The Annual CE Data Quality Profile - 2021

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Consumer Expenditure Surveys Program Report Series

Contents

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. 1[1]. 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 provides data users with a variety of resources to assist them in analyzing overall data quality of the Consumer Expenditure (CE) Surveys. CE data users can evaluate quality on their own by utilizing the following:

- Standard errors provided for the official CE tables.

- 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.

- BLS-provided CE response rates (provided for all BLS household surveys).

In addition, the Data Quality Profile (DQP) provides a comprehensive set of quality metrics that are timely, routinely updated, and accessible to users. These metrics cover various dimensions of the CE lifecycle, including details on how data were collected in the field, what assistance was used in respondent reporting, and what data edits were made during processing. For data users, DQP metrics are an indication of quality for both the Interview and Diary surveys. For internal stakeholders, these metrics signal areas for potential survey improvement.

This DQP includes a brief description of each metric, along with accompanying tables and graphs of their results. 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 Library Page. BLS began publishing DQPs annually beginning with the 2017 data, though prototype DQPs are available for 2013 and 2015. Midyear DQPs started with the 2020 midyear data release, which featured data collected between July 1, 2019 and June 30, 2020. 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. Respondents to the Interview Survey are asked to recall their expenditures from the prior three months, as a result, the data collected in 2021q1 correspond to expenditures made in both 2020q4 and 2021q1, dependent on month of interview. In contrast, respondents to the Diary Survey report expenditures on the days they were incurred over a two week period. This is the reason why the Interview Survey metrics appear to be "ahead" of the Diary Survey by a quarter (e.g., 2022q1 for the Interview Survey and 2021q4 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.

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[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 report, we cover recent metric trends from the past three years. This time frame covers the first quarters of the 2019 collection period to the final quarters of the 2021 collection period. Because Interview Survey respondents are asked to recall their spending over the prior three months, the data collected in one calendar quarter include some expenditures made in the previous quarter. Hence, the Interview Survey metrics in this profile cover the data collection time period of 2019q2 through 2022q1, which includes the expenditures transacted from 2019q1 to 2021q4. Diary Survey respondents are asked to report their spending as it occurs, so Diary Survey metrics in this profile cover the time period of 2019q1 through 2021q4. Subsequent sections describe the individual metrics with detailed data tables. While the annual report focuses on the three-year period described above, it should be noted that the graphs displayed in the report go back to 2016q1 to provide additional context for the reader.

Recent Trends of Note:

- After the initial drop that followed the onset of the COVID-19 pandemic in early 2020, response rates in the Interview Survey saw little recovery. Rates rose to 46.7 in 2021q2 before falling again to 43.5 in 2021q4. This was followed by an increase in 2022q1 to 45.8 percent (Table 1.3).

- Rates of records use in the Interview Survey varied little across interview waves since 2019q2. However, there have been noticeable increases in records use in each interview survey wave since 2021q3 (Table 2.1).

- Allocation rates in the Interview Survey continued to fall over the course of 2021 (Table 4.2).

- Model based income imputation rates in the Diary Survey increased, which contributed to the decrease in the rate of unedited cases. In the beginning of 2019, the unedited rate had been at 56.8 percent but fell to 52.8 by 2021q4 (Table 5.1).

- The online diary accounted for 33.1 percent of complete Diary Survey cases when the mode was introduced in 2020q3, but the share of diaries has since fallen to 26.0 percent (Table 7.1).

- Median Interview Survey time increased by at least 2 minutes across all waves from 2021q3 to 2021q4, with the largest increase of 9.5 minutes for 4th wave interviews in 2021q4. This is likely due to a 2021q4 test of Computer Assisted Recorded Interviewing (CARI) for 4th wave participants. In 2022q1, average interview time fell to 62.8 minutes likely due to the conclusion of the CARI testing period in the previous quarter (Table 8.2).

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 BLS staff 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 the potential for nonresponse bias of an expenditure estimate if the cause of 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 temporarily suspended in-person diary placement interviews due to the COVID-19 pandemic. This caused response rates to drop to 26.1 percent in 2020q2 (Table 1.1). Since then, response rates have partially recovered, rising to 37.3 percent in 2021q4 (Table 1.1). Overall, response rates declined 16.9 percentage points from 54.2 in 2019q1 to 37.3 in 2021q4 (Table 1.1).
- Refusal rates contributed most to the decline in response rates with an increase of 10.5 percentage points from 28.5 to 39.0 percent (Table 1.1).
  - In 2021q4, the refusal rate exceeded the response rate for the first time in series history, by 1.7 percentage points.

- Noncontact rates rose 7.0 percentage points from 4.9 in 2019q1 to 11.9 in 2021q4 (Table 1.1).

- Other nonresponse rates declined by 0.6 percentage points overall from 2019q1 to 2021q4, but rose outside of the normal range to 26.3 percent in 2020q1, jumping to a historical high of 59.1 percent in 2020q2. This rate then fell from 2020q3 to 2021q4, returning to the historical norm in 2021q2 at 13.8 percent (Table 1.1).

  - At the start of the COVID-19 pandemic, the BLS reclassified ineligible interviews to eligible respondents, increasing 3,205 cases between 2019q4 and 2020q2 (Table 1.2). This increase in COVID-19 reclassifications primarily contributed to the increase in other nonresponse rates in these quarters.

Graph 1.1 Diary Survey Final Disposition Rates

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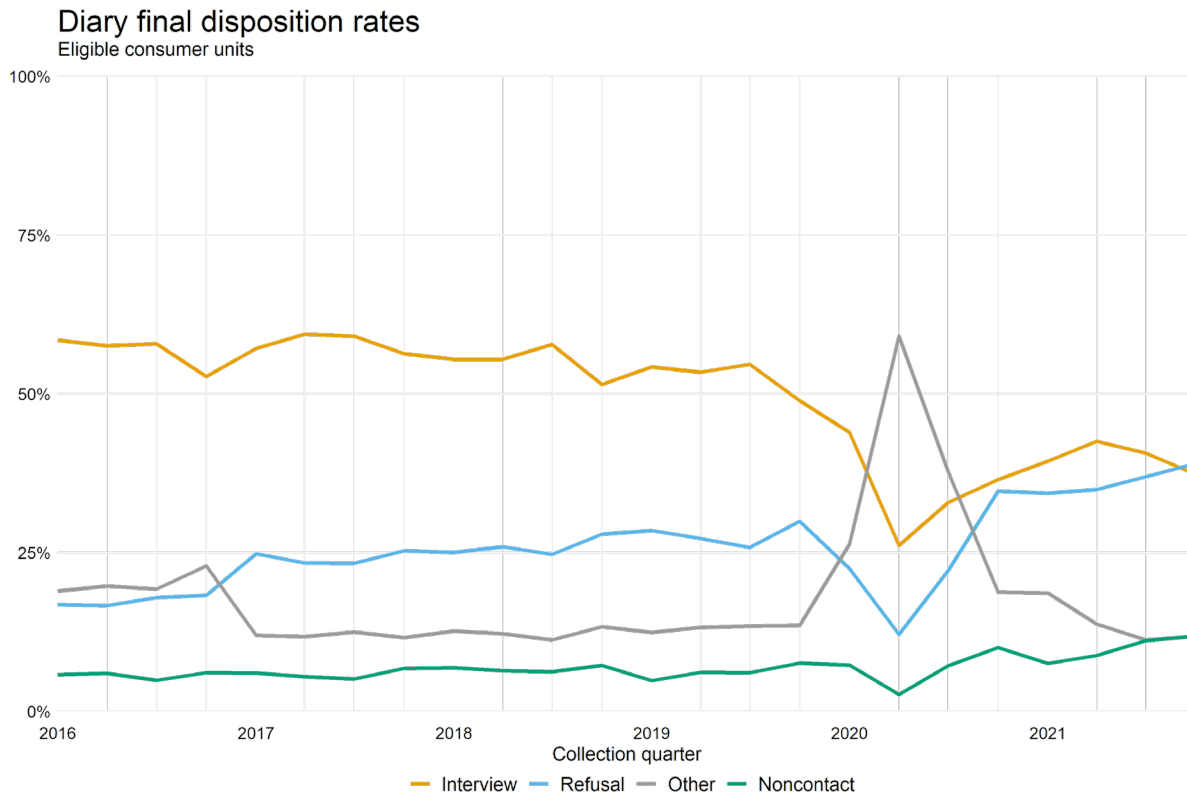
Table 1.1 Diary Survey: distribution of final dispositions for eligible sample units (unweighted)

