

Consumer Expenditure Survey Anthology, 2005



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Preface

This is the second in a series of reports presenting both articles that discuss ongoing research and methodological issues pertaining to the U.S. Bureau of Labor Statistics (BLS) Consumer Expenditure Survey (CE) and analytical articles using this survey's data. The first report, *Consumer Expenditure Survey Anthology, 2003*, was published in September 2003. Future CE anthology reports will be published biennially, with the next report scheduled for publication in 2006. The methodological articles included in this report are intended to provide data users with greater insight into improvements in the survey, as well as issues that are faced in collecting, processing, and publishing information from such a complex survey. The analytical articles provide information on topics of interest using CE data.

This report was prepared in the Office of Prices and Living Conditions, Division of Consumer Expenditure Surveys (DCES), under the general direction of Steve Henderson, Chief of the Branch of Information and Analysis, and was produced and edited by John M. Rogers, Section Chief. Articles on research and methodology were contributed by Jeanette Davis, Eric Figueroa, Lucilla Tan, and Nhien To of the Branch of Research and Program Development, and Sylvia Johnson-Herring, Sharon Krieger, Sally Reyes-Morales, and David Swanson of the Division of Price Statistical Methods. Analytical articles were contributed by Meaghan Duetsch,

Abby Duly, George Janini, Laura Paszkiewicz, and Mark Vendemia of the Branch of Information and Analysis.

BLS makes CE data available in news releases, reports, and articles in the *Monthly Labor Review*, as well as on CD-ROMs and on the Internet. A biennial report includes standard tables of recent survey data, a discussion of expenditure changes, and a description of the survey and its methods. Current and historical CE tables classified by standard demographic variables are available at the BLS Internet site <http://www.bls.gov/cex>. This site also provides other survey information, including answers to frequently asked questions, a glossary of terms, order forms for survey products, and *Monthly Labor Review* and other research articles.

The material that follows is divided into two sections: Part 1 includes articles on survey research and methodology, and Part 2 presents analysis of topics of interest based on CE data. An appendix includes a general description of the survey and its methods and a glossary of terms.

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Part I.
Survey Research and Methodology

Is a User-Friendly Diary More Effective? Findings from a Field Test

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Diary surveys are often used to collect information on daily activities such as consumer spending. They are particularly useful for collecting daily records of small frequently purchased items, which are normally difficult to recall.¹ The Consumer Expenditure (CE) survey, sponsored by the U.S. Bureau of Labor Statistics (BLS), with data collected by the U.S. Census Bureau, uses a diary survey to collect data on weekly household expenditures.

Recent efforts to improve the performance of the CE diary survey have focused on designing a more user-friendly form. Such a form would have a simpler recording scheme and be more attractive in appearance than the form currently used in production. Several prototype diaries were developed and refined with the use of feedback from survey respondents, field interviewers, and program staff.² On the basis of this feedback, CE management selected one of the designs (the Redesigned Diary) for field testing. This diary was intended to stem declining response rates and improve data quality by reducing respondent's burden associated with

¹ S. Sudman and N. Bradburn, *Asking Questions*, (San Francisco, Jossey Bass Publishers, 1982).

² J. Davis, L. Stinson, and N. To, "Creating a 'User-Friendly' Expenditure Diary," *Consumer Expenditure Survey Anthology* (Bureau of Labor Statistics, 2003), Report 967, p. 3.

the diary now used: the Production Diary. The Redesigned Diary is smaller and shorter than the Production Diary, has a simpler organization, and highlights important instructions and examples.

The Redesigned Diary was tested in the field from October through December of 2002.³ The primary objective of this field test was to compare the response rates and data quality obtained from the Redesigned Diary with those obtained from the Production Diary. The results showed no statistically significant difference between diary forms in completion response rates and only a few significant differences in expenditure means and allocation rates. (The latter measure the proportion of expenditures requiring further processing because they are reported with insufficient detail.⁴)

However, the Redesigned Diary performed statistically significantly better than the Production Diary in a majority of tests pertaining to the collection of item attribute information needed for

³ A field test is designed to reproduce data collection conditions as closely as possible to those in the production environment.

⁴ Allocation is an adjustment performed on expenditure entries that do not identify individual items at the required level of detail (for example, a report that says "groceries \$150," rather than listing the specific items purchased and the price of each). This type of entry requires additional processing to assign the aggregate expenditure to target items.

classification.⁵ In addition, the Census Bureau field representatives who worked on the field test expressed a strong preference for the Redesigned Diary because of its more attractive layout and simpler recording scheme.

On the basis of the field test results, it was decided to continue research on the Redesigned Diary before implementing it in production. The focus of the research was to test modifications to the Redesigned Diary that would increase reporting of expenditure levels for *food away from home* and reporting detail for *food for home consumption*.

Background

Diary Survey Instruments. Two paper-and-pencil questionnaires are currently used to collect diary data. The first is the Record of Daily Expenses, the actual diary form. This is a self-reporting form on which respondents record a detailed description of all expenses for their consumer units (CUs) for two consecutive 1-week periods. (Data collected each week are considered independently.) The diary is divided by day of purchase and by broad classifications of goods and services—a breakdown designed to aid the respondent in recording daily purchases. Currently, the major classifications are as follows:

- Food away from home
- Food for home consumption⁶
- Clothing, shoes, and jewelry
- All other purchases and expenses

Each classification is further divided into numerous subcategories within which the items reported are subsequently coded by the Census Bureau. Thus, BLS can aggregate individual purchases for representation in

⁵ *Attribute information* is needed to classify items; the percentage of entries missing such information measures the portion of entries for which respondents did not provide the needed attribute information (for example, a respondent who reports “peas,” but does not provide attribute information on the type of package—fresh, frozen, or canned).

⁶ Includes food and beverages purchased as gifts.

the Consumer Price Index and for presentation in statistical tables.

The second questionnaire used to collect diary data is the Household Characteristics Questionnaire, used to record information pertaining to age, sex, race, marital status, and family composition, as well as information on the work experience and earnings of each member of the consumer unit. This socioeconomic information is used by BLS to classify the CU for the publication of statistical tables and for economic analysis. Since 2003, the Household Characteristics Questionnaire has been administered with the use of computer-assisted personal interviews (CAPIs).

Redesigning the Diary Form. The objective of redesigning the diary was to produce a more user-friendly form to encourage higher response rates and more accurate reporting. BLS and the Census Bureau began developing the Redesigned Diary in 2000. Findings from focus groups were used to define the features of a user-friendly form: a form that is easier to understand, less complicated to navigate, simpler to complete, and looks more attractive than the Production Diary. Through a series of cognitive tests of several prototype diaries designed with these user-friendly features, one—the Redesigned Diary—was selected for testing in the field.

Following is a summary of the differences in the features of the Production Diary and the Redesigned Diary:

- *Smaller physical size.* The Redesigned Diary is smaller (8 ½” × 11”), has fewer pages (44), and is in portrait format. In contrast, the Production Diary is 14” × 8” with 66 pages and is in landscape format.
- *Simplified layout.* The Redesigned Diary has a simpler organization than the Production Diary. In the Production Diary, each day’s reporting space consists of seven pages, broken down into broad classifications and numerous

subcategories. In the Redesigned Diary, each day’s reporting space is reduced to four pages, also broken down into broad classifications, but without subcategories, simplifying the respondent’s task and the form’s appearance.

- *Clearer instructions and examples.* The Redesigned Diary’s instructions are formatted so topics are easier to find:

1. The Production Diary’s instructions are evenly spread over two pages, divided into eight topics, distinguished by their titles, which compete with numerous subtitles. The Redesigned Diary’s instructions are also contained on two pages, but the different topics are more easily distinguished from one another. The information is grouped into three topics, graphically set apart from one another through the use of frames and by means of title blocks in large fonts.
 2. A section titled “Frequently Asked Questions” was added to the Redesigned Diary. This section answers common questions asked about the diary-keeping task and is found on an easily accessible flap on the diary’s back cover. Examples of expenditures are contained on a flap on the front cover. Both flaps can be used as bookmarks to help the respondents keep their place.
 3. Compared with the Production Diary, the Redesigned Diary has a greater variety of examples, focuses on difficult cases, and highlights important data entry instructions and examples by using color, white space, boldface text, and superimposed balloons.
- *More check boxes to facilitate the recording task.* In contrast to the Production Diary, the Redesigned Diary has more check boxes, allowing respondents to classify expenditures more easily.

- *A more current and appealing look that still maintains a professional and official quality.* The Redesigned Diary uses color and photos to cue respondents and to make the diary more appealing. The Production Diary is printed in black and green on white paper and has no photos.

The 2002 Field Test

Sample Design. To assess the performance of the Redesigned Diary, a field test was conducted from September through December 2002. In addition to the redesigned form, a CAPI version of the Household Characteristics Questionnaire was tested. This alternative replaced the paper-and-pencil version of the questionnaire formerly used in production.⁷

The field test design included both test (Redesigned Diary) and control (Production Diary) samples. Both samples used the CAPI Household Characteristics Questionnaire. To create the samples, the Census Bureau selected 1,800 households from a previously unused supplemental sample. These sample units were drawn from 9 of the 12 Census regions.⁸ The test sample of 1,200 households received the Redesigned Diary, and the control sample of 600 households received the Production Diary.

As the field test proceeded, significant demographic differences were found between the test and control samples. The largest such differences identified were in the proportions of owners and renters. In the test sample, these proportions were close to those found in the general population. In the control sample, the proportion of renters was higher than that found in the general population. In addition, renters in the control sample had significantly lower incomes than renters in

the test sample. Because these characteristics affect expenditure levels, the disparities weakened the control sample's usefulness for comparisons with the test sample output.

In anticipation that the control sample would not be large enough to provide meaningful estimates, a production sample was selected for comparison with the test sample. The production sample was drawn from concurrent production data restricted to the regions, Metropolitan Statistical Areas, and sample frames used to draw the field test sample. The resulting sample consisted of 2,703 households.

Given the aforementioned differences in the demographics between the test and control samples, the authors chose to focus on comparisons between the test and production samples. Although the production data had been collected without the CAPI component, the demographic consistency of its data with the test sample was thought to make it a better subject for comparison.

Measures of Effectiveness. Our research goal was to compare the effectiveness of the Redesigned Diary with that of the Production Diary. Our null hypothesis states that they are equally effective. Our alternative hypothesis asserts that one diary is more effective than the other.

The more effective diary must have the following two attributes:

1. *Higher completion response rates.* Completion response rates measure the percentage of all eligible diaries successfully placed and completed.⁹
2. *Higher mean dollar expenditures per CU in the two food expenditure categories: food away from home and food for home consumption.*¹⁰

These two criteria were selected, respectively, because of concern over the declining response rates in the CE survey and the importance of the diary as the major source for data on food expenditures. It would also be desirable if a diary produced higher mean expenditures in the two nonfood expenditure categories, produced relative expenditure shares¹¹ consistent with the pattern in current production data, and had lower percentages of entries missing attribute information. However, it is sufficient for one diary to be judged more effective than the other if it meets the foregoing two criteria.

In addition to the quantitative analyses on the field test data, two other analyses were undertaken to evaluate the diary:

1. *A content analysis of the Redesigned and Production Diaries.* The objective of a content analysis is to compare the overall quality of entries in the diaries: Whether entries were recorded properly and clearly and whether relevant check boxes were marked. Ten percent of diaries were randomly selected for content analysis, ensuring coverage in the three areas: Single and multiperson CUs, diaries from Weeks 1 and 2, and diaries from all geographic regions.¹² A total of 47 Control Diaries and 81 Redesigned Diaries from the months of September and October were reviewed.
2. *A debriefing of field representatives.* Field representatives who participated in the field test were given an opportunity to share their impressions and reactions. In December 2002, a debriefing questionnaire was sent to those who participated in the field test. The response rate for this question-

⁷ After further refinement, the CAPI version was introduced into production in 2003.

⁸ The nine Census regional offices that participated in the field test were Atlanta, Boston, Charlotte, Chicago, Dallas, Denver, Detroit, Philadelphia, and Seattle; excluded were New York, Los Angeles, and Kansas City.

⁹ *Eligible* housing units are those in the designated sample, less housing vacancies, housing units under construction, housing units with temporary residents, destroyed or abandoned housing, and units converted to non-residential use.

¹⁰ The latter category includes food and beverages purchased as gifts.

¹¹ The relative share of each of the four expenditure classifications is the percentage of total expenditures that each constitutes.

¹² The geographic regions are the Northeast, Midwest, South, and West.

naire was 86 percent. A total of 17 field representatives representing the 9 Census regional offices participated in a 1-day debriefing in January 2003.

Determining Significant Differences. Statistical tests were performed to measure significant differences in the output of the Redesigned and the Production Diary. For the Redesigned Diary field test, variances were calculated using the method of “random groups.”

To obtain the random groups required for statistical analyses of the test and production samples, the CU universe was randomly divided into 10 groups called replicates, with each replicate containing approximately 10 percent of the universe. Each statistic of interest (such as mean expenditure, response rate, and relative importance) was computed separately for each replicate, as well as for the full sample.

