

# AN EVALUATION OF THE 1988 CURRENT POINT-OF-PURCHASE CATI FEASIBILITY TEST

Clyde Tucker and Robert Casady, Bureau of Labor Statistics

James Lepkowski, The University of Michigan

Clyde Tucker, BLS, 600 E Street, N.W., Room 5217, Washington, D.C., 20212

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## I. INTRODUCTION

In 1988, the Bureau of Labor Statistics (BLS), in conjunction with the Bureau of the Census, conducted a test of the feasibility of transforming the Current Point-of-Purchase Survey (CPP) from a personal interview to a telephone interview. The Bureau of the Census conducts this survey for BLS as part of the Consumer Price Index (CPI) program. Its purpose is to develop and maintain a timely list of retail, wholesale, and service establishments at which people shop for specified consumer items. This list serves as a sampling frame for BLS to update and maintain the sample of outlets it uses in pricing goods and services for the CPI. The survey is conducted on a five-year rotation schedule in which one-fifth of the 88 CPI primary sampling units (PSUs) are surveyed yearly in April, May, and June. Each year approximately 5000 consumer units or CUs (similar to household) are asked about their expenditures in almost 150 commodity categories with varying recall periods.

Conducting the CPP survey with CATI can offer several potential advantages. After the initial development costs, the cost for contacting a household by telephone will be substantially less than in person. Furthermore, supervisors can exercise more quality control over the interviewing in a centralized CATI facility. Using telephone survey methodology, the survey can be conducted continuously in all PSUs. This ultimately will reduce the cost and complexity of outlet sampling by eliminating the need for hiring and training a new staff in each PSU every five years and by transforming processing and sampling into routine tasks. A telephone survey also will provide greater flexibility with respect to adding new commodities to the CPI or changing PSUs, thus, making it more timely. The complexity of administration should be less for a telephone survey because there will be fewer layers of bureaucracy between the data collectors and those using the data. Finally, the burden for any single respondent will be less because each respondent will be asked about expenditures for only a portion of the commodity categories covered in the personal interview. This will necessitate an increase in sample size which hopefully will be more than offset by other cost savings.

Along with the above advantages come some disadvantages as well. About 7 percent of all households do not have telephones and, therefore, will not be covered by the survey. Response rates in telephone surveys are usually substantially lower than those in personal interviews. In addition to the loss of data due to undercoverage and nonresponse, the quality of the data collected by telephone may not be as good as that collected in personal interviews.

An important assumption underlying this research is that the coverage bias and increased nonresponse which would result from abandoning the personal interview mode ultimately will have very little effect on the estimates of price change in the CPI. Outlets are sampled at a rate proportional to estimated sales within a commodity category. Any bias resulting from the incorrect estimates of sales in the category will lead only to inefficiencies in estimating price change and not to a bias in price change so long as each store's estimated measure of size has an expected value which is greater than zero.

## II. PREVIOUS RESEARCH

As more and more survey organizations have considered switching to telephone surveys, interest in the effects of the mode of interview on survey results has intensified. This interest has produced a considerable volume of research over the last 25 years. These comparative studies, as Paul Biemer (1988) has pointed out, actually assess the differences between two data collection systems and do not simply estimate a mode effect. Most of the research has focused on differences in the amount of nonresponse (Groves and Kahn 1979; Drew et al. 1988), the demographic characteristics of the samples (Mulry-Liggan 1983; Thornberry and Massey 1983; Kormendi 1988), and the estimates for the variables of substantive interest (Hochstim 1967; Rogers 1976; Schuman et al. 1985). Some studies have provided details of differences in the costs of the two methodologies (Biemer 1983; Groves and Lepkowski 1986; Sirken and Casady 1988; Groves 1989).

## III. STUDY DESIGN

The CPP feasibility test was conducted in September through November, 1988 in four of the PSUs from the spring 1988 CPP sample. The nineteen PSUs in the spring survey were classified into four groups according to size, and one PSU from each group was purposefully chosen for the test. The four PSUs selected were Chicago, New Orleans, Tucson, and the urbanized part of Halifax County, North Carolina.

