2021q2. Subsequent sections describe the individual metrics with detailed data tables.

Recent Trends of Note:

- The final disposition rate for the Diary Survey has continued to recover following the onset of the COVID-19 pandemic in March 2020.
- Use of the Information Booklet for both the Interview and Diary Surveys have continued to improve after falling substantially in 2020q2.
- Despite a slight increase in 2021q2, the rate of respondents who report perceiving *no* burden has also generally declined.

1. Final disposition rates of eligible sample units (Diary and Interview Surveys)

Final disposition rates of eligible sample units report the final participation outcomes of field staff's survey recruitment efforts. The BLS classifies the final outcome of eligible sample units into the following four main categories:

1. Completed interview
2. Nonresponse due to *refusal*
3. Nonresponse due to *noncontact*
4. Nonresponse due to *other* reasons

Completed interviews reclassified to a nonresponse by BLS staff are included within the *other nonresponse* category and are presented in the nonresponse reclassification tables (Tables 1.2 and 1.4). More information on the nonresponse reclassification edit, along with information on how we calculate response rates can be found in the [DQP Reference Guide](#) (Armstrong, Jones, Miller, and Pham, 2022).

The key point of interest regarding response rates is that low response rates can indicate nonresponse bias of an expenditure estimate if the nonresponse is correlated with that expenditure category. While recently published research on nonresponse bias has not shown statistically significant bias in the CE survey estimates during the COVID 19 pandemic (Ash, Nix, and Steinberg, 2022), BLS continues to monitor this risk.

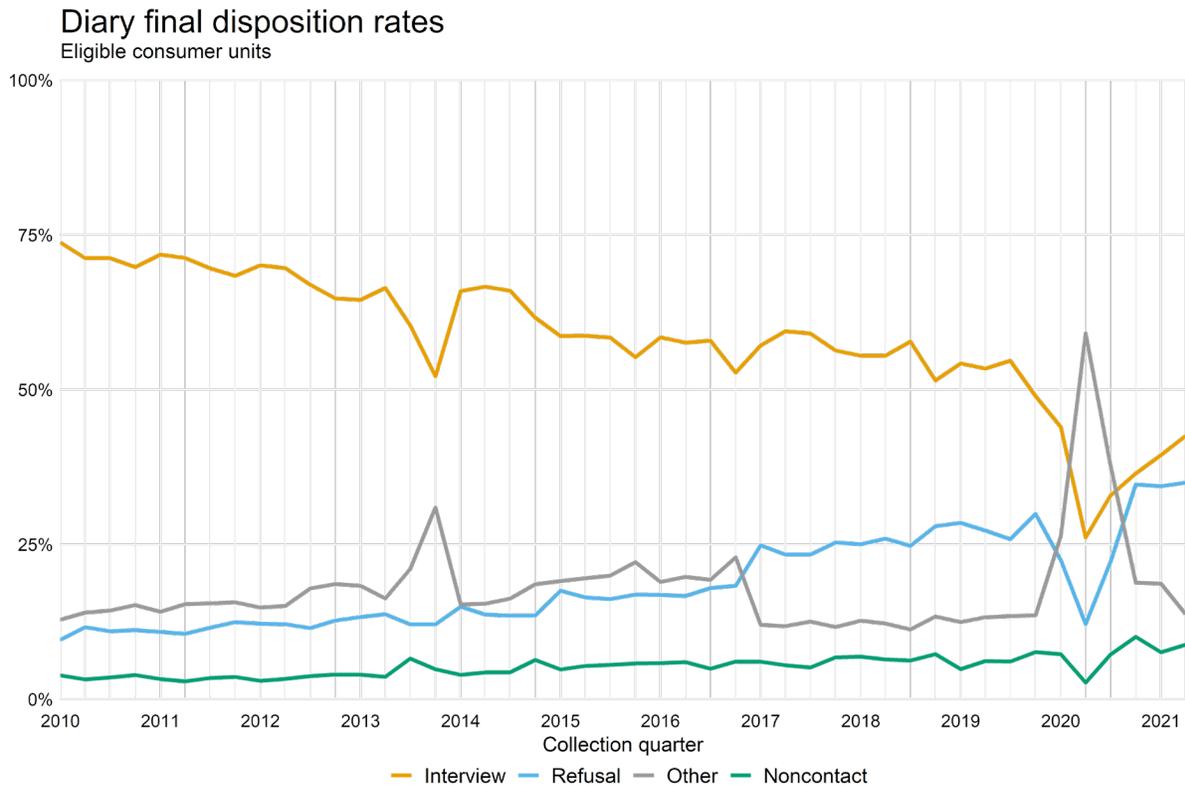
In addition, higher response rates are preferred for more precise estimates. We present unweighted response rates in this report because unweighted rates measure the effectiveness of our data collection efforts. When we previously calculated weighted response rates, they showed no meaningful difference from the unweighted rates.

Diary Survey Summary

- In March 2020, the Census Bureau suspended in-person diary placement interviews due to the COVID-19 pandemic, causing response rates to drop to 26.1 percent in 2020q2 (Table 1.1). Since then, response rates have slowly recovered, rising to 42.5 percent in 2021q2 (Table 1.1). Overall, response rates declined 15.3 percentage points from 57.8 in 2018q3 to 42.5 in 2021q2 (Table 1.1).
- Refusal rates contributed most to the decline in response rates with an increase of 10.1 percentage points from 24.8 to 34.9 percent (Table 1.1).
- Noncontact rates rose 2.6 percentage points from 6.2 to 8.8 percent (Table 1.1).
- Other nonresponse rates increased by a modest 2.6 percentage points overall from 2018q3 to 2021q3 but rose outside of the normal range to 26.3 percent in 2020q1 and jumped to a historical high of 59.1 percent in 2020q2 (Table 1.1). This was largely driven by other nonresponse reclassifications, which increased by 3,205 cases between 2019q4 and 2020q2, as the BLS reclassified a large number of

interviews from ineligible to eligible nonrespondents at the start of the COVID-19 pandemic (Table 1.2). Other nonresponse rates fell from 2020q3 to 2021q2, but remained relatively high until 2021q2 when they settled back to 13.8 percent (Table 1.2)²

Graph 1.1 Diary Survey Final Disposition Rates



² Many respondents could not be reached by telephone because interviewers did not have a working telephone number for the respondent. Interviewers were instructed to classify these cases as ineligible nonrespondents and BLS elected to reclassify the majority as eligible other nonrespondents. For more information on this nonresponse reclassification, see the [DQP Reference Guide](#) (Armstrong, Jones, Miller, and Pham, 2022).

Table 1.1 Diary Survey: distribution of final dispositions for eligible sample units (unweighted)

| Quarter | Number of eligible sample units | Row percentage | | | |
|---------|---------------------------------|----------------|---------|------------|-------------------|
| | | Interview | Refusal | Noncontact | Other Nonresponse |
| 2018q3 | 5,014 | 57.8 | 24.8 | 6.2 | 11.2 |
| 2018q4 | 5,072 | 51.5 | 27.9 | 7.3 | 13.3 |
| 2019q1 | 4,926 | 54.2 | 28.5 | 4.9 | 12.4 |
| 2019q2 | 5,082 | 53.4 | 27.2 | 6.1 | 13.2 |
| 2019q3 | 5,020 | 54.7 | 25.8 | 6.1 | 13.4 |
| 2019q4 | 5,216 | 48.9 | 29.9 | 7.6 | 13.5 |
| 2020q1 | 7,474 | 44.0 | 22.5 | 7.3 | 26.3 |
| 2020q2 | 7,409 | 26.1 | 12.1 | 2.7 | 59.1 |
| 2020q3 | 7,784 | 32.9 | 22.2 | 7.2 | 37.7 |
| 2020q4 | 7,774 | 36.5 | 34.7 | 10.1 | 18.8 |
| 2021q1 | 7,488 | 39.4 | 34.4 | 7.6 | 18.6 |
| 2021q2 | 7,584 | 42.5 | 34.9 | 8.8 | 13.8 |

Table 1.2 Diary Survey: prevalence of nonresponse reclassifications

| Quarter | Number of eligible sample units | Number of nonresponse reclassifications | | |
|---------|---------------------------------|---|----------------------------|-------------------------|
| | | Total reclassifications | COVID 19 reclassifications | Other reclassifications |
| 2018q3 | 5,014 | 247 | 0 | 247 |
| 2018q4 | 5,072 | 205 | 0 | 205 |
| 2019q1 | 4,926 | 232 | 0 | 232 |
| 2019q2 | 5,082 | 243 | 0 | 243 |
| 2019q3 | 5,020 | 229 | 0 | 229 |
| 2019q4 | 5,216 | 188 | 0 | 188 |
| 2020q1 | 7,474 ³ | 855 | 562 | 293 |
| 2020q2 | 7,411 | 3,393 | 3,202 | 191 |
| 2020q3 | 7,784 | 250 | 34 | 216 |
| 2020q4 | 7,774 | 248 | 10 | 238 |
| 2021q1 | 7,488 | 374 | 2 | 372 |
| 2021q2 | 7,584 | 353 | 0 | 353 |

³ The Diary Survey's sample size increased in 2020q1 to support the Consumer Price Index's Commodities and Services Survey sample frame.

Interview Survey Summary

- In March 2020, the Census Bureau suspended all in-person interviews due to the COVID-19 pandemic. Post suspension response rates fell 6.3 percentage points from 2020q1 to 2020q2 (Table 1.3). Since then, this rate has stagnated, only increasing from 45.9 to 46.1 percent between 2020q2 and 2021q3, still well below pre-pandemic levels (Table 1.3).
- Refusal rates generally rose, being 8.3 percentage points higher in 2021q3 (43.0 percent) than in 2018q4 (34.7 percent); however, they were sharply lower in 2020q2 and 2020q3 due to a large jump in the number of COVID-19 pandemic related other nonresponse cases (Table 1.3).
- In the quarters prior to 2020q2, noncontact rates remained fairly steady but fell to near zero in 2020q2 (0.8 percent) due to the onset of the COVID-19 pandemic and the resulting large increase in the number of other nonresponse cases. Noncontact rates rose back to 4.0 percent in 2020q3, but in the subsequent quarters (2020q4 to 2021q3), continued to increase past the pre-pandemic norm (Table 1.3).
- Other nonresponse rates declined from 5.0 in 2018q4 to 2.5 in 2021q3, a significant drop from 37.9 percent in 2020q2 due to COVID-19 reclassifications at BLS (Table 1.3). Eventually, the COVID-19 reclassifications declined to 0 due to the BLS transferring the reclassification process to the Census Bureau in 2021q2.⁴

⁴ It should also be noted that in the nonresponse reclassification tables, the COVID 19 reclassifications dropped to zero for both the Diary Survey and the Interview Survey in 2021q2 due to the Census Bureau taking over the reclassification process. Now, BLS receives the data with the correct final outcomes, so there is no in-house reclassification process that would present itself in these tables.

