

New methodology for selecting CPI outlet samples

A new Point-of-Purchase Survey, conducted in a computer-assisted telephone interview environment, eliminates the costs associated with personal-visit data collection and reduces the time required to edit, review, and process responses

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To maintain the accuracy of the Consumer Price Index (CPI), the Bureau of Labor Statistics conducts a review of the CPI program approximately every 10 years. Out of this review flows improvement initiatives known as CPI revisions. One of the major objectives of each revision of the CPI is to update the content and definition of its so-called market basket, the set of goods and services that are purchased for consumption by urban consumers and that are, therefore, eligible to be priced for the CPI. Consumers change their purchasing patterns over time, and to ensure a contemporaneous nexus between average price change as measured by the CPI and the spending behavior of urban consumers, it is necessary to redefine and update the market basket periodically.

One method used to modernize the CPI market basket is to revise the item classification structure. The structure is updated and redefined to correspond to a more current view of the consumer marketplace.¹ The other method is called *sample rotation*, which is simply the ongoing process of reselecting the sample of products and services that represent the market basket items in each geographic area (primary sampling unit) included in the CPI sample. This is accomplished by (1) reselecting the retail stores and business establishments to be visited by BLS field representatives and (2) reselecting the unique products and services to be priced for the market basket. For example, a cassette tape sold in Outlet A could be replaced by a compact disk sold in Outlet B to

represent the market basket item "records and tapes."

Currently, sample rotation is engineered through the Continuing Point-of-Purchase Survey (CPOPS). This household survey provides the Bureau with a sampling frame of outlets and retail establishments visited by urban consumers. Conducted via a personal-visit interview, the CPOPS obtains data on the types of goods and services consumers purchase, the amount of these expenditures, and the places the expenditures were made. The survey is administered roughly once every 5 years in each primary sampling unit (here after, sampling unit) on a rolling basis, so that every year 20 percent of all sampling units participate. The CPI outlet and item samples are then updated and replaced in those sampling units, using information collected in the CPOPS. Because rotation occurs every year, it has the advantage of providing a contemporaneous sample of unique goods and services to represent an otherwise fixed market basket of items. This allows the overall sample to represent current consumer spending behavior without overly compromising the CPI's theoretical foundation as a fixed-base quantity price index.

As part of the 1998 revision, the Bureau will substantially improve the administration of the CPOPS and, consequently, the sample rotation methodology. CPOPS data will be collected via computer-assisted telephone interviews (CATI), rather than by personal visit. The advantages and efficacy of collecting such data in a CATI environ-

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ment will allow a portion of all commodities and services to be updated, or rotated, in each sampling unit every year (category rotation), instead of rotating all commodities and services in 20 percent of the sampling units each year (area rotation). Currently, the time and travel costs associated with a personal-visit interview prohibit the Bureau from conducting a CPOPS in every sampling unit every year. The CATI data collection process eliminates these travel constraints and makes category rotation feasible. Category rotation will allow the Bureau to respond to changes in the consumer marketplace more rapidly. This article compares and contrasts the Bureau's current area rotation methodology with the planned category rotation methodology. The critical role of CPOPS data in the sample rotation process will be identified and the advantages of switching from the current personal-visit survey to a CATI survey discussed.

Brief history of sample rotation

Outlets and items constituting the CPI sample were not always rotated between major revisions, and statistical sampling techniques were not always applied at the various stages of item and outlet sample selection. (See exhibit 1.) Prior to 1978, new items were introduced into the sample exclusively at the time of a major revision. In what was dubbed "specification pricing," a set of very specific, unique products was selected to represent the market basket of all goods and services purchased by urban consumers in a particular geographic area. The detailed specifications for each item were basically the same for every store across the country. For example, heavyweight coats, wool or wool-blend sport coats, dungarees, and undershorts were selected to represent boys' apparel in the 1964 revision.² In fact, these were the only unique items included in the CPI sample for boys' apparel. Once selected, the price of a unique item was monitored until the next major revision—roughly 10 years later. Prior to the 1978 revision, the CPI outlet sample was identified and selected from among a variety of sources of retail businesses and consumption.

By 1978, it was evident that tracking the price movements of roughly 400 preselected items in the same outlets, in each sampling unit, over a 10-year interval resulted in several theoretical and practical shortcomings. First, confining the items priced for the CPI to a relatively narrow band of the range of quality available in the market resulted in a sample that was not fully representative of the actual items consumed by the urban population.³ Second, the various data sources used to produce an outlet sampling frame—a representative list of retail, wholesale, and service establishments at which urban consumers shopped—were not necessarily appropriate for the population represented by the CPI.⁴ The data provided from these sources rarely gave sufficient detail on merchandise purchased in each outlet. This made it extremely difficult to select a sample of outlets that represented the true distribution

of all retail establishments patronized by urban consumers. The preselection of unique products also created many item-outlet mismatches, because the preselected item was not always available for sale at the selected outlet. Finally, there was no systematic statistical process for the replacement of outlets that closed, moved, or changed their lines of merchandise. As a result, as new retail establishments and businesses appeared in the marketplace, the CPI sample of outlets became antiquated and less representative of the outlets actually patronized by the consumer population.

In an effort to improve the CPI item and outlet samples, the 1978 revision championed several major innovations in sampling techniques which resulted in a market basket that was categorically more contemporaneous with consumer behavior. The Point-of-Purchase Survey (POPS) was created to provide the Bureau with a representative outlet sample frame. In 1974, the POPS was administered to approximately 20,000 urban families. Survey respondents were queried about purchases in specific expenditure categories, referred to as POPS categories,⁵ during a prescribed reference period. If a purchase was made, the outlet's name and address were recorded along with the expenditure amount. Outlets identified in the 1974 POPS provided a scientific sampling frame for the initial set of outlets that were selected for the 1978 revised CPI.