Quarter	Number of eligible sample units	Row percentage			
		Interview	Refusal	Noncontact	Other Nonresponse
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
2021q3	7,456	40.7	37.0	11.1	11.2
2021q4	7,676	37.3	39.0	11.9	11.8

Table 1.2 Diary Survey: prevalence of nonresponse reclassifications

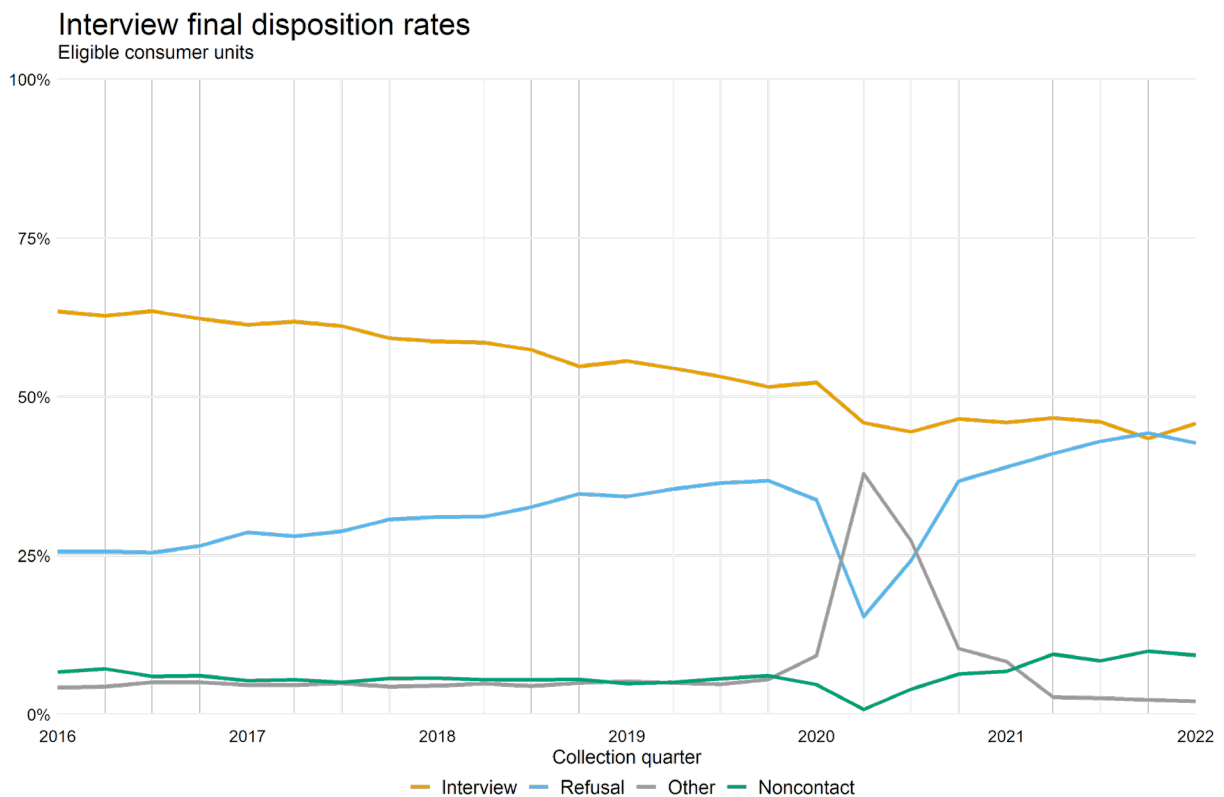| Quarter	Number of eligible sample units	Number of nonresponse reclassifications		
		Total reclassifications	COVID-19 reclassifications	Other reclassifications
2019q1	4,926	232	0	232
2019q2	5,082	243	0	243
2019q3	5,020	229	0	229
2019q4	5,216	188	0	188
2020q1	7,474[2]	855	562	293
2020q2	7,409	3,393	3,202	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
2021q3	7,456	348	0	348
2021q4	7,676	387	0	387

Interview Survey Summary

- In March 2020, the Census Bureau temporarily suspended all in-person interviews due to the COVID-19 pandemic. Post-suspension response rates fell 6.3 percentage points between 2020q1 to 2020q2. Since then, response rates have varied from a high of 46.7 percent in 2021q2 to a low of 43.5 percent in 2021q4. Response rates as of 2022q1 are at 45.8 percent, still well below pre-pandemic levels (Table 1.3).

- Refusal rates generally rose, 7.3 percentage points higher in 2022q1 (42.8 percent) than in 2019q2 (35.5 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.
    - In 2021q4, the refusal rate (44.3 percent) exceeded the response rate (43.5 percent) for the first time by 0.8 percentage points (Table 1.3).

- Overall, other nonresponse rates declined from 5.0 in 2019q2 to 2.1 in 2022q1, but in that time there was noteworthy fluctuation, with the rate peaking at 37.9 percent in 2020q2. This variation was driven by high instances of COVID-19 reclassifications at the onset of the

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

pandemic (Table 1.3). These COVID-19 reclassifications eventually fell to zero as the BLS incorporated COVID-19 related nonresponses in the refusal category in 2021q2, and began treating them like other illness-related refusals [3].

- Prior to 2020q2, noncontact rates remained fairly steady but fell to near zero in 2020q2 (0.8 percent) due to a large increase in the number of nonresponse cases classified as other (Table 1.3). This is a consequence of BLS reclassification policy in response to the onset of the COVID-19 pandemic.

- Noncontact rates rose back to 4.0 percent in 2020q3 but continued to increase past the pre-pandemic norm in the following quarters (Table 1.3).

Graph 1.2 Interview Survey Final Disposition Rates

Interview final disposition rates
Eligible consumer units

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[3] 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 1.3 Interview Survey: distribution of final dispositions for eligible sample units (unweighted)

Quarter	Number of eligible sample units	Row percentage			
		Interview	Refusal	Noncontact	Other nonresponse
2019q2	10,075	54.5	35.5	5.0	5.0
2019q3	10,036	53.2	36.5	5.6	4.8
2019q4	10,170	51.6	36.8	6.1	5.5
2020q1	9,956	52.2	33.8	4.7	9.3
2020q2	10,581	45.9	15.4	0.8	37.9
2020q3	11,190	44.5	24.2	4.0	27.4
2020q4	11,185	46.5	36.8	6.3	10.4
2021q1	11,125	46.0	38.9	6.8	8.3
2021q2	11,120	46.7	41.1	9.5	2.7
2021q3	11,117	46.1	43.0	8.4	2.5
2021q4	11,275	43.5	44.3	9.9	2.3
2022q1	11,320	45.8	42.8	9.3	2.1

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
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
2021q4	11,275	16	0	16
2022q1	11,320	13	0	13

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 report more expenditures with lower rates of missing data (Abdirizak, Erhard, Lee, and McBride, 2017), so a higher prevalence of records use is desirable. Metrics in this section are presented by survey wave[4].

Interview Survey Summary

- Records usage temporarily rose in 2016 for Wave 1 respondents. This is likely a result of a field test conducted in that year that gave a subset of respondents monetary incentives (Elkin, McBride, and Steinberg, 2018) to use records (Table 2.1).

- Until 2021q3, records use had been stable across interview waves. Since then, there have been noticeable increases in records use in each wave of the interview survey (Table 2.1).