Table 1.4 Interview Survey: prevalence of nonresponse reclassifications

| Quarter | Number of eligible sample units | Number of nonresponse reclassifications | | |
|---------|---------------------------------|---|----------------------------|-------------------------|
| | | Total reclassifications | COVID 19 reclassifications | Other reclassifications |
| 2018q4 | 10,161 | 5 | 0 | 5 |
| 2019q1 | 10,108 | 8 | 0 | 8 |
| 2019q2 | 10,075 | 2 | 0 | 2 |
| 2019q3 | 10,037 | 9 | 0 | 9 |
| 2019q4 | 10,170 | 14 | 0 | 14 |
| 2020q1 | 9,956 | 197 | 186 | 11 |
| 2020q2 | 10,581 | 2,955 | 2,944 | 11 |
| 2020q3 | 11,190 | 88 | 74 | 14 |
| 2020q4 | 11,185 | 32 | 14 | 18 |
| 2021q1 | 11,125 | 72 | 2 | 70 |
| 2021q2 | 11,120 | 522 | 0 | 522 |
| 2021q3 | 11,117 | 156 | 0 | 156 |

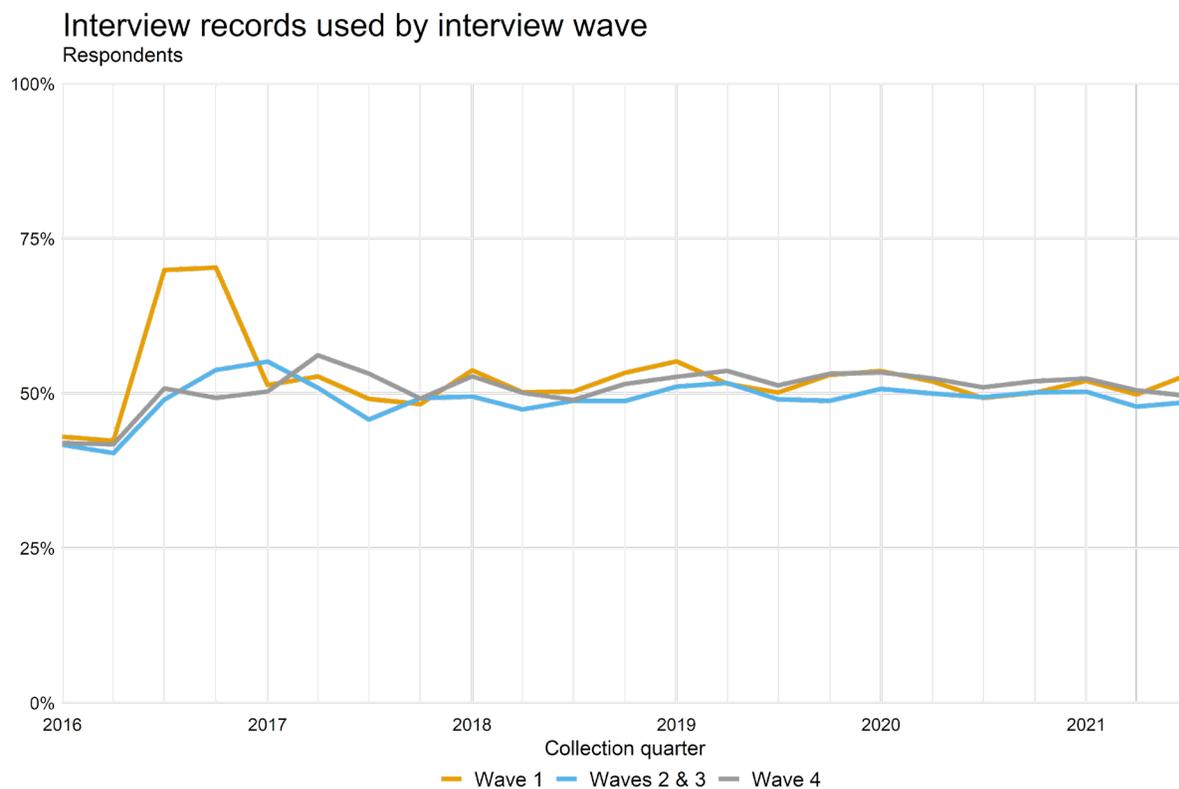
2. Records Use (Interview Survey)

The Records Use metric measures the proportion of respondents who refer to records while answering the Interview Survey questions, according to the interviewer. Examples of records include, but are not limited to, receipts, bills, checkbooks, and bank statements. Records use is retrospectively recorded by the interviewer at the end of the interview. Past research has shown that respondents who use expenditure records reported more items with lower rates of missingness (Abdirizak, Erhard, Lee, and McBride, 2017), so a higher prevalence of records use is desirable. Metrics in this section are presented by survey wave⁵.

Interview Survey Summary

- Records usage temporarily rose in 2016 for Wave 1 respondents, and this is likely a result of a field test conducted during this period that gave a subset of respondent's monetary incentives to use records.
- Since 2017, records use has been stable across interview waves.

Graph 2.1 Interview Survey Records Used by Interview Wave



⁵ In the Interview Survey, each family in the sample is interviewed every 3 months over four calendar quarters. These interviews are commonly referred to as waves. For more information on survey administration please see [the CE handbook of methods](#).

Table 2.1 Interview Survey: prevalence of records use among respondents

| Quarter | Wave | Number of respondents | Row percentage | | |
|---------|-------------|-----------------------|----------------|-------------|------------------|
| | | | Used | Did not use | Missing response |
| 2018q4 | Wave 1 | 1,399 | 53.3 | 45.7 | 0.9 |
| 2018q4 | Waves 2 & 3 | 2,782 | 48.7 | 50.8 | 0.4 |
| 2018q4 | Wave 4 | 1,390 | 51.5 | 47.4 | 1.1 |
| 2019q1 | Wave 1 | 1,465 | 55.2 | 43.8 | 1.0 |
| 2019q1 | Waves 2 & 3 | 2,730 | 51.1 | 48.4 | 0.5 |
| 2019q1 | Wave 4 | 1,428 | 52.7 | 46.9 | 0.4 |
| 2019q2 | Wave 1 | 1,443 | 51.6 | 47.6 | 0.8 |
| 2019q2 | Waves 2 & 3 | 2,653 | 51.7 | 47.9 | 0.4 |
| 2019q2 | Wave 4 | 1,397 | 53.6 | 45.5 | 0.9 |
| 2019q3 | Wave 1 | 1,401 | 50.1 | 48.7 | 1.2 |
| 2019q3 | Waves 2 & 3 | 2,651 | 49.0 | 50.2 | 0.8 |
| 2019q3 | Wave 4 | 1,285 | 51.3 | 48.1 | 0.6 |
| 2019q4 | Wave 1 | 1,318 | 53.0 | 46.2 | 0.8 |
| 2019q4 | Waves 2 & 3 | 2,637 | 48.8 | 51.0 | 0.2 |
| 2019q4 | Wave 4 | 1,293 | 53.1 | 46.3 | 0.5 |
| 2020q1 | Wave 1 | 1,239 | 53.6 | 45.2 | 1.2 |
| 2020q1 | Waves 2 & 3 | 2,601 | 50.7 | 48.9 | 0.4 |
| 2020q1 | Wave 4 | 1,362 | 53.4 | 46.2 | 0.4 |
| 2020q2 | Wave 1 | 965 | 51.9 | 47.3 | 0.8 |
| 2020q2 | Waves 2 & 3 | 2,559 | 50.0 | 49.7 | 0.3 |
| 2020q2 | Wave 4 | 1,334 | 52.4 | 47.1 | 0.5 |
| 2020q3 | Wave 1 | 1,143 | 49.3 | 49.3 | 1.4 |
| 2020q3 | Waves 2 & 3 | 2,444 | 49.4 | 50.3 | 0.3 |
| 2020q3 | Wave 4 | 1,393 | 51.0 | 48.7 | 0.4 |
| 2020q4 | Wave 1 | 1,230 | 50.1 | 49.6 | 0.3 |
| 2020q4 | Waves 2 & 3 | 2,589 | 50.1 | 49.3 | 0.5 |
| 2020q4 | Wave 4 | 1,386 | 51.9 | 47.8 | 0.2 |
| 2021q1 | Wave 1 | 1,250 | 52.0 | 47.4 | 0.6 |
| 2021q1 | Waves 2 & 3 | 2,515 | 50.3 | 49.4 | 0.4 |
| 2021q1 | Wave 4 | 1,350 | 52.4 | 47.0 | 0.7 |
| 2021q2 | Wave 1 | 1,325 | 49.8 | 49.6 | 0.6 |
| 2021q2 | Waves 2 & 3 | 2,534 | 47.8 | 51.4 | 0.7 |
| 2021q2 | Wave 4 | 1,337 | 50.5 | 48.9 | 0.6 |
| 2021q3 | Wave 1 | 1,352 | 53.0 | 46.1 | 1.0 |
| 2021q3 | Waves 2 & 3 | 2,488 | 48.6 | 50.6 | 0.8 |
| 2021q3 | Wave 4 | 1,281 | 49.6 | 49.6 | 0.8 |