The partitioning of the CPI market basket into "item strata"⁶ and "entry-level items"⁷ also was introduced with the 1978 revision. Item strata represented the major categories of goods and services to be priced in each sampling unit—for example, eggs, laundry equipment, and boys' apparel. Each item stratum was priced in each sampling unit. Because some item strata (for instance, laundry equipment) represented a broad range of goods, they were divided into subgroups known as entry-level items (for example, washers and dryers). The first part of the item selection process involved identifying the entry-level items to price for each item stratum in each sampling unit. Entry-level items were selected to represent the market basket of items in each sampling unit, using expenditure data reported in the 1972 and 1973 Consumer Expenditure Surveys.⁸ Then, selected entry-level items were matched with selected outlets, using information collected in the CPOPS.

In conjunction with the classification of item strata in the market basket, the Bureau replaced item specification pricing with store-specific pricing. Instead of pricing a preselected unique good or service universally across the country, field staff entered a store to collect the price of an entry-level item. Entry-level items represented a broader classification of goods and services than the preselected items that were previously used. All unique items included within a particular entry-level item (and sold within the outlet) became eligible for pricing. In a process called disaggregation, the sales information of the outlet was used to select a unique item to price within the selected entry-level item at the selected outlet.⁹ This, in effect, made the selection of items dependent upon each outlet's sales

Exhibit 1. Chronology of changes in sample rotation, 1940–98 (projected)

Year of revision	Sample rotation methodology
1940	<ul style="list-style-type: none"> • No sample rotation
1953	<ul style="list-style-type: none"> • No sample rotation
1964	<ul style="list-style-type: none"> • Specific items and outlets selected at time of revision
1978	<ul style="list-style-type: none"> • Outlet rotation by geographic area introduced • Entry-level items selected at time of revision; specific items selected at outlets • All outlets reselected in 20 percent of all primary sampling units each year; new outlets assigned entry-level item selected at time of revision; specific items reselected at new outlets
1987	<ul style="list-style-type: none"> • Rotation of entry-level items by geographic area joins outlet rotation • Entry-level items reselected at time of outlet rotation; specific items selected at outlets • All outlets reselected in 20 percent of all primary sampling units each year; new outlets assigned newly selected entry-level items; specific items reselected at new outlets
1998	<ul style="list-style-type: none"> • Outlet and item rotation by expenditure category replaces area rotation • Some items and outlets reselected in every primary sampling unit each quarter • Entry-level items reselected each quarter for items undergoing rotation; specific items selected at outlets • All items and outlets updated roughly every 4 or 5 years per primary sampling unit

and merchandising characteristics and greatly reduced the incidence of item-outlet mismatch. In addition, the process was designed to give an opportunity for every variety of an entry-level item within a store to be selected to represent the purchases of the entire item stratum.

The concept of outlet sample rotation also was introduced with the 1978 revision. In 1977, the POPS became a continuing survey (called the CPOPS) and was administered each year to a sample of households in 20 percent of all sampling units constituting the CPI's geographic sample. The CPOPS was designed to update and replace the outlet sample in each sampling unit every 5 years, so that over a 5-year period, the entire CPI outlet sample would be completely replenished. This area rotation design provided a systematic mechanism for the continuous replacement and replenishment of outlets between major revisions of the CPI. Each time a sampling unit underwent outlet rotation, newly selected outlets were matched with the same set of entry-level items that were selected at the start of the 1978 revision.

At the time of the 1987 revision, the concept of sample rotation was extended to market basket items. Beginning that year, sampling units that underwent outlet rotation also were subjected to item rotation. Not only were outlets reselected

and replaced on the basis of the most recent CPOPS data, but the sample of entry-level items that were selected to represent the item strata were also reselected and updated. This was accomplished by using the two most recent available years of expenditure data from the Consumer Expenditure Survey.¹⁰ For example, in 1988, the entry-level item “washing machines” may have been selected to represent the item stratum “laundry equipment” in a particular sampling unit. Five years later, when that sampling unit underwent outlet rotation, the entry-level item “dryers” may have been selected to represent laundry equipment. Item rotation incorporated shifts in current expenditure patterns into the selection of entry-level items. Hence, when a sampling unit underwent sample rotation, its updated sample of both outlets and items were as current as possible and reflected changes in what consumers purchased and where they shopped. Reselecting entry-level items jointly with outlets also helped to reduce the number of item-outlet mismatches. The complete rotation of outlets and items concomitantly in 20 percent of all sampling units every year resulted in a CPI sample that was continuously updated and modernized.

CPOPS and area sample rotation

CPI outlet and item samples have been rotated together since 1987. With the exception of the shelter components of rent and owners' equivalent rent, all item strata constituting the CPI market basket in each sampling unit currently are subject to rotation when the sampling unit undergoes outlet rotation.¹¹ Items making up these strata form the commodities and services portion of the CPI, which accounts for roughly 75 percent of the expenditure weight of the CPI market basket. The shelter components account for the remaining 25 percent.¹² The CPOPS provides the sampling frame of outlets for most commodities and services items to be priced in the CPI. Outlet frames for a few commodities and services items, dubbed non-POPS items, are obtained from various other sources.¹³

The CPOPS has been conducted by the Bureau of the Census, under contract with the Bureau of Labor Statistics, on an ongoing basis since 1977. Three critical data elements are derived from the CPOPS survey: the names and addresses of outlets and retail establishments reported by the respondents; an estimate of the total daily expenditure, by POPS category, for each unique outlet and each sampling unit half-sample,¹⁴ and the month and year (or base period) of the expenditure estimate. The survey was administered each year over a period of 4 to 6 weeks, usually beginning in April, to a sample of households in approximately 20 percent (17 of 85) of sampling units. The number of units interviewed, or consumer units,¹⁵ varied by sampling unit size, but averaged around 200.¹⁶ The survey was conducted during a personal-visit interview, which averaged 80 minutes in length. Respondents were asked to report purchases made for roughly 147 POPS

categories. On average, approximately 55 outlets were reported for each POPS category within each sampling unit. About 50 percent of the outlets that were actually reported in a given year were selected as part of the CPI outlet sample. Table 1 gives a statistical snapshot of the CPOPS conducted between 1988 and 1994.

