ON THE ACCURACY OF RECORDING OF CONSUMER PANELS

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I. Introduction

There are two major reasons for being interested in the accuracy of recording of consumer panels. Panels have become an increasingly useful source of market research information. Accuracy of response is vital to all surveys. A knowledge of the accuracy of the recording of consumer panels not only makes panel data more useful, but also gives new insights into the general area of survey response accuracy.

This paper is based on research conducted during the past five years with the National Consumer Panel of the Market Research Corporation of America.

Households in the National Consumer Panel report their purchases of a selected group of products on a continuing basis. They use for this purpose self-administered forms called diaries. Diaries for grocery products cover one week's purchase behavior and are mailed in at the end of each week. Diaries for less frequently purchased items, such as clothing and photographic equipment, are kept on a monthly basis.

Households are recruited and trained by personal contact, but additional contacts are normally made by mail. During training, the immediate entry system of recording is taught, i.e., diary keepers are told to record their purchases immediately upon their return from the shopping trip.

The diary forms developed from the accumulated twenty year experience of MRCA in operating panels. As the requirements for information were revised, or as data problems arose, the forms were modified. The research studies described in this paper were not intended to develop a diary de novo, but rather to measure the results obtained with the current forms and to measure the effects of varying these forms.

II. Factors Determining the Accuracy of Recording

First, let us consider the factors determining the accuracy of recording of panel households. Cost considerations have prevented direct measurement of recording accuracy using observational methods.

Indirect measurements using client shipment data are possible, however, after correction for differences in universal definitions.

In observing differences between consumer panel reports and client shipments, it is immediately evident that recording accuracy depends on the characteristics of the product and the techniques used to obtain purchase information. During 1959-1960, seventy-two products were examined for which information was available from National Consumer Panel reports and client shipment data. Many variables were originally considered as being related to accuracy of recording.

The following eight were finally selected for testing:

1. Page in diary
2. Position on page
3. Prominence on page
4. Complexity of entry
5. Frequency of purchase of product class
6. Per cent of product class purchased in chain stores
7. Type of product
8. Convenience of product preparation

Empirical Recording Model. An empirical model was constructed to relate these factors to accuracy of recording. The form of the model was multiplicative. The fitting of the parameters was performed using a simple least squares criterion. Alternative methods of fitting the parameters were considered and tested, but the least squares criterion appeared to be most satisfactory. Computations of the parameters were performed on an IBM 704 Computer. Table 1 shows the computed values of the parameters.

These values agree well with experience in areas other than panel operations. Recording is found to be less accurate for products in the rear of the diary and least accurate for products in the middle, in agreement with the laws of proactive and retroactive inhibition. Accuracy declines as complexity increases. Infrequently purchased products and those not purchased by the housewife are less accurately recorded. The more prominently mentioned products are more accurately recorded as are products at the top of a page.

The values of the parameters have also been tested on fifteen products which were not included in the original model. In no case did the difference between the predicted accuracy of recording and the observed accuracy exceed ten per cent.

III. Factors Influencing Changes in Accuracy of Recording

I shall next describe a series of experiments which measured changes in accuracy of recording resulting from changes in total work load, compensation and training. In each experiment, the Panel was divided into experimental and control groups. The number of diary entries per group was then observed before and during the experiment. The difference due to the experiment was computed as the difference between the changes of the two groups.

Diary Tests. Two major diary tests were conducted. In the first, it was found that recording was more complete in a ledger diary listing the items to be entered than in a journal diary in which purchases were entered in time sequence. Length of diary and position in diary were also found to affect recording, as might have been deduced from the results of the previous section.

A separate monthly diary for miscellaneous products resulted in substantially higher recording for these products. Finally, a weekly check list reminder appeared to have no significant effect on recording. The results of this first test were incorporated into a new diary which was tested for two years and finally adopted for all NCP households.

Table 2 indicates the 2^4 x 3 factorial design with which 432 National Consumer Panel households were tested on 48 different diaries in the period February-April, 1958. Tables 3-6 below show the details for each of the comparisons. Note that in all cases increased recording was considered an improvement. This was confirmed by examination of specific products. Those which were known to be under-recorded, such as non-food and miscellaneous products, had large increases in purchase entries, while those food items which were already recorded completely were unchanged. These conclusions were further verified by a two year experiment with 600 households using a new diary based on the results described above.

Minor Diary Changes. The same methods used for testing major changes in diary format are also used continuously to measure small changes such as moving a product from one page to another, changing its heading, or adding a check box. The following results have generally been observed:

1. Adding or deleting a check box or changing the wording within a check box will not change recording accuracy.
2. Changing a product heading may change the level of recording.
3. Moving a product from one page to another will have the temporary effect of reducing the level of recording.
4. Special reminders result in temporary increases in the level of recording, but not necessarily in long-term changes.