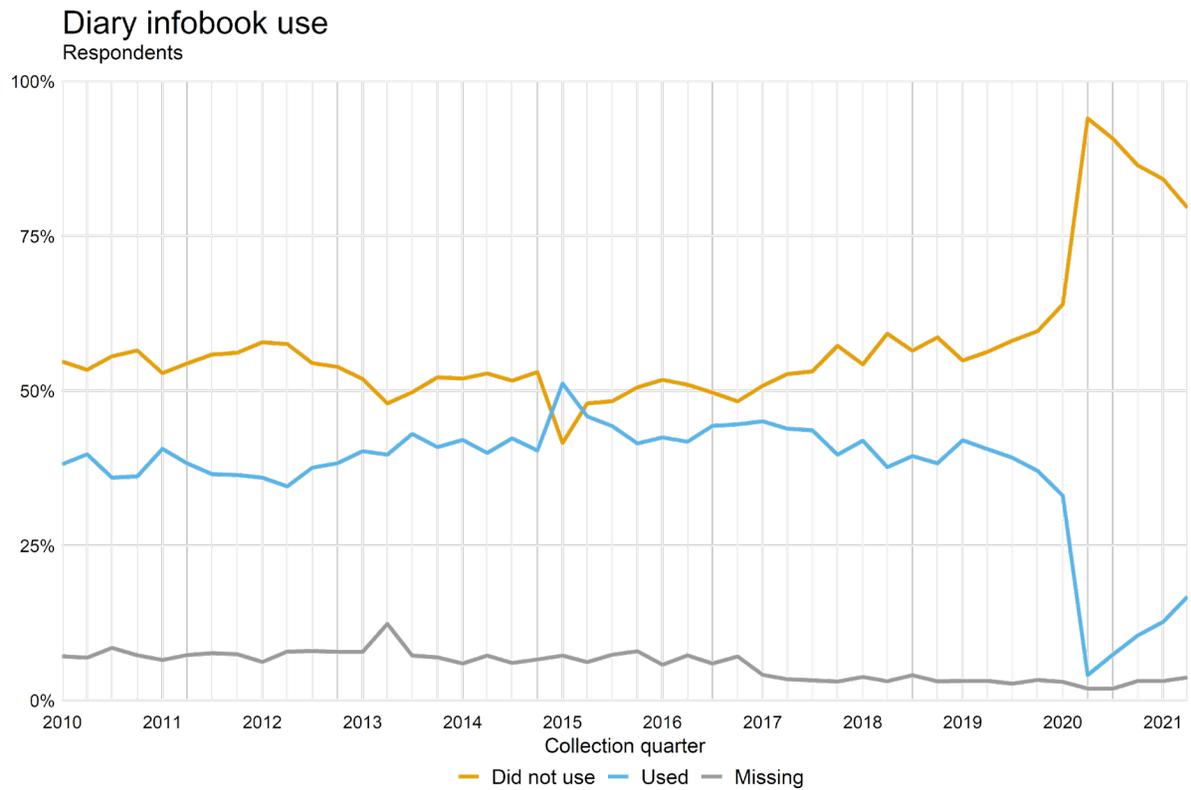
3. Information Booklet use (Diary and Interview Surveys)

The Information Booklet is a recall aide the interviewer provides for respondents for both the Interview and Diary surveys, and each provides the response options for demographic questions and the income bracket response options. In addition, the Interview Information Booklet provides clarifying examples for the kinds of expenditures that each section/item code is intended to collect.

This metric measures the prevalence of Information Booklet use among respondents during their interviews, according to interviewers. For interviews conducted over the phone, the Information Booklet is typically not directly available to the respondent (although a PDF version is available on the BLS website), so this metric should be interpreted in conjunction with the rise in telephone interviews during the COVID-19 pandemic. Higher rates of Information Booklet usage are encouraged, as use can improve reporting quality by clarifying concepts and providing examples.

Diary Survey Summary

- The prevalence of Information Booklet use among Diary Survey respondents remained fairly constant from 2018q3 to 2019q4.
- In mid-March 2020, CE suspended all in-person interviews and Information Booklet use declined by 29 percentage points from 2020q1 to 2020q2.

Graph 3.1 Diary Survey Information Booklet Use**Table 3.1 Diary Survey: prevalence of Information Booklet use among respondents**

| Quarter | Number of respondents | Row percentage | | |
|---------|-----------------------|----------------|-------------|------------------|
| | | Used | Did not use | Missing response |
| 2018q3 | 2,896 | 39.5 | 56.5 | 4.0 |
| 2018q4 | 2,611 | 38.3 | 58.6 | 3.1 |
| 2019q1 | 2,671 | 42.0 | 54.9 | 3.1 |
| 2019q2 | 2,713 | 40.6 | 56.3 | 3.1 |
| 2019q3 | 2,745 | 39.2 | 58.1 | 2.7 |
| 2019q4 | 2,553 | 37.1 | 59.6 | 3.3 |
| 2020q1 | 3,285 | 33.1 | 64.0 | 3.0 |
| 2020q2 | 1,936 | 4.1 | 94.0 | 1.9 |
| 2020q3 | 2,559 | 7.3 | 90.8 | 1.9 |
| 2020q4 | 2,835 | 10.5 | 86.4 | 3.1 |
| 2021q1 | 2,952 | 12.7 | 84.2 | 3.1 |
| 2021q2 | 3,224 | 16.7 | 79.6 | 3.7 |

Interview Survey Summary

- In mid-March 2020, BLS temporarily discontinued the use of physical copies of the Information Booklet due to the COVID-19 pandemic and referred respondents to the online version. As a result, the Information Booklet use rate declined 44.1 percentage points for Wave 1 respondents from 2019q4 to 2020q2.
- Declines in Information Booklet use were similar for subsequent waves and about 95 percent of all respondents in 2020q2 did not have access to the Information Booklet.
- In the beginning in July 2020, disposable copies of the Information Booklets were provided to respondents and Information Booklet use rose to an average of 5.3 percent for all waves in 2020q3.
- Since then, Information Booklet use across all waves has continued to recover from the 2020q2 low.
- Information Booklet use for Wave 1 respondents improved 16.7 percentage points from 2020q2 to 2021q3, but still remains well below pre-pandemic highs of 50 percent.

Graph 3.2 Interview Survey Information Booklet Use

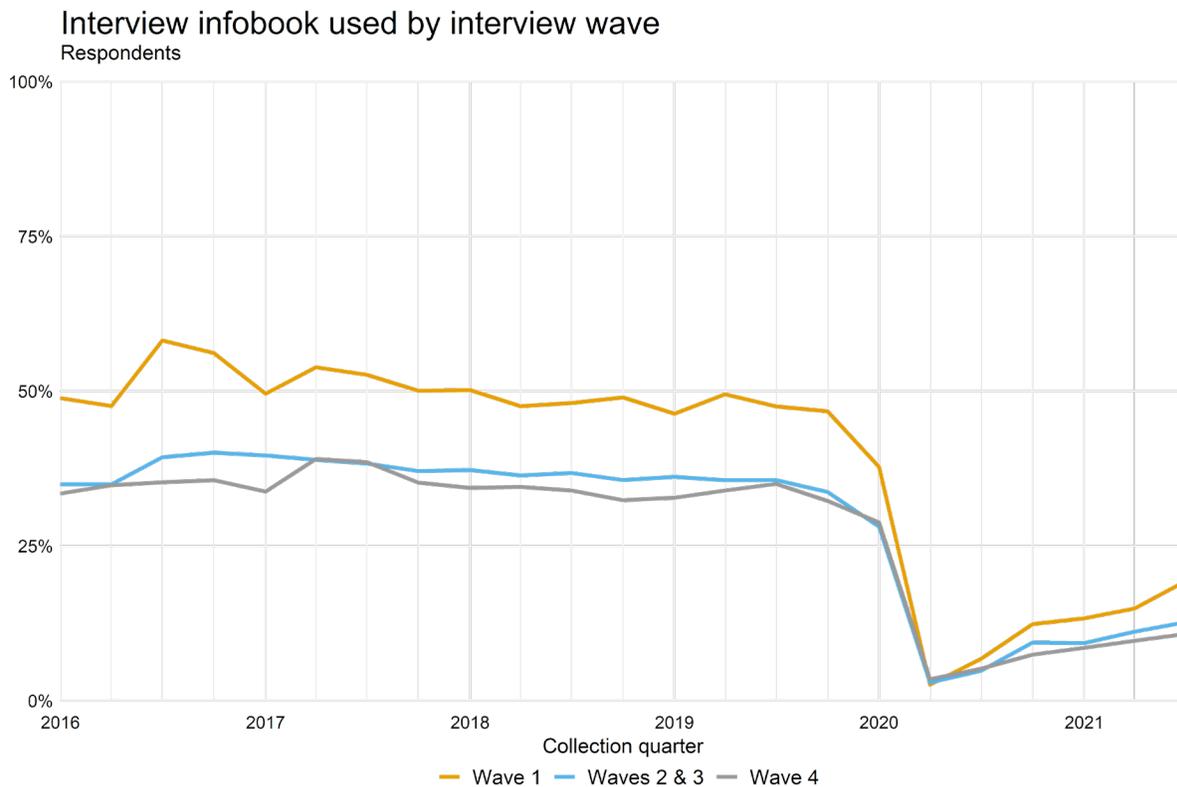


Table 3.2 Prevalence of Information Booklet use among Interview Survey respondents

| Quarter | Wave | Number of respondents | Row percentage | | |
|---------|-------------|-----------------------|----------------|--------------------------|------------------|
| | | | Used | Did not use ⁶ | Missing response |
| 2018q4 | Wave 1 | 1,399 | 49.0 | 17.3 | 0.9 |
| 2018q4 | Wave 2 & 3 | 2,782 | 35.6 | 15.9 | 0.4 |
| 2018q4 | Wave 4 | 1,390 | 32.4 | 16.7 | 1.1 |
| 2019q1 | Wave 1 | 1,465 | 46.3 | 15.8 | 1.0 |
| 2019q1 | Wave 2 & 3 | 2,730 | 36.2 | 14.0 | 0.5 |
| 2019q1 | Wave 4 | 1,428 | 32.8 | 14.6 | 0.4 |
| 2019q2 | Wave 1 | 1,443 | 49.5 | 17.3 | 0.8 |
| 2019q2 | Wave 2 & 3 | 2,653 | 35.6 | 15.9 | 0.4 |
| 2019q2 | Wave 4 | 1,397 | 33.9 | 16.7 | 0.9 |
| 2019q3 | Wave 1 | 1,401 | 47.5 | 18.0 | 1.2 |
| 2019q3 | Wave 2 & 3 | 2,651 | 35.6 | 15.2 | 0.8 |
| 2019q3 | Wave 4 | 1,285 | 35.0 | 13.8 | 0.6 |
| 2019q4 | Wave 1 | 1,318 | 46.7 | 16.5 | 0.8 |
| 2019q4 | Wave 2 & 3 | 2,637 | 33.7 | 14.9 | 0.2 |
| 2019q4 | Wave 4 | 1,293 | 32.3 | 15.3 | 0.5 |
| 2020q1 | Wave 1 | 1,239 | 37.8 | 15.7 | 1.2 |
| 2020q1 | Wave 2 & 3 | 2,601 | 28.1 | 13.9 | 0.4 |
| 2020q1 | Wave 4 | 1,362 | 28.8 | 13.7 | 0.4 |
| 2020q2 | Wave 1 | 965 | 2.6 | 1.8 | 0.8 |
| 2020q2 | Wave 2 & 3 | 2,559 | 2.9 | 1.8 | 0.3 |
| 2020q2 | Wave 4 | 1,334 | 3.4 | 0.8 | 0.5 |
| 2020q3 | Wave 1 | 1,143 | 6.7 | 2.4 | 1.4 |
| 2020q3 | Wave 2 & 3 | 2,444 | 4.8 | 2.7 | 0.3 |
| 2020q3 | Wave 4 | 1,393 | 5.2 | 2.1 | 0.4 |
| 2020q4 | Wave 1 | 1,230 | 12.4 | 6.7 | 0.3 |
| 2020q4 | Waves 2 & 3 | 2,589 | 9.4 | 3.6 | 0.5 |
| 2020q4 | Wave 4 | 1,386 | 7.4 | 3.8 | 0.2 |
| 2021q1 | Wave 1 | 1,250 | 13.3 | 6.2 | 0.6 |
| 2021q1 | Waves 2 & 3 | 2,515 | 9.3 | 3.3 | 0.4 |
| 2021q1 | Wave 4 | 1,350 | 8.5 | 4.2 | 0.7 |
| 2021q2 | Wave 1 | 1,325 | 14.9 | 7.8 | 0.6 |
| 2021q2 | Waves 2 & 3 | 2,534 | 11.1 | 7.0 | 0.7 |
| 2021q2 | Wave 4 | 1,337 | 9.6 | 5.2 | 0.6 |
| 2021q3 | Wave 1 | 1,352 | 19.3 | 11.7 | 1.0 |
| 2021q3 | Waves 2 & 3 | 2,488 | 12.7 | 7.4 | 0.8 |
| 2021q3 | Wave 4 | 1,281 | 10.8 | 7.2 | 0.8 |