Then the variance for the statistic is estimated by

$$\text{Var}(\bar{x}) = \frac{\sum_{r=1}^{10} (\bar{x}_r - \bar{x})^2}{10(10-1)} 5,$$

where

\bar{x} = the full sample statistic of interest

and

\bar{x}_r = the statistic for the r th replicate.

The standard error is estimated by

$$\text{SE}(\bar{x}) = \sqrt{\text{Var}(\bar{x})}.$$

To determine whether the statistic of interest was significantly different between the test \bar{x}_{Test} and production ($\bar{x}_{\text{Production}}$) samples, z -scores (Z) that allow a statement of statistical significance were calculated with the formula

$$Z = \frac{|\bar{x}_{\text{Test}} - \bar{x}_{\text{Production}}|}{\sqrt{\text{Var}(\bar{x}_{\text{Test}}) + \text{Var}(\bar{x}_{\text{Production}})}},$$

where $\text{Var}(\bar{x}_{\text{Test}})$ and $\text{Var}(\bar{x}_{\text{Production}})$ are the variance of the test and production statistics, respectively.

If $|Z| > 2$, then the difference between the statistics of interest is statistically significant.

Findings

On the basis of comparisons between the test and production samples, the data yielded the following results:

Response rates. No significant difference in the response rates for completed diaries was found. (See table 1.) Compared with the refusal rate in the Redesigned Diary, the refusal rate in the Production Diary was significantly higher. However, the Redesigned Diary also had a significantly higher rate of incomplete interviews for “other” reasons, perhaps due to the more stringent placement dates enforced by CAPI.

Expenditure means. In the Redesigned Diary, expenditures were significantly lower for *Food Away from Home*, but significantly higher for *Clothing, Shoes, and Jewelry*. In terms of expenditure shares—the percentage of total expenditures spent on each component—only *food away from home* was significantly lower in the Redesigned Diary. These results may be due to new titles¹³ in the Redesigned Diary for *food away from home and food for home consumption*. Because of the difference in titles, respondents using the Redesigned Diary may have thought they should omit from the *food away from home* section some expenditures that respondents using the Production Diary thought should be included.

Allocation rates. In the Redesigned Diary, the percentage of expenditures for *Food Away from Home* coming from allocation was significantly lower than that in the Production Diary. The dif-

¹³ In the Redesigned Diary, the *food away from home* and *food for home consumption* sections were retitled, respectively, “Food & Drinks from Food Service Places” and “Food & Drinks from Grocery and Other Stores.”

ference may be largely a reflection of the effectiveness of the additional check boxes in the Redesigned Diary. No other significant differences were found.

Percentage of missing attributes. Three of the five tests (*meal type, alcohol type, and gender*) showed significantly lower rates of missing attributes in the Redesigned Diary compared with the Production Diary. As with *food away from home*, this phenomenon may be due largely to the effectiveness of additional check boxes. One test (*package type*) showed significantly lower results in the Production Diary, and one (*age*) showed no difference between the diaries.

Content analyses. On the basis of the diaries that were manually reviewed, it was not apparent that one type of diary had consistently higher error rates than the other. (See table 2.)

Debriefings of field representatives.

- Survey of Census Bureau field representatives who administered the field test. The field representatives expressed overwhelming support for the Redesigned Diary. When asked to compare the two diaries on several criteria (overall impression, ease of administration, ease of respondent use, layout design, complete interviews obtained, accurate data obtained), a majority of the field representatives consistently gave the Redesigned Diary favorable ratings and gave the Production Diary neutral or negative ratings.
- In-person debriefing of 17 representatives. The majority of the field representatives thought that the format of the Redesigned Diary, with fewer categories, effectively reduced respondent burden. They believed that respondents were more likely both to record in the diary and to persevere with recording entries through the second week.

Conclusion

The findings of the diary field test did not allow us to reject the null hypothesis. Thus, both the Redesigned Diary and the Production Diary are equally effective. No significant difference was found in the test of completion response rates. Results were mixed for tests of mean expenditures in the two food categories: the Redesigned Diary had significantly lower expenditures than the Production Diary had for *food away from home*, and there was no significant difference between the diaries in *food for home consumption*. Higher results on both tests were necessary for either diary to be judged more effective than the other.

The Redesigned Diary performed significantly better in a majority of tests

having to do with missing attribute information. Taking into account all test differences—whether significant or not—we find that the Redesigned Diary produced higher expenditure means and lower allocation rates in three of the four expenditure categories. In addition, the field representatives who worked on the field test expressed a strong preference for the Redesigned Diary.

Further Research

The Redesigned Diary's weak areas merit additional research. The expenditure means in the *food away from home* section were lower in the Redesigned Diary than in the Production Diary. Cognitive work is needed to determine whether the titles used in each diary

are confusing to respondents, possibly leading to incorrect items being entered.

Additional research also is needed to develop effective cues to encourage more detailed reporting in the *food for home consumption*, the *clothing, shoes, and jewelry*, and the *all other purchases and expenses* sections. The cues should not be overwhelming or add significant amounts of respondent burden.

The authors would like to acknowledge the following BLS employees who contributed to this analysis: Jeff Blaha, Richard Dietz, Tammy Hagemeyer, William Mockovak, Troy Olson, Mary Lynn Schmidt, Linda Stinson, David Swanson, Clyde Tucker, and Wolf Weber. ■

Table 1. Comparison of data from the Redesigned and Production Diaries

Characteristic	Test (CAPI and Redesigned Diary)	Production (Production Diary)	Significant difference
Response rates (percent):			
Completed	74.5	75.2	—
Eligible CUs who did not complete interview because—			
refused	11.9	17.9	****
not home	5.0	4.3	—
other	8.6	2.6	****
Mean expenditures (dollars):			
All expenditure categories	371	359	—
Food for home consumption	64	64	—
Food away from home	37	41	**
Clothing, shoes, and jewelry	39	33	**
All other purchases and expenses	231	221	**
Allocation rates(percent of expenditures from allocated items):			
All expenditure categories	17.6	20.8	—
Food for home consumption	24.3	26.3	—
Food away from home	18.3	49.5	****
Clothing, shoes, and jewelry	22.2	17.5	—
All other purchases and expenses	15.6	16.2	—
Missing attributes (percent of entries missing attribute information):			
Package type.....	7.2	4.7	**
Meal type	2.8	30.3	****
Alcohol type	9.8	16.6	**
Age	17.7	21.4	—
Gender	16.4	21.4	**

NOTES: Statistical significance based on Z-score: ** $2 \leq \text{abs}(Z) < 3$, *** $3 \leq \text{abs}(Z) < 4$,**** $\text{abs}(Z) \geq 4$. Dash indicates no significant statistical difference.

SOURCE: The Consumer Expenditure Survey Redesigned Diary field test, September–December 2002.

Table 2. **Content analysis of the Redesigned and Production Diaries**

Characteristic	Redesigned Diary (in percent)	Production Diary (in percent)
Error rate of illegible entries (cannot read, due to handwriting):		
Food away from home	0.0	0.0
Food for home consumption .....	.4	.2
Clothing, shoes, and jewelry .....	.0	.0
All other purchases and expenses .....	.2	.0
Error rate of unintelligible entries (can read, but cannot tell what the entry means):		
Food away from home .....	.6	.0
Food for home consumption .....	.9	5.5
Clothing, shoes, and jewelry .....	.0	.0
All other purchases and expenses .....	.9	1.8
Error rate of missing description fields:		
Food away from home .....	.7	.0
Food for home consumption .....	.0	.0
Clothing, shoes, and jewelry .....	.0	.0
All other purchases and expenses .....	.0	.0
Error rate of missing total-cost fields:		
Food away from home .....	.0	.0
Food for home consumption .....	.0	.2
Clothing, shoes, and jewelry .....	.0	.0
All other purchases and expenses .....	.0	.6
Error rate of missing alcohol check marks (when alcohol is described or cost is given):		
Food away from home0	3.4

The Efficacy of Cues in an Expenditure Diary

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In designing any survey, it is important to provide respondents with clear instructions and examples. Self-administered expenditure diaries often use cues as examples, not only to aid recall, but also to prompt the respondent as to what types of expenses to record and how those expenses should be recorded. This cognitive study investigates how cues should be used in an expenditure diary to instruct respondents to record their expenses completely and accurately.

Background

The Consumer Expenditure Diary (CED) Survey is a nationwide survey of households used by the U.S. Bureau of Labor Statistics (BLS) to collect expenditures on small, frequently purchased items. The respondent is asked to record the household's expenses for 2 consecutive weeks. Depending on how promptly the respondent records the expenditures in the diary after incurring them, various degrees of recall are involved in the task. To aid in recall, diary forms are often organized into broad categories (e.g., "Food and Drinks for Home Consumption" or "Clothing, Shoes, Jewelry, and Accessories") and include cues that are examples of expenditure items.

Over the years, the use of cues in the CED has undergone a variety of changes. The first annual CED, implemented in 1980, was organized into five

broad expenditure categories that were repeated for each day of the week, resulting in a diary that was 23 pages long. There were 76 specific cues¹ on the recording pages for each day.

In 1991, a new version of the diary (the Current Diary) was introduced. In this version, the five broad expenditure categories were further divided into 42 subcategories (e.g., an "Eggs and Dairy Products" subcategory within the "Food for Home Consumption" category). As a result, there were 305 specific cues on the recording pages for each day. A field test conducted in 1991 showed that, for items mentioned in the cues, the Current Diary yielded higher reporting rates with relatively higher reporting detail than did the 1980 diary.²

Despite the Current Diary's strong performance in the field test, declining response rates and diminishing data quality during the 1990s led CED researchers to reexamine the diary and the diary-keeping task. A previous test in 1985 had revealed some disadvan-

¹ Specific cues are precise examples of items described with sufficient detail for coding. For example, "powdered milk" and "whole milk" are specific cues because they contain enough information to be accurately coded. By contrast, "milk" is not a specific cue, because it does not specify the type of milk.

² Silberstein, A.R., "Part-Set Cuing in Diary Surveys," paper presented at the annual meeting of the American Statistical Association, 1993.

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tages associated with the subcategories,³ namely, that the amount of successful recall decreases as the number of cues increases.⁴ Furthermore, the instrument looked intimidating: it was 66 pages long (compared with the 23 pages in the 1980 CED); and although the physical size of the Current Diary was smaller than the 1980 version (14" × 8", compared with 17" × 11"), it was still large and bulky and had a landscape layout.

In response to these factors, a joint BLS and U.S. Census Bureau⁵ team was chartered in 2000 to design a more user-friendly diary that would encourage greater participation by simplifying the diary-keeping task, yet still solicit the reporting detail required.⁶ The team identified nine main themes from participants' recommendations. One prominent theme was a reaction to the subcategory cues. Participants recommended that the recording task be reduced to the minimum number of major categories and not include a secondary classification task required by subcategories. The team used these themes as a basis for designing a more user-friendly diary.

The Redesigned Diary

The Redesigned Diary has four broad categories with no subcategories. To simplify the appearance of the recording pages, specific cues were removed and placed on a flap attached to the front cover. The Redesigned Diary has an 8 1/2" × 11" portrait layout with 44 pages.

³ Vitrano, F.A., et al., "Cognitive Issues and Reporting Level Patterns from the CE Diary Operational Test," in *Proceedings of the Section on Survey Research Methods*. Washington DC: American Statistical Association, pp. 262–267, 1988.

⁴ Roediger, H. L., "Inhibiting Effects of Recall," *Memory and Cognition*, pp. 261–269, 1974.

⁵ BLS contracts with the U.S. Census Bureau to implement the Consumer Expenditure Diary Survey in the field.

⁶ Davis, J., et al., "What Does It Really Mean to Be User-Friendly when Designing an Expenditure Diary?" paper presented at the annual meeting of the American Association of Public Opinion Research (2002). See also Davis, J., et al. "Creating a User-Friendly Expenditure Diary," *Consumer Expenditure Survey Anthology*, Report 967, pp. 3–17, Sept. 2003.

The Redesigned Diary was field-tested from September to December of 2002. Results from the test were mixed. The new user-friendly design was overwhelmingly preferred and supported by Census field staff. Moreover, the field-test data indicated that the Redesigned Diary was comparable to the Current Diary in response rates and overall levels of reported expenditures.

However, the data also indicated that respondents failed to record expenditures at a sufficient level of detail, causing an increase in allocation rates.⁷ This loss of detail was attributed to the elimination of the specific cues on the recording pages. Consequently, further research into the addition of cues on those pages in the Redesigned Diary was recommended.

Scope and methodology

The purpose of the cognitive study that was recommended was to test whether adding specific cues on the recording pages would alleviate the problem of respondents failing to record at a sufficient level of detail, while maintaining the user-friendly layout of the Redesigned Diary. To accomplish this task, alternative means of adding cues to the recording pages of the Redesigned Diary were evaluated.

A. Test diaries

Three formats of the Redesigned Diary were tested in the cognitive study:

1. *The No-Cues Diary*. This diary was similar to the one used in the 2002 field test and had no cues on the recording pages. (See exhibit 1.)
2. *The Margin-Cues Diary*. This diary listed cues along the left side of the recording pages. (See exhibit 2.)