Work Load Changes. Three major changes in work load due to special studies were tested to see whether they influenced the continuing diary keeping. The first was the Menu Study for which households kept records of every meal prepared in the home in a two-week period. The second was a special monthly diary of purchases of gasoline, oil, and auto repairs. The final study was a seven-week study of magazine receivership and television viewing.

None of these three studies had any significant effect on the usual purchase recording behavior. It would appear that, given sufficient compensation, Panel households are willing and able to keep special studies.

Table 7 summarizes the changes in the estimated levels of recording of households in the Menu Study. Table 8 shows the comparison between the Auto Diary households and the control sample by month for the period of January-June, 1961. Table 9 gives the diary entries per household for households keeping media diaries and for all other NCP households for the period January-March, 1959.

Compensation Tests. Households keeping National Consumer Panel diaries received points redeemable in merchandise. Compensation is necessary to keep households cooperating, but the percentage of households who will keep a continuing record of purchases and the accuracy of their recording seems independent of the level of compensation within rather wide limits.

This was seen in a series of four tests, some of which are still in progress. Two of the tests involved new household recruiting, while in the third test, the compensation levels of regular Panel households were changed. In all three of these tests, two compensation levels were used. The lower compensation level was at six-tenths the rate of the higher level.

The fourth compensation test did not involve the regular National Consumer Panel, but was conducted in a midwestern city in which a special consumer panel was recruited. This test market panel kept a short two-page diary and appeared to be sensitive to the level of compensation. The households receiving the higher compensation made twelve per cent more purchase entries per diary than did the households receiving the lower compensation which was at two-thirds the rate of the higher compensation. Table 10 shows the number of purchase entries per diary for low and high compensation households in the test market city.

The National Consumer Panel continuously recruits newly formed households to represent the new household formations among all United States households. These newly formed households are recruited from split-offs of households already in the Panel, i.e., households formed when one or more members of a Panel household move away and establish a new household. Table 11 shows the purchase entries per diary of low and high compensation newly formed households for the period June-September, 1961.

Table 12 shows purchase entries per diary of 150 low and 150 high compensation households during the first thirteen weeks of their Panel membership. Assignments to interviewers were made in groups of ten, of which five households were selected in advance to receive higher compensation and five lower compensation. This design was intended to randomize interviewer effects.

An experiment was begun in January, 1962, which is intended to measure changes in recording behavior when compensation is changed after the household has joined the Panel. The test does not change work load but raises compensation rates by 60 per cent for an experimental group of 100 households and lowers compensation 60 per cent for the second experimental group of 100. Purchase entries per diary of the experimental groups are being compared to purchase entries of control households. Table 13 shows the results through March, 1962.

Special Training. A series of four special contacts with Panel households were tested to determine whether accuracy of recording could be improved by training.

Three of the contacts required the households to return special quizzes related to purchasing. These three quizzes had no important effects on recording. The final contact was a special store shopping record inserted at the front of the regular diary. The objective of this record was to require the household to open the diary after each shopping trip. This shopping record did measurably increase recording, and it was made a part of the new NCP diary.

Table 14 shows the purchase entries per diary of the households receiving the special quizzes for October, 1957-June, 1958 indexed to September,

1957, which was the month prior to the start of the test. The control group for this test was the remainder of the Panel.

Table 15 shows purchase entries per diary of the households who kept the store shopping record compared with the control households. Here, December, 1957, was the base month, since the test ran from January-April, 1958.

TABLE 1

ESTIMATED EFFECTS OF VARIABLES ON ACCURACY OF RECORDING

Diary Page Number	May 1960 All Products
3 - 7	1.00
8 - 26	0.89
27 - 34	0.91
Complexity	
Easy	1.00
Medium	0.91
Complex	0.87
Product Class Purchases per Month in a Panel of 6,000 Households	
Over 2,000	1.00
Under 2,000	0.92
Type of Product	
Food	1.00
Non-Food, Grocery	1.00
Non-Food, Non-Grocery	0.56
Prominence of Entry	
Main	1.00
Subtype	0.86
Position on Diary Page	
Top half of top page	1.00
Bottom half of top page	0.87
Top half of bottom page	0.99
Bottom half of bottom page	0.95
Residual	1.07