⁶ This "Did not use" category does not include records where there was no Information Booklet available.

4. Expenditure edit rates (Diary and Interview Surveys)

The Expenditure edit rates metric measures the proportion of reported expenditure data that are edited. These edits are changes made to the reported expenditure data during CE data processing, excluding changes due to time period conversion calculations and top-coding or suppression of reported values. Top-coding and suppression are done to protect respondent confidentiality in the public-use microdata. More information on these concepts is available on the [CE Website](#).

The Interview Survey expenditure edit rates are broken down into three categories: Imputation, Allocation, and Manual Edits:

- *Imputation* replaces missing or invalid responses with a valid value.
- *Allocation* edits are applied when respondents provide insufficient detail to meet tabulation requirements. For example, if a respondent provides a non-itemized total expenditure report for the category of fuels and utilities, that total amount will be allocated to the target items mentioned by the respondent (such as natural gas and electricity).
- *Manual* edits occur whenever responses are directly edited by BLS economists based on their analysis and expert judgment.

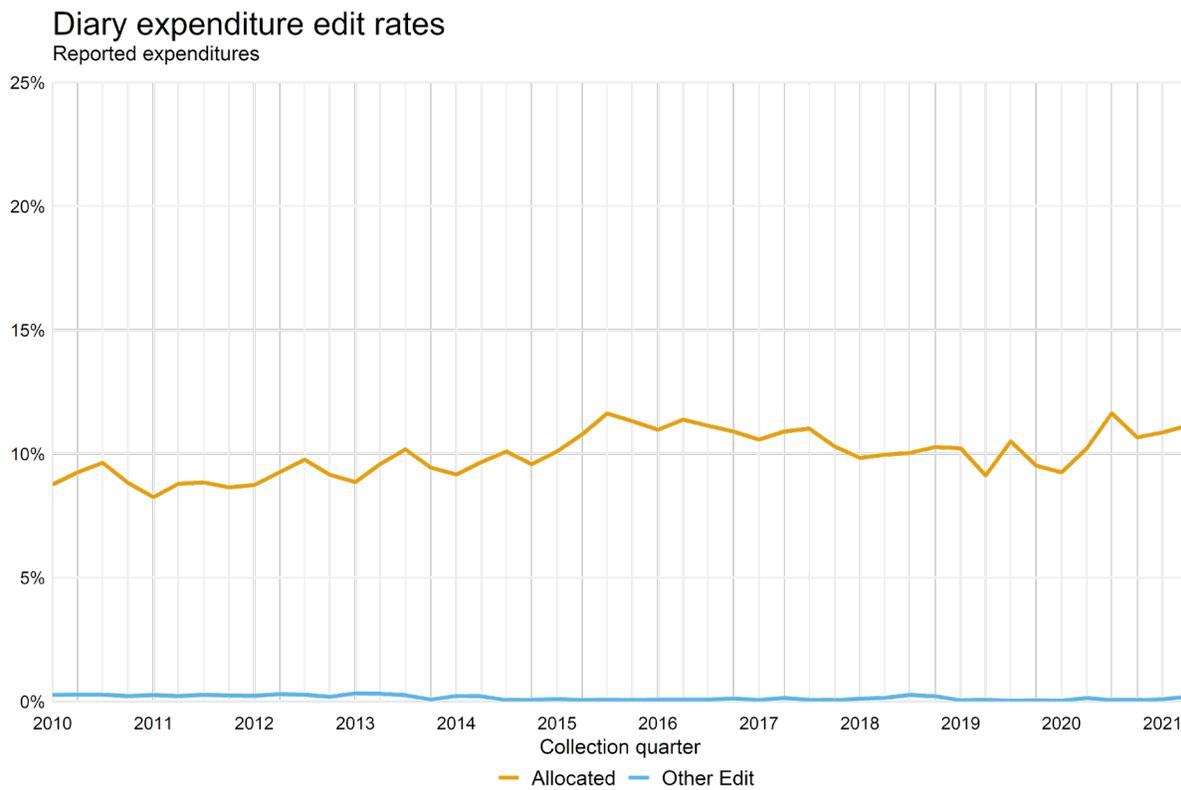
The Diary survey expenditure edit rates are only broken down into two categories: Allocations and Other Edits. Most edits in the Diary survey are allocations. Table 4.1 below shows the “other edits” category, which covers all other expenditure edits including imputation and manual edits, and we can see from the data that these edits are relatively rare.

Imputation in CE data results from expenditure amount nonresponse. Allocation is a consequence of responses lacking the required details for items asked by the survey. Lower edit rates are preferred, as it lowers the risk of processing error. However, edits based on sound methodology can improve the completeness of the data, and thereby reduce the risk of measurement error and nonresponse bias in survey estimates. Additional information on expenditure edits is available in the [DQP Reference Guide](#) (Armstrong, Jones, Miller, and Pham, 2022).

Diary Survey Edit Summary

- In the beginning of January 2020, an increase in CE’s sample size resulted in the number of reported expenditures rising by over 22,000, but as response rates dropped in 2020q2, so did the number of expenditures.⁷
- The total rate of unedited expenditure amounts fell 1 percentage point from 89.7 percent in 2018q3 to 88.7 percent in 2021q2.
- Increasing edit rates were driven by a 1.1 percentage point increase in allocation rates from 2018q3 to 2021q2.

Graph 4.1 Diary Survey Expenditure Edit Rates



⁷ This increase in sample size was made possible by increased funding to accommodate collection of outlet information needed for calculating the Consumer Price Index.

Table 4.1 Diary Survey: reported expenditure records

| Quarter | Number of expenditures | Row percentage | | |
|---------|------------------------|----------------|------------|----------|
| | | Allocated | Other edit | Unedited |
| 2018q3 | 88,342 | 10.0 | 0.3 | 89.7 |
| 2018q4 | 80,129 | 10.3 | 0.2 | 89.5 |
| 2019q1 | 79,626 | 10.2 | 0.0 | 89.7 |
| 2019q2 | 85,329 | 9.1 | 0.1 | 90.8 |
| 2019q3 | 83,639 | 10.5 | 0.0 | 89.5 |
| 2019q4 | 80,510 | 9.5 | 0.0 | 90.4 |
| 2020q1 | 102,693 | 9.2 | 0.0 | 90.7 |
| 2020q2 | 41,257 | 10.2 | 0.1 | 89.6 |
| 2020q3 | 56,071 | 11.6 | 0.0 | 88.3 |
| 2020q4 | 69,959 | 10.7 | 0.0 | 89.3 |
| 2021q1 | 72,138 | 10.9 | 0.1 | 89.1 |
| 2021q2 | 80,646 | 11.1 | 0.2 | 88.7 |

Interview Survey Edit Summary

- The total rate of unedited expenditure amounts increased 1.2 percentage points from 84.0 percent in 2018q4 to 85.2 percent in 2021q3.
- This was primarily driven by allocation rates declining 1.9 percentage points from 12.0 percent in 2018q4 to 10.1 percent in 2021q3.
- Declines in allocation rates were partially offset by increases in the manual edit rate from 0.1 percent in 2018q4 to 0.5 percent in 2021q3.

