

EFFECTS OF TIME AND SALIENCE FACTORS ON REPORTING PERFORMANCE IN DIARY SURVEYS

Monica L. Dashen¹

Bureau of Labor Statistics

2 Massachusetts Ave., N.E., Rm. 4915, Washington D.C. 20212

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The U.S. Consumer Expenditure Survey (CE) uses a two-week diary to collect data on frequent and inexpensive expenditures. During an interview conducted at pick-up, respondents are asked to recall frequent and inexpensive purchases made during a two-week period. Typically, data is collected about frequently-occurring events that may be easily omitted during the interview.

Diaries are generally thought to omit recall error because the events are recorded soon after they occur. However, under-reporting continues to be a problem for the CE Diary, and it is possible that forgetting is a contributing factor to measurement error in diaries.

Recall error conceivably could be a factor contributing to measurement error in diaries. Recall error arises from respondents' failure to make any or all entries in the diary during the specified time period. In a follow-up interviewer-coached interview, respondents are asked to recall all purchases made during the reference period. Under-reporting of events - reporting fewer events than actually occurred - is typical in this situation.

Research Questions

This study investigated two research questions:

1. the effects of time on reporting performance for frequent and inexpensive expenditures collected in the CE diary; and,

2. the effects of expenditure salience (e.g., meaningfulness) on the amount and rate of memory loss.

The second research question was investigated to evaluate whether the nature or salience of material to-be-remembered affects reporting performance. Using purchase price (cost) as an indicator of salience it was expected that expensive expenditures would be retained over time more than inexpensive expenditures.

Experimental Design

The effects of time on accurate reporting of expenditures was investigated by asking 48 respondents to recall their diary entries after a given time period had elapsed. All respondents were instructed to keep a sample diary of expenditures for 2 weeks and make daily recordings of the following purchases: 1) food away from home; 2) small clothing expenses (e.g., panty hose); 3) small household furnishings and; 4) entertainment expenses (e.g., movie tickets).

Respondents returned for the follow-up interview session either one, two, and four weeks after the end of the two-week reference period. Respondents were not told that they would be asked to recall expenditures during the follow-up session. During the follow-up interview session, respondents were expected to recall all items purchased during the two-week reference period. The recall test was administered after either one of three retention intervals: one, two, or four weeks following the end of the diary-keeping period.

Data Analysis Strategy

¹ The author would like to Clyde Tucker for help in various aspects of this project.

Items in both the diary and recall tests were edited to eliminate duplicate occurrence of items. The reported items in the recall test were classified into three mutually exclusive categories: (1) matches, (2) misses and (3) intrusions. Matches refer to those items reported in the recall test that were also recorded in the diary. Misses are those items not reported in the recall test, but recorded in the diary. Finally, intrusions are those items reported in the recall test that were not recorded in the diary.

The number of matches and intrusions were used to compute the following normalized measures of performance:

1. Match Rate: the fraction of items to be reported (e.g., items in the diary) that actually were reported by respondents over the total number of items recorded in the diary; and,
2. Intrusion Rate: the fraction of reported items not recorded in the diary over the total number of items reported in the interview.

Normalizing the recall rate allowed a respondent who recorded 40 items and recalled 30 items and to be equivalent to a respondent who recorded 60 items and recorded 40 items.

Correctly reported expenditures (or matches) were classified into one of two categories: "expensive" and "inexpensive." Purchases between one cent and \$20 were categorized as "inexpensive;" alternatively, purchases between \$21 and \$40 were categorized as "expensive." Over 96% of expenditures were under forty dollars; thus, the figure of forty dollars was selected as the cut-off point.

Results

Table 1 shows the mean match rate and mean intrusion rate for each those respondents who completed the interview one, two, and four weeks after diary completion, respectively.