The expenditure information collected in the CPOPS provided the Bureau of Labor Statistics with a scientific method of selecting outlets. Those outlets with larger expenditure weights received a greater probability of selection. The collection of prices began in selected outlets roughly 1 calendar year after the CPOPS data were collected. Each year, approximately 20,000 items were replaced as part of sample rotation. CPOPS expenditure data also provided the fundamental mechanism for weighting basic market basket items. Each item that was priced for the CPI was assigned an implicit quantity weight derived from the expenditure data captured in the CPOPS.¹⁷

Telephone data capture

As part of the 1998 CPI revision, several strategic activities are planned to help achieve the goal of providing a more timely, accurate, and objective measure of consumer price changes. One of these strategies is a restructuring of item and outlet rotation designed to produce a more efficient and timely method of introducing new items and outlets into the sample. The 1998 revision will extend the methodological and procedural advances introduced in previous revisions by implementing the CATI data collection methodology into the CPOPS. Conducting the CPOPS in a CATI environment creates the opportunity to administer the survey for selected POPS categories in every sampling unit each year. The costs associated with the current CPOPS personal-visit collection methodology make such a category rotation approach prohibitively expensive. Thus, CATI will facilitate the restructuring of item and outlet rotation so that, instead of updating all item and outlet samples in 20 percent of sampling units every year, between 20 percent and 25 percent of the products and services priced will be resampled in every sampling unit each year. It is an-

anticipated that this restructured survey design will be accomplished for roughly the same total cost of the current survey design. In addition, a CATI survey will address several shortcomings of the current implementation of the CPOPS and improve the overall quality of the data collected. It is envisioned that a CATI survey will allow the Bureau to accomplish all of the following:

- *Build in the capability of rotating POPS categories more frequently, especially to augment the sample of outlets for POPS categories with high attrition rates or to introduce new products into the CPI sample.* Currently, there is a concern that new products and new POPS categories are introduced into the sample too slowly. Given the present area rotation scheme, a minimum of 5 years is required to completely replace an item sample (POPS category) across all primary sampling units.
- *Reduce the overall data-processing time, and subsequently rotate outlets into the sample in a more timely fashion.* In the current survey, outlets are “old” when they are visited for price initiation. Because it takes about 1 year to process CPOPS data before prices can be initiated at newly selected outlets, outlets are not as contemporary as they could be when they are actually introduced into the CPI. For POPS categories associated with a 5-year recall period, outlets introduced into the sample may reflect consumption behavior up to 8 years prior to their price initiation.
- *Administer more narrowly defined POPS categories and reduce the duration of the interview at the same time.* The current CPOPS design requires a large amount of information to be obtained from each interview. The length of the survey creates a significant burden on the respondent that subsequently contributes to an incomplete reporting of expenditures and outlets. Historically, POPS categories have been broadly defined in an effort to shorten the duration of the CPOPS interview. However, broadly defined POPS categories may increase nonsampling errors and erroneous reporting of expenditures by respondents.
- *Conduct the POPS survey quarterly in every primary sampling unit, instead of over a 6-week period during the months of April and May in a selected group of units.* Administering the survey at the same time every year may result in data that represent spending behavior exhibited during the first quarter of a year only, rather than consumption patterns that occur over an entire year. Furthermore, the reference month of reported expenditures is inappropriately set. The current convention universally assigns the month of May as the reference month of all reported expenditures. However, the actual date for the reported expenditures varies from 1 week to 5 years prior to the month to the month of the interview. A quarterly survey would result in reported expenditures that are evenly distributed throughout the year.

Table 1. Statistical snapshot of the Continuing Point-of-Purchase Survey¹

Item	Number
Refusal rate (percent)	10
Average number of interviews per year	3,500
Average number of outlets reported per consumer unit	40
Average number of outlets reported per POPS category, per primary sampling unit	55
Average interview length (minutes)	80
Number of POPS categories administered to each consumer unit	147

¹ Figures are averages from CPOPS survey data collected over the 1988–94 period.

Exhibit 2. Test phases of the Telephone Point-of-Purchase Survey (TPOPS)

Phase	Objectives	Results
Fall 1988	<ul style="list-style-type: none"> To test telephone response rates and the reliability of data collected To administer all Point-of-Purchase (POPS) categories and compare outlet reporting rates with those of Continuing Point-of-Purchase Survey (CPOPS) To test different methods for selecting the sample To test the performance of long questionnaires (40 POPS categories) and short questionnaires (20 POPS categories) 	<ul style="list-style-type: none"> Response rates were sufficient; resulting sample was representative of urban population Number of outlets reported by POPS category in TPOPS was roughly 15 percent to 20 percent greater than in CPOPS A combination of random-digit dialing and selecting phone numbers from a list of residences was optimal Shorter questionnaires resulted in higher outlet reporting rates than did longer questionnaires
April 1991	<ul style="list-style-type: none"> To collect data concurrently with CPOPS and compare response rates To test eight questionnaires ranging from 17 to 28 POPS categories 	<ul style="list-style-type: none"> Response rate was roughly 70 percent, considerably lower than CPOPS rate Shorter questionnaires resulted in higher outlet reporting rates
August 1991– June 1992	<ul style="list-style-type: none"> To introduce the concept of paneled sampling and to measure sample attrition To reduce the number of POPS categories administered to 10–13 and to measure outlet yield 	<ul style="list-style-type: none"> Total attrition of the sample over four quarters was roughly 15 percent, within the bounds of the sample design Overall response rate improved to 86 percent; outlet yield was comparable to that of CPOPS
January 1993– December 1994	<ul style="list-style-type: none"> To test outlet reporting rates by primary sampling unit size To measure differences in data collected from multiple telephone collection facilities 	<ul style="list-style-type: none"> Outlet reporting rates did not vary significantly by primary sampling unit size Response rates did not vary significantly by collection site

The Bureau tested the feasibility of collecting POPS data via CATI between 1988 and 1994. Various aspects of POPS data collection were tested in the CATI environment. Exhibit 2 gives a general overview of the four phases of testing and the results of each test, which indicate that satisfactory data quality and response rates can be achieved. Therefore, beginning in 1997, the ongoing POPS will be collected entirely by CATI and will replace the CPOPS. Because of this change in the mode of data collection, the survey will henceforth be referred to as the Telephone Point-of-Purchase Survey, or TPOPS.