Graph 2.1 Interview Survey Records Used by Interview Wave

Interview records used by interview wave

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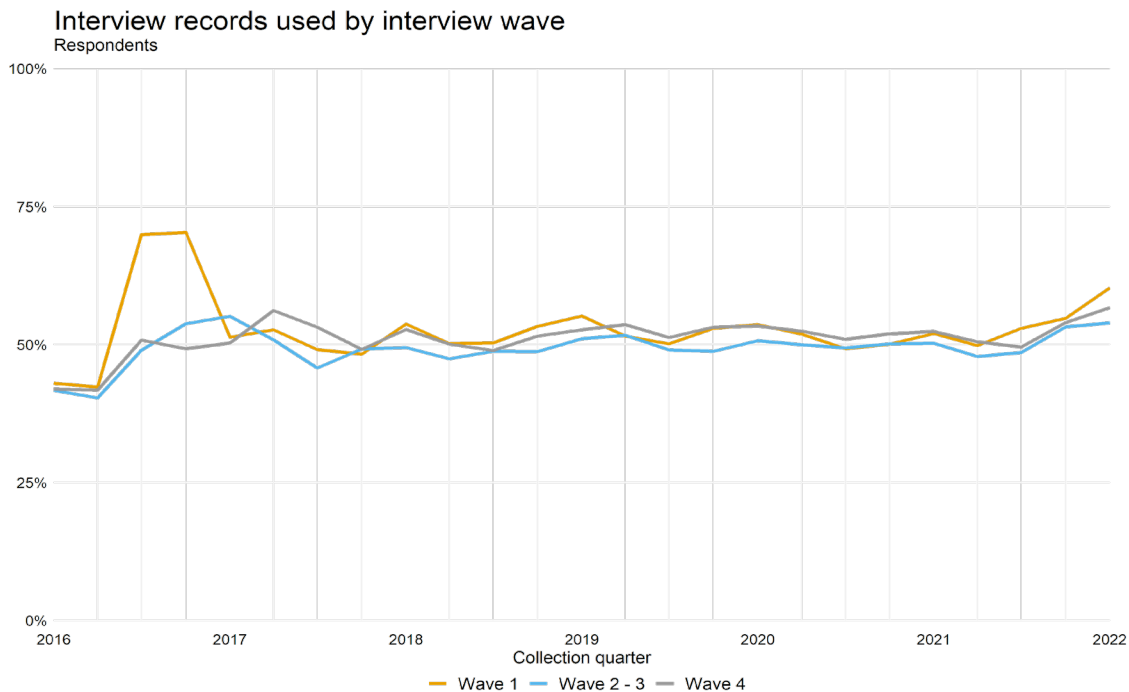
[4] In the Interview Survey, each family in the sample is interviewed every 3 months over four calendar quarters. These interviews are commonly referred to as waves. For more information on survey administration please see the CE handbook of methods.

Table 2.1 Interview Survey: prevalence of records use among respondents

Quarter	Wave	Number of respondents	Row percentage		
			Used	Did not use	Missing response
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
2021q4	Wave 1	1,229	54.8	44.4	0.8
2021q4	Waves 2 & 3	2,450	53.2	46.4	0.4
2021q4	Wave 4	1,223	54	45.3	0.7
2022q1	Wave 1	1,347	60.3	39.2	0.5
2022q1	Waves 2 & 3	2,551	53.9	45.7	0.4
2022q1	Wave 4	1,289	56.7	42.7	0.5

3. Information Booklet use (Diary and Interview Surveys)

The Information Booklet is a recall aid the interviewer provides for respondents for both the Interview and Diary surveys. Each survey's Booklet provides the response options for demographic questions and income brackets. In addition, the Interview Survey 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 usage among Diary Survey respondents declined steadily from 2019q1 to 2019q4 (Table 3.1).

- In mid-March 2020, CE suspended all in-person interviews and Information Booklet usage declined by 29.0 percentage points from 2020q1 to 2020q2 (Table 3.1).

- As in-person Diary placements resumed in 2020q3 Information Booklet usage has slowly increased 14.9 percentage points, from 7.3 in 2020q3 to 22.2 in 2022q4 (Table 3.1).
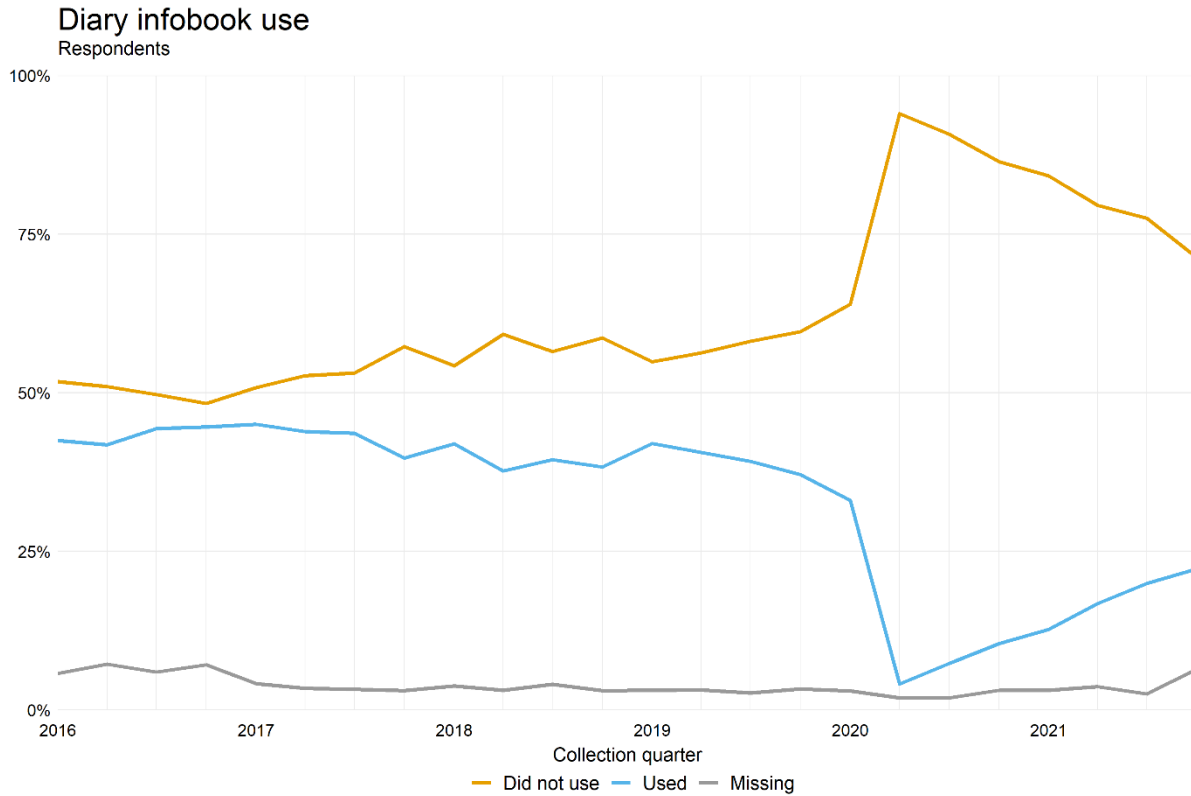
Graph 3.1 Diary Survey Information Booklet Use

Diary infobook use
Respondents

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

Quarter	Number of respondents	Row percentage		
		Used	Did not use	Missing response
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
2021q3	3,027	20.0	77.5	2.5
2021q4	2,864	22.2	71.3	6.4

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 (Table 3.2).

- Declines in Information Booklet usage were similar for subsequent waves. Roughly 95.0 percent of all respondents in 2020q2 did not have access to the Information Booklet (Table 3.2).

- Beginning in July 2020, disposable copies of the Information Booklet were provided to respondents and Information Booklet usage rose to an average of 5.3 percent for all waves in 2020q3 (Table 3.2).

- Since then, Information Booklet use across all waves has continued to recover from the 2020q2 low (Table 3.2).

- Information Booklet use for Wave 1 respondents improved 24.3 percentage points from 2020q2 to 2022q1, but still remains well below pre-pandemic highs of 50.0 percent (Table 3.2).

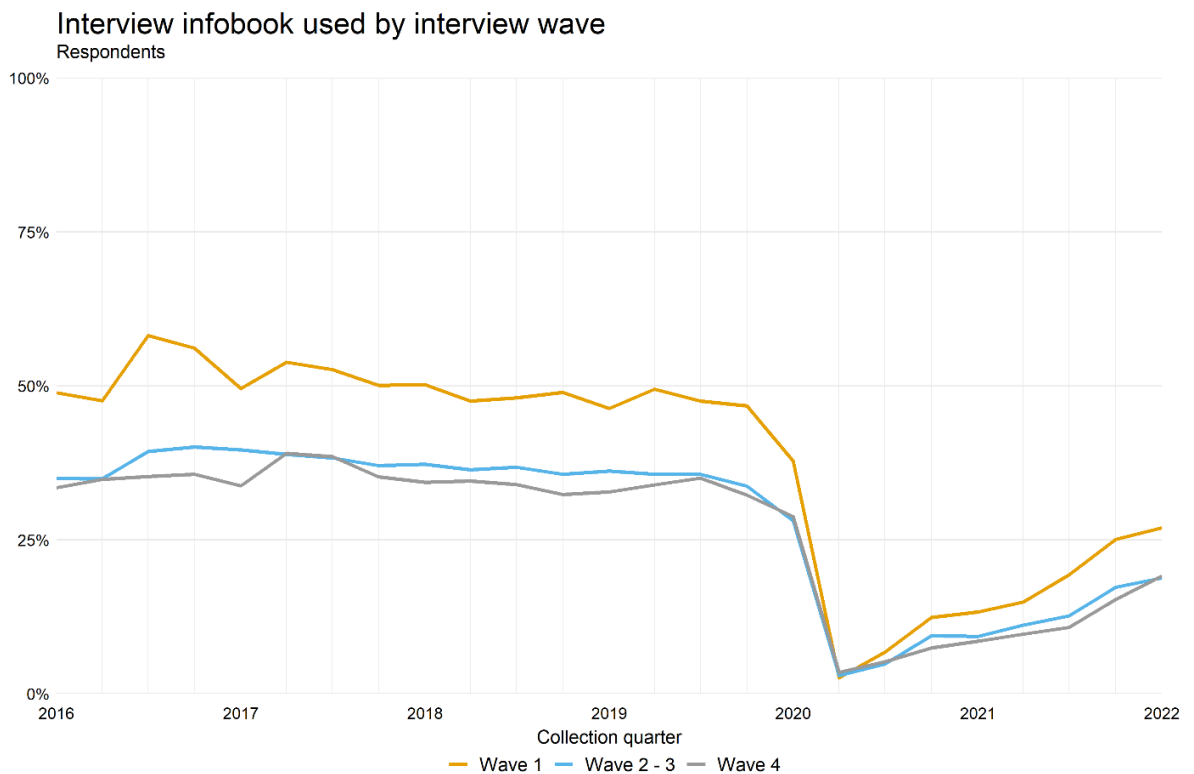**Graph 3.2 Interview Survey Information Booklet Use**

