THE CE DIARY OPERATIONAL TEST - DIFFERENCES IN REPORTING LEVELS

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1. INTRODUCTION

The Consumer Expenditure Surveys (CE) provide a current and continuous series of data on consumer expenditures and other related characteristics. One component of the CE is the Diary Survey where respondents are asked to keep two 1-week diaries for recording purchases. The Diary Survey is intended to provide data primarily on small everyday types of purchases (food, meals, personal care products and services, housekeeping supplies, etc.) The other component of the CE is the Quarterly Interview Survey which, for the most part, focuses on large expenditures and expenditures which occur on a fairly regular basis; that is, the types of expenditures which respondents can be expected to recall fairly accurately over a 3-month period or for which records are likely to be available.

There has been some research to indicate that benefits can be derived from more detailed diary formats. Sudman and Ferber (1) found that the overall mean expenditures from a diary organized and labeled according to product categories was 12 percent higher than the mean from a journal diary in which no product categories were mentioned. An internal Bureau of Labor Statistics (BLS) memorandum (2) showed that food items with examples in the current CE Diary Survey were less likely to show a reporting rate decline over time. Pearl (3) in a methodological history of consumer expenditure surveys states that itemized diaries which list specific kinds of expenditures in some detail have been used widely in market research surveys restricted to certain classes of products. In such instances, these diaries have been regarded as more effective in achieving reporting of desired items than has been the case for open diaries, which may only provide for a simple listing of consecutive expenditures on successive lines of a page for each day. In a 1960 Canadian study (4), it was found that itemized listing of consumer expenditures in a diary of the semi-open type (i.e., similar to the open type, except that each page is divided into different sections covering broad classes of expenditures such as food, clothing, etc.) resulted in higher reporting levels for the items listed but lower levels for the unlisted products. Another study (5) found no difference between the journal or semi-open diary form.

Most CE interviewers generally conduct both the Diary Survey and the Quarterly Interview Survey. No concrete evidence exists concerning the effects of having the interviewers confine themselves to collecting data for only one of the CE Surveys. However, there is a general impression that interviewers who work solely on the diary get better results than interviewers who also collect quarterly data. This belief is a result of remarks made by interviewers who work both surveys suggesting that more importance is attached to the quarterly interview survey for various reasons (size of the questionnaire, length of interview, number of times a unit is interviewed, depth of topics covered, etc.).

For these reasons and because the diary estimates have generally been lower when compared with other independent estimates (6 and 7), a research sample was selected and the CE Diary Operational Test was conducted in 1985 to study alternative diary formats and to investigate the possible detrimental effects of having interviewers conduct both the Quarterly Interview and Diary Surveys. This paper reports on the differences in reporting levels observed for the CE Diary Operational Test.

The study was designed to compare three test diaries:

1. Control Diary-current full length diary with item descriptions in the category headings used in the regular, ongoing CE Diary Survey
2. Specific Diary-reduced (i.e., having less content and physically, smaller in size, than the control but not necessarily shorter) diary with preprinted item codes and item descriptions for each entry on each line
3. Nonspecific Diary-reduced diary with more item descriptions in the category headings than the control diary but no preprinted item descriptions

Comparisons were also made between the research sample and the regular diary production sample for the control diary. For the remainder of this paper, the control diary administered to the production sample will be called the production diary, and the control diary administered to the research sample will be called the control diary.

2. RESULTS

The primary focus of the research was to characterize differences in levels of reporting. Three variables, weekly expenditures, number of entries, and reporting rates were examined. Weekly expenditures refer to expenditures reported in each diary and in the Diary Check Section of the Household Characteristics Questionnaire. In addition, expenditures reported in the special Recall Section of

the Household Characteristics Questionnaires for the research diaries were included in the weekly expenditures of the research diaries. Mean expenditures were compared because the Diary Survey Bulletins put out by BLS report results in terms of mean expenditures for similar totals and expenditure classes (EC's) of items. An EC is simply a subset of similar items, and the EC's examined in this report were broad enough so as to be less sensitive to rare or outlier expenditure values. Number of entries refers to the number of nonzero expenditure entries in each diary. For the research diaries, the number of nonzero expenditure entries in the Recall Section were included in the number of entries. Another criterion for choosing between diaries was that greater importance is attached to variety or detail in expenditures as measured by larger numbers of expenditures. For this reason and in order to confirm the expected effect (less entries) of the format of the specific diary, comparisons were made between the mean number of entries. Reporting rate refers to the percentage of interviewed CU's with at least one nonzero expenditure entry. An examination of reporting rates was conducted to determine which diary provided the broadest base of respondents.