New sample design

Because the TPOPS will be conducted over the telephone in a CATI environment, it will have no paper questionnaires, letters for respondents, or collection forms. Instead, the actual questions that will be read to respondents over the telephone are contained in a computer program called an “instrument.” This program is run on a personal computer and serves as the method of recording and editing responses during the interview, which is divided into front, middle, and back segments. The front portion of the interview identifies eligible consumer units and screens out ineligible units (for example, businesses). The middle portion of the interview contains questions about purchases made by all members of the consumer unit for selected POPS categories. If the consumer unit incurred an expense for a POPS category during the specified recall period, then the amount of the expenditure and the name and address of the outlet where the item was purchased are collected. The back portion of the instrument collects demographic information and contains administrative questions relating to scheduling future interviews.

The Census Bureau, which will continue to conduct the survey under contract with the Bureau of Labor Statistics, will select the sample of telephone numbers for TPOPS interviewing based upon a list-assisted random-digit-dialing procedure. A random sample of area code-exchange-100 bank combinations (for example, 202–555–12xx) that are known to contain at least one listed residential telephone number is selected for each sampling unit each year. A random sample of unique telephone numbers is then selected within the 100-bank telephone numbers. This sample is designed to yield approximately 140 completed interviews per sampling unit half-sample per quarter. Based upon results from the CATI testing, the expectation is that 45 percent of all designated cases will be nonfunctioning or nonresidential numbers and 7 percent will be other ineligible units, leaving an eligible residential unit “hit rate” of roughly 48 percent. Of these, approximately 85 percent of the units are expected to respond to the survey.

The TPOPS will have a quarterly rotating panel design. Once a household has been selected for interview and has been

identified as an eligible unit, it will remain in the sample for four consecutive quarters. The total sample in each sampling unit will be divided into four panels. During any given quarter, one panel will be administered the first interview, another panel will be administered the second interview, a third panel will be administered the third interview, and the final panel will be administered the fourth interview. Consumer units are dropped from the sample after four interviews, to be replaced by new units.

Accompanying the transition from CPOPS to TPOPS is the introduction of a completely revised set of POPS categories, redefined to reflect the 1998 item classification structure. There are 217 POPS categories in the new structure, compared with 170 in the old one. These categories have been arranged into 16 groups, or questionnaires, for the purpose of collecting information on the characteristics of expenditures and outlets. (See the appendix for a complete list of the new categories.) Each questionnaire is composed of 10 to 16 POPS categories and has been constructed so that the average interview will last 12 minutes. In forming the questionnaires for the TPOPS, attempts were made to homogenize POPS categories by recall period—that is, to minimize the number of different recall periods in a questionnaire. Also, POPS categories supplying an outlet frame for the same item stratum were grouped together, POPS categories that are likely to be initiated at the same outlets and that belong to the same major expenditure category were grouped together, and attempts were made to distribute evenly the total expected pricing work load associated with each questionnaire.

Once the TPOPS is fully operational, every sampling unit will be assigned one of the 16 POPS questionnaires for interviewing each quarter. During each subsequent quarter of interviewing, each sampling unit will receive a completely different POPS questionnaire than it did the previous quarter. Hence, each sampling unit will undergo sample rotation of a small percentage of all POPS categories each quarter. Depending on cost considerations, all categories will be updated in each sampling unit over a 4- or 5-year period.

Costs and benefits

The CATI TPOPS has numerous advantages over the personal-visit CPOPS. Exhibit 3 compares the two surveys and highlights the major improvements brought forth by the new design and rotation methodology. Following is a brief description of the methodological change and its impact on various CPI survey processes.

Sample design. Instead of rotating all commodities and services in 20 percent of all geographic sampling areas each year, under the TPOPS a portion of all commodities and services will be rotated in every geographic sampling area every year. TPOPS data will be collected quarterly, compared with the

annual collection of CPOPS data. This should reduce any seasonal bias that may exist in the POPS category expenditure data. The TPOPS spreads the collection of expenditure data over the year, which will reduce nonsampling errors associated with respondents' inability to recall expenditures at different times throughout the year.

Under the current sample design, the rotation frequency of all POPS categories is fixed at once every 5 years for a particular sampling unit. Under the TPOPS, POPS category rotation is more flexible. Categories with deficient outlet frames and categories in which products are introduced into the market more frequently, or are more important, than others could be rotated more frequently than every 4 or 5 years within the same sampling unit. Meanwhile, some POPS categories could be rotated less often. Under the TPOPS, a new category can be fielded in every sampling unit in the same quarter, and pricing activities could be initiated in every sampling unit 10 months later. This significantly reduces the time required to introduce new products and outlets into the complete CPI geographic sample.

Sampling issues. The TPOPS sampling frame will be constructed from a random list of telephone numbers; by contrast, the CPOPS sampling frame was constructed from the 100-percent detailed address file from the decennial census. Therefore, the eligible unit hit rate is significantly lower under the TPOPS. Since 1988, roughly 15 percent of the total designated sample in the CPOPS has been ineligible (for example, vacant units and demolished units). The number of ineligible cases under the TPOPS is expected to be close to 50 percent, due to the large number of nonworking, commercial, fax, mobile, or otherwise ineligible phone numbers that will be randomly selected. The response rate under the TPOPS is expected to be about 85 percent, about 5 percent lower than under the CPOPS. Tests indicate that slightly more refusals result from telephone interviewing relative to personal-visit interviewing.¹⁸ The average TPOPS interview (12 minutes) will be much shorter than the average CPOPS interview (80 minutes), reducing the burden on the respondent. Automated data collection also provides more flexibility in scheduling interviews at the respondent's convenience.