Interview infobook used by interview wave

Table 3.2 Prevalence of Information Booklet use among Interview Survey respondents

Quarter	Wave	Number of respondents	Row percentage		
			Used	Did not use [5]	Missing response
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
2021q4	Wave 1	1,229	25.1	9.3	0.8
2021q4	Waves 2 & 3	2,450	17.3	7.6	0.4
2021q4	Wave 4	1,223	15.3	6.1	0.7
2022q1	Wave 1	1,347	26.9	9.8	0.5
2022q1	Waves 2 & 3	2,551	18.8	8.2	0.4
2022q1	Wave 4	1,289	19.1	7.1	0.5

[5] 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.

Diary Survey expenditure edit rates are broken down into two categories: Allocations and Other Edits. Most edits in the Diary survey are allocations. Table 4.1 below also shows the "other edits" category, which covers all other expenditure edits including imputation and manual edits, which 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 all expenditure edits are available in the DQP Reference Guide (Armstrong, Jones, Miller, and Pham, 2022).

Diary Survey Edit Summary

- The total rate of unedited expenditure amounts fell 0.6 percentage points from 89.7 percent in 2019q1 to 89.1 percent in 2021q4 (Table 4.1).

- The allocation rate has remained fairly stable with a 0.1 percentage point decrease from 10.2 percent in 2019q1 to 10.1 percent 2021q4, driven by a 1.2 percentage point drop after 2021q3 (Table 4.1).

- 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 the number of expenditures fell by about 60 percentage points. (Table 4.1)[6].

**Graph 4.1 Diary Survey Expenditure Edit Rates**

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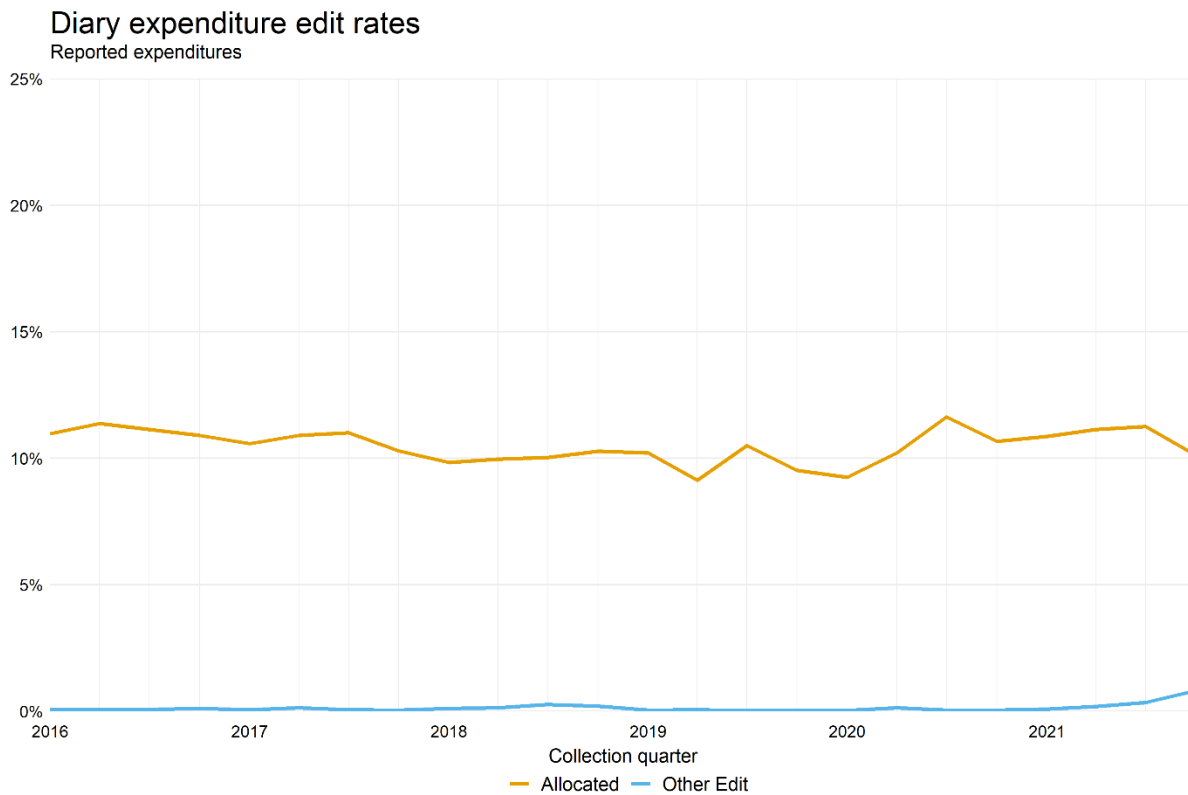
[6] This increase in sample size was made possible by increased funding to accommodate the collection of outlet information needed for calculating the Consumer Price Index.

Table 4.1 Diary Survey: reported expenditure records

Quarter	Number of expenditures	Row percentage		
		Allocated	Other edit	Unedited
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
2021q3	75,663	11.3	0.3	88.4
2021q4	71,144	10.1	0.8	89.1

Interview Survey Edit Summary

- The total rate of unedited expenditure amounts increased 2.2 percentage points from 84.2 percent in 2019q2 to 86.4 percent in 2022q1 (Table 4.2).

- This was primarily driven by allocation rates declining 2.3 percentage points from 11.7 percent in 2019q2 to 9.4 percent in 2022q1 (Table 4.2).

- Declines in allocation rates were partially offset by increases in the manual edit rate from 0.1 percent in 2019q2 to 0.5 percent in 2022q1 (Table 4.2).

Graph 4.2 Interview Survey Expenditure Edit Rates

Interview expenditure edit rates
Reported expenditures
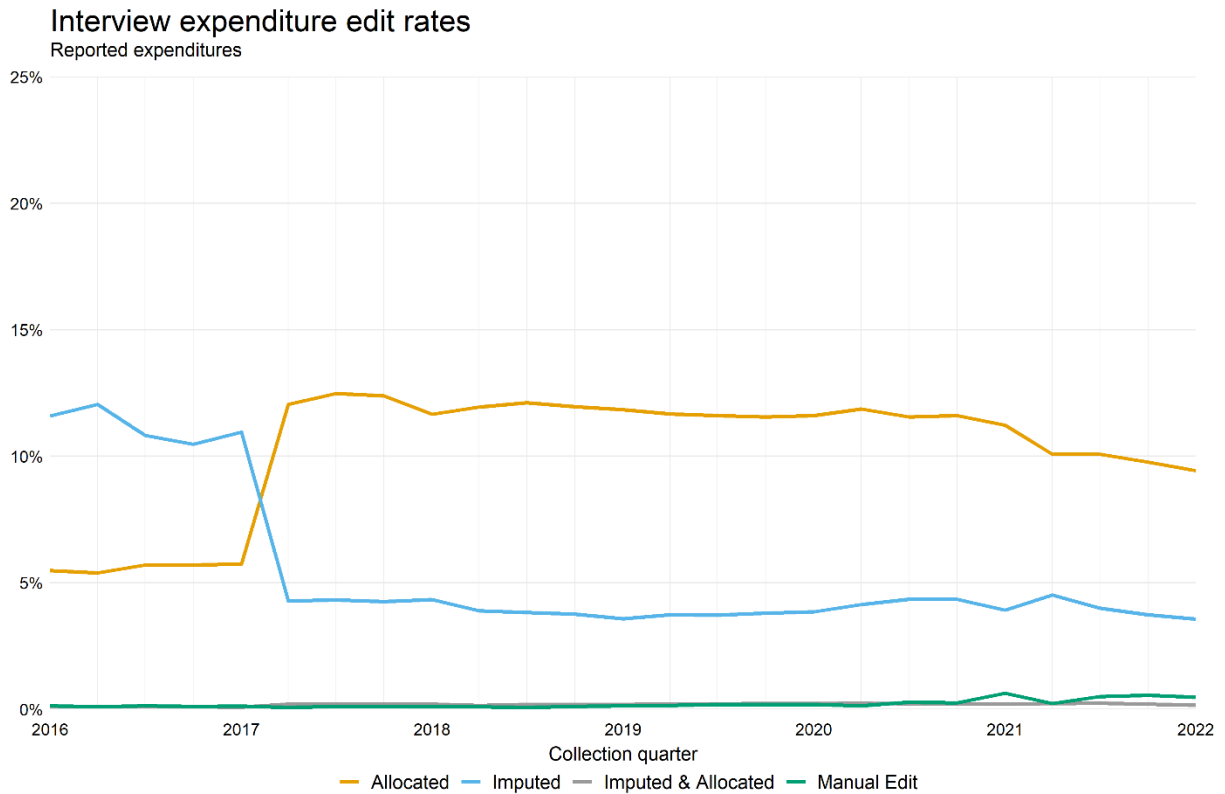
Table 4.2 Interview Survey: reported expenditure records