Each respondent in the personal-interview survey is asked about purchases in 143 of the 166 commodity categories because there are two versions of the questionnaire administered to half samples. Most of the categories (120) are on both versions, but 23 categories are unique to each version. For the feasibility test, all 166 commodity categories were divided first into eight versions, each containing approximately 20 categories. To gain some understanding about respondent burden in a telephone CPP survey, however, the eight versions were paired to produce four forty-category questionnaires that were also a part of the test. In order to ensure comparability, the forty-category telephone surveys and the two personal questionnaires were split into the eight

twenty-category versions, and all data quality measures were calculated at that level.

#### IV. MEASUREMENT OF THE DEPENDENT VARIABLES

##### IV.1 Quantitative Measures

The first set of quantitative measures assess the possibility of bias in the measures of size due to differences in the samples of households obtained using the two survey procedures. Three indicators are used. The first is the differences in response rates, and the second is the differences in demographic distributions. The demographic variables are age, marital status, sex, and race of the CU reference person (comparable to household head), the size of the consumer unit, whether the housing unit is owned or rented, and whether or not the CU has lived in the PSU for more than five years.

The third indicator is the differences in the proportions of total expenditures and outlets accounted for by each of the eight versions. These proportions are calculated using two methods to compute the number of outlets reported by an individual respondent on a particular version. The **gross number of outlet reports** is the number of places the respondent reported purchasing specific commodities, summed across commodity categories. If a respondent had expenditures in two different commodity categories from the same store, the store would be counted twice. The **CU-unique number of outlets** is calculated without regard to the commodity category, counting an outlet only once no matter the number of categories in which it is mentioned by a respondent.

Another measure of outlets reported is not used in the proportion comparisons. It is the **number of PSU-unique outlets**, which cannot be determined from the respondent level. Here an outlet is counted only once per PSU per version. The PSU-unique outlets per category, which comprise the CPI sampling frame, diminish as the sample grows because the likelihood of finding a new outlet declines. Simulations were done with data from each version in every treatment cell to determine the effects of the independent variables on the rate of decline as well as the number of unique outlets that can be expected for a given sample size.

The mean expenditure and the means for the different measures of number of outlets are the primary indicators of the quality of the collected data. In addition, the results of attempting to locate each reported outlet are used. Both the proportion of outlets located and the proportion with correct addresses are available.

##### IV.2 Qualitative Dependent Variables

The opinions of Census staff members who were involved with data collection constitute a source of non-quantitative quality information. Results from interviewer questionnaires and a debriefing session were used to gather this information. A discussion with those who assigned outlet codes also was conducted. In addition, field supervisor reports describing the

difficulties associated with locating the outlets in the four PSUs are available.

##### IV.3 Costs

Relatively detailed costs are available for the telephone survey, and the per interview cost for the personal interview is known. In order to make meaningful comparisons, it was necessary to remove developmental costs from the telephone survey, to apportion costs to the short and long surveys, and to make adjustments for economy of scale in both the test and the production surveys.

#### V. ANALYSIS OF THE QUANTITATIVE AND QUALITATIVE MEASURES

##### V.1 Comparability of Household Samples

The bias in the measures of size considered here relates only to that resulting from differences in the household samples obtained with the two sets of survey procedures. In general, the personal interview survey should provide better coverage of the population of households. To the extent that the demographic characteristics of the telephone sample deviate from those of the personal interview sample, the greater the possibility of bias in the measures of size estimated from the telephone survey.

The first measure of this potential bias is the differences in response rates, which are given in Table 1 by PSU. As expected, the response rate in the telephone survey is about 20 percent less than that for the personal interview. The potential for bias in the CATI survey is present given these results.

The lower response rates in the CATI survey might explain some of the differences between the demographic distributions for the two modes. The CATI demographic distributions were compared to both the entire personal interview sample and just those households with telephones. The first comparison estimates the overall differences that are likely to result from switching modes, while the second estimates only the mode effect on the same population of households as in the CATI survey. Most of the significant effects in the three largest PSUs seem to arise from differences in the age distributions; however, they are not consistent. A larger proportion of respondents under the age of 25 are found in the telephone survey compared to the personal interview in Tucson and Chicago. The opposite is the case for New Orleans. In Halifax, the only difference is a greater number of homeowners in the CATI sample.

Given the differences in response rates and demographic characteristics, the distributions of expenditure and outlet reports over the eight versions might be expected to differ. Preliminary chi-square tests, however, show no differences between any of the distributions by length or mode.