⁷ Figueroa, E., et al., "Is a User-Friendly Diary More Effective? Findings from a Field Test," paper presented at the annual meeting of the American Statistical Association, 2003. Although allocations are often used to account for item nonresponse, in the diary the term refers to an expenditure that does not identify individual items at the required level of detail (e.g., a respondent reports "groceries, \$150," rather than the specific items purchased). This type of entry requires additional processing to assign the aggregate expenditure to target items.

3. *The Header-Cues Diary*. This diary listed cues along the top of the recording pages. (See exhibit 3.)

Selection of cues: Because space on the recording pages was limited, the number of cues had to be minimal, making the selection of cues an important task. The cues were selected on the basis of four criteria:

1. *Analysis of the 2002 field-test data*. A comparison was made between the mean expenditures of the Redesigned Diary and the Current Diary. Because research has shown that cues improve the reporting of an item, items for which reported expenditures were significantly lower in the Redesigned Diary compared with the Current Diary were identified, and a subset of those items was selected as cues. Examples include white bread, oranges, and whole chicken.
2. *Items commonly reported without adequate detail*. Certain items are commonly entered into the CED with insufficient detail, requiring data adjustment. For example, entries of "gas" must be allocated to either gasoline or utility gas. Similarly, entries of "books" must be allocated to either schoolbooks or other books. To encourage more specific reporting of items, cues such as "gasoline," "utility gas bill," "textbooks," and "cookbook" were selected.
3. *Problems identified in the two food categories "Food and Drinks Away from Home" and "Food and Drinks for Home Consumption."*
 - *Drinks without a meal*. Team members were concerned that linking "Food and Drinks" together in the titles would discourage the reporting of drinks without a meal. To encourage such entries, cues such as "beer at happy hour" and "soda from vending machine" were selected.

- *Delivery and takeout meals.* Due to the wording of these two food entries, the reporting of items such as pizza delivery and Chinese takeout is confusing to respondents. Both entries should be reported as “Food Away from Home,” but are often entered as “Food for Home Consumption,” because respondents usually consume these foods in the home. To encourage entering these items in the correct section, cues of “pizza delivery,” “Chinese takeout,” and “carryout lunch” were placed on the “Food Away from Home” recording pages.

4. *A balanced representation of items.* One specific cue from each subcategory in the Current Diary was selected:

- “cigarettes” from “Tobacco and Smoking Supplies”
- “prescription drugs” from “Medicines, Medical Supplies, and Services”

An effort was made to emphasize items that are currently known to be underreported.

Specificity of the cues: Cues were restricted to specific items (e.g., skim milk) that do not require allocation because they contain sufficient detail. Cues for items requiring allocation (e.g., milk) were excluded from consideration. It was thought that cuing for sufficient detail would instruct respondents to record expenditures with similar specificity. A BLS study of the CED in the early 1990s noted that cued items have higher reporting rates when the cues are specific (e.g., chuck roast vs. beef).⁸

Order of the cues: Most cues are grouped with similar items (e.g., wine, beer, and liquor) to emphasize the variety and specificity desired. Pairs of

⁸ Dippo, C.S., and Norwood, J.L., “A Review of Research at the Bureau of Labor Statistics,” in *Questions about Questions*, ed. J.M. Tanur: Russell Sage Foundation, NY, pp. 271–290, 1992.

cues selected to encourage more specific reporting of items were placed next to one another to illustrate the importance of distinguishing similar items (e.g., “gasoline” and “utility gas bill” were placed next to each other to avoid an entry such as “gas”).

B. Participants

Participants for this study were recruited from a database maintained by the BLS Office of Survey Methods Research and through an advertisement placed in a local newspaper. Sixty-one individuals were recruited through these methods, together with an additional 5 BLS employees, for a total of 66 participants, all from the Washington, DC, area. Thirty-four participants were women, and while no information on race or ethnicity was collected, observationally, there appeared to be a balance among African-Americans, Caucasians, and Hispanics. The average age of the participants was 42, with subjects ranging from 17 to 77 years. The completed education level of the participants ranged from 11th grade to doctorate. The average education level of the participants was 16 years, equivalent to a college degree. About one-third of the participants ($n = 24$) were employed part time, one-third ($n=19$) full time, and the remaining participants were unemployed ($n = 9$), self-employed ($n = 6$), and retired ($n = 3$). The average self-reported income was \$37,000. The median income was \$31,000, with reports ranging from \$800 to \$100,000.

Twenty-four participants were single, 19 were married, 13 were divorced, and 3 were widowed. Of those from whom data were collected, half had children ($n = 28$) and half did not. The median number of children per participant was one, and the ages of the children ranged from 1 to 42 years, with the average being 22 years.

C. Study design

1. *The recall task.* Each participant was provided a diary and asked to enter all of his or her household’s expenses for the previous week. Since respondents in the field would

be able to use receipts, checkbooks, and other records to help them complete the diary, any participant who had such records available was allowed to use them. Diaries were distributed among three groups of participants, with 21 participants receiving the No-Cues Diary, 23 receiving the Margin-Cues Diary, and 20 receiving the Header-Cues Diary.⁹

2. *The recognition task.* After completing the diary-recall task, participants were given a comprehensive list of commonly purchased and frequently forgotten items and were asked to check off all items, including those they had recorded in the diary, that they or anyone in their household had purchased during the past week.

Recall versus recognition. Research on memory has revealed that, when given a recall task and a recognition task, participants are able to remember more items with the recognition task¹⁰ (Standing et al., 1970, and Sternberg, 1999). Therefore, it was thought that participants in this study would identify more of the purchases made by their households when using the recognition list than had been reported by completing the diary (a pure recall task). The items that were checked on the recognition list, but not recorded in the diary during the recall task, would provide some measure of underreporting (how many items respondents forgot when completing the pure recall task of recording in the diary).

Results from the study showed that the average number of unique recognition items reported by participants was greater than the average number of unique diary (or recall) items reported. There was no significant difference

⁹ The original sample contained 66 diaries. Due to data problems, 2 diaries from the group receiving the Header-Cues Diary were eliminated from the analysis.

¹⁰ Standing, L., et al., “Perception and memory for pictures: Single-trial learning of 2500 visual stimuli,” *Psychonomic Science*, 19, pp. 73–74, 1970. Also Sternberg, R.J., *Cognitive Psychology*, 2nd edition. Harcourt Brace College Publishers, New York, 1999.

across the diaries in the percentage of respondents underreporting. (See table 1.)

3. Followup questionnaire and debriefing. After completing both the recall and recognition tasks, participants were given a questionnaire about their experience with the diary. There was a separate questionnaire for each diary format. The questions were designed to identify the various features of the cues, including the location, format, and the actual cues that were selected.

Finally, before concluding the session, each participant received a 5-minute debriefing in which he or she had the opportunity to provide further comments.

Findings

A. Qualitative findings

Observational findings

Because the goal of the study was to examine the impact of adding cues to the recording pages of the Redesigned Diary, it was important to identify any problems participants had that appeared to be a direct result of the cues. This goal was achieved by observing the participants and noting the questions they asked as they completed the tasks and then reviewing each diary for errors.

One of the main problems found was with the Margin-Cues Diary. A few participants circled the margin cues instead of entering the description in the space provided. This problem may have stemmed from the visual layout of the vertically formatted cues in the Margin-Cues Diary, compared with the horizontally formatted cues in the Header-Cues Diary. Apparently, when cues are listed vertically, some participants are more likely to view them as a comprehensive list of expenses to circle than when they are listed horizontally.

When recalling their purchases, some participants asked what they should do if they didn't buy something that was listed. Others asked what they should do if they purchased something that was *not* listed. These questions

suggested that some participants did not fully understand the purpose of the cues and thought of them as comprehensive lists from which they had to choose. This type of confusion could lead to overreporting of cued items and underreporting of noncued items.

Findings from the followup questionnaire

Because the cues were designed to help participants recall items they may have purchased, one question asked whether the participants used the sample items (on the flap of the No-Cues Diary, listed along the side of the recording pages in the Margin-Cues Diary, and listed along the top of the recording page in the Header-Cues Diary) to help them remember their purchases. Among participants using the No-Cues Diary, 50 percent reported that they found the sample items helpful in remembering purchases. Almost 70 percent of participants using the Margin-Cues Diary said the cues along the side of the recording pages were helpful, and 86 percent of respondents using the Header-Cues Diary reported that the sample cues along the top of the recording pages were helpful.

In addition, the majority of the participants indicated that cues were helpful for determining which purchases to record, how to record purchases, and in which section to record purchases.

Findings from the debriefing

The debriefing questions provided additional feedback about the participants' experience with the diary, so any comments they made regarding the cues were seen as particularly useful. Many participants stated that the examples were very helpful. Although the term "examples" may have been used to denote examples anywhere in the diary, some participants specifically referred to the cues listed along the top of the page or cues along the side of the recording page.

B. Quantitative findings

A one-way analysis of variance

(ANOVA) was performed to test differences between the three diary forms on the following factors:¹¹

- Overall level of expenditures
- Total number of items reported
- Number of unique diary items (items recorded only with the recall task)
- Number of unique recognition items (items checked only with the recognition task)
- Percent of reported items requiring allocation
- Percent of items that matched the cues verbatim

Comparing diary items

The only significant difference found among the three types of diaries was the average proportion of items matching the cues printed on the recording pages verbatim. (See table 1.) Compared with the No-Cues diary, the Margin-Cues Diary and the Header-Cues Diary both had more than twice the proportion of items matching the cues (7 percent, as opposed to 19 and 20 percent, respectively). This difference suggests that the participants were looking at the cues on the pages. However, there was no significant difference between the Margin-Cues Diary and the Header-Cues Diary (19.1 percent and 19.7 percent, respectively).

No significant differences were found on any of the other variables measured, including number of unique diary items recalled, number of unique recognition items reported, and percentage of items requiring allocation due to inadequate detail in reporting.

Comparing diary expenditures

No significant differences in expenditures were found among the three diaries.

¹¹ Where the data met the assumptions required for ANOVA. When the data violated these assumptions, the nonparametric Wilcoxon Rank Sum test was performed.

Conclusion

The purpose of the cognitive study was to test whether adding specific cues on the recording pages would alleviate the problem of respondents failing to record at a sufficient level of detail. Although there was no significant finding that the recording page cues resulted in more detailed reporting, the qualitative results provided evidence that respondents used the cues and found them helpful both in recalling purchases and in remembering how to record purchases. Quantitative analysis showed no significant differences in the number of entries among the diaries, but there were significantly more entries in the Header-Cues and Margin-Cues Diaries that matched the recording page cues than did entries in the No-Cues Diary, suggesting that respondents noticed and used the recording page cues.

Given both the qualitative and quan-

titative evidence that respondents found the recording page cues helpful and that the vertical format of the cues in the Margin-Cues Diary might be problematic, the team recommended that the Header-Cues Diary be implemented with two modifications, to emphasize that the cues are only examples and not a comprehensive list. This change would help to decrease the potential for overreporting of cued items and underreporting of noncued items. The modifications are as follows:

1. The word "Examples" is to be added in a larger and different-color font next to the lists of cues.
2. The arrow that was used to instruct respondents to look in a different section for "Additional Examples" is to be moved to a more prominent location closer to the list of cues, to encourage respondents to utilize a

more extensive list.

The Modified Header-Cues Diary (exhibit 4) will be implemented in January 2005.

In 1980, the CED had five broad categories, which were then divided into 42 detailed subcategories in 1991. In 2005, the subcategories will be removed, leaving four broad categories. In terms of the specific cues it contains, the CED went from 76 in 1980 to 305 in 1991. The 2005 diary has 89 specific cues.

Will the combination of a user-friendly layout and a decreased number of specific cues on the recording pages have a positive impact on response rates and quality of the data? Did BLS strike the right balance between too many cues and too few? These questions will be answered after data are collected with the Redesign Diary in 2005. ■

Table 1. Comparing the sample means of the three diaries

Characteristic	No-Cues Diary	Margin-Cues Diary	Header-Cues Diary
Sample size (number of diaries).....	21	23	20
Number of entries in diary	42	43	42
Part 1. Food away from home	7	10	9
Part 2. Food for home consumption	21	17	16
Part 3. Clothing, shoes, jewelry, and accessories	3	3	4
Part 4. All other products, services, and expenses	11	12	13
Number of unique diary items	27	26	27
Number of unique recognition items	35	47	44
Percent of items reported need allocation ¹	5.6	6.2	5.3
Percent underreporting ²	28.2	37.7	37.4
Percent of cued items reported	51.0	62.0	56.2
Percent of items that matched the cues(verbatim) ³	7.3	19.1	19.7
Total expenditure	1,317	893	1,100
Part 1. Food away from home	39	61	96
Part 2. Food for home consumption	67	82	58
Part 3. Clothing, shoes, jewelry, and accessories	83	79	71
Part 4. All other products, services, and expenses	1,128	672	875

¹ Although "allocation" is often used to account for item nonresponse, in the diary, the term refers to an expenditure that does not identify individual items at the required level of detail. (For example, a respondent reports "groceries \$150," rather than the specific items purchased.) This type of entry requires additional

processing to assign the aggregate expenditure to target items.