Quarter	Number of expenditures	Row percentage				
		Allocated	Imputed	Imputed & allocated	Manual Edit	Unedited
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
2021q4	222,027	9.8	3.7	0.2	0.6	85.7
2022q1	231,495	9.4	3.6	0.2	0.5	86.4

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. As stated 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 (e.g., providing bundled terms like "grocery", "food", or "expenses" that offer little detail), 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 fell 4.0 percentage points from 56.8 percent in 2019q1 to 52.8 percent in 2021q4 due to the rise in model-based imputation(Table 5.1). Although unimputed data rates reached a three-year high in late 2019 through early 2020, this rate has generally declined over the presented period (Table 5.1).

- Model-based imputation rates rose 4.6 percentage points from 17.8 percent in 2019q1 to 22.4 percent in 2021q4 (Table 5.1). In contrast to the rate of unimputed data, model-based imputation dipped between early 2019 and late 2020 but has generally trended upwards over the three year period (Table 5.1).
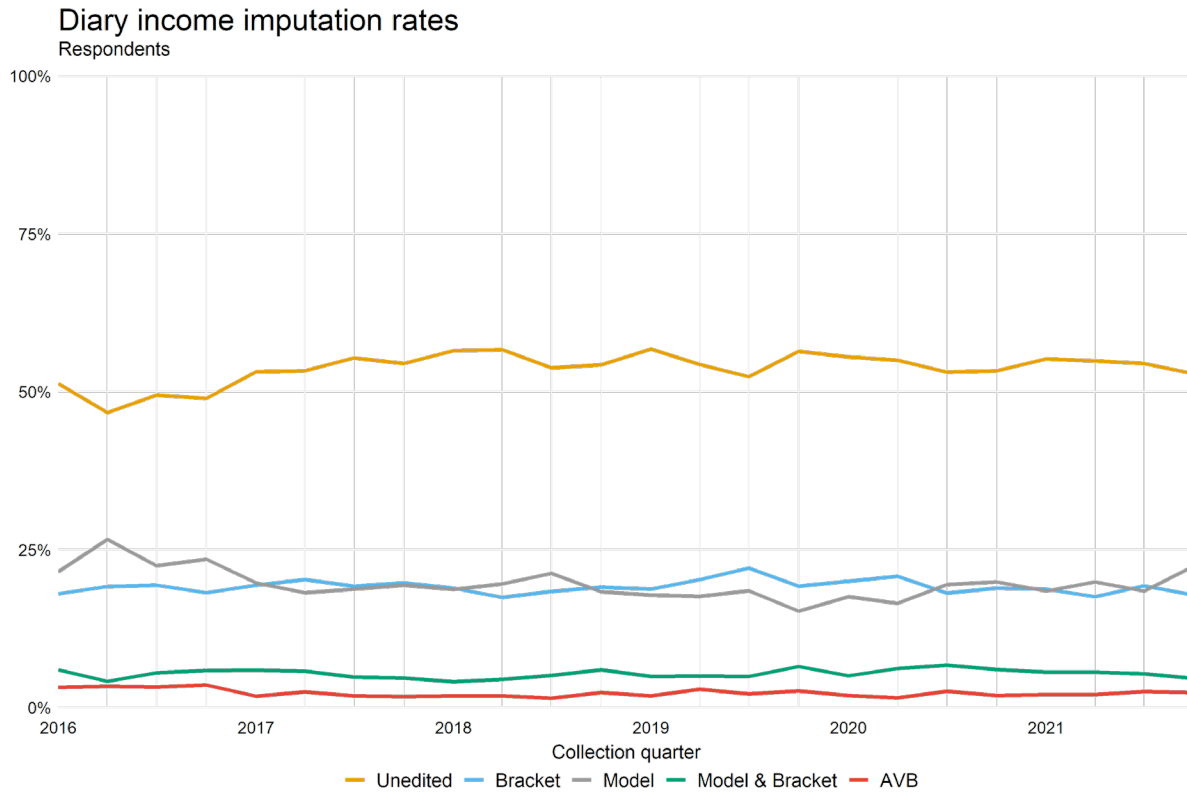
Graph 5.1 Diary Survey Income Imputation Rates

Diary income imputation rates
Respondents

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
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
2021q3	3,027	2.5	19.3	18.4	5.3	54.5
2021q4	2,864	2.4	17.8	22.4	4.6	52.8

Interview Survey Summary

- The rate of unimputed total income before taxes declined 0.6 percentage points from 58.4 in 2019q2 to 57.8 percent in 2022q1, dropping as low as 54.7 percent in 2020q4 due to an increase in model-based imputation(Table 5.2).

- Model-based imputation rates rose 0.2 percentage points from 17.5 percent in 2019q2 to 17.9 percent in 2022q1 (Table 5.2).

- The proportion of respondents requiring both model-based and bracket response imputation rose a further 0.8 percentage points from 4.4 percent in 2019q2 to 5.2 percent in 2022q1 (Table 5.2).

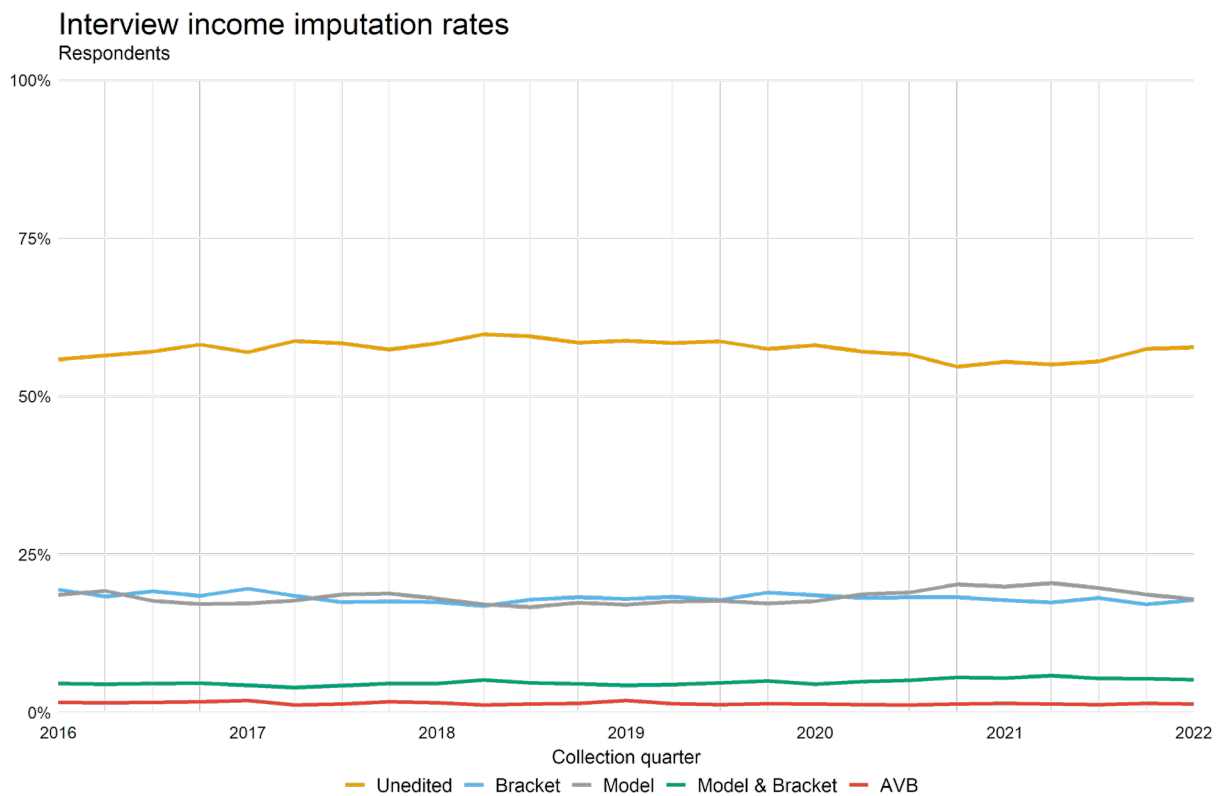**Graph 5.2 Interview Survey Income Imputation Rates**