Reporting rates were unweighted, and 6-month weighted estimates were calculated for weekly expenditures and number of entries. Variance and covariance estimates were obtained using 24 half-sample replicates. Detailed comparisons using two-tailed t-tests with 23 degrees of freedom (alpha = .01, .05, and .10) were made for various EC's. Further investigations focused on various subpopulations based on region, income, CU size, race and age of reference person, tenure, number of earners, and CU composition.

Response rates were much lower for the research sample than for the production sample and refusal rates were much higher. The interview rates (percentage of eligible diaries resulting in an interview) were 78.6 percent, 80.7 percent, 78.1 percent, and 88.0 percent for the control, nonspecific, specific, and production diaries, respectively, and the corresponding refusal rates were 13.0 percent, 12.5 percent, 14.7 percent, and 7.7 percent. Indications from interviewers were that using a retired CPS sample for the research sample was one reason for the lower response rates and higher refusal rates. Interviewer experience was probably also another contributing factor in that most interviewers assigned to the research sample had little or no previous CE experience.

Four diary comparisons (control vs. nonspecific, control vs. specific, nonspecific vs. specific, and control vs. production) of average weekly CU expenditures for 23 EC's and various totals ("total", "food", "food at home", and "nonfood items") appear in Table 1A. The corresponding data for mean number of expenditure entries and percent of diaries containing expenditures appear in Tables 1B and 1C respectively. Not contained in this paper, but available from the author by request are 84 additional tables displaying these same data for each diary by several demographic characteristics. The results contained in these demographic tables are similar to those observed in Tables 1A, 1B, and 1C, and any differences will be highlighted at the end of this section.

Total mean weekly expenditures reported in the control diary significantly exceeded mean expenditures reported in the nonspecific diary by $174.77 (see Table 1A). However, only one EC "other nonfood items" was almost totally responsible for this significant difference. "Other nonfood items" had mean expenditures totaling $194.27 for the control diary as opposed to $26.18 for the nonspecific diary. This huge difference in nonfood expenditures is not surprising. On the control diary, respondents were instructed to record or were not prohibited from recording certain "other nonfood items" such as rent, mortgage, utilities, clothing, shoes, jewelry, and certain medical and entertainment expenses. In fact, the first instruction as to what to report in the control diary read, "Include - Every purchase, no matter how small or inexpensive it is." This emphasis on every purchase resulted in some respondents reporting costly nonfood items on the control diary. No such instructions appeared on either research diary, since these types of "other nonfood items" along with other large nonfood purchases are more appropriately obtained from the Quarterly Interview Survey.

For the small everyday type of "food at home" purchases the nonspecific diary proved to be significantly superior to the control diary in terms of mean expenditures. "Food at home" expenditures averaged $43.80 for the nonspecific diary as compared with $38.74 for the control diary. Of the 15 EC's under "food at home", 11 had significantly larger mean expenditures for the nonspecific diary. "Alcoholic beverages" was the only "food at home" EC where the control diary's average expenditures were significantly greater. Expenditures for "food away from home" were significantly larger for the control diary.

The "other nonfood" EC again dominated the $172.92 significant difference by which the control diary's mean expenditures for nonfood items exceeded the nonspecific's. However, unlike the "food at home" EC's, all five of the remaining nonfood EC's exhibited greater mean expenditures for the

control diary. In fact, for two of these EC's, "housekeeping supplies and services" and "gasoline, motor oil, and additives" the control diary had significantly greater average expenditures.