TABLE 2

FACTORIAL DESIGN USED IN 1958 DIARY FORMS TEST OF NATIONAL CONSUMER PANEL

		JOURNAL DIARY		LEDGER DIARY	
		Long	Short	Long	Short
With Buying Record Checklist	With Separate Monthly Diary	Sequence a	a	a	a
		b	b	b	b
		c	c	c	c
	Without Separate Monthly Diary	Sequence a	a	a	a
		b	b	b	b
		c	c	c	c
Without Buying Record Checklist	With Separate Monthly Diary	Sequence a	a	a	a
		b	b	b	b
		c	c	c	c
	Without Separate Monthly Diary	Sequence a	a	a	a
		b	b	b	b
		c	c	c	c

TABLE 3

INDICES OF TOTAL PURCHASE ENTRIES BY TYPE OF DIARY, LONG LEDGER (CURRENT DIARY) = 100.0

Type of Diary	Length of Diary		
	Short	Long	Combined
Ledger	110.5	100.0	105.2
Journal	101.6	101.7	101.7
Combined	106.1	100.8	

TABLE 4

INDICES OF PURCHASE ENTRIES OF NCP TEST HOUSEHOLDS FEBRUARY-APRIL, 1958 BY TYPE OF PRODUCT AND POSITION IN DIARY

PRODUCT IN FRONT SECTION=100.0

Type of Product and Diary	Product In 1st Section	Product In 2nd Section	Product In 3rd Section	Product In 2nd or 3rd Sections
Ledger Diary				
Food	100.0	91.6	96.3	93.8
Laundry	100.0	99.6	98.5	99.0
Utility	100.0	84.7	98.0	90.9
Combined	100.0	91.9	96.7	94.3
Journal Diary				
Food	100.0	100.6	100.3	100.4
Laundry	100.0	96.7	89.8	93.1
Utility	100.0	114.9	98.2	105.9
Combined	100.0	101.8	98.8	100.3

TABLE 5

INDICES OF TOTAL PURCHASE ENTRIES OF NCP TEST HOUSEHOLDS FEBRUARY-APRIL, 1958 BY TYPE OF DIARY AND DIARIES WITH AND WITHOUT WEEKLY CHECK LIST REMINDER

DIARIES WITHOUT CHECK LIST REMINDER = 100.0

Type of Diary	With Weekly Check List Reminder	Without Weekly Check List Reminder
Ledger	101.3	100.0
Journal	99.5	100.0
Combined	100.4	100.0

TABLE 6

PURCHASE ENTRIES AND INDICES OF PURCHASE ENTRIES OF MISCELLANEOUS PRODUCTS BY NCP TEST HOUSEHOLDS FEBRUARY-APRIL, 1958 BY WEEKLY VS. MONTHLY DIARIES

WEEKLY DIARY = 100.0

Type of Diary	Purchase entries of Miscellaneous Products	Index
Weekly	350	100.0
Monthly	566	161.7

TABLE 7

CHANGES IN AVERAGE ITEMS RECORDED BY MENU RECEIVERS AND CONTROL HOUSEHOLDS, BY TYPE OF PRODUCT

Items	Net Changes in Items Recorded			Total Items Listed Weekly	Per cent Change
	(1) Menu Receivers	(2) Control	Net Differences (1)-(2)		
A. Total Items					
Pre-Test 1 . . .	-0.28	-0.22	-0.06		0.4%
2 . . .	-0.50	-0.89	+0.39		7.0
3 . . .	+0.84	-0.51	+1.35		8.4
Average	+0.02	-0.54	+0.56	16.1	3.5
S E_d (3 tests combined)					4.0
B. Food Items					
Pre-Test 1 . . .	+0.07	-0.30	+0.37		2.7%
2 . . .	-0.51	-0.83	+0.32		2.4
3 . . .	+0.82	-0.37	+1.19		8.8
Average	+0.13	-0.50	+0.63	13.6	4.6
C. Non-Food Items					
Pre-Test 1 . . .	-0.38	-0.12	-0.26		-10.4%
2 . . .	-0.08	+0.07	-0.15		- 6.0
3 . . .	+0.04	-0.08	+0.12		4.8
Average	-0.14	-0.04	-0.10	2.5	- 4.0

TABLE 8

CODED ENTRIES PER WEEKLY DIARY OF NCP HOUSEHOLDS
KEEPING AUTO DIARY VS. CONTROL GROUP
JANUARY-JUNE, 1961

Month	Coded Entries Per Weekly Diary		
	(1) Auto Diary Households	(2) Control Group	(3) Ratio (1) / (2)
January	8.38	8.32	1.008
February	8.47	8.54	0.991
March	8.27	8.26	1.001
April	8.20	8.08	1.015
May	8.36	8.29	1.010
June	7.90	7.89	1.001
January-June Average	8.20	8.17	1.004