Interview 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
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
2021q4	4,902	1.4	17.1	18.6	5.3	57.5
2022q1	5,187	1.3	17.8	17.9	5.2	57.8

6. Respondent burden (Interview Survey)

Respondent 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 respondent burden as it has the potential to negatively impact response rates and overall response quality. Beginning in April 2017, the Interview Survey introduced a respondent burden question with response options describing five different levels of burden at the end of the Wave 4 interview. The respondent burden metric is derived from 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 may underestimate survey burden due to self-selection bias. That is, respondents who have agreed to participate in the final wave of the survey presumably 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 percentage of respondents who report perceiving no burden reached a series low of 24.2 percent in 2019q4. Overall, this category declined 4.6 percentage points from 30.9 percent in 2019q2 to 26.3 percent in 2022q1 (Table 6.1).

- Rates of respondents who felt that the survey was very burdensome increased 2.6 percentage points, rising from 13.7 percent in 2019q2 to 16.3 percent in 2022q1 (Table 6.1).

- Respondents perceiving some burden also increased 2.8 percentage points from 52.4 percent in 2019q2 to 55.2 percent in 2022q1 (Table 6.1).

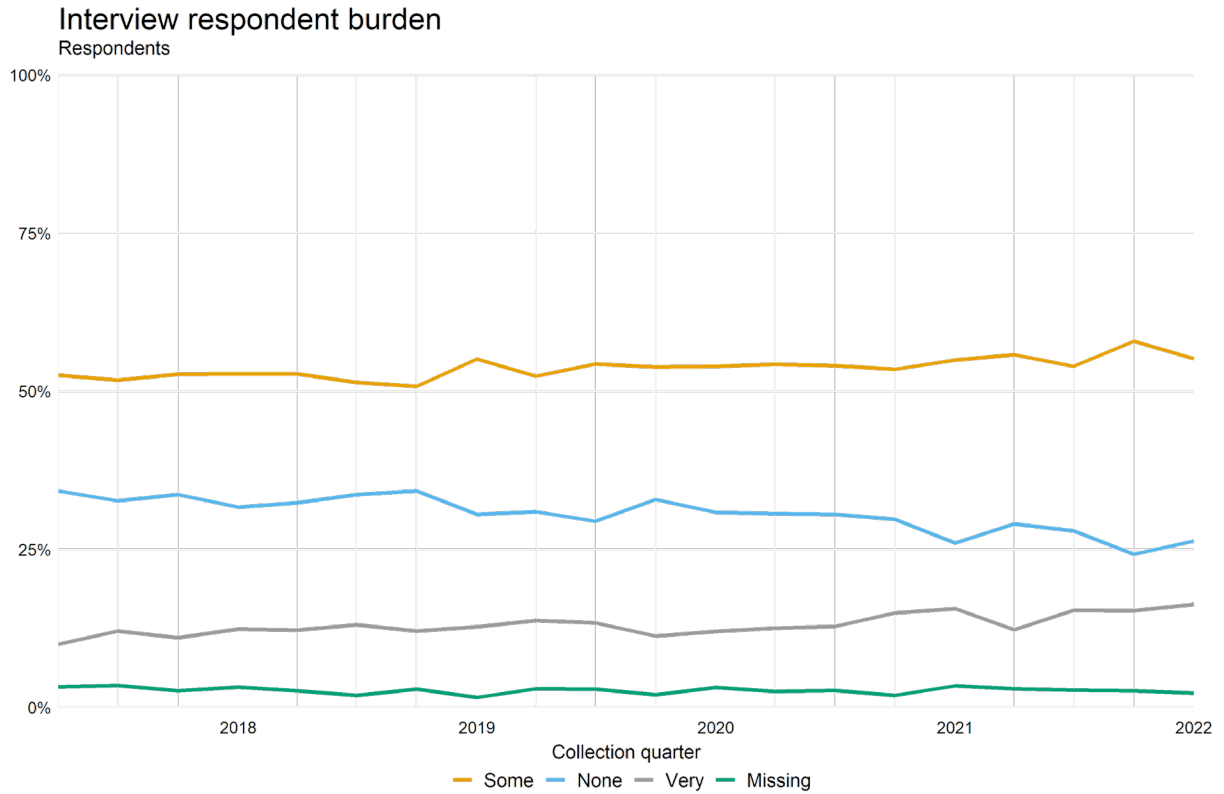**Graph 6.1 Interview Survey Respondent Burden**

Interview 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
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
2021q4	1,223	24.2	57.9	15.3	2.6
2022q1	1,289	26.3	55.2	16.3	2.2

7. Survey mode (Diary and Interview Surveys)

In both the Diary and the Interview Surveys, this metric measures the mode of data collection.

In the Diary Survey, mode is based on the form of diary used, as opposed to whether the initial field representative and respondent interaction (where information is collected about the household and the diary-keeping task is explained) was in-person or over the phone. Until recently, the Diary Survey was administered strictly in paper form. As part of the CE program's redesign, the BLS introduced a new online diary mode[7]. This new mode prompted the inclusion of a quality metric that tracks the mode of diary chosen by the respondent at the time of placement. It should be noted that while the online diary became available in July 2020, due to changes in interviewing procedures, it was not officially implemented into CE production until July 2022.

The Interview Survey was designed to be an in-person interview; however, the interviewer can also collect data 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.

More information on how we calculate the mode metrics can be found in the DQP Reference Guide (Armstrong, Jones, Miller, and Pham, 2022).

Diary Survey Summary

- In the first quarter of its availability, 2020q3, the online diary mode accounted for 33.1 percent of complete cases, while paper diaries made up 66.3 percent of cases (Table 7.1).

- The proportion of paper diaries moved up 5.0 percentage points to 71.3 in 2020q4, while the share of online diary cases fell to 26.8 percent in that quarter (Table 7.1).

- Over the course of 2021 the proportion of paper diaries dropped in each quarter, ultimately falling 1.6 percentage points to 69.6 percent (Table 7.1).

- Most of this change can be attributed to the increase in the rate of "missing" cases, which rose from 1.6 percent in 2021q3 to 4.3 in 2021q4 (Table 7.1)[8].

- Online diary cases also fell slightly in 2021 from 27.1 in 2021q1 to 26.0 in 2021q4 (Table 7.1).

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[7] The Gemini Project was launched to research and develop a redesign of the Consumer Expenditure (CE) surveys, addressing issues of measurement error and respondent burden.