The control diary's mean weekly expenditures of $10.50 for "combination of items" was significantly larger than the $6.18 observed for the nonspecific diary. "Combinations of items" is a separate EC constructed for expenditures overlapping two or more separate Census item codes (e.g., $4.00 for eggs and bacon).

As was the case for the control/nonspecific comparison, the total mean weekly expenditures of CU's administered the control diary was significantly greater than that of CU's administered the specific diary. Again, however, the "other nonfood" EC was the only reason for this observed difference in total average expenditures. For "other nonfood items" the control diary exceeded the specific diary by $158.35, while for total expenditures the difference was $152.81, and for total nonfood expenditures the difference was $156.99.

When it came to the comparisons for the 23 individual EC's, the superiority of the specific diary was obvious. The specific diary produced significantly larger mean expenditures than the control for 11 of the 15 "food at home" EC's resulting in "food at home" expenditures averaging $46.62 for the specific diary as compared with only $38.74 for the control. Of the five remaining nonfood EC's, two, "personal care products and services" and "nonprescription drugs and medical supplies" had mean expenditures that were significantly larger on the specific diary. With the exception of the "other nonfood" EC, only combinations of items had significantly larger mean expenditures on the control diary.

Table 1A displays the mean expenditure comparisons between the nonspecific and specific diaries. Not a single comparison resulted in significantly greater expenditures for the nonspecific diary. In all four of the overall comparisons ("total", "food", "food at home", and "nonfood items"), the specific diary had mean expenditures significantly exceeding the nonspecific diary. For 10 of the 23 individual EC's (six "food at home" EC's, "food away from home", and three "nonfood" EC's). the mean expenditures on the specific diary were significantly larger.

The results in Table 1A4, which attempts to determine the effect of the Quarterly Interview Survey on mean expenditures, were somewhat mixed. A significantly large difference of $5.07 for "other food at home" favoring the production diary dominated four smaller significant differences of $0.27, $0.35, $0.37, and $0.31 favoring the control diary for the individual EC's of "bakery products", "beef", "eggs and diary products", and "fruits and fruit juices", respectively. Some examples of "other food at home" are: soup, baby food, frozen prepared foods (pizza), snacks, etc. This dominance contributed in large measure to the significantly greater mean expenditure for "food at home" of $42.50 in the production diary as compared with $38.74 in the control diary. "Food away from home" expenditures were significantly larger for the production diary, and this along with the "food at home" difference made the difference for "food" significant in favor the production diary. In the "nonfood" department, three of the six "nonfood" EC's had significantly greater mean expenditures on the production diary. The $6.42 difference by which the control diary exceeded the production diary for "combinations of items" was also significant.

Tables 1B displays the mean weekly number of expenditure entries for the various diary comparisons. Each dollar amount reported in a diary was counted as one entry. Instances where purchases were reported, but no expenditure (dollar amount) appeared, were not considered entries.

The influence of the "other nonfood" EC on the two overall totals ("total" and "nonfood items") was slightly less. The total mean number of expenditure entries observed for the control diary was 35.00, which was not significantly different from the 35.56 entries averaged for the nonspecific diary. Similar to the mean expenditure comparisons, both research diaries significantly dominated the control diary in terms of more entries. This was especially so for the "food at home" EC's, where 13 and 9 of the 15 EC's in this category had significantly more entries on the nonspecific and specific diaries, respectively. There was only one "food at home" EC where the control diary averaged significantly more entries. That occurred for the catch-all EC of "other food at home" in the control versus specific comparison. The superiority of the nonspecific diary over the control diary with regard to entries for the "food" EC's resulted in the nonspecific diary having significantly more entries than the control for both "food" and "food at home". With the exception of the "other nonfood" EC, the nonspecific diary obtained more entries than the control for the nonfood EC's, and for two of the EC's ("personal care products and services" and "gasoline, motor oil, and additives") the differences were significant.