##### V.2 Analysis of the Means for Three Quality Measures

Tables 2-4 give the means for expenditures, gross outlet reports, and CU-unique outlets by treatment. At this point in the analysis of these data, statistical testing is limited to t-tests by version, not taking into account the covariances among the

reports from different versions by the same respondent to the personal interview or the long CATI questionnaire. These covariances are positive, so the Type 1 error rate may be larger than it should be; therefore, tests are performed at the .01 level instead of the traditional .05. Tests which incorporate the covariances will be done at a later date.

Turning first to Table 2, it is apparent that the expenditures reported in the CATI surveys are comparable to those received in the personal interview, and the shorter CATI questionnaire is somewhat better than the longer one. The short survey, in fact, has some significantly higher mean expenditures than the personal visit survey, especially in New Orleans and Chicago. It is interesting that no significant procedural effects are found in Halifax, perhaps because respondents there are fairly cooperative no matter the survey procedure used.

Tables 3 and 4 provide the estimates of outlet reports, which most demonstrate the level of respondent effort. Based on these results, the short CATI survey outperforms the personal visit, especially in New Orleans and Chicago. Only in one case does the personal interview do better than the shorter CATI questionnaire. The pure mode effect, measured by the differences between the CATI survey and the subset of telephone households in the personal interview, is somewhat smaller, as expected. The fact that the differences between the two surveys is greater in the largest cities may mean that respondents in these areas are more sensitive to the level of burden.

One reason the quality of the outlet data from the CATI survey was comparable to that from the personal visit may be the reduced level of respondent burden in the telephone survey. The short CATI survey averaged about 19 minutes, the long about 27, and the personal interview over 70 minutes.

### **V.3 Locating the Outlets**

All outlets named in the personal visit survey and the CATI survey were transmitted to the appropriate field offices so they could be located. This project was designed to provide an objective measure of address quality. The results of this undertaking are given in Table 5. Overall, the outlets named by CATI respondents are at least as likely to be found as those obtained from respondents to the personal interview. It is, however, less likely that a CATI respondent will provide an address which is entirely correct.

### **V.4 Size of the Outlet Frames**

Success in the CPP Survey is measured in terms of achieving the minimum number of outlets per commodity category required for sampling in each PSU. Thus, the most important measure of quality is the count of the unique outlets collected with each survey procedure. Unfortunately, the comparisons are complicated by the fact that the number of unique outlets is a function of sample size which is not strictly linear. The rate of decrease depends on the particular commodity category and the PSU.

In order to evaluate the decline across survey procedure,

PSU, and commodity, simulations were run by version for various sample sizes from both the CATI surveys and the personal visit survey, and the number of PSU-unique outlets was calculated. To ensure comparability, only the categories in each version which were asked of all respondents in the personal interview were used.

Based on the simulations run with the personal interview, Halifax begins with the fewest unique outlets and declines at the fastest rate thereafter. This is an indication of the limited number of outlets in this rural county. The diminishing returns for additional increments of sample households sets in most quickly here. At the other extreme is Chicago, which exhibits only a slight decline in the gain in unique outlets from additional sample size because of the large number of outlets in the population. As might be expected, Tucson and New Orleans fall between Chicago and Halifax. Both the number of unique outlets and the rate of decline depend on the particular commodities on each version.

Simulations from both CATI surveys and the personal interview were compared. Only sample sizes up to forty were used in these simulations because of the small samples for the CATI surveys. In general, the short CATI survey outperforms the other two. Each respondent reports more unique outlets in the CATI short survey, and the decline in the rate of additional new outlets is least for this survey so that the line for the short survey begins to diverge from the other two as the sample size grows. Thus, if the short CATI survey were used, fewer respondents per commodity category would be needed to obtain a sufficient number of outlets compared to the long CATI survey or the personal interview.