[8] "Missing" diary cases are those that were successfully placed but were coded as "temporarily absent" at pick-up.
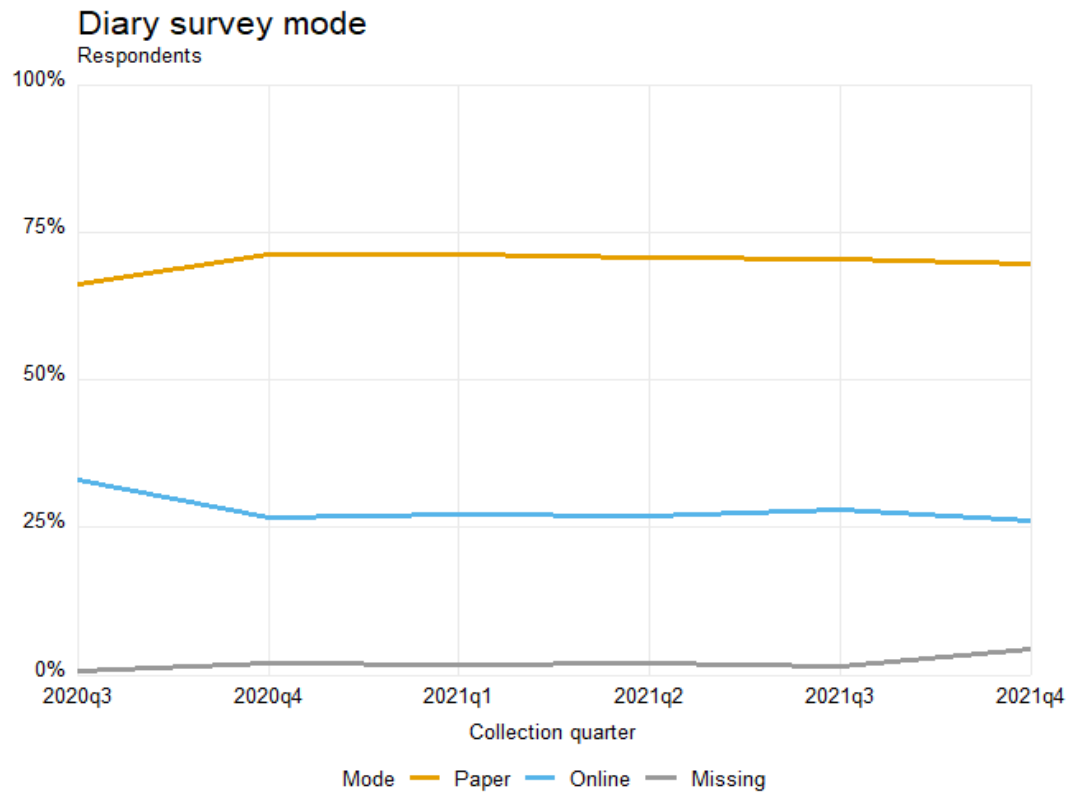
Graph 7.1 Diary Survey Mode

Diary survey mode
Respondents

Mode — Paper — Online — Missing

Table 7.1 Diary Survey: survey mode

Quarter	Number of Diary Cases	Row percentage		
		Paper	Online	Missing
2020q3	2,559	66.3	33.1	0.6
2020q4	2,835	71.3	26.8	1.9
2021q1	2,952	71.2	27.1	1.6
2021q2	3,224	70.8	27.1	2.1
2021q3	3,027	70.5	27.9	1.6
2021q4	2,864	69.6	26.0	4.3

Interview Survey Summary

- Prior to the onset of the COVID-19 pandemic in early 2020, the proportion of in-person interviews remained relatively steady across all interview waves before beginning to drop in 2020q1 and hitting a low point in 2020q2 (Table 7.2).

- In every quarter prior to 2020q1, the proportion of telephone interviews, across all waves, remained below the in-person proportion. In 2020q1 this changed for Wave 4 interviews when the share of these interviews conducted via telephone rose to 51.1 percent (Table 7.2).

- 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 (Table 7.2).

- Beginning in July 2020, interviewers were allowed to resume in-person interviews, depending on local rules (Table 7.2).

- From 2020q3 to 2021q3 the rate of in-person interviews increased across all waves, but the trend of recovery toward the pre-pandemic levels stalled in 2021q4 and 2022q1 as Wave 1 in-person interview rates fell each of the next three quarters from 46.1 in 2021q3 to 42.1 in 2022q1 (Table 7.2).
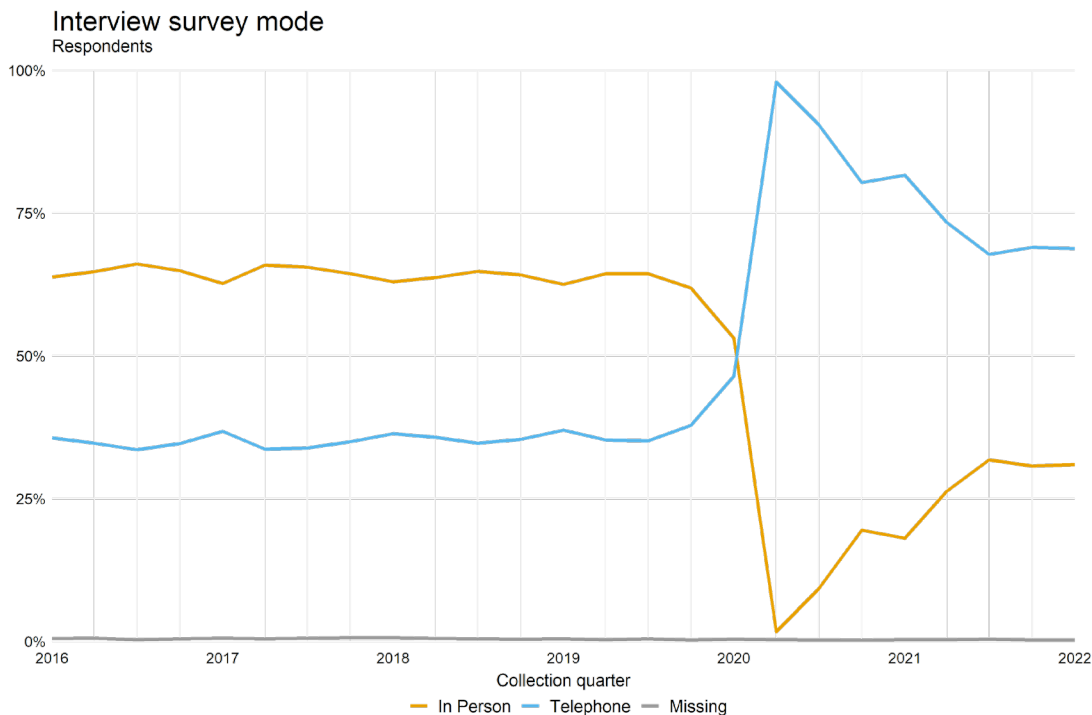
Graph 7.2 Interview Survey Mode

Interview survey mode
Respondents

Table 7.2 Interview Survey: survey mode

Quarter	Wave	Number of respondents	Row percentage		
			In-person	Telephone	Missing
2019q2	Wave 1	1,443	75.6	22.7	0.5
2019q2	Wave 4	1,397	58.3	40.9	0.2
2019q2	Waves 2 & 3	2,653	60.0	39.2	0.2
2019q3	Wave 1	1,401	77.3	21.1	0.6
2019q3	Wave 4	1,285	57.7	41.6	0.5
2019q3	Waves 2 & 3	2,651	59.7	39.5	0.4
2019q4	Wave 1	1,318	74.2	24.6	0.4
2019q4	Wave 4	1,293	55.0	43.9	0.4
2019q4	Waves 2 & 3	2,637	57.9	41.5	0.2
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
2021q4	Wave 1	1,229	42.6	57.0	0.5
2021q4	Wave 4	1,223	25.0	74.8	0.2
2021q4	Waves 2 & 3	2,450	27.6	72.2	0.2
2022q1	Wave 1	1,347	42.1	57.6	0.3
2022q1	Wave 4	1,289	24.2	75.5	0.3
2022q1	Waves 2 & 3	2,551	28.5	71.3	0.2

8. Survey Response Time (Diary and Interview Surveys)

In both the Interview and Diary Surveys, survey response time is defined as the number of minutes needed to complete an 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. For the Interview Survey, the survey response time metric is the median number of minutes to complete the interview. In the Interview Survey, wave 1 & 4 interviews are typically longer because they collect additional information not usually collected in the other waves, like household demographics or assets and liabilities. 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

- While the median Diary Survey response time only fell 0.1 minutes from 35.0 in 2019q1 to 34.9 in 2021q4, the metric did experience some variation throughout the period (Table 8.1).

- After remaining above 33.0 minutes for all of 2019, and the first three quarters of 2020, the median diary survey time fell to 32.7 minutes in 2020q4 (Table 8.1).

- Response time remained below 33.0 minutes from 2021q1 to 2021q3 before jumping back up to 34.9 minutes in 2021q4 (Table 8.1).