Graph 4.2 Interview Survey Expenditure Edit Rates

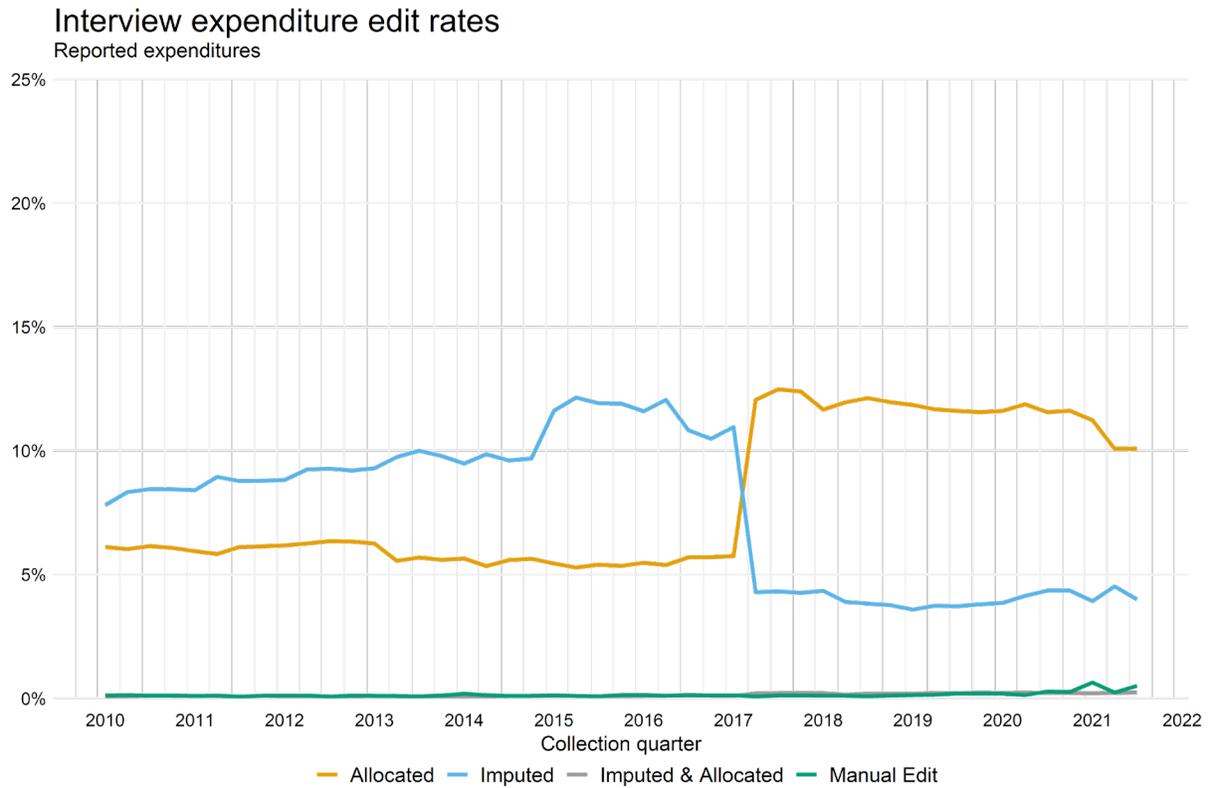


Table 4.2 Interview Survey: reported expenditure records

| Quarter | Number of expenditures | Row percentage | | | | Unedited |
|---------|------------------------|----------------|---------|---------------------|-------------|----------|
| | | Allocated | Imputed | Imputed & allocated | Manual Edit | |
| 2018q4 | 259,508 | 12.0 | 3.8 | 0.2 | 0.1 | 84.0 |
| 2019q1 | 264,424 | 11.8 | 3.6 | 0.2 | 0.1 | 84.3 |
| 2019q2 | 255,037 | 11.7 | 3.7 | 0.2 | 0.1 | 84.2 |
| 2019q3 | 251,370 | 11.6 | 3.7 | 0.2 | 0.2 | 84.3 |
| 2019q4 | 244,834 | 11.6 | 3.8 | 0.2 | 0.2 | 84.2 |
| 2020q1 | 246,488 | 11.6 | 3.9 | 0.2 | 0.2 | 84.1 |
| 2020q2 | 217,785 | 11.9 | 4.1 | 0.2 | 0.1 | 83.6 |
| 2020q3 | 224,639 | 11.6 | 4.3 | 0.2 | 0.3 | 83.6 |
| 2020q4 | 232,195 | 11.6 | 4.3 | 0.2 | 0.3 | 83.6 |
| 2021q1 | 231,850 | 11.2 | 3.9 | 0.2 | 0.6 | 84.0 |
| 2021q2 | 232,282 | 10.1 | 4.5 | 0.2 | 0.2 | 85.0 |
| 2021q3 | 231,351 | 10.1 | 4.0 | 0.2 | 0.5 | 85.2 |

5. Income imputation rates (Diary and Interview Surveys)

The Income imputation rates metric describes edits performed on a consumer unit's nonresponse to at least one source of income. This edit is based on three imputation methods, applicable to both CE Surveys:

1. Model-based imputation: when the respondent mentions receipt of an income source but fails to report the amount.
2. Bracket response imputation: when the respondent mentions receipt of an income source, but only reports that income as falling within a specified range.
3. All valid blank (AVB) conversion: when the respondent reports no receipt of income from any source, but the CE imputes receipt from at least one source.

After imputation, income from each component source is summed to compute total income before taxes. In the text that follows, income before taxes is defined as "unimputed" if no source of total income required imputation for one of the three reasons identified above. Again, this applies to both the Diary and Interview Surveys.

Since the need for imputation reflects either item nonresponse or that insufficient item detail was provided, lower imputation rates are desirable for lowering measurement error. However, imputation based on sound methodology can improve the completeness of the data and reduce the risk of nonresponse bias due to dropping incomplete cases from the dataset. Further details on the income imputation methodology can be found in the [DQP Reference Guide](#) (Armstrong, Jones, Miller, and Pham, 2022) and the User's Guide to Income Imputation in the CE (Paulin, Reyes-Morales, and Fisher, 2018).

Diary Survey Summary

- The rate of unimputed total income before taxes rose slightly from 53.8 percent in 2018q3 to 54.9 percent in 2021q2.
- Model-based imputation rates declined 1.4 percentage points from 21.3 percent in 2018q3 to 19.9 percent in 2021q2.

Graph 5.1 Diary Survey Income Imputation Rates

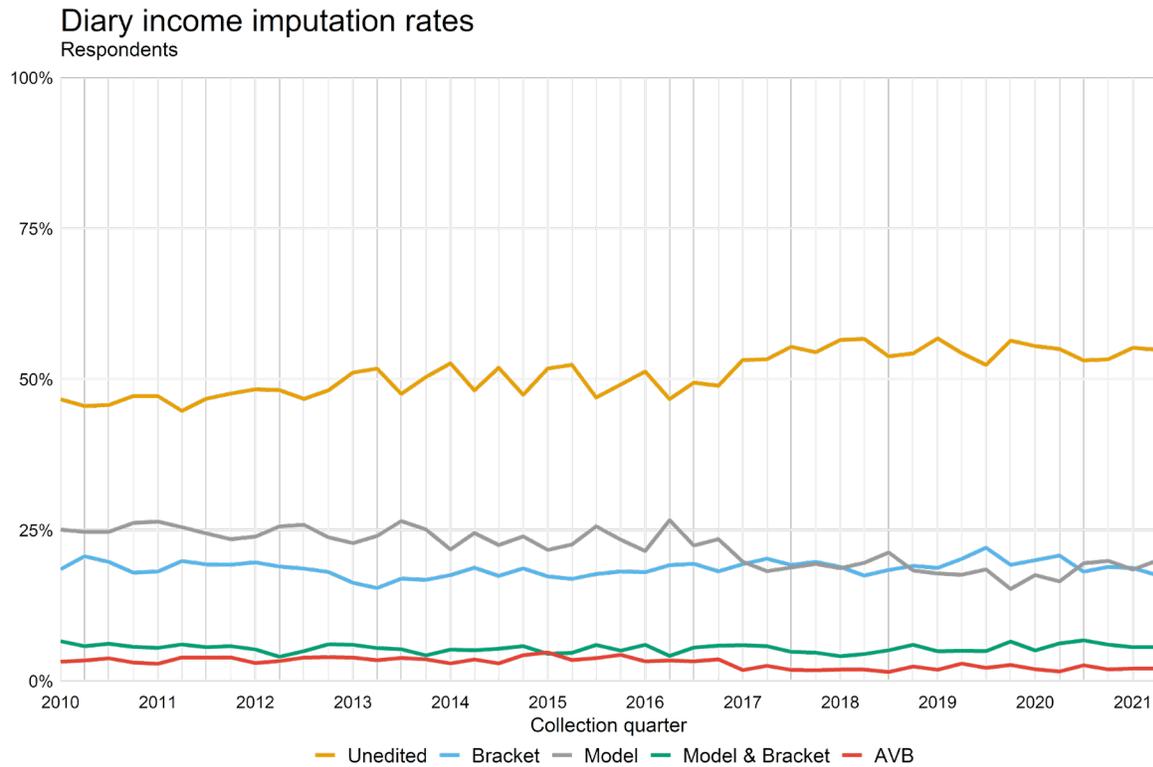


Table 5.1 Diary Survey: income imputation rates for total amount of family income before taxes

| Quarter | Number of respondents | Row percentage | | | | |
|---------|-----------------------|------------------------------|--------------------|------------------|----------------------------|----------|
| | | Valid blanks converted (AVB) | Bracket imputation | Model imputation | Model & bracket imputation | Unedited |
| 2018q3 | 2,896 | 1.5 | 18.4 | 21.3 | 5.1 | 53.8 |
| 2018q4 | 2,611 | 2.4 | 19.1 | 18.3 | 6.0 | 54.3 |
| 2019q1 | 2,671 | 1.8 | 18.7 | 17.8 | 4.9 | 56.8 |
| 2019q2 | 2,713 | 2.9 | 20.2 | 17.6 | 5.0 | 54.3 |
| 2019q3 | 2,745 | 2.1 | 22.1 | 18.5 | 4.9 | 52.4 |
| 2019q4 | 2,553 | 2.6 | 19.2 | 15.2 | 6.5 | 56.4 |
| 2020q1 | 3,285 | 1.9 | 20.0 | 17.5 | 5.1 | 55.5 |
| 2020q2 | 1,936 | 1.5 | 20.8 | 16.5 | 6.2 | 55.5 |
| 2020q3 | 2,559 | 2.6 | 18.1 | 19.5 | 6.7 | 53.1 |
| 2020q4 | 2,835 | 1.9 | 18.9 | 19.9 | 6.0 | 53.3 |
| 2021q1 | 2,952 | 2.0 | 18.7 | 18.4 | 5.6 | 55.2 |
| 2021q2 | 3,224 | 2.1 | 17.5 | 19.9 | 5.6 | 54.9 |

Interview Survey Summary

- The rate of unimputed total income before taxes declined 3 percentage points from 58.5 in 2018q4 to 55.5 percent in 2021q3.
- Model-based imputation rates rose 2.4 percentage points from 17.3 percent in 2018q4 to 19.7 percent in 2021q3 and accounted for the largest share of the decline in unimputed income.
- The proportion of respondents requiring both model-based and bracket response imputation rose a further 0.9 percentage points from 4.5 percent in 2018q4 to 5.4 percent in 2021q3.