Nonsampling issues. Data capture under the TPOPS will be significantly more efficient than under the CPOPS, in which responses are first transcribed onto questionnaires and then keyed into a computer by data processors months after the interview occurred. With the TPOPS, responses will be keyed directly into a computer during the interview. Under the CPOPS, extreme data values are not verified with the respondent, but they will be under the TPOPS. Data collectors have to be hired and trained every 5 years in order to administer the CPOPS in any given sampling unit, but under the TPOPS, data collection will occur on an ongoing basis from three centralized loca-

Exhibit 3. Comparison of Telephone Point-of-Purchase Survey (TPOPS) with Continuing Point-of-Purchase Survey (CPOPS)

Characteristic	CPOPS	TPOPS	Change from CPOPS to TPOPS
Sample design			
Frequency of data collection	Annual	Quarterly	Survey is continuous throughout the year
Month(s) of interview	April	January, April, July, October	Reduces any seasonal bias that may exist
Percent of primary sampling units rotated each year	20	100	All areas will undergo annual sample replenishment
Percent of POPS categories rotated each year per primary sampling unit	100	Flexible 100	Items will undergo sample replenishment as needed
Percent of market basket items rotated each year	20	20–25	Total sample rotated each year is roughly the same
POPS category rotation frequency	Every 5 years	Flexible	Can rotate deficient POPS categories more frequently; can rotate new categories in more quickly
Sampling issues			
Percent of ineligible units	15	48	Eligible-unit “hit rate” is much lower
Percent of refusals	10	15	Slightly more refusals over the phone
Average duration of interview	80 minutes	12 minutes	Average duration is much shorter
Number of interviews per respondent	1	4	Total interview time per respondent (48 minutes) is shorter
Number of interviews per year	3,500	65,000	Increased sample size obtainable without significant increase in overall cost; should reduce expenditure variance
Nonsampling issues			
Method of data capture	Keyed in after interview	Keyed in during interview	Data capture is more efficient; errors are reduced
Treatment of extreme data values	Not verified	Verified	Nonsampling errors are reduced
POPS category design			
Number of categories	170	217	Categories more narrowly defined
Number of categories asked to each respondent	147	64	Reduced burden on respondents; must conduct more interviews to collect all POPS categories
Implications for Commodities and Services Survey			
Number of initiations required per primary sampling unit per year	.2	4	Balances BLS fieldwork load from month to month; may require multiple initiations at same outlet in same year
Minimum time between data collection and initiation	13 months	6 months	Base-price month closer to month of expenditure data; outlets not as “old” at time of initiation

tions. This creates the advantage of continued participation on behalf of the data collectors and a retention of interviewer expertise. Overall training costs should decrease as a pool of more experienced interviewers collects data over time. All of these factors should decrease nonsampling errors associated with the data collection.

POPS category design. The number of POPS categories has increased from 170 to 217, and the categories themselves have, on average, become more narrowly defined. This should reduce incorrect reporting of expenditures by respondents and, ultimately, the number of mismatches between selected items and selected outlets. The number of categories that will be presented to the average respondent has been decreased by 55 percent, thereby reducing the burden on the respondent. However, for every consumer unit interviewed in the CPOPS, the Bureau must interview roughly 3.4 consumer units in the TPOPS in order to administer all POPS categories.

Implications for the Commodities and Services Survey. The total number of initiations required per sampling unit per year will increase from 0.2 to 4 under the TPOPS. This will balance the work load of the average BLS field representative from month to month. The quarterly design of the TPOPS will function so as to distribute initiations evenly throughout a year. Consequently, the selection of the base period for commodities and services items that rotate into the sample will also be evenly distributed by month. This should improve the quality of the implicit quantity weights assigned to market basket items. Furthermore, the total duration between data collection and price initiation should be reduced by 6 months under the TPOPS. This is because data capture and processing will be fully automated, and less time will be required to code and edit the data. In addition, sample rotation will be incorporated into the regular monthly work load in each sampling unit. Due to the increased processing efficiency, the collected price that will be used to set the base-period price will be closer to the actual reference period of the TPOPS expenditure. This should also improve the quality of the implicit quantity weight estimate.

Summary

The Bureau of Labor Statistics has relied upon the results of TPOPS testing, as well as its experience with other Federal household surveys, as the means of finalizing the TPOPS and its sample design. Two main aspects of conducting the POPS survey in a CATI environment make the TPOPS advantageous over the CPOPS: the time and travel costs associated with personal-visit data collection are eliminated in the CATI environment, and the automation of data capture in CATI reduces the total time required to edit, review, and process the data collected. These two factors result in three fundamental im-

provements in the CPI's sample rotation methodology. First, the TPOPS can be administered in every sampling unit making up the CPI geographic sample without a prohibitive increase in overall survey costs. Therefore, new products can be introduced into the CPI sample in all sampling units more rapidly than under the CPOPS. Second, individual POPS categories can be rotated independently of other POPS categories, ultimately creating greater flexibility in sample design. Categories associated with outlets that experience rapid entry into and exit from the consumer marketplace (for example, home electronics) can be rotated more frequently than more stable categories, such as household utilities. Finally, the sample size can be increased, shorter interviews can be conducted, and there can be more narrowly defined POPS categories without a significant increase in overall survey costs. A shorter interview composed of narrowly defined categories significantly reduces the burden on respondents and, ultimately, nonsampling errors associated with the POPS expenditure and outlet data.

The efficacy of TPOPS data collection allows the Bureau to switch from an annual one-time sample design in which interviewing occurs in only one-fifth of all areas each year to a quarterly rotating panel design in which interviewing occurs in all areas each year. Ultimately, this allows the Bureau to rotate items and outlets that make up the CPI sample on a rolling, quarterly basis in every area, as opposed to rotating all items and all outlets on an annual basis in only a select group of areas. Without question, this will give the Bureau the capability to introduce new products into the CPI sample more rapidly. The reduced processing time of TPOPS data will, in turn, produce a CPI sample of outlets that is more reflective of current consumption patterns and marketplace behavior. □

Footnotes

¹ See Walter Lane, "Changing the item structure of the Consumer Price Index," this issue, pp. 18–25.