² "Underreporting" refers to the items that were checked on the recognition list, but not recorded in the diary during the recall task.

³ Significant difference at $p = 0.05$.

Exhibit 1. The No-Cues Diary

Day 1 SUN MON TUE WED THU FRI SAT

← Please unfold the LEFT FLAP to see Examples

1. Food and Drinks Away from Home

	Mark (X) one that best describes the type of meal				Please specify briefly	Mark (X) one that best describes where you made this purchase				Total Cost with tax & tip	If alcoholic beverages included, mark (X) all that apply			Enter the total cost of the alcohol
	breakfast	lunch	dinner	snack/other		Fast Food Take-out Delivery Concession	Full Service Places	Vending Machines or Mobile Vendors	Employer or School Cafeteria		wine	beer	other	
101.	1 2 3 4					1 2 3 4					1 2 3			
102.	1 2 3 4					1 2 3 4					1 2 3			
103.	1 2 3 4					1 2 3 4					1 2 3			
104.	1 2 3 4					1 2 3 4					1 2 3			
105.	1 2 3 4					1 2 3 4					1 2 3			
106.	1 2 3 4					1 2 3 4					1 2 3			
107.	1 2 3 4					1 2 3 4					1 2 3			
108.	1 2 3 4					1 2 3 4					1 2 3			
109.	1 2 3 4					1 2 3 4					1 2 3			
110.	1 2 3 4					1 2 3 4					1 2 3			
111.	1 2 3 4					1 2 3 4					1 2 3			
112.	1 2 3 4					1 2 3 4					1 2 3			
113.	1 2 3 4					1 2 3 4					1 2 3			
114.	1 2 3 4					1 2 3 4					1 2 3			
115.	1 2 3 4					1 2 3 4					1 2 3			
116.	1 2 3 4					1 2 3 4					1 2 3			
117.	1 2 3 4					1 2 3 4					1 2 3			
118.	1 2 3 4					1 2 3 4					1 2 3			
119.	1 2 3 4					1 2 3 4					1 2 3			
120.	1 2 3 4					1 2 3 4					1 2 3			
121.	1 2 3 4					1 2 3 4					1 2 3			
122.	1 2 3 4					1 2 3 4					1 2 3			
123.	1 2 3 4					1 2 3 4					1 2 3			

If there are not enough lines in this part, please continue recording your expenses on pages 36 – 37.

FR USE: None TR VC



FORM CE-801

Exhibit 2. The Margin-Cues Diary

Day 1	SUN	MON	TUE	WED	THU	FRI	SAT
--------------	-----	-----	-----	-----	-----	-----	-----

← Please unfold the LEFT FLAP to see Examples →

1. Food and Drinks Away from Home

<u>Examples:</u>	Mark (X) one that best describes the type of meal				Description <i>(see examples on the left and on the flaps)</i>	Mark (X) one that best describes where you made this purchase				Total Cost with tax & tip	If alcoholic beverages included, mark (X) all that apply			Enter the total cost of the alcohol
	breakfast	lunch	dinner	snack / other		Fast Food Take-out Delivery Concession	Full Service Places	Vending Machines or Mobile Vendors	Employer or School Cafeteria		wine	beer	other	
	lunch from drive-thru beer tab at happy hour Chinese takeout iced coffee deli sandwich carry-out lunch soda from vending machine breakfast buffet child's school lunch popcorn & soda from movie concession wine at tavern dinner & cocktails at restaurant wedding reception caterer ice cream from truck beer at ballgame pizza delivery croissant from café hot dog from convenience store	1	2	3		4	1	2	3		4		1		2	3
101. 102. 103. 104. 105. 106. 107. 108. 109. 110. 111. 112. 113. 114. 115. 116. 117. 118. 119. 120. 121. 122. 123. 124.														

If there are not enough lines in this part, please continue recording your expenses on pages 36 – 37.

FR USE: None TR VC



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Exhibit 3. The Header-Cues Diary

Day 1 SUN MON TUE WED THU FRI SAT

← Please unfold the LEFT FLAP to see Examples

1. Food and Drinks Away from Home

lunch from drive-thru beer tab at happy hour Chinese takeout iced coffee breakfast buffet soda from vending machine
 child's school lunch wine at tavern carry-out lunch croissant from café deli sandwich hot dog from convenience store
 dinner & cocktails at restaurant beer at ballgame pizza delivery wedding reception caterer ice cream from truck popcorn & soda from movie

	Mark (X) one that best describes the type of meal				Description (see examples above and on the flap)	Mark (X) one that best describes where you made this purchase				Total Cost with tax & tip	If alcoholic beverages included, mark (X) all that apply			Enter the total cost of the alcohol
	breakfast	lunch	dinner	snack/other		Fast Food Take-out Delivery Concession	Full Service Places	Vending Machines or Mobile Vendors	Employer or School Cafeteria		wine	beer	other	
101.	1	2	3	4		1	2	3	4		1	2	3	
102.	1	2	3	4		1	2	3	4		1	2	3	
103.	1	2	3	4		1	2	3	4		1	2	3	
104.	1	2	3	4		1	2	3	4		1	2	3	
105.	1	2	3	4		1	2	3	4		1	2	3	
106.	1	2	3	4		1	2	3	4		1	2	3	
107.	1	2	3	4		1	2	3	4		1	2	3	
108.	1	2	3	4		1	2	3	4		1	2	3	
109.	1	2	3	4		1	2	3	4		1	2	3	
110.	1	2	3	4		1	2	3	4		1	2	3	
111.	1	2	3	4		1	2	3	4		1	2	3	
112.	1	2	3	4		1	2	3	4		1	2	3	
113.	1	2	3	4		1	2	3	4		1	2	3	
114.	1	2	3	4		1	2	3	4		1	2	3	
115.	1	2	3	4		1	2	3	4		1	2	3	
116.	1	2	3	4		1	2	3	4		1	2	3	
117.	1	2	3	4		1	2	3	4		1	2	3	
118.	1	2	3	4		1	2	3	4		1	2	3	
119.	1	2	3	4		1	2	3	4		1	2	3	
120.	1	2	3	4		1	2	3	4		1	2	3	
121.	1	2	3	4		1	2	3	4		1	2	3	
122.	1	2	3	4		1	2	3	4		1	2	3	

If there are not enough lines in this part, please continue recording your expenses on pages 36 – 37.

FR USE: None TR VC



FORM CE-801

Exhibit 4. The Modified Header-Cues Diary

Day 1 SUN MON TUE WED THU FRI SAT

1. Food and Drinks Away from Home

Examples: breakfast buffet pizza delivery beer at happy hour croissant from café soda from vending machine
 carry-out lunch Chinese takeout pretzels at ballgame ice cream from truck hot dog from convenience store
 dinner & cocktails at restaurant child's school lunch wine at tavern wedding reception caterer popcorn & soda at movies

← Please unfold the LEFT FLAP to see Additional Examples

	Mark (X) one that best describes the type of meal				Description (see examples above and on the flap)	Mark (X) one that best describes where you made this purchase				Total Cost with tax & tip	If alcoholic beverages included, mark (X) all that apply			Enter the total cost of the alcohol
	breakfast	lunch	dinner	snack/other		Fast Food Take-out Delivery Concession	Full Service Places	Vending Machines or Mobile Vendors	Employer or School Cafeteria		wine	beer	other	
101.	1	2	3	4		1	2	3	4		1	2	3	
102.	1	2	3	4		1	2	3	4		1	2	3	
103.	1	2	3	4		1	2	3	4		1	2	3	
104.	1	2	3	4		1	2	3	4		1	2	3	
105.	1	2	3	4		1	2	3	4		1	2	3	
106.	1	2	3	4		1	2	3	4		1	2	3	
107.	1	2	3	4		1	2	3	4		1	2	3	
108.	1	2	3	4		1	2	3	4		1	2	3	
109.	1	2	3	4		1	2	3	4		1	2	3	
110.	1	2	3	4		1	2	3	4		1	2	3	
111.	1	2	3	4		1	2	3	4		1	2	3	
112.	1	2	3	4		1	2	3	4		1	2	3	
113.	1	2	3	4		1	2	3	4		1	2	3	
114.	1	2	3	4		1	2	3	4		1	2	3	
115.	1	2	3	4		1	2	3	4		1	2	3	
116.	1	2	3	4		1	2	3	4		1	2	3	
117.	1	2	3	4		1	2	3	4		1	2	3	
118.	1	2	3	4		1	2	3	4		1	2	3	
119.	1	2	3	4		1	2	3	4		1	2	3	
120.	1	2	3	4		1	2	3	4		1	2	3	
121.	1	2	3	4		1	2	3	4		1	2	3	
122.	1	2	3	4		1	2	3	4		1	2	3	

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FORM CE-801

Characteristics of Nonresponders in the Consumer Expenditure Quarterly Interview Survey

SALLY E. REYES-MORALES

The Consumer Expenditure Quarterly Interview Survey collects data from selected consumer units (CUs) across the United States. Participating CUs are interviewed five times, and their responses from the second through fifth interviews provide data that are used in publications. Some CUs complete interviews 2 through 5; other CUs complete some, but not all, of these interviews; and some CUs do not complete any interviews. These CUs are called complete responders, intermittent responders, and nonresponders, respectively.

A study describing differences in demographic characteristics between complete and intermittent responders, and estimating the effect of nonresponses from intermittent responders on published consumer expenditure estimates, appeared in a previous U.S. Bureau of Labor Statistics (BLS) publication. (See “Characteristics of Complete and Intermittent Responders in the Consumer Expenditure Quarterly Interview Survey” by Sally E. Reyes-Morales, *Consumer Expenditure Survey Anthology*, 2003, Report 967, Sept. 2003.) This article presents results of a study of the characteristics of nonresponder CUs, who were excluded from the aforementioned study.

Background and definitions

The U.S. Census Bureau conducts the Consumer Expenditure Survey for BLS

to find out how Americans spend their money. Census Bureau field representatives collect data from a random sample of CUs chosen through systematic sampling of residential addresses across the United States. This sample is representative of the total U.S. civilian population not living in institutions.

The Consumer Expenditure Quarterly Interview Survey is a rotating panel survey. CUs are interviewed once per quarter for five consecutive quarters. After the fifth quarter, CUs leave the sample and are replaced by new CUs selected as before through systematic sampling of residential addresses.

In the initial interview, field representatives ask respondents to report all expenditures they made during the previous month. This interview is used only for “bounding” purposes—that is, to make sure the expenditures reported in the second through fifth interviews reflect the correct periods. In the second through fifth interviews, field representatives collect data for the 3 months prior to the interview. Only the expenditure data collected in the second through fifth interviews are used to compute official consumer expenditure estimates. Because data collected in each quarter are treated independently, annual estimates do not depend on CUs participating for all five quarters.

Terms used in this document are de-

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defined below:

Household. The people who occupy a housing unit. A housing unit is a house, an apartment, a mobile home, a room, or a group of rooms occupied (or intended to be occupied) as separate living quarters.

Consumer unit (CU). Members of a household related by blood, marriage, adoption, or some other legal arrangement; a single person living alone or sharing a household with others but who is financially independent; or two or more persons living together who share responsibility for at least two of the three major types of expenses: Food, housing, and other expenses. Students living in university housing are also included in the sample as separate consumer units.

Respondent. Ideally an adult household member who is familiar with all of the expenditures that his/her CU makes. An eligible respondent is any household member who is age 16 or older and who can answer questions on household and consumer unit composition accurately.

INSTAT. Interview status (ranges from 01 to 19):

01 = Interview

Type A noninterview:

02 = No one home
03 = Temporarily absent
04 = Refused
05 = Other Type A noninterview

Type B noninterview:

06 = Vacant (for rent)
07 = Vacant (for sale)
08 = Vacant (other)
09 = Occupied by person whose usual residence is elsewhere
10 = Under construction (not ready)
11 = Other Type B noninterview

Type C noninterview:

12 = Demolished
13 = House or mobile home moved
14 = Converted to nonresidential use
15 = Merged
16 = Condemned
17 = Located on military base
18 = CU moved
19 = Other Type C noninterview

Interview. Completed by an eligible CU

(INSTAT = 01).

Type A noninterview. Occurs when an address is within the scope of the survey and eligible for interview, but an interview is not obtained (INSTAT = 02 through 05).

Type B noninterview. Occurs when an address is within the scope of the survey but is not eligible for interview (INSTAT = 06 through 11).

Type C noninterview. Occurs when an address is out of the scope of the survey or is permanently ineligible for the survey sample (INSTAT = 12 through 19).

Record. Contains all the information relevant to each interview or noninterview. Each CU could have as many as five records.

Nonresponder CUs. CUs who did not complete interviews 2 through 5.

Eligible CUs. Nonresponder CUs assigned a Type A noninterview code in at least one of the last four records.

Ineligible CUs. Nonresponder CUs who had no Type A noninterview code in the last four records.

In-range CUs. CUs who were scheduled to participate in all five interviews between January 1997 and December 2000.

Out-of-range CUs. All CUs who were not in range.