Graph 5.2 Interview Survey Income Imputation Rates

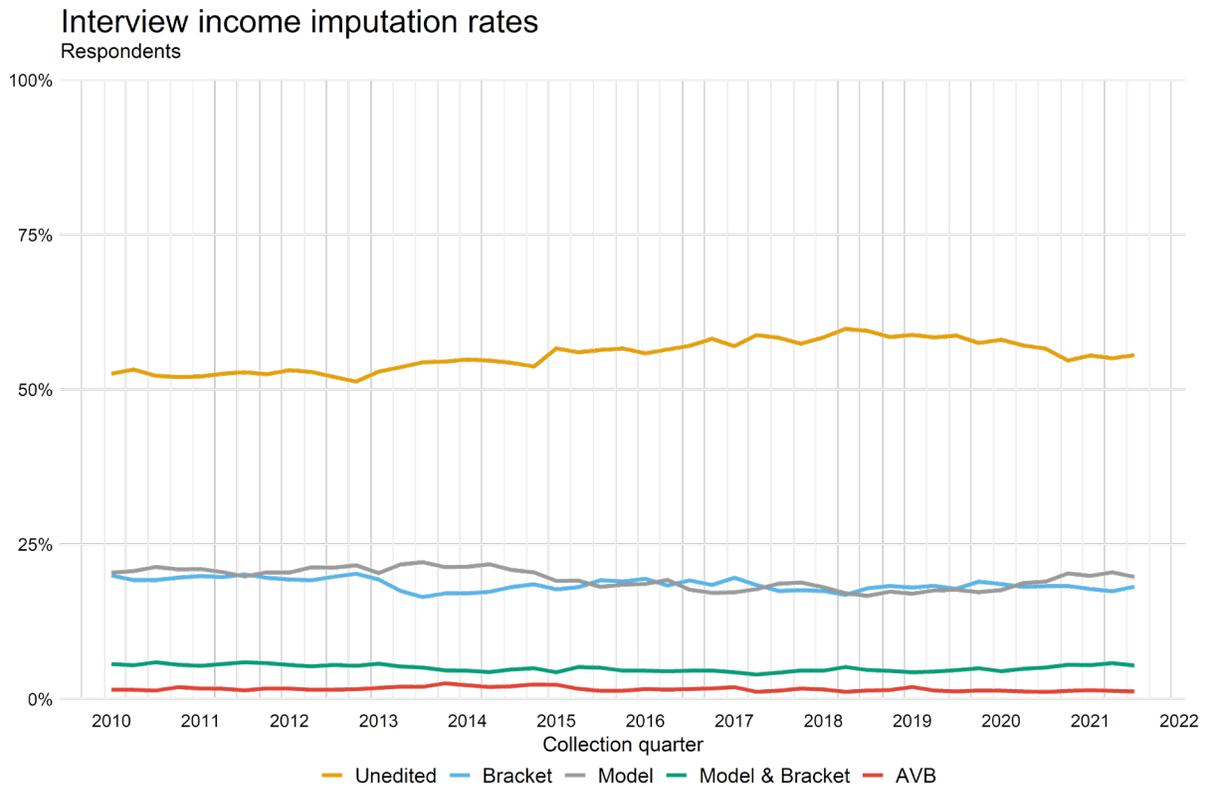


Table 5.2 Interview Survey: income imputation rates for total amount of family income before taxes

| Quarter | Number of respondents | Row percentage | | | | |
|---------|-----------------------|------------------------------|--------------------|------------------|-----------------|----------|
| | | Valid blanks converted (AVB) | Bracket imputation | Model imputation | Model & bracket | Unedited |
| 2018q4 | 5,571 | 1.4 | 18.2 | 17.3 | 4.5 | 58.5 |
| 2019q1 | 5,623 | 1.9 | 18.0 | 17.0 | 4.3 | 58.8 |
| 2019q2 | 5,493 | 1.4 | 18.3 | 17.5 | 4.4 | 58.4 |
| 2019q3 | 5,337 | 1.2 | 17.8 | 17.7 | 4.6 | 58.7 |
| 2019q4 | 5,248 | 1.4 | 18.9 | 17.2 | 5.0 | 57.5 |
| 2020q1 | 5,202 | 1.3 | 18.6 | 17.6 | 4.5 | 58.1 |
| 2020q2 | 4,858 | 1.2 | 18.1 | 18.7 | 4.9 | 57.1 |
| 2020q3 | 4,980 | 1.1 | 18.2 | 19.0 | 5.1 | 56.6 |
| 2020q4 | 5,205 | 1.3 | 18.2 | 20.3 | 5.5 | 54.7 |
| 2021q1 | 5,115 | 1.4 | 17.8 | 19.9 | 5.5 | 55.5 |
| 2021q2 | 5,196 | 1.3 | 17.4 | 20.5 | 5.8 | 55.0 |
| 2021q3 | 5,121 | 1.2 | 18.1 | 19.7 | 5.4 | 55.5 |

6. Respondent burden (Interview Survey)

Response burden in the Interview survey relates to the perceived level of effort exerted by respondents in answering the survey question. Survey designers are concerned about response burden as it has the potential to negatively impact response rates and the overall response quality. Beginning in April 2017, the Interview Survey introduced a response burden question with response options describing five different levels of burden at the end of the Wave 4 interview. The respondent burden metric is based on this question and maps the five burden categories to three metric values: not burdensome, some burden, and very burdensome. Please see the [DQP Reference Guide](#) (Armstrong, Jones, Miller, and Pham, 2022) for more details on the question wording and the burden categories.

A caveat to the interpretation of this metric is that since the burden question is only asked at the end of Wave 4, the metric likely underestimates survey burden due to self-selection bias. That is, respondents who have agreed to participate through the final wave of the survey tend to find the survey less burdensome than sample units who had dropped out at any point prior to completing the final survey wave.

However, it is also possible that the respondent answering this question did not participate in prior interview waves. For example, the respondent who participated in the first three survey waves might move out of the sampled address prior to the final interview. This is not a common occurrence, but if someone else moves into the sampled address in time for the final wave, then they would be asked these questions.

Interview Survey Summary

- The rate of respondents who report perceiving no burden declined 6.3 percentage points from 34.2 percent in 2018q4 to 27.9 percent in 2021q3.
- Rising rates of respondents who felt that the survey was very burdensome accounted for 3.3 percentage points of this change, rising from 12.1 percent in 2018q4 to 15.4 percent in 2021q3.
- Respondents perceiving some burden also increased 3.1 percentage points from 50.8 percent in 2018q4 to 53.9 percent in 2021q3.

Graph 6.1 Interview Survey Respondent Burden

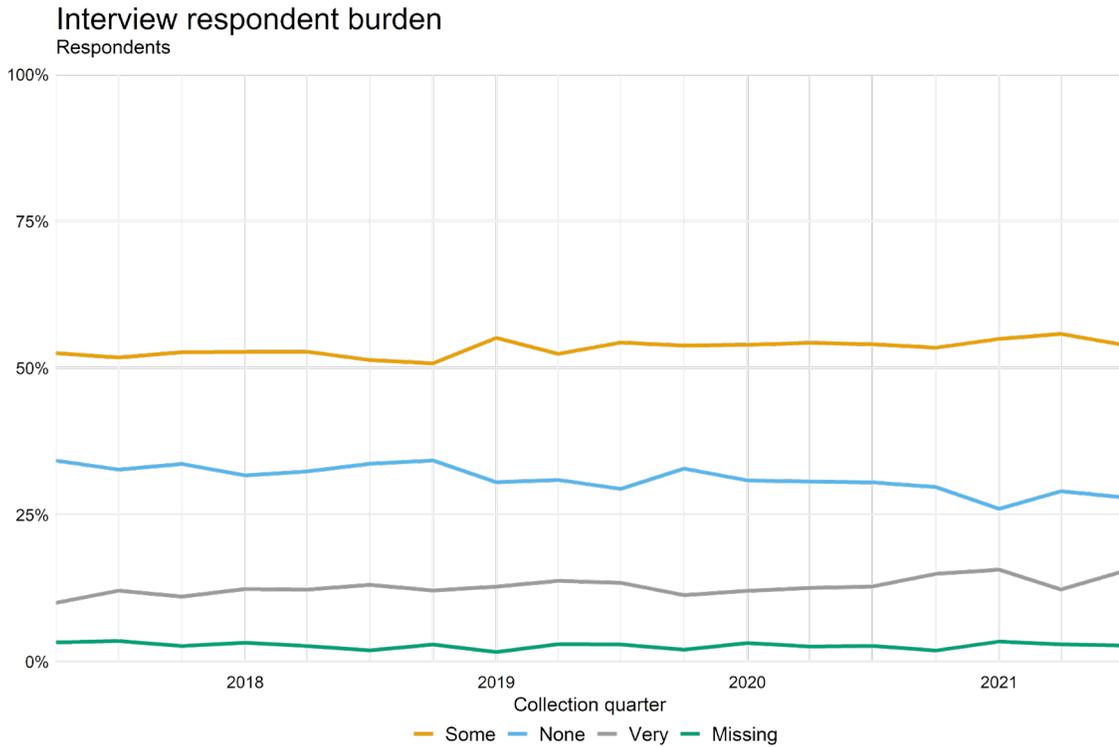


Table 6.1 Interview Survey: respondents' perceived burden in the final survey wave

| Quarter | Number of respondents | Row percentage | | | |
|---------|-----------------------|----------------|-------------|-----------------|------------------|
| | | Not burdensome | Some burden | Very burdensome | Missing response |
| 2018q4 | 1,390 | 34.2 | 50.8 | 12.1 | 2.9 |
| 2019q1 | 1,428 | 30.5 | 55.1 | 12.7 | 1.6 |
| 2019q2 | 1,397 | 30.9 | 52.4 | 13.7 | 2.9 |
| 2019q3 | 1,285 | 29.4 | 54.3 | 13.4 | 2.9 |
| 2019q4 | 1,293 | 32.9 | 53.8 | 11.3 | 2.0 |
| 2020q1 | 1,362 | 30.8 | 54.0 | 12.0 | 3.2 |
| 2020q2 | 1,334 | 30.7 | 54.3 | 12.5 | 2.5 |
| 2020q3 | 1,393 | 30.5 | 54.1 | 12.8 | 2.7 |
| 2020q4 | 1,386 | 29.7 | 53.5 | 14.9 | 1.9 |
| 2021q1 | 1,350 | 26.0 | 55.0 | 15.6 | 3.4 |
| 2021q2 | 1,337 | 29.0 | 55.8 | 12.3 | 2.9 |
| 2021q3 | 1,281 | 27.9 | 53.9 | 15.4 | 2.7 |

7. Survey mode (Interview Survey)

This metric measures the prevalence of the mode of data collection. The Interview Survey was designed to be an in-person interview. However, the interviewer can also collect data for the Interview Survey over the phone, or by a combination of the two modes. Higher prevalence of in-person data collection is preferred since the interviewer can actively prompt the respondent, as well as encourage the use of recall aids, thereby reducing the risk of measurement error. Conducting first wave interviews in-person is important because this is typically the respondent's first experience with the survey. Additionally, BLS has agreements with the Census Bureau that no more than 24 percent of first interviews or 48 percent of subsequent interviews will be collected over the phone. This agreement is still in effect, but the COVID-19 pandemic has made collecting in-person interviews unsafe for respondents and interviewers. BLS expects to return to the agreed upon rates as it becomes safer for in-person interviews to resume.