² For a complete list of market basket items selected as part of the 1964 CPI revision, see *BLS Handbook of Methods* (Bureau of Labor Statistics, 1964–77).

³ See W. John Layng, *Revising the CPI: A Brief Review of Methods*, Report 484 (Bureau of Labor Statistics, 1976), p. 2.

⁴ *Ibid.*

⁵ POPS categories represent the entry-level items that make up the CPI market basket. Some POPS categories consist of only one entry-level item, while others consist of multiple items. Generally speaking, entry-level items are combined into a single POPS category when the set of unique products that are included in the entry-level items is sold in the same outlets.

⁶ An item stratum is a group of items sold for consumption for which the Bureau calculates an average price change to be used in the Consumer Price Index for All Urban Consumers (CPI-U). With rare exceptions, the item stratum is the lowest level of product aggregation for which collected prices are pooled together to measure an average change in price.

⁷ An entry-level item is a group of specific goods and/or services sold for consumption that establish the definition used by field staff in the identification of unique items within an outlet that can be selected for pricing.

⁸ For more information on the selection of item samples, see *BLS Hand-*

book of Methods, Chapter 19, "The Consumer Price Index," pp. 176–235.

⁹ For more information regarding disaggregation, see *BLS Handbook of Methods, Volume II: The Consumer Price Index*, Bulletin 2134 (Bureau of Labor Statistics, 1984).

¹⁰ For example, 1985–86 Consumer Expenditure Survey data were used for the selection of entry-level items in sampling units administered the CPOPS survey in 1988.

¹¹ The samples of housing units selected to represent rent and owners' equivalent rent are derived from a separate process. For more information on housing samples, see Frank Ptacek, "Revision of the CPI housing sample and estimators," this issue, pp. 31–39.

¹² For a complete list of the relative importance of CPI market basket items, see *Relative Importance of Components in the Consumer Price Index, 1995*, Bulletin 2476 (Bureau of Labor Statistics, February 1996).

¹³ Most non-POPS categories represent items that are sold in monopolistic markets (for example, electricity and intercity bus service) and therefore do not require a survey of consumers to determine a representative list of outlets patronized in each sampling unit.

¹⁴ For the purpose of selecting outlets, sampling units are divided into one or more "half-samples." The majority of large, or A-size, sampling units are composed of two half-samples, while all smaller units receive one half-sample. Outlets are selected by POPS category for each half-sample. Thus, sampling units with more than one half-sample receive a larger sample of outlets than those with only one half-sample. Half-samples also provide a mechanism for the Bureau of Labor Statistics to calculate variances for price-relative estimates. For more information on variance estimation, see Sylvia G. Leaver and David C. Swanson, "Estimating Variances for the U.S. Con-

sumer Price Index for 1987–1991," *Proceedings of the Survey Research Methods Section*, American Statistical Association, 1992, pp. 740–45.

¹⁵ A consumer unit is the technical reference unit of the CPOPS survey. It is defined as (1) all members of a particular household who are related by blood, marriage, adoption, or some other legal arrangement; (2) a person living alone; or (3) two or more persons living together who pool their incomes to make joint expenditure decisions.

¹⁶ The designated number of completed interviews per sampling unit half-sample is set at 140 for large areas and 160 for small areas (urban, nonmetropolitan areas).

¹⁷ The implicit quantity weight for an item priced in the CPI is equal to $(\alpha Efg)/(MB)$, where α is the percent of sales of the corresponding entry-level item to the total sales of the corresponding POPS category in the selected outlet; E is the total daily expenditure for the POPS category in the corresponding index area replicate, derived from CPOPS; f is a factor that reflects any special subsampling of outlets or items; g is a geographic factor representing differences in index coverage in geographic areas over revision periods; M is the number of usable quotes for the entry-level item/sampling unit half-sample for the corresponding item stratum; and B is the proportion of expenditures for the corresponding entry-level item of the total expenditures for the corresponding item strata, as derived from the Consumer Expenditure Survey. For more information on item weights, see *BLS Handbook of Methods*, Chapter 19, "The Consumer Price Index," pp. 190–91.

¹⁸ See Clyde Tucker, Robert Cassady, and James Lepkowski, "An evaluation of the 1988 Current Point of Purchase CATI feasibility test." Paper presented at annual meeting of the American Statistical Association, Atlanta, GA, Aug. 19–22, 1991.

APPENDIX: Telephone Point-of-Purchase Survey (TPOPS) questionnaire groups and Point-of-Purchase Survey (POPS) expenditure categories

TPOPS questionnaire group	Major expenditure group	Recall period	POPS category title
1	Housing	5 years	Major appliance repair
	Housing	5 years	Reupholstery of furniture
	Housing	5 years	Inside home maintenance and repair
	Housing	2 years	Power tools
	Housing	6 months	Paint, wallpaper, related tools, and supplies
	Housing	6 months	Nonpowered tools, and miscellaneous hardware and supplies
	Recreation	5 years	Outboard motors and powered sports vehicles
	Recreation	5 years	Unpowered boats and trailers
	Recreation	2 years	Bicycles and accessories
	Recreation	6 months	General sports equipment
	Recreation	6 months	Hunting, fishing, and camping equipment
	Recreation	6 months	Toys, games, hobbies, and playground equipment
	Recreation	6 months	Video game hardware, cartridges, disks, and accessories
2	Food	2 weeks	Seasonings, spices, and miscellaneous baking products
	Food	2 weeks	Condiments, sauces, and gravies, such as catsup, mustard, relishes, tomato sauces, and gravy mixes
	Housing	5 years	Moving, storage, and freight expenses
	Housing	2 years	Housekeeping services
	Housing	2 years	Gardening and lawn care services
	Apparel	3 months	Infants' and toddlers' clothing and accessories
	Apparel	2 weeks	Infants' and toddlers' underwear and diapers
	Transportation	5 years	Ship fares
	Recreation	5 years	Musical instruments and accessories