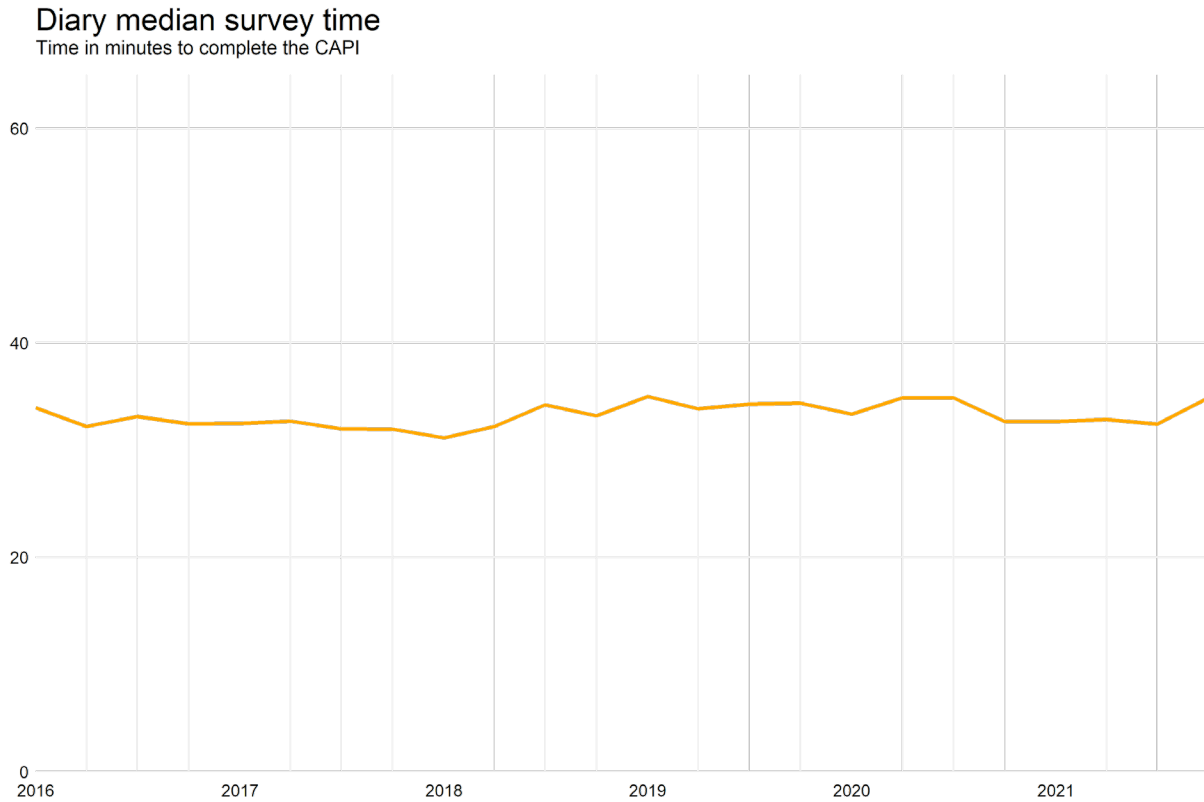**Graph 8.1 Diary Survey Median Survey Time**

Diary median survey time
Time in minutes to complete the CAPI

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

Quarter	Number of respondents	Minutes
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
2021q3	3,027	32.4
2021q4	2,864	34.9

Interview Survey Summary

- Median time for Wave 1 interviews fluctuated over the past three years between 74.1 and 80.2 minutes (Table 8.2).

- Wave 1 median interview time trended upward from 75.9 in 2019q2 to 78.8 in 2020q1, before trending downward over the rest of 2020 and into 2021q1 when it fell to 74.4 minutes. Over the last four quarters, median time rose to a recorded high of 80.2 minutes in 2021q4 before falling slightly to 79.6 minutes in 2022q1 (Table 8.2).

- In the last three years, median time to complete Waves 2 and 3 interviews ranged between 53.3 and 57.8 minutes (Table 8.2).

- For Wave 4 interviews, median interview time ranged between 58.8 and 69.5 (Table 8.2).

- Median times for Waves 2 & 3 and Wave 4, remained steady between 2019q2 and 2021q3, but jumped up above the previous range in 2021q4 to 57.8 and 69.5 minutes,.0ZX respectively. For Wave 4 interviews, the main source of this fluctuation was likely the test of Computer Assisted Recorded Interviewing (CARI) for 4th wave participants in 2021q4 (Table 8.2).

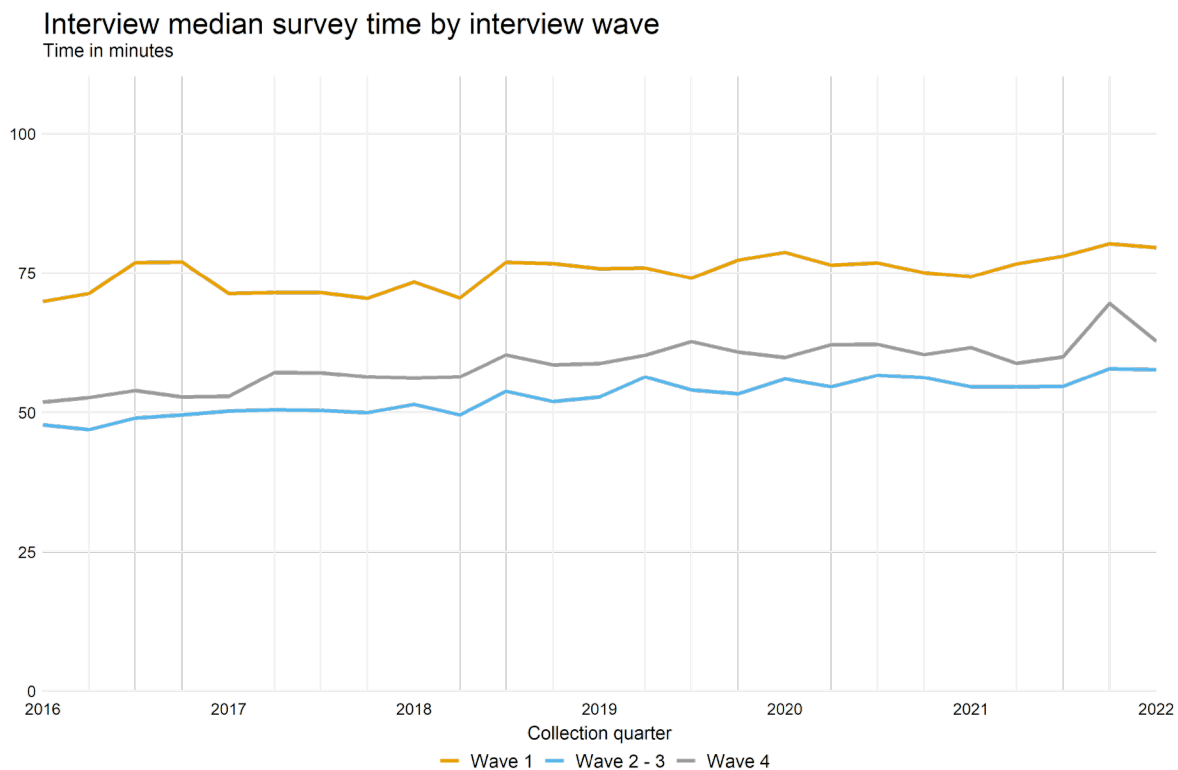**Graph 8.2 Interview Survey Median Survey Time by Interview Wave**

Interview median survey time by interview wave
Time in minutes

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

Quarter	Number of respondents	Minutes		
		Wave 1	Waves 2 & 3	Wave 4
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
2021q4	4,902	80.2	57.8	69.5
2022q1	5,187	79.6	57.7	62.8

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 metrics 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.

Response rates for the Diary Survey appeared to be on the mend following the onset of the COVID-19 pandemic in early 2020, but recently began a downward trend in the final quarters of 2021. Response rates in the Interview Survey, on the other hand, largely stalled following the drop off in early 2020 and have since continued to decline further.

While record use in the Interview Survey remained stable across interview waves for most of the available time series, the rate has increased in each wave of the interview survey since 2021q3. This is a positive finding, as past CE research indicates that record use is a helpful tool for improving data quality (Wilson, T. J., 2017). With respect to respondent burden in the Interview Survey, the rate of respondents who reported being "not burdened" by the Interview Survey has fallen steadily since the beginning of 2020 despite a slight increase in 2021q2.

Median Interview Survey time also saw fluctuation in the final quarters of 2021, with fourth wave interview time rising sharply in 2021q4 before falling back to a more normal level in the 2022q1. It should be noted that this increase in median time coincided with the test of Computer audio-recorded interviewing (CARI) on wave 4 interviews in 2021q4. We cannot definitively state that this is the cause of the increase, but past literature does suggest that recording interviews can result in longer average interviews (McGonagle, K. et al, 2019). Internal CE research is currently being conducted on CARI that will analyze this relationship with median survey time.

Interview Survey Mode and Information Booklet Use appear to be on a path toward their pre-COVID figures, but the recovery is still slow. 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 and Expenditure edit rates for the Diary Survey and the Interview Survey remained fairly stable over the time period covered, as did Median survey time in the Diary Survey.

BLS will continue to monitor these trends, and the next issue of the CE Data Quality Profile will be released in the second quarter of 2023 with BLS's midyear release of CE data. This report will feature CE Diary Survey data through 2022q2 and CE Interview Survey data through 2022q3.

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