### **V.5 Qualitative Measures of Quality**

Debriefings of personnel involved in both the collection and use of the outlet information from the feasibility test were conducted. The interviewers' impressions of the respondents' attitudes toward the survey were somewhat contradictory. Most reported on a written questionnaire that the respondents were not enthusiastic about the telephone interview; but, in the oral portion of the debriefing, they said most of the reactions they received from respondents were positive. The interviewers may have focused on the beginning of the interview in their answers to the questionnaire but on the entire interview in the oral debriefing. The interviewers believed that the outlet information was "somewhat accurate," and probably better for Halifax than for the other PSUs as a result of greater respondent cooperation. They did report, however, that information was definitely easier to collect with the shorter form. All interviewers agreed that outlet information could be collected successfully over the telephone.

BLS personnel who monitored the telephone interviews reported that there was greater respondent resistance with the longer questionnaire. Some questions used in the personal interview were not easily communicated over the telephone. The same was true for certain commodity category

definitions.

The Census clerical staff who assigned outlet codes reported that the coding was more difficult for the CATI survey than for the personal interview. This was because the CATI address information was less complete. It should be noted, however, that expenditure amounts and an indication of whether the outlet was previously reported, two pieces of information provided with the personal interview data, were not transmitted to the coders of the CATI outlets.

The opinions of the BLS field staff who attempted to locate the outlets from both the CATI and personal interview surveys were mixed. The proportion of outlets which could be located was about the same for both modes. On the other hand, there were complaints that the outlets from the CATI survey had less address information, and spelling was more of a problem.

#### V.6 Complexity and Flexibility

It is difficult to evaluate fairly the level of complexity and flexibility of the two sets of survey procedures when one is new and the other has been used for ten years. Furthermore, information about the shortcomings of the personal interview is not as easily obtained. There were certainly some problems during the developmental stage of the CATI surveys. Many of these resulted from breakdowns in communications either between BLS and Census or between Census headquarters and the CATI facility and/or the Census field staff. This was to be expected, and similar problems probably occurred when the personal-visit survey began. Fortunately, these problems appear to have had little impact on the results.

#### VI. COST COMPARISONS

The costs cannot be reduced to the PSU level so the comparisons between the two surveys are made after the results are combined across PSU and version. A problem arises, however, from the fact that the costs for the feasibility test do not have the economy of scale which the personal interview does. To be truly comparable, the costs for conducting a CATI survey that produces the same amount of information for the four PSUs as does the personal-visit survey had to be estimated. This required increasing the costs for certain items such as interviewer salaries, and holding others constant (e.g., computer programming). The costs for the personal interview were based on a per interview cost estimate for the entire CPP survey in 1988. In this case, there is a loss of economy in reducing the number of PSUs from 19 to 4. Thus, the fixed costs had to be spread over a smaller number of interviews.

Details of the cost estimates are given in Table 6. The last two figures in each column are estimates including and excluding the upper bounds on fixed management and development costs. It appears that the short CATI CPP survey may cost a little more than a survey which uses personal interviews; but this probably will be offset by improved estimates.

#### VII. DISCUSSION

On almost all of the measures of performance, the short CATI survey is as good as or better than the personal interview. The one drawback is the high level of nonresponse. It may be true that the amount of nonresponse results in little bias in the outlet frame, but the measures of quality used here might have been affected. Thus, the short CATI survey could look better than it actually is.

It is important to note that the performance of CATI was relatively better in the two largest PSUs. Respondents in large cities may be more sensitive to respondent burden or prefer the relative anonymity of the telephone, although the latter is not reflected in the response rates. The results in Tucson might result from language difficulties more easily overcome in personal visits, and the respondents in Halifax may be fairly cooperative no matter the mode.

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Table 5. Results of Attempts to Locate Outlets by PSU and Mode <sup>1</sup>

Table 1. Response Rates by PSU and Mode

	TUCSON		NEW ORLEANS		CHICAGO		HALIFAX	
	CATI	IN PERSON	CATI	IN PERSON	CATI	IN PERSON	CATI	IN PERSON
INTERVIEWED	74.1%	95.5%	70.0%	93.9%	72.2%	87.7%	80.0%	100%
REFUSED	22.5	2.7	24.8	6.1	23.3	9.8	13.3	0.0
NOT CONTACTED	0.2	1.4	0.8	0.0	0.5	2.1	0.3	0.0
OTHER	3.2	0.4	4.4	0.0	4.0	0.4	6.4	0.0
N=	866	222	1378	180	1383	471	765	213

	TUCSON		NEW ORLEANS		CHICAGO		HALIFAX <sup>2</sup>	
	CATI	IN PERSON	CATI	IN PERSON	CATI	IN PERSON	CATI	IN PERSON
LOCATED	79.1%	76.8%	75.5%	71.6%	80.8%	76.6%	58.8%	63.2%
ADDRESS CORRECT	57.5%	66.5%	55.6%	58.3%	47.3%	61.5%	44.5%	52.2%
N=	1958	2091	3238	2049	3233	6244	1091	1129

<sup>1</sup> Rates for the telephone households compared to all households in production are almost identical so only all households are reported.