TPOPS questionnaire group	Major expenditure group	Recall period	POPS category title
3	Other	5 years	Funeral expenses
	Other	2 years	Legal services
	Other	2 years	Luggage, briefcases, purses, and other carrying cases
	Other	2 years	Infants' equipment, such as strollers, car seats, bottles, and dishes
	Other	2 weeks	Stationery, school supplies, and gift wrap
	Food	2 weeks	Canned fruits and vegetables
	Food	2 weeks	Frozen fruits and vegetables
	Food	2 weeks	Dried and other processed fruits and vegetables
	Food	2 weeks	Soups
	Food	2 weeks	Frozen prepared foods
Food	2 weeks	Chips, nuts, and other snacks	
4	Housing	1 year	Refrigerators and home freezers
	Housing	1 year	Washers and dryers
	Housing	1 year	Stoves, ovens, and microwave ovens
	Housing	1 year	Vacuums and other floor-cleaning equipment
	Housing	1 year	Small electric kitchen appliances
	Housing	1 year	Heating and cooling equipment, home safety devices, and other electric appliances
	Housing	1 year	Household decorative items, including clocks and lamps
	Housing	1 year	Dishes and flatware
	Housing	3 months	Tableware and nonelectric kitchen cookware
	Housing	3 months	Indoor plants and fresh-cut flowers
5	Food	2 weeks	Flour and prepared flour mixes
	Food	2 weeks	Breakfast cereal
	Food	2 weeks	Rice, pasta, and cornmeal
	Food	2 weeks	Coffee
	Food	2 weeks	Powdered drinks, tea, cocktail mixes, and ice
	Housing	1 year	Housing at school, excluding board
	Educ. & comm. ¹	5 years	Technical and business school tuition and fixed fees
	Educ. & comm. ¹	1 year	College textbooks
	Educ. & comm. ¹	1 year	Elementary and high school textbooks
	Educ. & comm. ¹	1 year	Encyclopedias and other sets of reference books
Educ. & comm. ¹	1 year	College tuition and fixed fees	
Educ. & comm. ¹	1 year	Elementary and high school tuition and fixed fees	
Educ. & comm. ¹	1 year	Day care and nursery school	
6	Food	2 weeks	Eggs and egg substitutes
	Food	2 weeks	Milk
	Food	2 weeks	Cheese and cheese products
	Food	2 weeks	Ice cream and related products
	Food	2 weeks	Miscellaneous dairy products, including yogurt, powdered milk, and coffee creamers
	Food	2 weeks	Butter and margarine
	Food	2 weeks	Salad dressing
	Food	2 weeks	Other fats and oils, including peanut butter, mayonnaise, cooking fats, and oils
	Food	2 weeks	Baby food
	Apparel	1 year	Men's suits or sport coats
Apparel	1 year	Men's outerwear	
Apparel	6 months	Men's shirts, sweaters, and vests	
Apparel	6 months	Men's pants and shorts	
Recreation	1 year	Televisions	
Recreation	1 year	VCR's, camcorders, and other video equipment	
Recreation	6 months	Auto and home audio equipment	
6	Food	2 weeks	Apples
	Food	2 weeks	Bananas
	Food	2 weeks	Citrus fruits
	Food	2 weeks	Other fresh fruits

TPOPS questionnaire group	Major expenditure group	Recall period	POPS category title
	Food	2 weeks	Potatoes
	Food	2 weeks	Lettuce
	Food	2 weeks	Tomatoes
	Food	2 weeks	Other fresh vegetables, including fresh herbs
	Transportation	5 years	New vehicles
	Transportation	5 years	New motorcycles
	Transportation	5 years	Leased cars and trucks
	Transportation	5 years	Car and truck rental
	Recreation	2 years	Photographic equipment
	Recreation	2 years	Photographer's fees
	Recreation	3 months	Film and photographic supplies
	Recreation	3 months	Film processing
	7	Food	2 weeks
Food		2 weeks	Fresh biscuits, rolls, and muffins
Food		2 weeks	Cakes and cupcakes (excluding frozen)
Food		2 weeks	Cookies
Food		2 weeks	Crackers and bread products
Food		2 weeks	Other bakery products, including frozen
Apparel		1 year	Watches
Apparel		6 months	Jewelry
Educ. & comm. ¹		5 years	Home and cellular telephones, answering machines, and other phone accessories
Educ. & comm. ¹		2 years	Personal computers and peripheral equipment
Educ. & comm. ¹		1 year	Calculators, typewriters, and other information-processing equipment
Educ. & comm. ¹		6 months	Computer software and accessories
Educ. & comm. ¹		6 months	On-line and other information services
Other	1 year	Shoe repair and other shoe services	
Other	1 year	Clothing rental, alterations, or repairs	
Other	1 year	Watch and jewelry repair	
8	Housing	5 years	Floor coverings, such as hard surface tiling and all types of carpets and scatter rugs
	Housing	5 years	Window coverings, such as curtains, drapes, and blinds
	Housing	5 years	Sofas, slipcovers, and decorative pillows
	Housing	5 years	Living room chairs and tables
	Housing	5 years	Kitchen and dining room furniture
	Housing	2 years	Infants' furniture
	Housing	1 year	Bedroom furniture, including mattresses and springs
	Housing	1 year	Outdoor furniture
	Housing	1 year	Occasional furniture, such as bookcases, desks, ottomans, etc.
	Medical care	1 year	Physicians' services
	Medical care	1 year	Dental services
	Medical care	1 year	Eyeglasses and eye care
	Medical care	1 year	Services by other medical professionals
9	Housing	1 year	Powered lawn and garden equipment and other outdoor items
	Housing	6 months	Lawn and garden supplies and insecticides
	Apparel	1 year	Men's active sportswear, such as exercise apparel or bathing suits
	Apparel	1 year	Women's active sportswear and playwear
	Apparel	6 months	Men's accessories, such as ties, belts, and wallets
	Apparel	3 months	Men's socks, underwear, sleepwear, and bathrobes
	Apparel	3 months	Women's underwear and nightwear
	Apparel	3 months	Women's hosiery and accessories
	Transportation	1 year	Motor vehicle insurance
	Recreation	6 months	Pet services
	Recreation	6 months	Veterinarian services