In comparisons between the two research diaries, the nonspecific proved to be significantly better at obtaining entries for all four of the overall totals, for 9 of the 15 "food at home" EC's, for 2 of the 6 "nonfood" EC's, and for "combinations of items." In no EC was the number of entries

significantly more for the specific diary. This situation was almost completely the opposite of what was observed for mean expenditures (see Table 1A3) between the two research diaries. Differences in the diary formats is one obvious reason for this reversal of results. The specific diary required respondents to add all purchases on the same day of all items included on the same line, while in the nonspecific diary each purchase could be listed separately. For example, purchases of cream cheese and cottage cheese could appear as two separate entries on the nonspecific diary but should be recorded as one entry, "cheese," on the specific diary.

Any effect of the Quarterly Interview Survey as measured by the mean entry comparisons between the control and production diaries was negligible. Other than a few significant differences such as more entries on the production diary for three EC's as compared with two EC's on the control, the trend favored the production for the nonfood EC's and the control for the food EC's. This generally was very similar to what was observed in the mean expenditure comparisons between the production and control diaries.

Data on the percentage of diaries containing expenditures for each EC are compared by diary type in Table 1C. Again, the control diary fared poorly when compared with either of the research diaries. With the exception of "other nonfood items" for both research diaries and "combinations of items" for the specific diary, the percentage of control diaries containing various expenditures was consistently lower.

Of the nonspecific diaries, 1.9 percent more had at least one expenditure, 3.0 percent more had at least one "food" expenditure, and 4.3 percent more had at least one "food at home" expenditure than the control. All three of these differences were statistically significant. "Alcoholic beverages" was the only "food at home" EC where the percentage of nonspecific diaries with entries was not significantly more than the percentage of control diaries. For two of the "nonfood" EC's, "personal care services" and "housekeeping supplies and services", the likelihood was significantly higher that the nonspecific diary would contain expenditures.For the specific diary the results were very similar. A significantly greater percentage (1.7 percent more specific diaries than control) had at least one expenditure, and 3.7 percent more (significant also) had at least one "food at home" expenditure. Again, except for "alcoholic beverages", the percentage of specific diaries with entries was significantly greater for all 14 other "food at home" EC's. Also, the probabilities that the specific diary would contain at least one entry for the "nonfood" EC's, "personal care products and services" and "nonprescription drugs and medical supplies", were significantly higher than the probabilities for the control diary.

Table 1C shows very little difference between the two research diaries with respect to the chances of obtaining certain types of expenditures. Except for "flour, cereal, and other grain products" and "combinations of items", where 3.5 percent and 10.6 percent more nonspecific diaries had entries, respectively, all other differences were not statistically significant.

The control versus production comparison in Table 1C seemed to indicate, contrary to what was expected, that the Quarterly Interview Survey had the beneficial effect of significantly increasing the likelihood of entries on the current diary for at least the four overall totals. However, a closer look at Table 1C reveals that such a conclusion might be difficult to support. The "other nonfood" EC, for which a significantly larger portion of the production diaries have entries, contributes to the significant differences observed for "nonfood items" and "total" (i.e., any entry). A similar statement can be made for "food away from home" as it relates to "food" and "total". Since none of the 15 individual "food at home" EC's showed significent differences between the percentage of control and production diaries with such expenditures, the significant "food at home" difference can probably be attributed to a one-time cumulative effect over the 15 EC's. Otherwise, only the nonfood EC of "gasoline, motor oil, and additives" had a significantly greater percentage of production diaries with expenditures. Also, the percentage of control diaries was significantly larger than that of the production diaries when it came to reporting expenditures classified as "combinations of items."

As stated earlier, these same types of comparisons were also made within various demographic subgroups based on region, income, CU size, race and age of reference person, tenure, number of earners, and CU composition. Generally, the results were very similar to those observed for the overall population. There were 22 instances where significant differences occurred between diaries within a particular subpopulation, but these same differences were significant in the opposite direction for the overall population. However, given the large number of tests that were conducted, such a small number of changes may not mean much.

No such switches in the direction of signnificance were observed for the four major regions of the country (Northeast, North Central, South, and West) or for the tenure classifications (owner and renter). CU's with income from $15,000 to $19,999 accounted for six of the 22 changes; CU's

consisting of one person accounted for seven; and CU's consisting of four persons resulted in three.