<sup>2</sup> The proportions for Halifax are so low because many outlets were outside the PSU boundaries. No attempt was made to locate these outlets, but they were included in the base.

Table 2. Weighted Mean Expenditure by PSU, Version, and Survey Procedure <sup>1</sup>

VERSION	TUCSON				NEW ORLEANS				CHICAGO				HALIFAX			
	CATI		IN PERSON		CATI		IN PERSON		CATI		IN PERSON		CATI		IN PERSON	
	Long	Short	All HH	Phone HH	Long	Short	All HH	Phone HH	Long	Short	All HH	Phone HH	Long	Short	All HH	Phone HH
2	\$3186.42	\$2934.80	\$1420.44	\$1610.03	\$2958.44	\$4585.49	\$1652.78	\$1798.17	\$4179.46	\$3948.11	\$1770.87	\$1874.08	\$1394.95	\$593.80	\$1341.31	\$1517.19
3	709.76	1059.56	577.44	673.28	687.32	1397.51	849.07	936.71	1390.16	1878.68	942.21	1013.05	954.29	965.35	846.74	941.37
5	6991.96	8233.81	7199.28	8346.70	8683.57	14353.35	6885.27	7413.91	8492.62	15078.00	9630.70	10218.00	7501.56	6983.86	7318.14	8103.71
6	116.78	136.03	124.96	125.34	136.68	126.12	120.18	118.61	141.62	141.39	133.14	136.77	188.23	131.54	109.80	114.72
8	1211.61	1356.07	1246.21	1405.62	1044.10	1472.87	1371.58	1500.60	1127.47	2393.67	1457.48	1571.38	725.70	835.00	842.07	926.30
9	127.63	158.35	117.01	121.27	140.38	157.93	156.99	155.10	122.10	158.63	130.07	133.47	89.48	122.87	89.52	97.79
11	805.91	841.78	532.76	589.24	668.63	668.51	741.69	790.66	744.33	1223.54	761.92	811.72	648.05	919.17	566.96	605.07
12	243.28	320.64	135.04	150.43	153.23	401.31	188.92	207.88	206.53	271.30	148.49	155.65	137.92	234.71	103.67	115.13
Total	13393.35	15041.04	11353.14	13029.93	14472.35	23163.09	11966.48	12921.64	16434.29	25093.32	14976.08	15914.12	11540.18	13785.60	11218.21	12421.28

<sup>1</sup> ○ Short mean significantly larger at .01 level.

△ Short mean significantly smaller at .01 level.

Table 3. Weighted Mean Number of Gross Outlets by PSU, Version, and Survey Procedure

VERSION	TUCSON				NEW ORLEANS				CHICAGO				HALIFAX			
	CATI		IN PERSON		CATI		IN PERSON		CATI		IN PERSON		CATI		IN PERSON	
	Long	Short	All HH	Phone HH	Long	Short	All HH	Phone HH	Long	Short	All HH	Phone HH	Long	Short	All HH	Phone HH
2	6.29	6.83	4.83	5.55	4.77	5.45	4.51	4.81	5.92	5.61	5.07	5.40	4.05	3.57	3.42	3.69
3	4.46	6.60	5.03	5.84	4.82	7.03	5.04	5.32	5.55	7.81	5.77	6.09	4.41	5.98	4.77	5.22
5	1.85	2.44	2.19	2.46	2.73	2.68	1.95	2.09	2.01	2.81	2.23	2.39	2.04	2.89	1.87	2.05
6	10.93	10.83	10.49	10.50	12.20	11.96	9.47	9.45	10.75	11.77	10.78	11.12	9.81	14.24	10.74	11.09
8	3.10	4.69	5.07	5.48	3.39	4.64	4.22	4.44	3.62	6.11	4.91	5.23	2.41	3.57	3.25	3.52
9	6.24	6.06	6.03	6.34	6.25	7.01	5.95	6.10	5.85	7.05	5.93	6.12	5.51	6.73	4.79	5.10
11	8.91	7.62	7.47	7.93	6.85	6.77	7.18	7.36	8.31	9.14	8.30	8.76	6.85	7.70	6.38	6.73
12	4.84	5.85	3.74	4.14	3.14	6.23	3.76	3.97	4.46	5.52	3.88	4.04	3.18	4.23	2.63	2.80
Total	46.22	50.92	44.85	48.32	44.15	51.77	42.08	43.54	46.47	55.82	46.87	49.15	38.26	48.91	37.82	40.20