TPOPS questionnaire group	Major expenditure group	Recall period	POPS category title
10	Food	6 months	Distilled spirits at home
	Food	6 months	Wine at home
	Food	2 weeks	Beer, ale, and other malt beverages at home
	Apparel	6 months	Boys' clothing and accessories
	Apparel	6 months	Women's outerwear
	Apparel	6 months	Women's dresses
	Apparel	6 months	Women's tops, skirts, pants, and shorts
	Apparel	6 months	Women's suits and suit components
	Apparel	6 months	Girls' clothing and accessories
	Transportation	1 year	Tires
	Transportation	1 year	Local vehicle registration
	Transportation	6 months	Vehicle parts and accessories
	Transportation	6 months	Motor oil, coolants, and fluids
11	Transportation	3 months	Taxi fare
	Transportation	1 month	Diesel and alternative fuels
	Transportation	1 month	Intracity mass transit
	Transportation	1 month	Carpools and vanpools
	Transportation	1 week	Gasoline
	Medical care	1 month	Nonprescription medical equipment, supplies, topicals, and dressings
	Recreation	3 months	Blank and prerecorded videocassettes and disks
	Recreation	3 months	Prerecorded and blank audiotapes, CD's, and records
	Recreation	1 month	Cable television
	Recreation	1 month	Rental of videotapes and disks
	Recreation	1 month	Pet food
	Recreation	1 month	Pets, pet supplies, and accessories
	Educ. & comm. ¹	3 months	Long-distance telephone service
Educ. & comm. ¹	1 month	Local telephone service	
12	Medical care	2 weeks	Prescription drugs and medical supplies
	Medical care	2 weeks	Internal and respiratory over-the-counter drugs
	Other	1 year	Electric personal care appliances, such as shavers and hair dryers
	Other	1 year	Tax return preparation and other accounting services
	Other	1 month	Tobacco products other than cigarettes
	Other	1 month	Dental and shaving products, including nonelectric articles
	Other	1 month	Deodorant, feminine hygiene products, suntan lotions, and foot care products
	Other	1 month	Cosmetics, perfumes, and bath and nail preparations
	Other	1 month	Checking accounts, credit card fees, and other bank services
	Other	2 weeks	Cigarettes
	Other	2 weeks	Hair products, such as shampoos, sprays, pins, and combs
13	Food	2 weeks	Sugar and artificial sweeteners
	Food	2 weeks	Candy and chewing gum
	Food	2 weeks	Jellies, syrups, toppings, and other sweets
	Recreation	2 weeks	Single-copy newspapers and magazines
	Recreation	1 year	Sewing machines, fabric, and supplies
	Recreation	1 year	Club membership dues paid for fraternal and civic organizations, and fees for participant sports
	Recreation	1 year	Newspaper and magazine subscriptions`
	Recreation	1 year	Books purchased through book clubs
	Recreation	3 months	Books not purchased through book clubs
	14	Housing	1 year
Housing		1 year	Fuel oil

TPOPS questionnaire group	Major expenditure group	Recall period	POPS category title
15	Housing	1 year	Other household fuels for heating and cooking, such as propane, firewood, and coal
	Housing	1 year	Residential water and sewer
	Housing	1 year	Garbage and trash collection
	Housing	1 month	Household cleaning products and supplies
	Housing	1 month	Household paper products such as tissues, paper towels, and napkins
	Housing	1 month	Other disposable household products, such as food wraps, garbage bags, paper plates, and light bulbs
	Transportation	1 year	Automobile service clubs
	Transportation	1 month	Parking fees and tolls
	Recreation	1 year	Admissions to sporting events
	Recreation	1 month	Admissions, such as to movies, concerts, theme parks, etc.
	Other	1 month	Haircuts and other personal care services
	Food	2 weeks	Uncooked beef and veal, including frozen
	Food	2 weeks	Pork, ham, and breakfast meats
	Food	2 weeks	Lunch meats, hotdogs, and other meats
	Food	2 weeks	Chicken and other poultry, including turkey
Food	2 weeks	Fresh fish and seafood	
Food	2 weeks	Processed fish and seafood, including frozen, canned, and cooked	
Food	2 weeks	Carbonated drinks	
Food	2 weeks	Noncarbonated juices and drinks, frozen and nonfrozen	
Food	2 weeks	Prepared salads or salad bars, excluding restaurants	
Food	2 weeks	Easy-to-prepare canned and packaged foods, excluding fruits, vegetables, and soups	
16	Transportation	2 years	Motor vehicle bodywork
	Transportation	2 years	Motor vehicle repair
	Transportation	1 year	Motor vehicle maintenance, inspections, and towing
	Educ. & comm. ¹	3 months	Delivery services
	Recreation	6 months	Fees for lessons or instruction
	Other	1 month	Laundry and drycleaning services
	Food	6 months	Catered events or board
	Food	2 weeks	Full-service meals and snacks
	Food	2 weeks	Limited-service meals and snacks
	Food	2 weeks	Meals and snacks at schools or employer-provided cafeterias, dining rooms, or snackbars
Food	2 weeks	Food and beverages from vending machines and mobile vendors	
Food	2 weeks	Alcoholic beverages away from home	
Housing	6 months	Household linens, such as kitchen and bathroom towels, bedding, or tablecloths	
Apparel	6 months	Men's footwear	
Apparel	6 months	Boys' and girls' footwear	
Apparel	6 months	Women's footwear	
Medical care	1 year	Hospital services	
Medical care	1 year	Adult day care	
Other	5 years	Care of invalids, elderly, and convalescents in the home	

¹ Educ. & comm. = education and communication.