Table 1

Number of Weeks	Match Rate	Intrusion Rate
1	.40	.50
2	.32	.69
4	.24	.78
Mean	.34	.68

The average proportion of matches decreased as a function of retention interval (number of weeks prior to the recall test) was revealed by a one-way ANOVA (using three levels): $F(2,45) = 5.90, p < .01$. The results of a contrast comparing levels of retention using an independent group t-test indicate that:

1. the average match rate for respondents in the 1-week interval (.46) was significantly higher than the match rate for respondents in the 2-week interval (.32);
2. the average match rate for respondents in the 1-week interval (.46) was also significantly higher than the average match rate in the 4-week interval (.24);
3. an unexpected finding was that the average match for respondents in the 2-week interval (.32) was not significantly higher than the average match rate in 4-week interval (.24);
4. the average proportion of matches increased for expensive compared to inexpensive items, indicating that memory for expensive items was greater than inexpensive items; and,

The average proportion of intrusions increased as a function of retention interval as revealed by a one-way ANOVA (using three levels): $F(2,45) = 6.76, p < .01$. The results of a contrast comparing levels of retention using an independent group t-test indicated that:

1. the average intrusion rate for respondents in the 1-week interval (.55) was significantly

lower than the rate in the 2-week interval (.69).

2. the average match rate for respondents in the 1-week interval (.55) was significantly lower than the rate in the 4-week interval (.78).
3. an unexpected finding was that the average match for respondents in the 2-week interval (.69) was not significantly lower than the rate in 4-week interval (.78).

Discussion

The findings indicate that, over time, memory for expenditures deteriorated, as indicated by low match rates and high intrusion rates. One of the most striking findings was the low match rate (.34) obtain for all three retention intervals, because the process of recording each event in the diary should have ensured greater memory of the material. It seems likely that under normal conditions, memory for expenditures would be even poorer.

Memory for frequent and inexpensive expenditures rapidly decreased within the first two weeks; 46% of expenses were reported after one week, and after a two-week delay this match rate had dropped to 32%. This substantial decrease in match rates represents a high rate of forgetting for expenditures within a two-week period. In contrast to the rapid decline of reporting performance after one week, this rate appears to be much slower after two weeks. There was an 8% decrease in match rates between the two- and four-week retention intervals.

This fluctuation in match rates between retention intervals can be attributed to the nature of the to-be-reported events, which were frequent expenditures. Event frequency has been shown to affect reporting performance; specifically, reporting performance for frequent events tends to rapidly decline after short retention intervals, compared to long retention intervals.

The salience of the expenditure salience, represented in this study by purchase price, also appears to influence reporting performance. The observed results suggest that inexpensive purchases were more likely to be forgotten than expensive purchases; however,

interpretation of these findings are constrained by the fewer number of cases involved in the analysis.

Increased intrusion rates are another indication of memory deterioration. The intrusion rate increased by 14% after two weeks compared to one week. This sharp increase in intrusion rates was not observed after two weeks. The reporting rates increased by 9% between the second and fourth week time interval. These results indicates that respondents' memory deteriorates quickly during the first two weeks; however, the rate of deterioration gradually slows down afterwards.

The present work is of practical interest. For the designer of retrospective surveys, the most obvious message from the present work is that respondents will forget and that this will affect the interpretation of any results. Whenever possible, the time interval between the completion of the diary and the follow-up interview should be minimized since forgetting occurs over time.

Do we know what would be the optimal time interval or delay between the diary completion and interview? The present findings suggest that the delay should be ideally one day because a large fraction of the information is lost within the first week. In contrast, the effects of a two week delay on reporting performance is relatively nominal because a smaller fraction of the information was lost after two weeks compared to one week.

Given the amount of expenditure under-reporting observed in this study, it becomes useful to devise a means of correcting for these errors. One way would be to provide the respondent with probes or cues as a means to reduce forgetting. For example, it might be useful to ask the respondent about inexpensive expenditures, because the present findings indicate that people are more apt to forget inexpensive items. One probe may involve asking the respondent 'to report all items purchased under \$5.00 during the reference period.'