Interview Survey Summary

- Prior to the onset of the COVID-19 pandemic, for all but two quarters (2019q1 and 2019q4), the rate of Wave 1 telephone interviews remained below the 24 percent threshold.
- In every quarter prior to COVID 19, the rate of Wave 2 through 4 telephone interviews remained below the 48 percent threshold.
- In mid-March 2020, the Census Bureau suspended all in-person interviews, and by April, close to 98 percent of all interviews were conducted over the phone regardless of wave.
- Beginning in July 2020, interviewers were allowed to resume in-person interviews, depending on local rules.
- Since July of 2020 the rate of in-person interviews has increased across all waves, with at least 24 percent of interviews being conducted in-person regardless of wave in 2021Q3.
- For Wave 1 interviews in particular, in-person interviews have risen 44.6 percentage points from 1.5 percent in 2020Q2 to 46.1 percent in 2021Q3.

Graph 7.1 Interview Survey Mode

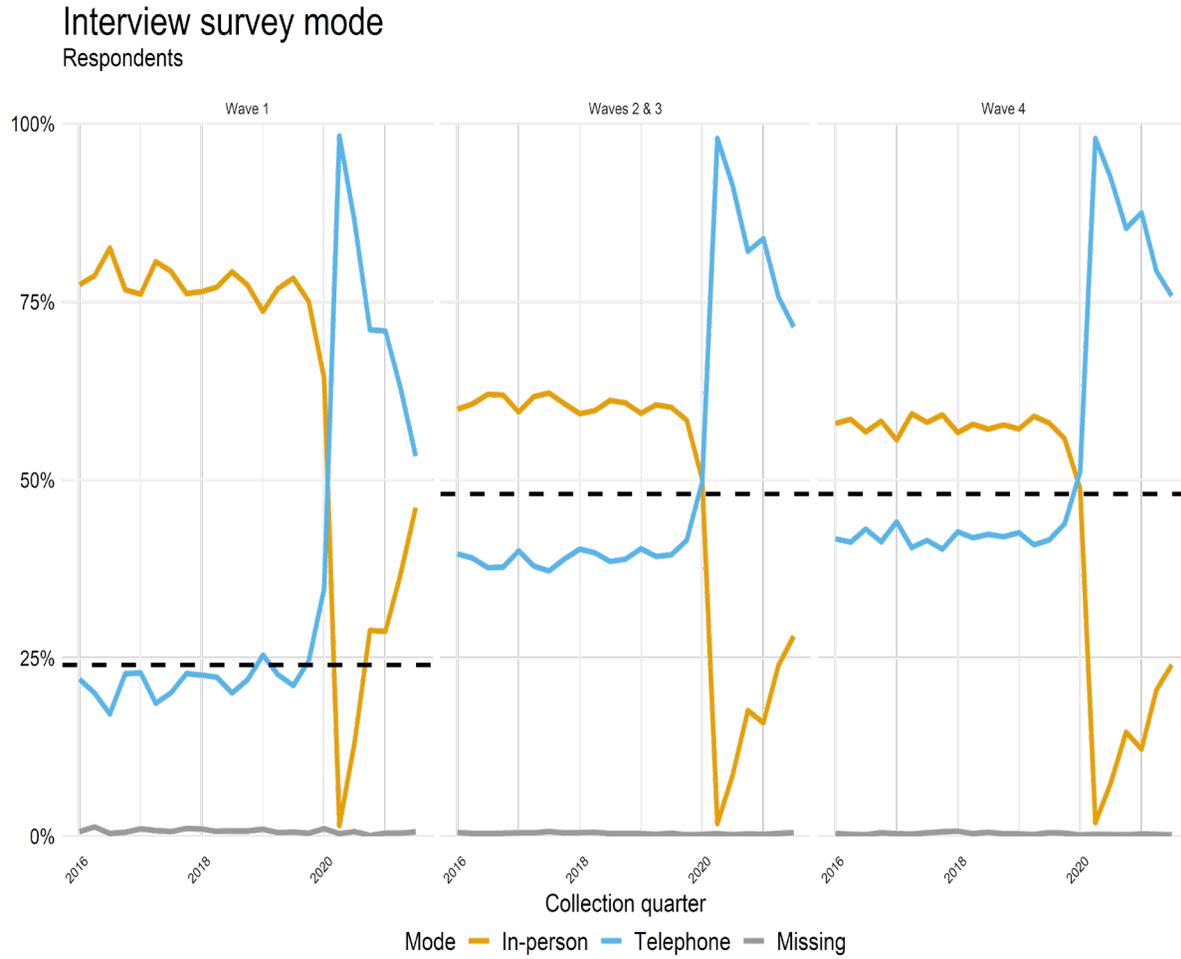


Table 7.1 Interview Survey: survey mode

| Quarter | Wave | Number of respondents | Row percentage | | |
|---------|-------------|-----------------------|----------------|-----------|---------|
| | | | In-person | Telephone | Missing |
| 2018q4 | Wave 1 | 1,399 | 76.1 | 21.9 | 0.7 |
| 2018q4 | Waves 2 & 3 | 2,782 | 60.1 | 38.9 | 0.4 |
| 2018q4 | Wave 4 | 1,390 | 57.3 | 42.0 | 0.3 |
| 2019q1 | Wave 1 | 1,465 | 71.9 | 25.4 | 1.0 |
| 2019q1 | Waves 2 & 3 | 2,730 | 59.0 | 40.3 | 0.3 |
| 2019q1 | Wave 4 | 1,428 | 56.7 | 42.6 | 0.3 |
| 2019q2 | Wave 1 | 1,443 | 75.6 | 22.7 | 0.5 |
| 2019q2 | Waves 2 & 3 | 2,653 | 60.0 | 39.2 | 0.2 |
| 2019q2 | Wave 4 | 1,397 | 58.3 | 40.9 | 0.2 |
| 2019q3 | Wave 1 | 1,401 | 77.3 | 21.1 | 0.6 |
| 2019q3 | Waves 2 & 3 | 2,651 | 59.7 | 39.5 | 0.4 |
| 2019q3 | Wave 4 | 1,285 | 57.7 | 41.6 | 0.5 |
| 2019q4 | Wave 1 | 1,318 | 74.2 | 24.6 | 0.4 |
| 2019q4 | Waves 2 & 3 | 2,637 | 57.9 | 41.5 | 0.2 |
| 2019q4 | Wave 4 | 1,293 | 55.0 | 43.9 | 0.4 |
| 2020q1 | Wave 1 | 1,239 | 64.2 | 34.7 | 1.0 |
| 2020q1 | Wave 4 | 1,362 | 48.8 | 51.1 | 0.1 |
| 2020q1 | Waves 2 & 3 | 2,601 | 50.1 | 49.7 | 0.2 |
| 2020q2 | Wave 1 | 965 | 1.5 | 98.2 | 0.3 |
| 2020q2 | Wave 4 | 1,334 | 1.9 | 97.9 | 0.2 |
| 2020q2 | Waves 2 & 3 | 2,559 | 1.8 | 97.9 | 0.3 |
| 2020q3 | Wave 1 | 1,143 | 13.0 | 86.4 | 0.6 |
| 2020q3 | Wave 4 | 1,393 | 7.4 | 92.4 | 0.2 |
| 2020q3 | Waves 2 & 3 | 2,444 | 8.6 | 91.3 | 0.2 |
| 2020q4 | Wave 1 | 1,230 | 28.9 | 71.1 | 0.1 |
| 2020q4 | Waves 2 & 3 | 1,386 | 14.6 | 85.3 | 0.1 |
| 2020q4 | Wave 4 | 2,589 | 17.6 | 82.1 | 0.3 |
| 2021q1 | Wave 1 | 1,250 | 28.7 | 70.9 | 0.4 |
| 2021q1 | Wave 4 | 1,350 | 12.2 | 87.5 | 0.3 |
| 2021q1 | Waves 2 & 3 | 2,515 | 15.9 | 83.9 | 0.2 |
| 2021q2 | Wave 1 | 1,325 | 36.7 | 62.9 | 0.4 |
| 2021q2 | Wave 4 | 1,337 | 20.5 | 79.3 | 0.2 |
| 2021q2 | Waves 2 & 3 | 2,534 | 24.0 | 75.7 | 0.4 |
| 2021q3 | Wave 1 | 1,352 | 46.1 | 53.3 | 0.6 |
| 2021q3 | Wave 4 | 1,281 | 24.0 | 75.8 | 0.2 |
| 2021q3 | Waves 2 & 3 | 2,488 | 28.1 | 71.5 | 0.5 |

8. Survey Response Time (Diary and Interview Surveys)

For both Interview and Diary Surveys, survey response time is the number of minutes needed to complete an interview. For the Interview Survey, the survey response time metric is the median number of minutes to complete the interview. For the Diary Survey, the survey response time metric is the median number of minutes to complete the personal interview component that collects information on income and demographics. Survey response time has been used as an objective indicator for respondent burden: the longer the time needed to complete the survey, the more burdensome the survey. Fricker, Gonzalez, and Tan (2011) find that higher respondent burden negatively affects both response rates and data quality. However, survey response time could also reflect the respondent's degree of engagement. Engaged and conscientious respondents might take longer to complete the survey because they report more thoroughly or use records more extensively. Tracking the median survey response time can be useful for assessing the effect of changes in the survey design.

Diary Survey Summary

- The survey response time in the Diary Survey remained just over one-half hour throughout the period: 34.2 minutes in 2018q3 and 32.9 minutes in 2021q2.