Consumer units studied

Characteristics of nonresponder CUs are the focus of this study. Data were drawn from the universe of Consumer Expenditure Quarterly Interview Survey responder and nonresponder CUs (1997 through 2000) using the following criteria:

- Only in-range CUs were used, in order to track their history throughout the survey.

- Only nonresponder CUs were used in the study.

A summary of the 4 years of data appears in table 1. Because CUs could participate in the survey for five quarters, they could have as many as five records. Of the total number of CU records in the sample during the period of analysis, 71.5 percent (147,513 records) were in range; 28.5 percent were out of range. Of the in-range records, however, 76.1 percent were provided by complete and intermittent responders, who were excluded from the study.

Nonresponder CUs' records made up 17.1 percent of all records and 23.9 percent of in-range records (corresponding to 27.5 percent of in-range CUs). Nonresponder CUs were separated into those who were eligible and those who were ineligible for interview (table 2). Eligible nonresponder CUs were those assigned a Type A noninterview code for at least one of the last four interviews (interviews 2 through 5)—that is, those nonresponders who were eligible for interview during a particular survey quarter but did not participate in the survey for that period. Conversely, the nonresponder CUs categorized as ineligible were those CUs coded as Type B noninterviews (ineligible for interview because the residence was vacant, occupied by temporary residents, or under construction) or Type C noninterviews (out of the scope of the survey because the residence was demolished, abandoned, or converted to nonresidential use) for each of the last four interviews.

Most nonresponder CUs (62.2 percent) were categorized as ineligible for interview. The remaining 37.8 percent were eligible for interview at some point during the last four quarters of the survey but did not complete interviews. Accordingly, ineligible nonresponder CUs made up a larger percentage (53.1 percent) of records than did eligible nonresponder CUs (46.9 percent).

Although nonresponder CUs did not complete any of the last four interviews, some of them completed the first (bounding) interview. Nonresponder

CUs who completed the first interview accounted for 21.7 percent of all CUs in the study (9.1 percent of eligible CUs and 12.6 percent of ineligible CUs).

Of the ineligible nonresponder CUs, 74.8 percent were coded as Type B or Type C noninterview at the initial interview. This shows that most ineligible nonresponder CUs were true nonresponders, as defined for the survey: they were ineligible for interview and did not contribute to the survey's response rate. The remaining 25.1 percent can be divided into those that completed the first interview (20.3 percent) and those for whom the first interview resulted in a Type A noninterview (4.8 percent).

Reasons for dropping out of the survey

Reasons for which CUs dropped out of the survey can be identified by the interview code of the first noninterview.

Table 3 shows that, among eligible nonresponder CUs, refusal was the most common reason for nonparticipation, accounting for 81.2 percent of nonresponder CUs who completed the first interview and 79.0 percent of those who did not complete the first interview. (Four out of five instances of nonparticipation in the survey were due to the refusal of the CU respondent.) The second most common reason was an "Other Type A noninterview," accounting for 15.4 percent of those who did and 13.0 percent of those who did not complete the first interview. Because the rankings of the reasons for nonparticipation and their respective percentages were similar for both categories, completion or noncompletion of the first interview seems to have factored little in a CU dropping out of the survey.

Ineligible nonresponders can be partitioned into three distinct groups. (See table 4.) The first group comprises CUs who participated in the first interview but became ineligible for subsequent interviews. In this group there are more CUs coded Type B noninterview (57.8 percent) than Type C noninterview (42.1 percent).

CUs who were coded as a Type A

noninterview for the first interview and became ineligible for subsequent interviews constitute the second group. For these CUs, the leading reason for not participating in the survey (61.7 percent of the responses) was refusal; the other reasons were combined into "Other Type A noninterview" (38.3 percent).

The last group of ineligible CUs included those who did not complete any of the five interviews and for which none of the noninterviews were coded as Type A. For these CUs, the bounding interview was coded as a Type B noninterview (ineligible; 63.0 percent) or as a Type C noninterview (out of scope; 37.0 percent).

There were no conversions to Type A noninterview in any of the four subsequent interviews for any of the three groups of ineligible CUs.

Household and respondent characteristics

The demographic characteristics of the nonresponders at the household and CU levels are summarized in tables 5, 6, and 7. Household tenure, race, and mean family size cannot be obtained for ineligible CUs, but degree of urbanization (urban or rural) and CUs per household (one or multiple) are presented in table 5 from all five interviews for eligible and ineligible CUs. Percentages of rural CUs and multiple-CU households are larger for ineligible CUs than for eligible CUs (37.7 percent and 3.4 percent compared with 18.4 percent and 2.0 percent, respectively). The relatively high percentage of rural households in the ineligible column may suggest a problem with the rural sampling frame (the list of all addresses in the target population from which the sample is selected.) The sampling frame may be more accurate in urban areas; the rural sampling frame may contain addresses that are out of the scope of this survey.

Comparative statistics about the demographic characteristics of the nonresponder CUs at the household and consumer-unit levels are given in tables 6 and 7.

Table 6 presents the race, sex, mari-

tal status, age range, and education of respondents from eligible and ineligible CUs who completed the first interview. Respondents from eligible nonresponder CUs who completed the first interview tended to be White (78.9 percent) women (59.1 percent) who were married (43.1 percent), were 65 or older (16.8 percent), and had at most a high school diploma (28.8 percent). Respondents from ineligible nonresponder CUs who completed the first interview were mostly White (80.6 percent) women (53.9 percent) who had never married (41.9 percent), were under 25 years old (24.1 percent), and had at most some college or an associate degree (36.6 percent).

Both eligible and ineligible nonresponder CUs had high percentages of white female respondents. Eligible CUs had a higher percentage of married respondents than of any other category, while ineligible CUs had a higher percentage of those who never married than of any other category. Eligible CUs had a higher percentage of respondents aged 65 and older, and ineligible CUs a higher percentage of respondents under age 25. Eligible CUs had a larger percentage of respondents whose highest educational level was high school, whereas ineligible CUs had a larger percentage of respondents with some college or associate degree.

Table 7 gives summary statistics about characteristics of eligible nonresponder CUs who had Type A noninterviews. Eligible CUs are separated into two groups, those who completed the first interview and those who did not. Mean family size was slightly greater (2.4) for CUs who completed the first interview than for those who did not (2.2). Percentages of urban CUs and one-CU households differed little between CUs who completed the first interview and those who did not—78.2 percent and 97.5 percent compared with 81.9 percent and 98.6 percent, respectively.

There appears to be a relationship between household tenure and race and whether an eligible nonresponder CU completed the first interview. The percentage of homeowners was higher among those who completed the

first interview than among those who did not complete the first interview. Similarly, the percentages of Blacks or African Americans; American Indians, Aleuts, or Eskimos; and Asians or Pacific Islanders were higher among those who completed the first interview than among those who did not.

Conclusion

The study presented in this article, based on Consumer Expenditure Quarterly Interview Survey data collected from 1997 to 2000, led to the following conclusions:

- Most nonresponder CUs were in-

eligible CUs, or true nonresponder CUs, as defined for the survey.

- Most nonresponder CUs were urban, one-CU households (although a high percentage of ineligible CUs in rural areas may suggest a problem with the rural sampling frame).
- The most common reason for the nonparticipation of eligible nonresponder CUs was refusal.
- Most respondents from nonresponder CUs who completed the

first interview were White women with high school diplomas or with some college or an associate degree. (From this group, eligible CU respondents were mostly married and older, whereas ineligible CU respondents were mostly younger and had never married.)

- Eligible nonresponder CUs who completed the first interview were more likely to be homeowners and to include a smaller percentage of Whites than were those who did not complete the first interview. ■

Table 1. Summary data from the Consumer Expenditure Quarterly Interview Survey, 1997-2000

Type of consumer unit (CU)	Number of records	Percent of records	Percent of in-range records	Number of in-range CUs	Percent of in-range CUs
Total	206,339	100.0	—	—	—
In range ¹	147,513	71.5	100.0	34,286	100.0
Complete and intermittent responders	112,318	54.4	76.1	24,860	72.5
Nonresponders	35,195	17.1	23.9	9,426	27.5
Out of range	58,826	28.5	—	—	—

¹ In-range CUs were those scheduled to participate in all five interviews between January 1997 and December 2000.
NOTE: Dash indicates inapplicability.

Table 2. In-range¹ nonresponder consumer units (CUs) in the Consumer Expenditure Quarterly Interview Survey, 1997-2000

Type	All CUs	Percent of all CUs	Percent of CUs by category	All records	Percent of all records	Type A records	Percent of Type A records
Total	9,426	100.0	—	35,195	100.0	11,868	100.0
Eligible CUs ²	3,567	37.8	100.0	16,516	46.9	11,868	100.0
Completed first interview	858	9.1	24.1	4,119	11.7	2,827	23.8
Did not complete first interview ..	2,709	28.7	75.9	12,397	35.2	9,041	76.2
Ineligible CUs	5,859	62.2	100.0	18,679	53.1	0	.0
Completed first interview	1,192	12.6	20.3	3,593	10.2	0	.0
First interview was Type A	282	3.0	4.8	794	2.3	0	.0
First interview was Type B/C	4,385	46.5	74.8	14,292	40.6	0	.0

¹ In-range CUs were those scheduled to participate in all five interviews between January 1997 and December 2000.

² Eligible CUs were assigned a Type A noninterview code in at least one of the last four records; ineligible CUs had no Type A noninterview code in the last four records.

NOTE: Dash indicates inapplicability.

Table 3. Reasons for which eligible¹ nonresponder consumer units (CUs) dropped out of the Consumer Expenditure Quarterly Interview Survey, 1997-2000

(Percent of CUs)

Reason	Completed first interview	Did not complete first interview
Refusal	81.2	79.0
Other Type A noninterview	15.4	13.0
(temporary absences, noncontacts, and other)		
Type B noninterview	3.3	8.0
(residence was vacant, occupied by a person whose usual residence was elsewhere, or under construction)		
Type C noninterview .....	.1	.0
(residence was demolished, moved, converted to nonresidential use, merged, condemned, or on a military base, or CU moved)		
Total	100.0	100.0

¹ Eligible CUs were assigned a Type A noninterview code in at least one of the last four records.

Table 4. Reasons for which ineligible¹ nonresponder consumer units (CUs) dropped out of the Consumer Expenditure Quarterly Interview Survey, 1997-2000

(Percent of CUs)

Reason	Completed first interview	Type A first interview	Type B/C first interview
Refusal	0.0	61.7	0.0
Other Type A noninterview .....	.0	38.3	.0
(temporary absences, noncontacts, and other)			
Type B noninterview	57.8	.0	63.0
(residence was vacant, occupied by a person whose usual residence was elsewhere, or under construction)			
Type C noninterview	42.1	.0	37.0
(residence was demolished, moved, converted to nonresidential use, merged, condemned, or on a military base, or CU moved)			
No records .....	.1	.0	.0
Total	100.0	100.0	100.0

¹ Ineligible CUs had no Type A noninterview code in the last four records.

Table 5. Household characteristics of nonresponder consumer units (CUs) in the Consumer Expenditure Quarterly Interview Survey, 1997-2000

(Percent of records in each category)

Characteristic	Eligible ¹ CUs	Ineligible CUs
Degree of urbanization:		
Urban	81.6	62.3
Rural	18.4	37.7
Total	100.0	100.0
CUs per household:		
One	98.0	96.6
Multiple	2.0	3.4
Total	100.0	100.0

¹ Eligible CUs were assigned a Type A noninterview code in at least one of the last four records; ineligible CUs had no Type A noninterview code in the last four records.

Table 6. **Characteristics of respondents¹ from nonresponder consumer units (CUs) who completed the first interview for the Consumer Expenditure Quarterly Interview Survey, 1997-2000**

(Percent)

Characteristic	Eligible ² CUs	Ineligible CUs
Race:		
White	78.9	80.6
Black	12.3	10.9
American Indian, Aleut, Eskimo	1.5	1.8
Asian or Pacific Islander	5.5	3.8
Other .....	.4	1.3
No information	1.5	1.6
Sex:		
Male	40.9	45.9
Female	59.1	53.9
No information .....	.0	.2
Marital status:		
Married	43.1	27.3
Widowed	12.3	9.9
Divorced	15.1	17.1
Separated	3.0	3.7
Never married	25.6	41.9
No information .....	.8	.2
Age range:		
24 or younger	9.4	24.1
25 to 34	16.6	17.3
35 to 44	13.9	13.9
45 to 54	14.5	11.2
55 to 64	11.5	6.5
65 and older	16.8	9.8
No information	17.3	17.3
Highest level of education:		
Never attended or no high school diploma	14.3	14.3
High school diploma	28.8	24.0
Some college or associate degree	27.7	36.6
Bachelor's degree	17.7	12.8
Master's, professional school, or doctoral degree	6.7	6.4
No information	4.8	5.9

¹ For 125 eligible and 127 ineligible CUs, the respondent was not identified; as a result, those CUs were excluded from the calculations.

² Eligible CUs were assigned a Type A noninterview code in at least one of the last four records; ineligible CUs had no Type A noninterview code in the last four records.

NOTE: Percentages do not all add to 100 due to rounding.