TABLE 9

DIARY ENTRIES/HOUSEHOLD OF MEDIA DIARY RECEIVERS
AND ALL OTHER NCP HOUSEHOLDS
JANUARY-MARCH, 1959

Households	Diary Entries/Household		
	January	February	March
Media diary households	33.7	33.8	32.4
All other NCP households	33.2	33.1	31.6
$S E_d = 0.6$ for monthly comparisons			

TABLE 10

PURCHASE ENTRIES PER DIARY OF LOW AND HIGH COMPENSATION HOUSEHOLDS
CITY:M TEST MARKET - THIRD QUARTER 1961

Period Week Ending	Low Compensation Households Entries per Diary	High Compensation Households Entries per Diary
July 1, 1961	2.30	2.85
July 8	2.33	2.67
July 15	2.47	2.60
July 22	2.40	2.72
July 29	2.07	2.51
August 5	2.34	2.36
August 12	2.14	2.31
August 19	2,30	2.86
August 26	2.37	2.51
September 2	2.22	2.30
September 9	2.35	2.87
September 16	2.40	2.51
September 23	2.42	2.69
Average. . . .	2.32	2.60

SE_d = 0.11 for overall average.

TABLE 11

PURCHASE ENTRIES PER DIARY OF LOW AND HIGH COMPENSATION
NEWLY FORMED NATIONAL CONSUMER PANEL HOUSEHOLDS
JUNE-SEPTEMBER, 1961

Month	Low Compensation Households Entries per Diary	High Compensation Households Entries per Diary
June	9.7	10.2
July	9.1	9.3
August	10.8	9.7
September	9.5	9.6
Average June-September .	9.8	9.7 SE_d=0.9

TABLE 12

PURCHASE ENTRIES PER DIARY OF LOW AND HIGH COMPENSATION HOUSEHOLDS CONTROLLED RECRUITING STUDY, OCTOBER, 1961

FIRST THIRTEEN WEEKS OF RECORDING

Week	Low Compensation Households Entries per Diary	High Compensation Households Entries per Diary
1	15.0	15.3
2	14.6	14.6
3	13.1	13.1
4	13.8	14.6
5	12.7	13.4
6	13.2	12.4
7	13.7	12.9
8	13.6	11.5
9	12.5	14.0
10	15.4	11.6
11	11.4	14.0
12	15.5	12.2
13	14.1	13.3
Average of first 13 weeks	13.8	13.4
SE_d (overall average)	0.6	

TABLE 13

PURCHASE ENTRIES PER DIARY
EXPERIMENTAL VS. CONTROL PANEL HOUSEHOLDS
DECEMBER - MARCH 1962

A. Month	Entries Per Diary: Low Compensation Households Compensation Increased 60%	Low Compensation Households Control	D*
December	13.9	14.1	
January	12.8	13.7	-0.7
February	13.3	14.0	-0.5
March	13.5	14.4	-0.7
Average January-March	13.2	14.0	-0.6

B. Month	Entries Per Diary: High Compensation Households Compensation Reduced 60%	High Compensation Households Control	D*
December	12.0	12.6	
January	12.6	12.0	+1.2
February	12.0	12.6	0.0
March	12.6	12.5	+0.7
Average January-March	12.4	12.4	+0.6
SE_d (overall average)			0.7

$$*D = (X_{Jan.-Mar.} - X_{Dec.}) - (C_{Jan.-Mar.} - C_{Dec.})$$

TABLE 14

INDEX OF PURCHASE ENTRIES PER DIARY
EXPERIMENTAL DIARY REMINDER GROUP
vs.
BALANCE OF NATIONAL CONSUMER PANEL
SEPTEMBER, 1957-JUNE, 1958

September, 1957=100.0

Month	Index of Purchase Entries	
	Diary Reminder Experimental Groups	Balance of NCP
September, 1957	100.0	100.0
October, 1957	105.1	103.1
November, 1957	102.9	104.3
December, 1957 (contacts end)	107.3	103.0
January, 1958	111.3	109.2
February, 1958	108.6	108.8
March, 1958	104.1	107.7
April, 1958	103.0	105.6
May, 1958	103.4	102.9
June, 1958	99.9	99.0

SE_d=2.1

TABLE 15

INDEX OF PURCHASE ENTRIES PER DIARY
OF STORE TRIP RECORD KEEPERS
vs.
CONTROL GROUP
JANUARY-JUNE, 1958

December, 1957=100.0

Month	Index of Purchase Entries	
	Store Trip Record Keepers	Control Groups
December	100.0	100.0
January	108.9	103.1
February	106.7	101.5
March (contacts end)	102.1	97.8
April	104.0	95.4
May	97.2	100.0
June	95.7	92.9

SE_d = 4.2