Graph 8.1 Diary Survey Median Survey Time

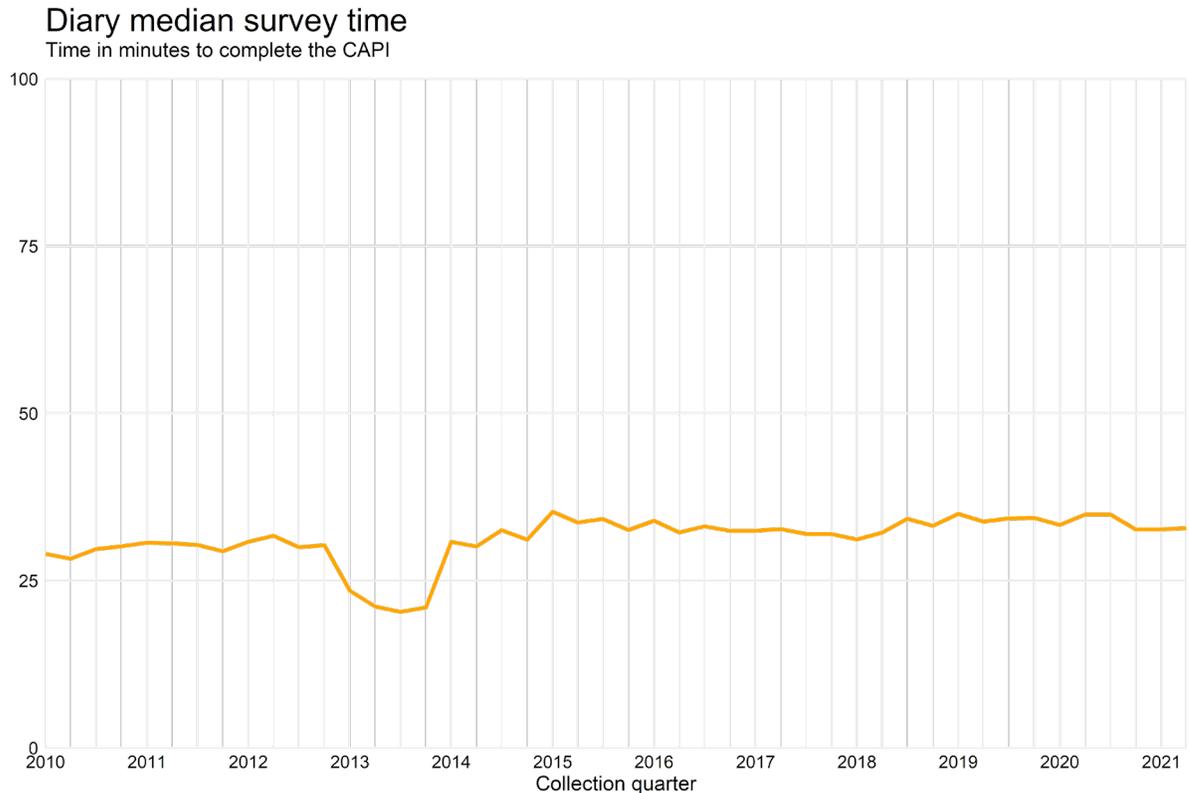


Table 8.1 Diary Survey: median length of time to complete the interview components (income and demographics)

| Quarter | Number of respondents | Minutes |
|---------|-----------------------|---------|
| 2018q3 | 2,896 | 34.2 |
| 2018q4 | 2,611 | 33.2 |
| 2019q1 | 2,671 | 35.0 |
| 2019q2 | 2,713 | 33.8 |
| 2019q3 | 2,745 | 34.3 |
| 2019q4 | 2,553 | 34.4 |
| 2020q1 | 3,281 | 33.3 |
| 2020q2 | 1,936 | 34.9 |
| 2020q3 | 2,559 | 34.9 |
| 2020q4 | 2,835 | 32.7 |
| 2021q1 | 2,952 | 32.7 |
| 2021q2 | 3,224 | 32.9 |

Interview Survey Summary

- Median time to complete Wave 1 interviews remained fairly stable , ranging from 74.1 minutes (2019q3) to 78.8 minutes (2020q2).
- Median time to complete Waves 2 and 3 interviews was 2.6 minutes higher in 2021q3 (54.6 minutes) than it was in 2018q1 (52.0 minutes).
- Wave 4 interviews also remained steady, rising from 58.6 minutes in 2018q4 to peak at 62.8 minutes in 2019q3, and settling at 60.0 minutes in 2021q3.

Graph 8.2 Interview Survey Median Survey Time by Interview Wave

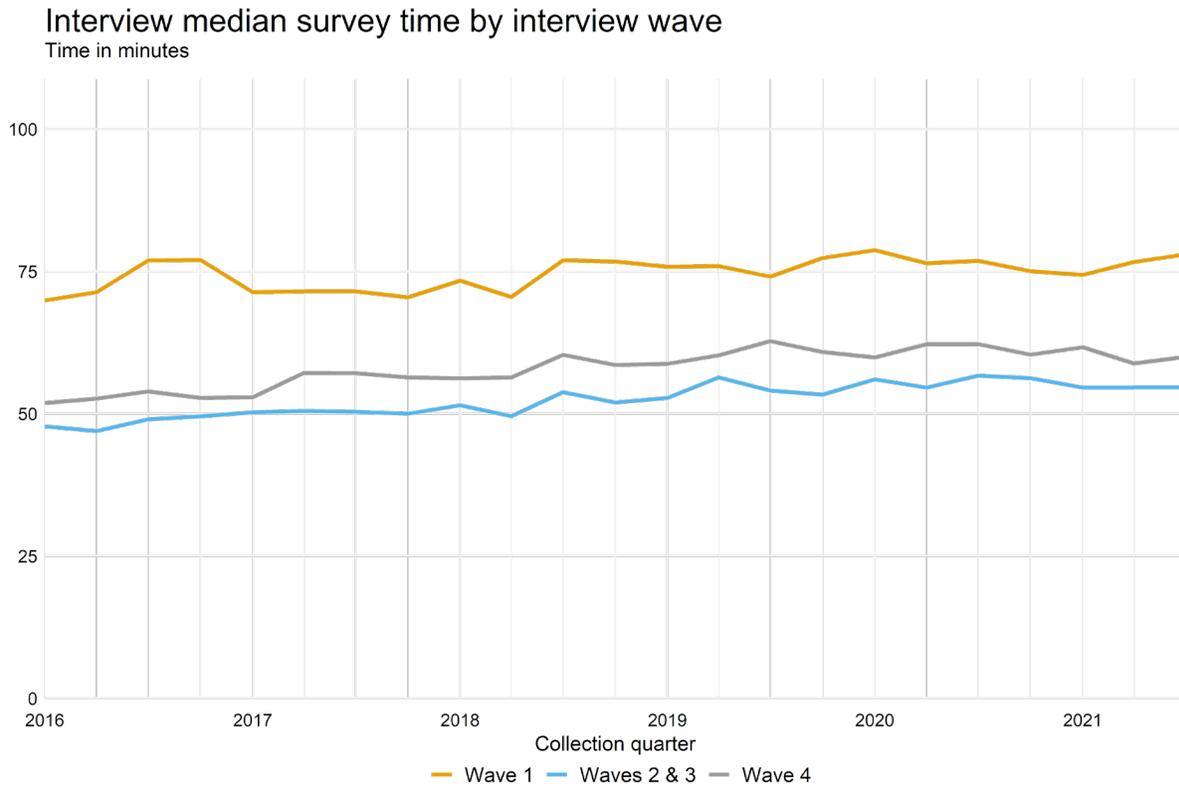


Table 8.2 Interview Survey: median length of time to complete survey

| Quarter | Number of respondents | Minutes | | |
|---------|-----------------------|---------|-------------|--------|
| | | Wave 1 | Waves 2 & 3 | Wave 4 |
| 2018q4 | 5,570 | 76.7 | 52.0 | 58.6 |
| 2019q1 | 5,618 | 75.8 | 52.8 | 58.8 |
| 2019q2 | 5,486 | 75.9 | 56.4 | 60.2 |
| 2019q3 | 5,332 | 74.1 | 54.0 | 62.8 |
| 2019q4 | 5,239 | 77.4 | 53.3 | 60.8 |
| 2020q1 | 5,199 | 78.8 | 56.0 | 59.9 |
| 2020q2 | 4,855 | 76.4 | 54.6 | 62.2 |
| 2020q3 | 4,980 | 76.8 | 56.7 | 62.2 |
| 2020q4 | 5,205 | 75.0 | 56.2 | 60.4 |
| 2021q1 | 5,115 | 74.4 | 54.6 | 61.7 |
| 2021q2 | 5,196 | 76.7 | 54.6 | 58.8 |
| 2021q3 | 5,121 | 78.0 | 54.6 | 60.0 |

Summary

BLS is committed to producing data that are consistently of high statistical quality. As part of that commitment, BLS publishes the DQP and its accompanying [Reference Guide](#) (Armstrong, Jones, Miller, and Pham, 2022) to assist data users as they evaluate CE data quality and judge whether CE data fit their needs. DQP metrics therefore cover both the Interview and Diary Surveys, multiple dimensions of data quality, and several stages of the survey lifecycle. Additionally, BLS uses these metrics internally to identify areas for potential survey improvement, evaluate the effects of survey changes, and to monitor the health of the surveys.

From the final quarters of 2018 to the first quarters of 2021, response rates for the Diary Survey and wave 1 of the Interview Survey recovered from large drop offs due to the COVID-19 pandemic in the first two quarters of 2020. Information booklet use for both the Interview and Diary Surveys have also both continued to increase.

Despite a slight decline in 2021q2, respondent burden in the Interview Survey has risen steadily since the beginning of 2020. While several metrics have recovered in the direction of their pre-COVID figures, some, such as Survey Mode, are still lagging behind. The data show that it may be some time before in-person and phone interviews are at their pre-2020 levels. Several metrics showed little change. Income imputation rates for the Diary Survey and the Interview Survey remained stable, as did Median survey time for both surveys.

BLS will continue to monitor these trends, and the next issue of the CE Data Quality Profile will be released in September 2022 with BLS's annual release of CE data and will report on the remainder of the 2021 data.

References

- Abdirizak, S., Erhard, L., Lee, Y., & McBride, B. (2017). Enhancing Data Quality Using Expenditure Records. *Paper Presented at the Annual Conference of the American Association for Public Opinion Research*, New Orleans LA.
- Fricker, S., Gonzalez, J., & Tan, L. (2011). Are you burdened? Let's find out. *Paper Presented at the Annual Conference of the American Association for Public Opinion Research*, Phoenix AZ.
- Ash, S., B. Nix, and B. Steinberg (2022). Report on Nonresponse Bias during the COVID-19 Period for the Consumer Expenditures Interview Survey. *Published as part of the Consumer Expenditure Surveys Program Report Series*.
- Armstrong, G., G. Jones, T. Miller, and S. Pham (2022). Reference Guide CE Data Quality Profile
- Paulin, G., Reyes-Morales, S., & Fisher, J (2018). User's Guide to Income Imputation in the CE. U.S. Bureau of Labor Statistics.