Table 7. **Household characteristics of eligible¹ nonresponder CUs in the Consumer Expenditure Quarterly Interview Survey, 1997-2000**

Characteristic ²	Completed first interview	Did not complete first interview
Mean family size	2.4	2.2
Other characteristic (Percent of households)		
Degree of urbanization:		
Urban	78.2	81.9
Rural	21.8	18.1
CUs per household:		
One	97.5	98.6
Multiple	2.5	1.4
Household tenure:		
Homeowner	81.0	69.0
Renter or other	19.0	31.0
Household race:		
White	81.8	87.1
Black	11.7	8.7
American Indian, Aleut, Eskimo	1.1	.7
Asian or Pacific Islander	5.4	3.6

¹ Eligible CUs were assigned a Type A noninterview code in at least one of the last four records.

² Data are from all Type A noninterview records.

NOTE: Percentages do not all add to 100 due to rounding.

Determining Area Sample Sizes for the Consumer Expenditure Survey

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The Consumer Expenditure Survey (CE) is a national household survey conducted by the U.S. Bureau of Labor Statistics (BLS) to find out how Americans spend their money. The survey's sample design, based on the decennial census, is updated approximately every 10 years. At that time, many decisions need to be made, such as the number of geographic areas in which to collect data and the number of households from which to collect data in each area. This article describes a new method for making these decisions, one that has been incorporated in the sample design to be introduced in 2005.

Background

The CE is used to produce the most accurate estimate of consumer expenditures possible at the national level. The U.S. Consumer Price Index (CPI) program relies on CE data to produce inflation estimates. The most comprehensive CPI is based on the expenditure patterns of consumers in urban and metropolitan areas and is denoted CPI-U. The CPI-U population represents about 87 percent of the total U.S. population. The CE is designed to balance the goals of the CE and CPI programs. These goals compete with each other when BLS allocates the CE's nationwide sample of households to geographic areas covered by the two programs.

The number of households in the CE's national sample is determined by the survey's data collection budget. Allocating this fixed number of households to individual geographic areas must be done in a way that satisfies the competing goals of the CE and CPI programs as much as possible. The CE program's goal is to allocate the sample households to the selected geographic areas in proportion to their share of the U.S. population, whereas the CPI program's goal is to allocate sample households to the selected urban areas in proportion to their share of the Nation's urban population. The CPI program further strives to include a minimum number of households in each selected urban area to ensure the statistical quality of its published price indexes for those areas.

This article describes a new automated method of allocating the CE's nationwide sample of households in a way that balances competing goals and constraints. The CE actually consists of two surveys, the Diary and Interview surveys, but this article focuses on the Interview survey.

Geographic areas in the CE sample

The selection of households for the survey begins with the definition and selection of primary sampling units (PSUs), which consist of counties (or parts thereof), groups of counties, or

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independent cities. The sample design currently used in the survey, based on the 1990 census, consists of 105 PSUs, classified into 4 size categories:

- 31 “A” PSUs, which are metropolitan statistical areas (MSAs) with a population of 1.5 million or greater
- 46 “B” PSUs, which are MSAs with a population less than 1.5 million
- 10 “C” PSUs, which are nonmetropolitan urban areas
- 18 “D” PSUs, which are nonmetropolitan rural areas. The “D” PSUs are used in the CE program but not in the CPI program.

These 105 PSUs are grouped according to the geographic areas they represent. A populous PSU constitutes its own geographic area, which is called a “self-representing” geographic area. The 31 A PSUs are self-representing geographic areas, and they are in the sample with certainty. The 74 B, C, and D PSUs are “non-self-representing” PSUs. They were randomly selected to represent all of the less populous PSUs in the Nation. The 74 non-self-representing PSUs are grouped into 11 geographic areas called region-size classes, which are formed by cross-classifying the 4 regions of the country (Northeast, Midwest, South, and West) with the 3 size classes (B,C, and D) as shown in the shaded area of the table below. There are only 11 region-size classes for the areas that are not self-representing because no C PSUs were selected in the Northeast.

These 11 region-size classes are treated just like the 31 A PSUs and are also referred to as self-representing geographic areas. Hence, the CE can be thought of as having 42 self-representing geographic areas: 31 A PSUs plus 11 region-size classes for the smaller PSUs. Because the 4 D region-size classes are used by the CE only, there are only 38 self-representing geographic areas used by the CPI.

The sample allocation problem

In the CE’s current sample design, usable interviews are collected from 7,760 households¹ in each calendar quarter of the year: 4,260 households in the A PSUs, and 3,500 households in the B, C, and D PSUs. To guarantee that enough data are collected to satisfy CPI’s publication requirements, the sample of 7,760 households is allocated so that at least 120 usable interviews are obtained in each of the 38 geographic areas used by the CPI, with no minimum number of usable interviews required in the 4 D geographic areas.

Thus, the problem is to allocate the 7,760 households in the CE’s national sample to the 42 geographic areas in a way that satisfies the following constraints:

- The 31 A PSUs are allotted 4,260 households.
- The 11 B, C, and D region-size classes are allotted 3,500 households.
- Each of the 38 geographic areas used in the CPI is allotted 120 or more households.

BLS staff recently reevaluated the minimum sample size requirement of 120 usable interviews to determine whether it is still an appropriate number. One of the results of the reevaluation was the development of a new automated method of allocating the nationwide sample of households to geographic areas. The new method allowed repeated analyses to be conducted quickly and easily using different minimum sample size requirements. The method involved setting up the sample allocation problem as a mathematical optimization problem and using SAS statistical software to solve it.

Target versus required sample size

In the past, there were various interpretations of the word “required” in the phrase “minimum required sample size.” At times, the requirement that at least 120 usable interviews be obtained was interpreted as a target sample size, meaning that the expected number of usable interviews should be at least 120:

$$E(x_i) \geq 120.$$

At other times, it was interpreted as a required sample size, meaning that there should be a very high probability that at least 120 interviews be obtained,

$$P \{ x_i \geq 120 \} \geq 0.95$$

where x_i is the number of usable interviews collected in geographic area = i .

For example, under the first interpretation (target sample size), data collectors would have to visit 185 households in each quarter of the year to collect 120 usable interviews in the Boston metropolitan area, assuming that usable interviews are obtained at 65 percent of the residential addresses in the CE’s sample.²

$$E(x_i) = 185 \times 0.65 = 120$$

Table 1. PSU region-size classes

Region	Size				Total
	A	B	C	D	
Northeast	6	8	—	4	18
Midwest	8	10	4	4	26
South	7	22	4	8	41
West	10	6	2	2	20
Total	31	46	10	18	105

¹ In 2000 the average number of usable interviews collected per quarter in the CE Interview Survey was 7,760.

² Approximately 15 percent of the residential addresses selected for the CE Interview Survey are ineligible for the survey, and 20 percent do not participate in the survey due to refusal or to no one being home. This leaves 65 percent of the sample to participate in the survey.

However, under the second interpretation (required sample size), data collectors would have to visit 202 households to be 95-percent certain of getting at least 120 usable interviews, again assuming a 65-percent survey participation rate.

$$P \{ x_i \geq 120 \} =$$

$$\sum_{k=120}^{202} \binom{202}{k} 0.65^k (1 - 0.65)^{202-k} = 0.95$$

Table 2 shows the difference in the sample size that would be needed for a target versus a required minimum number of usable interviews. The number of selected addresses needed to achieve a target minimum sample size is approximately 10 percent less than that needed for a required sample size.

The estimates in table 2 were produced using formulas from the binomial distribution for the mean and variance of the number of usable interviews,

$$\mu = E(x_i) = 0.65n$$

$$\sigma^2 = V(x_i) = 0.65(1 - 0.65)n$$

and the normal distribution was used to approximate the binomial distribution to estimate a 95-percent confidence interval on the number of usable interviews:

One-sided confidence interval:

$$[\mu - 1.64\sigma, +\infty)$$

Two-sided confidence interval:

$$[\mu - 1.96\sigma, \mu + 1.96\sigma]$$

After some discussion, staff decided that target sample sizes would be satisfactory. Because the widths of the two-sided confidence intervals are relatively small, it is unlikely that any sample sizes achieved will be greatly below the target level.

Setting up the optimization problem

The CE's current sample design calls for allocating 7,760 households to the 42 geographic areas in a way that satisfies the three constraints mentioned previously.

These constraints can be written in mathematical terms as follows:

- $x_1 + x_2 + \dots + x_{31} = 4,260$
- $x_{32} + x_{33} + \dots + x_{42} = 3,500$
- $x_i \geq 120$ for $i = 1, 2, \dots, 38$

where x_i is the number of usable interviews collected in geographic area= i .

Again, the objective of the CE's sample design is to allocate the nationwide sample of households to geo-

graphic areas in a way that minimizes the standard error of the expenditures estimate at the national level. Allocating the sample in proportion to the population that each geographic area represents comes very close to achieving that goal. Although this allocation does not minimize the nationwide standard error, it is a very simple sample design that is known to achieve near minimization. Staff chose to implement this method because of its simplicity and its near optimal properties.

Based on research and evaluation, staff modified the sample allocation problem described above. More of the CE's sample households were allocated to the urban portion of the Nation (of interest to the CPI), and fewer households were allocated to rural areas. This change results in a slight oversampling of the urban areas: The CPI-U population represents about 87 percent of the total U.S. population, but it is given 95 percent of the CE's sample. An analysis showed that limiting the rural sample to 400 households would have a minimal effect on the nationwide standard error of the CE's expenditure estimates. Thus, the revised optimization problem allocates exactly 400 households to the 4 rural geographic areas, leaving 7,360 households to be allocated to the 38 urban geographic areas.

For some of the geographic areas with small populations—for example, Anchorage and Honolulu—the requirement that at least 120 usable interviews be collected during each calendar quarter conflicts with the objective of allocating the sample in proportion to the population. For example, the Anchorage metropolitan area has approximately 0.09 percent of the U.S. population, and allocating the 7,760 usable interviews proportionally would give Anchorage only enough addresses to obtain 7 usable interviews—not 120.

Because an exact proportional allocation cannot be achieved within the given constraints, BLS staff decided to allocate the sample as proportionally as possible. This involved setting up a least-squares problem to square the

Table 2. Sample size needed to obtain a target versus a required minimum number of usable interviews for the Consumer Expenditure Survey

Number of sample households (n)	Expected number of usable interviews assuming a 65-percent survey participation rate (=0.65n)	95-percent confidence interval
Target sample size (two-sided 95-percent confidence interval)		
62	40	[33, 47]
92	60	[51, 69]
123	80	[70, 90]
154	100	[88, 112]
185	120	[107, 133]
215	140	[126, 154]
Required sample size (one-sided 95-percent confidence interval)		
72	47	[40, +∞)
105	68	[60, +∞)
137	89	[80, +∞)
170	110	[100, +∞)
202	131	[120, +∞)
234	152	[140, +∞)

difference between each geographic area's proportion of the population and its proportion of the sample and then minimize the sum of those 42 squared differences.

Thus, the optimization task is to solve the following constrained least-squares problem:

Given values of n , p_i , and p ,
find values of n_i that

$$\begin{aligned} &\text{Minimize} && \sum_{i=1}^{42} \left(\frac{n_i - p_i}{n} \right)^2 \\ &\text{Subject to} && \\ &&& n_1 + n_2 + \dots + n_{38} = 7,360 \\ &&& n_{39} + n_{40} + n_{41} + n_{42} = 400 \\ &&& n_i \geq 120 \text{ for } i = 1, 2, \dots, 38 \\ &&& n_i \geq 0 \text{ for } i = 39, \dots, 42 \end{aligned}$$

where

- n_i = number of housing units assigned to geographic area = i
- n = number of housing units nationwide ($n = 7,760$)
- p_i = population of geographic area = i
- p = population in all geographic areas ($p = p_1 + p_2 + \dots + p_{42}$)

Solving the optimization problem

The optimization problem described above can be seen to have both equality and inequality constraints. This creates a practical problem because optimization problems with equality constraints are usually solved with different techniques than those with inequality constraints. Least-squares problems with equality constraints are usually solved with linear algebra and linear regression theory, while problems with inequality constraints are usually solved with iterative search techniques. Fortunately, the SAS[®] procedure for nonlinear programming (PROC NLP) can handle both kinds of constraints simultaneously. An example using this SAS[®] procedure to solve the problem above is given at the end of this paper.