Table 4. Weighted Mean Number of CU-Unique Outlets by PSU, Version, and Survey Procedure

VERSION	TUCSON				NEW ORLEANS				CHICAGO				HALIFAX			
	CATI		IN PERSON		CATI		IN PERSON		CATI		IN PERSON		CATI		IN PERSON	
	Long	Short	All HH	Phone HH	Long	Short	All HH	Phone HH	Long	Short	All HH	Phone HH	Long	Short	All HH	Phone HH
2	6.20	6.72	4.66	5.34	4.60	5.25	4.33	4.61	5.75	5.53	4.90	5.23	3.94	3.47	3.36	3.63
3	4.27	6.49	4.69	5.44	4.58	6.51	4.77	5.01	5.30	7.42	5.34	5.64	4.12	5.58	4.58	5.01
5	1.82	2.46	2.12	2.39	2.64	2.62	1.91	2.05	1.94	2.78	2.18	2.33	1.84	2.72	1.78	1.95
6	5.45	4.78	4.48	4.90	5.80	5.97	6.10	6.12	7.96	8.44	6.62	6.78	4.82	6.78	6.42	6.68
8	2.85	4.21	4.31	4.70	3.04	4.10	3.67	3.85	3.41	5.74	4.28	4.55	2.26	3.04	2.77	2.99
9	4.87	4.98	5.01	5.37	5.00	5.52	5.26	5.38	5.09	6.34	5.17	5.30	4.36	5.07	4.28	4.60
11	6.12	5.00	5.48	6.15	4.63	4.76	5.4	5.52	6.39	7.42	6.41	6.75	4.50	5.24	4.88	5.13
12	4.38	5.31	3.48	3.87	2.89	5.63	3.44	3.68	4.19	5.19	3.64	3.80	2.90	3.47	2.43	2.58
Total	35.96	39.95	36.63	40.16	33.20	40.36	34.94	36.22	40.03	48.86	38.58	40.40	28.74	35.38	30.50	32.57

Table 6. Cost for the CATI<sup>1</sup> and Personal Visit<sup>2</sup> Surveys Collapsed Across PSU and Version

	LONG CATI	SHORT CATI		ALL HH PV	PHONE HH PV
Sampling-Weighting	\$ 99,520.00	\$ 99,520.00	Cost Per Interview for All PSUS	\$315	\$315
Operation of CATI Facility	136,799.78	186,273.22	Costs Per Interview With Additional Sampling Costs	\$405	\$405
Assignment of Outlet Codes	57,297.07	69,186.97			
Computer Programs	41,433.00	41,433.00	Costs Per Interview With Additional Costs for Management	\$450	\$450
Computer Processing	25,510.86	50,868.90			
Travel	3,685.00	3,685.00	Number of Interviews	1007	870
Miscellaneous	3,756.46	7,490.01	Cost with Additional Sampling Costs	\$405,821	\$350,610
	367,982.17	458,457.10	Cost with Additional Management Costs	\$453,150	\$391,500
50K for Management & Development	417,982.17	508,457.10			

<sup>1</sup> It was assumed that one-fourth of sampling-weighting would depend on sample size, just as in production. The salary and phone costs at the CATI facility as well as outlet coding costs were multiplied by 3.23 to inflate to production sample size. The same was true for computer processing and miscellaneous costs. Other costs were left the same.

<sup>2</sup> The additional sampling and management costs correct for the loss in economy when only 4 PSU's are used. About three-fourths of the sampling costs and 40% of the management costs were assumed to be fixed.