3. **Summary**

Respondent cooperation (i.e., high response rates and low refusal rates) was much better for the production sample than for the research sample. Two reasons can be cited for this lack of participation. The research sample was a retired CPS sample that was only 6 years old, and the research sample interviewers lacked CE experience.

The main purpose of the Diary Survey is to collect expenditure data on primarily small everyday purchases. In this respect, using greater mean expenditures as a criterion, the specific diary proved to be superior to both the control and nonspecific diaries. However, if more importance is attached to variety or detail in the expenditures, then the nonspecific diary may be the choice because the nonspecific diary had more entries than either the control or specific diaries. The format of the specific diary was almost certainly responsible for less entries. Adding more UCC's to the specific diary might increase the number of entries, but the effects of such a change could also be detrimental. Diary size would increase and respondents would be forced to make even more classification decisions. This in turn could negatively influence response rates, refusal rates, mean expenditures, and even the number of entries.

Another gauge of success among the three diaries is the degree of participation over all respondents as measured by the percentage of diaries containing entries. Having an overall greater amount of expenditures and more entries is desirable provided the expenditures and entries are not concentrated among a smaller group of respondents. Both research diaries were equally effective and outperformed the control diary with respect to the percentage containing at least one expenditure over the various categories.

Comparisons between the control and production diaries seemed to indicate that the Quarterly Interview Survey had no effect on the production diary. In fact, the interviewers assigned the production diaries obtained slightly better results (greater expenditures, more entries, and larger percentages with at least one entry) than interviewers assigned the control diaries, and interviewer CE experience was probably the major reason. Interviewers assigned to the research sample had little or no previous CE experience, and in addition, they had to administer three different diaries.

With the possible exception of CU's consisting of one or four persons and CU's with incomes from $15,000 to $19,999, the diary comparisons for different demographic subpopulations were very similar to the overall population comparisons. Sampling error is a reasonable explanation for the differences observed in CU's of size one or four and in CU's with income in the $15,000 to $19,999 range, especially since such differences were not prevalent throughout the other demographic subgroups.

1. BLS's estimates of percent reporting were weighted.
2. The BLS used monthly weighting as opposed to six-month weighting (i.e., each individual month was weighted separately using the same specifications employed for six-month weighting). By employing monthly weighting individual monthly estimates or estimates for any combination of the six months can be derived.
3. More detailed and extensive range checks and editing were employed by BLS.
4. Some expenditures (e.g., expenditures for large or expensive items, housekeeping services, etc.) were deleted from consideration by BLS.
5. Classification differences occurred for the following items: "margarine," "nondairy cream substitutes," "pet food," "groceries" and "alcoholic beverages."
6. BLS used some allocation among EC's for expenditures with a general item description (e.g., meat).

The extent to which these two reports differ might be a measure of the effect of the BLS procedures.

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TABLE 1A Weighted Average Weekly Expenditures of Consumer Units by Diary Type

	Control	Nonspecific	Specific	Production
Total	$299.94	$125.17	$147.13	$324.59
Food	61.09	65.56	69.68	67.82
Food at home	38.74	43.80	46.62	42.50
Flour, cereal and other grain products	1.39	1.83	1.85	1.27
Bakery products	3.19	3.53	3.83	2.92
Beef	3.18	4.52	4.71	2.83
Poultry	1.24	1.73	1.72	1.34
Pork	1.46	2.21	2.49	1.66
Other meats	1.87	2.03	1.88	1.94
Fish and seafood	1.14	1.46	1.34	1.16
Eggs and dairy products	4.86	5.42	5.81	4.49
Fruits and fruit juices	3.13	3.61	3.62	2.82
Vegetables and vegetable juices	2.26	2.73	3.02	2.20
Sugar, sugar substitutes and sweets	1.09	1.40	1.61	.99
Fats, oils and dressings	.56	.92	.86	.60
Nonalcoholic beverages	3.39	3.53	3.62	3.04
Alcoholic beverages	3.48	3.01	3.46	3.65
Other food at home	6.51	5.87	6.81	11.58
Food away from home	22.35	19.76	23.05	25.31
Nonfood items	228.35	55.43	71.36	252.70
Tobacco and smoking supplies	3.28	3.16	3.38	3.58
Personal care products and services	4.83	4.50	5.83	5.53
Housekeeping supplies and services	9.05	6.24	8.43	12.23
Gasoline, motor oil and additives	15.17	13.93	14.79	16.96
Nonprescription drugs and medical supplies	1.76	1.53	3.02	2.46
Other nonfood items	194.27	26.08	35.92	211.93
Combinations of items	10.50	6.18	6.09	4.08