Estimating the standard error

The variance of the estimate of con-

Table 3. The effect of changes in minimum target sample size on the standard error for the Consumer Expenditure Survey

Minimum target sample for each primary sampling unit	Percent change in standard error (from SE for a minimum target sample size of 120)
0	-4.16
10	-4.16
20	-4.15
30	-4.10
40	-4.04
50	-3.96
60	-3.88
70	-3.74
80	-3.54
90	-3.21
100	-2.72
110	-2.04
120	-1.14
130	+0.06
140	+1.45
150	+3.28
160	+5.63
170	+10.07
180	+14.41

sumer expenditures resulting from the sample allocation process described above was estimated using the following formula:

$$\begin{aligned} V(\bar{x}) &= V\left(\sum_{i=1}^{42} \left(\frac{p_i}{p}\right) \bar{x}_i\right) \\ &= \sum_{i=1}^{42} \left(\frac{p_i}{p}\right)^2 V(\bar{x}_i) \\ &= \sum_{i=1}^{42} \left(\frac{p_i}{p}\right)^2 \frac{\sigma^2}{n_i} \end{aligned}$$

where

\bar{x}_i = sample mean of geographic area = i

$$\begin{aligned} \bar{x} &= \text{sample mean of the Nation} \\ &= \frac{\sum_{i=1}^{42} p_i \bar{x}_i}{\sum_{i=1}^{42} p_i} = \frac{\sum_{i=1}^{42} p_i \bar{x}_i}{p} = \sum_{i=1}^{42} \left(\frac{p_i}{p}\right) \bar{x}_i \end{aligned}$$

σ^2 = expenditure variance of a randomly selected household

The variance of the estimate of consumer expenditures under the proposed sample allocation method is estimated by substituting the values of n_i obtained from the optimization problem (the output of PROC NLP) into the formula

$$V(\bar{x}) = \sum_{i=1}^{42} \left(\frac{p_i}{p}\right)^2 \frac{\sigma^2}{n_i}$$

Then the standard error is computed by taking the square root of the variance.

$$SE = \sqrt{\sum_{i=1}^{42} \left(\frac{p_i}{p}\right)^2 \frac{\sigma^2}{n_i}}$$

This formula allows comparisons to be made with the current method of sample allocation. The value of σ does not have to be known because the change in standard error is the number of interest; when the ratio of two estimates of the standard error is taken (to compare the standard error of using, say, 80 as the minimum sample size instead of 120), the σ in the numerator and the σ in the denominator cancel each other.

Standard error with different minimum sample size requirements

After allocating the CE's nationwide sample to individual geographic areas using PROC NLP, staff computed the percentage change in standard error for various minimum target sample sizes. The baseline used in the comparison was the current sample allocation. The current minimum target sample size is around 120, but for technical reasons it is not exactly equal to 120. The results

Chart 1. Changes in the Consumer Expenditure Survey's standard error with minimum sample size

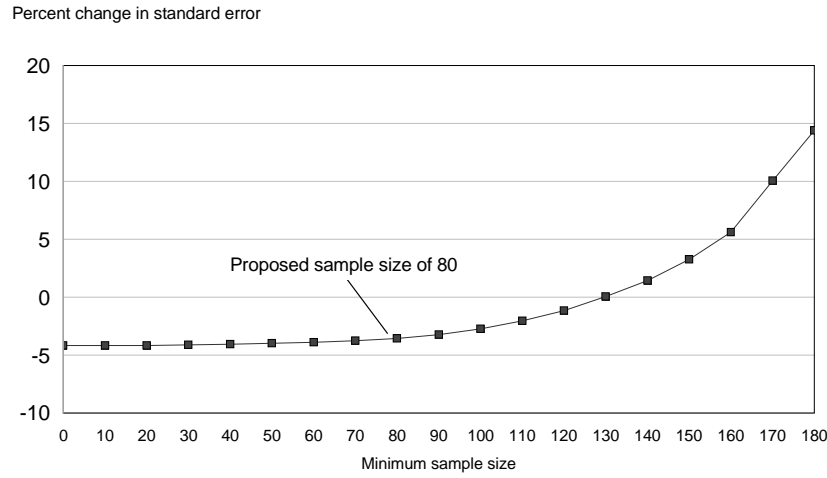


Table 4. The effect of changing sample allocations on the standard error for the Consumer Expenditure Survey: Primary sampling units in the West

Primary sampling unit	Population	Current sample size	Proposed sample size	Percent change in standard error
A419 Los Angeles	8,863,164	231	290	-10.81
A420 Greater Los Angeles	5,668,365	152	187	-9.88
A422 San Francisco	6,253,311	158	206	-12.44
A423 Seattle	2,970,328	119	100	+9.08
A424 San Diego	2,498,016	104	85	+10.78
A425 Portland	1,793,476	130	80	+27.48
A426 Honolulu	836,231	112	80	+18.32
A427 Anchorage	226,338	125	80	+25.00
A429 Phoenix	2,238,480	132	80	+28.45
A433 Denver	1,980,140	121	80	+22.98
Total U.S.	240,218,238	7,760	7,760	-3.54

NOTE: Minimum target sample size is 80.

of the comparisons are shown above in table 3.

Standard error is minimized when the sample is allocated directly in proportion to population—that is, when 0 is the minimum number of usable interviews required in each geographic area (table 3). Reducing the target number of usable interviews from 120 to 0 would reduce the standard error by 4.16 percent. Standard error is maximized when the sample is divided equally among all geographic areas—180 usable interviews per geographic area. Increasing the target number of usable interviews from 120 to 180 would increase the standard error by 14.41 percent.

Reducing the minimum target number of usable interviews from 120 to 80 per geographic area would reduce the

standard error by 3.54 percent. Nearly all the reduction in standard error is achieved by reducing the minimum target sample size to 80, and little further reduction is achieved by reducing the minimum target sample size below 80 (chart 1). Therefore, staff decided to reduce the minimum target sample size from 120 to 80 usable interviews per geographic area.

Other effects of the proposed allocation

A minimum target sample size of 80 usable interviews per geographic area reduces the national standard error by 3.54 percent and reduces the standard error in the urban portion of the Nation by 3.86 percent. After some discussion, staff decided that a minimum target

sample size of 80 would be satisfactory for both surveys because the overall standard error would be reduced and publication criteria met for both the CE and CPI programs.

Table 4 shows current and proposed sample sizes for A PSUs in the West after applying the proposed sample allocation method. The PSUs with populations larger than 4 million will have their sample sizes increased, while the PSUs with populations less than 4 million will have their sample sizes decreased. This change will decrease the standard error in the larger A PSUs and increase the standard error in the smaller A PSUs, but the standard error for the Nation as a whole will be reduced.

BLS staff tested other methods to find one that satisfied the goals of both the CE and CPI programs. Some of the other methods tested had a positive effect on reducing the standard error for CE, but not for CPI, and vice versa. The chosen method reduced CE and CPI standard errors by about the same amount, 3.54 percent and 3.86 percent, respectively.

Conclusion

A new sample design for the CE will be introduced in 2005. Based on analysis of the current design, the new method of sample allocation could reduce the standard error of the estimate of consumer expenditures at the national level by from 3 percent to 4 percent.

The CE and CPI programs' competing goals and constraints complicated the process of allocating households to geographic areas in constructing the CE's national sample. CE program staff wanted to allocate the sample in a way that minimized the national variance, while CPI program staff wanted to minimize the variance of the urban portion of the Nation and also limit the variance of individual sampled areas. Setting up a mathematical optimization problem and then solving a constrained least-squares problem led to a solution that satisfied the requirements of both the CE and the CPI programs.

Writing the problem as a formal mathematical optimization problem had several advantages:

- It required the objectives and constraints to be stated clearly and explicitly.
- It helped document the allocation process.
- It allowed several different allocation methods to be tested quickly and easily.
- It led to an optimal solution to the problem.

This approach offers clear benefits for allocating the CE's nationwide sample of households to individual geographic areas while satisfying the CE and CPI programs' competing goals. ■

APPENDIX: Automating the Sample Allocation Process

Below is the optimization problem for the sample allocation, along with a SAS® program (PROC NLP) that solves it.

Given values of n , p_i , and p ,

find values of n_i that

Minimize

$$\sum_{i=1}^{42} \left(\frac{n_i}{n} - \frac{p_i}{p} \right)^2$$

Subject to

$$n_1 + n_2 + \dots + n_{38} = 7,360$$

$$n_{39} + n_{40} + n_{41} + n_{42} = 400$$

$$n_i \geq 80 \text{ for } i = 1, 2, \dots, 38$$

$$n_i \geq 0 \text{ for } i = 39, \dots, 42$$

Where

n_i = number of housing units assigned to geographic area = i

n = number of housing units nationwide ($n = 7,760$)

p_i = population of geographic area = i

p = population in all geographic areas ($p = p_1 + p_2 + \dots + p_{42}$)

```
*****
* COMPUTE THE SQUARED DIFFERENCE BETWEEN EACH *
* AREA'S PROPORTION OF THE POPULATION & ITS *
* PROPORTION OF THE SAMPLE. *
*****;
%MACRO MAC1;
SUM_POP = SUM(OF POP1-POP42);
%DO I=1 %TO 42;
  SQR&I = ((N&I/7760) - (POP&I/SUM_POP))**2;
%END;
%MEND MAC1;

*****
* SOLVE A CONSTRAINED LEAST-SQUARES PROBLEM TO *
* FIND THE NUMBER OF HOUSEHOLDS IN EACH PSU *
* THAT MINIMIZES THE SUM OF SQUARED DIFFERENCES *
*****;

PROC NLP DATA=POP_DATA (KEEP=POP1-POP42) NOPRINT
  OUT=RESULTS (KEEP=N1-N42)

  /* CONVERGENCE CRITERIA */
  GCONV=1E-15 FCONV2=1E-15 MAXITER=100000;

  /* DECISION VARIABLES */
  DECVAR N1-N42;

  /* COMPUTE THE SQUARED DIFFERENCES */
  %MAC1;

  /* SUM THE SQUARED DIFFERENCES */
  F1=SUM(OF SQR1-SQR42);

  /* FUNCTION TO BE MINIMIZED */
  MIN F1;

  /* PROBLEM CONSTRAINTS */
  BOUNDS N1-N38 >= 80, N39-N42 >= 0;
  NLINCON F2=7360, F3=400;
  F2=SUM(OF N1-N38);
  F3=SUM(OF N39-N42);
RUN;
```


Part II.
Analyses Using Survey Data

From AFDC to TANF: Have the New Public Assistance Laws Affected Consumer Spending of Recipients?

LAURA PASZKIEWICZ

Introduction

The Personal Responsibility and Work Opportunity Reconciliation Act of 1996 (the Welfare Reform Act) replaced the previous welfare program, Aid to Families with Dependent Children (AFDC), with a new program, Temporary Assistance for Needy Families (TANF). The new program gives block grants to States to design their own welfare programs—provided that they meet certain Federal guidelines. One of the main requirements is to limit the amount of time that a person can receive welfare (hence, temporary assistance).

Since the implementation of the new laws, numerous research projects have investigated just how well TANF has been doing. Some studies have looked at how the welfare reform affects different groups of people, employment and earnings, and family structure.

This study looks at how the welfare reform has affected the spending patterns of welfare recipients. Looking at spending can give insights into welfare recipients' quality of life.

Using the Consumer Expenditure Survey (CE), a comparison of data on welfare recipients prior to TANF (1988-89), during the transition to TANF (1997-98), and post-TANF (2001-02) was made. An analysis of the sample characteristics of welfare recipients over the three time periods was done, as well as an analysis of expenditure patterns.

A brief overview of TANF

The welfare reform established block grants for States to develop their own welfare programs as long as certain requirements were met. States were mandated to limit the amount of time that recipients could receive funds, to require that recipients work when ready or after 24 months of receiving assistance, and to establish goals to reduce out-of-wedlock pregnancies.

Prior to the Welfare Reform Act, as far back as 1987, some States had already established welfare programs similar to TANF.¹ The Welfare Reform Act was passed in 1996 and fully implemented in all states by 1998. Data from 1997-98 were used to look at TANF's transition period, and data from 2001-02 were used to look at the post-TANF time period.

In 2003, TANF was due for reauthorization in Congress. A bill reauthorizing TANF was passed in the House of Representatives, but not in the Senate. Funding was extended by Congress through March of 2005.

¹ This article assumes that these States would not have a large effect on the welfare population in the 2 years following the development of their programs. Due to the design of the CE, data from 1988-89 were more accessible than earlier data (from 1986-87), so these data were used to reflect the welfare population prior to TANF.

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The sample

Data on welfare receipts are collected in the income section (section 22) of the Interview Survey in the CE. Established survey participants are asked to answer the income section of the questionnaire during the second and fifth interviews. Respondents who replace original CUs are also asked to report their income for section 22 at the time that they enter the survey. Income information from the second interview is carried over to the third and fourth interviews.

The screener question about welfare has changed over the three time periods of interest. For 1988 and 1989 (prior to TANF), each respondent was asked the following question about welfare receipts and other forms of income:

“During the past 12 months, did you (or any member of your CU) receive income from...worker’s or unemployment compensation; veteran’s payments; public assistance or welfare from Federal, State, or local welfare offices?”

If the respondent replied that he or she had received some form of assistance, he or she was then asked for each amount individually:

“How much was received from public assistance or welfare, including money received from job training grants, such as Job Corps?”

If a respondent answered affirmatively to the screener question but did not know or refused to say the amount, then there was no way to know which type of assistance was collected.

The question used during 1997 and 1998 (transition to TANF) asked the respondent about welfare assistance separately from other forms of assistance and grouped the screener question and the amount question together:

“During the past 12 months, did you (or any member of your CU) receive income from...public assistance or welfare, including money received from job training grants, such as Job Corps?”

If the respondent answered affirmatively, the interviewer asked:

“What was the total amount received by all CU members?”