TABLE 1B Weighted Mean Weekly Number of Expenditure Entries by Diary Type

	Control	Nonspecific	Specific	Production
Total	35.00	35.56	32.39	35.55
Food	23.18	26.40	23.97	22.98
Food at home	18.32	21.76	19.15	17.69
Flour, cereal and other grain products	.83	1.10	.87	.78
Bakery products	2.14	2.45	2.33	2.01
Beef	.69	.89	.95	.64
Poultry	.34	.48	.44	.36
Pork	.43	.65	.71	.50
Other meats	.70	.84	.69	.69
Fish and seafood	.33	.43	.38	.32
Eggs and dairy products	2.85	3.24	3.09	2.71
Fruits and fruit juices	2.10	2.46	2.05	1.95
Vegetables and vegetable juices	2.30	2.81	2.05	2.30
Sugar, sugar substitutes and sweets	.64	.94	.94	.60
Fats, oils and dressings	.30	.49	.40	.31
Nonalcoholic beverages	1.40	1.56	1.45	1.23
Alcoholic beverages	.49	.49	.53	.51
Other food at home	2.78	2.77	2.27	2.92
Food away from home	4.86	4.63	4.83	5.29
Nonfood items	11.36	8.68	8.17	12.42
Tobacco and smoking supplies	.74	.86	.86	.85
Personal care products and services	1.01	1.25	1.08	1.04
Housekeeping supplies and services	2.36	2.49	2.17	2.44
Gasoline, motor oil and additives	1.15	1.21	1.23	1.32
Nonprescription drugs and medical supplies	.33	.35	.34	.31
Other nonfood items	5.77	2.53	2.48	6.45
Combinations of items	.45	.48	.25	.15

TABLE 1C Percentage of Diaries Containing Expenditures by Diary Type

	Control	Nonspecific	Specific	Production
Number of diaries	1830	1802	1761	2014
Total	92.6	94.5	94.3	96.2
Food	89.7	92.7	91.9	93.9
Food at home	84.4	88.7	88.1	89.6
Flour, cereal and other grain products	41.0	49.7	46.2	38.5
Bakery products	66.6	72.6	71.0	67.1
Beef	37.8	47.8	46.1	35.0
Poultry	25.2	34.4	33.7	26.7
Pork	29.0	37.7	40.0	29.3
Other meats	37.4	43.9	41.5	36.5
Fish and seafood	22.7	29.7	28.7	21.6
Eggs and dairy products	73.3	77.5	77.1	72.6
Fruits and fruit juices	58.7	65.2	65.6	56.7
Vegetables and vegetable juices	56.6	62.9	63.5	54.4
Sugar, sugar substitutes and sweets	36.7	46.1	47.6	34.6
Fats, oils and dressings	21.0	32.8	31.2	22.2
Nonalcoholic beverages	56.4	60.5	59.8	54.5
Alcoholic beverages	25.6	27.3	27.5	26.7
Other food at home	63.3	67.4	68.9	65.6
Food away from home	71.0	70.8	70.6	76.1
Nonfood items	88.1	88.2	87.5	93.8
Tobacco and smoking supplies	29.7	30.6	32.6	33.1
Personal care products and services	43.9	48.7	48.2	43.6
Housekeeping supplies and services	61.9	66.3	65.1	64.3
Gasoline, motor oil and additives	61.3	62.5	60.0	68.1
Nonprescription drugs and medical supplies	21.5	22.8	24.8	19.5
Other nonfood items	77.6	63.6	61.8	82.5
Combinations of items	26.6	27.1	16.5	10.8