For 2001 and 2002 (post TANF), the questions about welfare were similar to those used during 1997 and 1998, but the wording specified the AFDC and Job Corps programs²:

“During the last 12 months, did you (or any member of your CU) receive any income from...public assistance or welfare, such as AFDC and grants from Job Corps? Do not include non-monetary assistance, such as food stamps.”

If the respondent answered affirmatively, the interviewer asked:

“What was the total amount received by all CU members?”

An additional difference in the 2001 and 2002 questionnaires was the introduction of income ranges or brackets in section 22. If the respondent did not know or refused to say the amount of the welfare payments received, he or she would be shown a number of brackets and asked to indicate which bracket the amount fell in. The introduction of brackets decreased the percentage of overall refusals to the amount question.

The differences in the questions between 1988 and 2002 led to the definition of the welfare sample used in this study. Because the screener question that was used in 1988 and 1989 did not separate welfare payments from other forms of income, it was not possible to identify welfare recipients based on that screener question. Instead, a welfare recipient was defined as a person who reported a positive amount for welfare assistance (or indicated an income bracket for 2001 or 2002) when asked about specific amounts. Respondents in CUs who refused to provide an amount or did not know the amount of welfare assistance and would not provide a bracket (in 2001-02) were excluded from the sample. No other sample restrictions were made.

The sample was weighted to match the U.S. population; and, using the

² Although AFDC was discontinued in 1996, the CE did not reflect this change until 2003.

above definition of a welfare recipient, the weighted welfare sample made up 3.2 percent of the population in the 1988-89 period, 2.3 percent in the 1997-98 period, and 1.4 percent in the 2001-02 period.³ The decreasing percentage of welfare recipients was expected because TANF was designed to give temporary assistance. This is consistent with data on welfare receipts published in the 2003 Statistical Abstract, which shows that the percent of families receiving welfare decreased from 4.1 percent in 1988-89 to 3.34 percent in 1997-98, and, then, to 1.91 percent in 2001-02.⁴

Sample characteristics

In the 1988-89 period, 83.1 percent of consumer units (CUs) who received welfare payments also received some other form of assistance (food stamps, housing assistance, unemployment compensation, or worker’s compensation). (See table 1.) This percentage didn’t change significantly in 1997-98 or 2001-02.⁵ The largest form of additional assistance among welfare recipients was food stamps. Seventy-eight percent of welfare recipients also received food stamps in 1988-89, but this percentage decreased from 73.1 in 1997-98 to 66.8 percent in 2001-02.⁶ The Welfare Reform Act also imposed some stricter eligibility requirements for receiving food stamps, which may explain some of the decline in food stamp recipients among welfare recipients. Other studies have shown overall declines in the numbers of both welfare and non-welfare recipients receiving food stamps. Percentages of welfare recipients receiving other forms of assistance either increased or trended upwards over the same three time periods.

³ Including the CUs who claimed welfare receipts but did not know the amount or refused to share the amount, welfare recipients made up 3.1 percent of the population in 1997-98 and 1.6 percent in 2001-02. This statistic is not available for 1988-89.

⁴ These statistics from the Statistical Abstract differ slightly from the CE numbers due to definitional differences and sample error.

⁵ All significance tests are at the .05 significance level.

⁶ Whenever the words “increase or decrease” are used, the modifier “statistically significant” should be understood.

The distribution of welfare recipients by race in the sample changed significantly between 1988-89 and 2001-02. The percentage of welfare recipients who were White increased from 53.7 percent in 1988-89 to 58.1 percent in 1997-98 and, then, to 61.4 percent in 2001-02. The percentage of welfare recipients who were Black decreased from 41.6 percent in 1988-89 to 36.4 percent in 1997-98 and, then, to 31.3 percent in 2001-02. For the non-welfare population, the percentage of Whites in the sample decreased from 87.7 percent to 84.7 percent and, then, to 83.6 percent, while the percentage of Blacks increased from 9.6 percent to 11.3 percent and, then, to 11.9 percent. The percentage of welfare recipients who were Hispanic rose from 16.0 percent to 20.3 percent and, then, to 21.5 percent over the three time periods, but these changes weren't statistically significant.

Among welfare recipients, single mothers were the largest portion of the population for all three time periods with no significant changes. Single mothers composed 41.5 percent of the welfare population in the 1988-89 period, 38.3 percent in the 1997-98 period, and 38.1 percent in the 2001-02 period. There were not many fluctuations in the distribution of family type among welfare recipients over these time periods. The only significant change was a 3 percent decrease in the population of husband and wife families with at least one school-aged child.

The average size of CUs receiving welfare did not change significantly with the implementation of TANF. In 1988-89, the average CU size was 3.7 persons; in 1997-98 and 2001-02, it was 3.6 persons. The percentage of welfare recipients that were two-person CUs significantly increased from 16.9 percent in 1988-89 to 21.9 percent in 2001-02. The only other significant change for welfare recipients was a decrease in five-person CUs from 16.7 percent in 1997-98 to 11.6 percent in 2001-02. For non-welfare CUs, the percent distribution of CU sizes did not vary much over the three time periods.

Expenditures

To compare expenditure patterns over time, data on relative shares (the percent of total expenditures accounted for by an expenditure item or component), percent reporting (the percent of the sample that reported an expenditure greater than zero for the item or component), and selected means were tracked. Looking at all three types of statistics gives a better idea of spending patterns over time than looking at only one type.

Typically, relative shares do not fluctuate much from year to year, so large changes in shares indicate changes in spending patterns. Shares also remain pretty consistent if prices rise for everything at an equal rate and all else remains constant.

When comparing the percent reporting, keep in mind that expenditures can be affected by various factors, including policy changes. For example, with a policy change requiring welfare recipients to work, an increase in people with work-related expenditures would be expected. Thus, spending on child care services would be likely to increase as well as expenditures on commuting costs, and, possibly, work apparel.

In order to compare means over the three time periods, it was necessary to remove the effects of price changes over those periods. For selected items, which are described in the following paragraphs, means were compared after they were adjusted to 2002 dollars by the Consumer Price Index.⁷ Means can be affected by the price of a good or service and the number of people reporting it. When more CUs report an expenditure, the mean will increase. If there is a low percent reporting for a particular item, then the mean can be highly variable and can show large jumps from year to year. The means here were adjusted for change in price and have a relatively large percent reporting, so they should not have as much variability.

For welfare recipients, there were significant changes in spending pat-

⁷ Not all expenditure items had an associated price index.

terns in a number of categories, based on fluctuations in the expenditure shares, percent reportings, and inflation-adjusted means. For specifics, see the text and tables that follow.

Food

There were a number of significant changes in the food category. The percent of welfare recipients who reported an expense for eating away from home increased from 56.5 in 1988-89 to 64.4 in 1997-98 and, then, to 69.6 in 2001-02. (See table 2.) This is a contrast to the non-welfare population, in which the percentage of the group eating away from home declined over the same time period from 85.2 percent in 1988-89 to 85.3 percent in 1997-98 and, then, to 81.8 in 2001-02.

Expenditure shares for food away from home did not change significantly for the welfare population during the time period before and after TANF; however, the share for food at home decreased. About 5 percentage points less of the household budget was spent on groceries in 2001-02 than in 1988-89. (See table 3.) The non-welfare population spent about 1.5 percentage points less of their budget on groceries in 2001-02 than they did in 1988-89.

There were no significant changes in the adjusted means for food expenditures among welfare recipients, but there was an upward trend of average expenditures for food away from home, which rose from \$441 in 1988-89 to \$485 in 1997-98 and, then, to \$581 in 2001-02. (See table 4.) The adjusted means decreased significantly for expenditures on food away from home in the non-welfare population. The average fell from \$1,661 in 1988-89 to \$1,526 in 1997-98 and, then, to \$1,428 in 2001-02.

Spending on food includes expenditures made using all available sources of income, including food stamps. As noted previously, the overall percent of the welfare sample and non-welfare sample receiving food stamps decreased with the welfare reform over the three time periods in this study. This could have affected the food expenditure results.

Housing

After the welfare reform, there were a larger number of home owners among welfare recipients; the percent reporting expenditures on owned dwellings nearly doubled from 13.1 percent in 1988-89 to 25.0 percent in 2001-02. The relative share of total expenditures on owned dwellings also increased, from 2.7 percent of the total in 1988-89 to 5.2 percent in 2001-02. The non-welfare sample showed similar increases in both the percent reporting and the relative share spent on owned dwellings over that time period. In the 1988-89 period, 55.3 percent of the non-welfare population reported expenditures on owned dwellings; in the 2001-02 period, 66.9 percent reported expenditures on owned dwellings. The relative share spent on owned dwellings by the non-welfare population rose from 10.9 percent in 1988-89 to 13.6 percent in 2001-02. Although the relative shares of expenditures on rented dwellings did not significantly change for either group before and after the implementation of TANF, there was a significant decrease in the percent of CUs reporting expenditures on rented dwellings for both groups. For the welfare population, reporting dropped from 82.7 percent in 1988-89 to 82.0 percent in 1997-98 and, then, to 72.2 percent in 2001-02; and for non-welfare recipients, reporting dropped from 35.5 percent in 1988-89 to 33.4 percent in 1997-98 and, then, to 31.6 percent in 2001-02.

Transportation

There were some significant changes in the transportation category of the survey. Transportation includes purchases of vehicles; vehicle finance charges; vehicle insurance; vehicle rental, leases, and licenses; gas and motor oil; maintenance and repairs; and public transportation. For overall transportation, there was an increase in the share of total expenditures between 1988-89 and 2001-02; the share rose from 13.3 percent of total expenditures in 1988-89 to 16.0 percent in 1997-98 and, then, to 18.1 percent in 2001-02. There was no significant change in expenditure shares for non-welfare

recipients. Within the transportation category, there was a significant decrease in percent reporting for used cars and trucks for the welfare and non-welfare populations; however, shares of expenditures on used cars and trucks trended upward for the welfare population and increased for the non-welfare population. The percent reporting new cars and trucks trended upward between 1988-89 and 2001-02 for welfare recipients. The percent reporting new cars and trucks decreased for non-welfare recipients over the same time period. Shares of expenditures on new cars and trucks increased between 1988-89 and 2001-02 for welfare recipients from 0.4 percent of total expenditures in 1988-89 to 2.1 percent in 2001-02. Shares of expenditures on new cars and trucks decreased for non-welfare recipients over the same time period from 5.3 percent to 4.5 percent.

Public transportation expenditures remained constant between 1988-89 and 1997-98, but showed a significant drop in expenditure shares and percent reporting for both welfare and non-welfare recipients between 1997-98 and 2001-02. Public transportation spending includes airfares as well as expenditures on buses, trains, and other forms of mass transit. The time period after 9/11 caused a drop in overall expenditures on airfares, most likely driving the decrease in overall public transportation expenditures. A subcategory for public transportation was available only for 1997-98 and 2001-02, which includes data on intracity mass transit, taxis and limousines, and school buses (excluding all public transportation expenditures on trips).⁸ Data available between 1997-98 and 2001-02 indicate that the share of total expenditures spent on intracity mass transit, taxi fares and limousines, and school buses by the welfare population decreased from 0.2 percent to 0.1 percent between 1997-98 and 2001-02. The percent reporting expenditures for these items also declined from 4.4 percent to 2.9 percent.

⁸ Trips are defined as any overnight trips or day trips of 75 or more miles.

With the work requirement for welfare recipients that was instituted with the 1996 legislation, welfare recipients were expected to have more transportation expenditures due to the necessity of commuting. Data indicate that vehicle purchases and operating expenditures increased for welfare recipients from before to after the welfare reform, even though public transportation expenditures decreased.

Child care

With the new work requirements for receiving TANF benefits and the large percentage of single parents receiving benefits, expenditures on child care were expected to increase. While there were no significant changes for the welfare population, the percent reporting an expenditure for child care trended upward from 8.8 percent in 1988-89 to 10.6 percent in 2001-02. Alternately, percent reporting for child care by the non-welfare population decreased over the three time periods with 10.0 percent reporting in the 1988-89 period, 8.8 percent reporting in the 1997-98 period, and 8.1 percent reporting in the 2001-02 period. There were no significant changes in expenditure shares for child care in either group.

Entertainment

Before the welfare reform, 70.2 percent of welfare recipients reported an expenditure on entertainment. The percentage rose to 82.1 in 1997-98 and to 83.5 percent in 2001-02. For non-welfare recipients, the percent reporting also increased overall, rising from 86.7 percent in 1988-89 to 90.0 percent in 1997-98, but, then, remaining about the same for 2001-02. A large part of the change in the percent reporting appears to be from the purchase of televisions, radios, and sound equipment. The percent of welfare recipients reporting an expenditure on that component rose from 49.8 percent to 72.3 percent between 1988-89 and 2001-02. For non-welfare recipients, spending on that component rose from 70 to 81.8 percent over the same time period. There were no significant changes in the expenditure shares of overall entertainment expenditures for

either group during that time period; however, the non-welfare recipients' expenditure share on televisions, radios, and sound equipment rose slightly.

Apparel

There were not many significant differences in percent reporting or in expenditure shares on apparel for the welfare sample. Overall, the total share on apparel decreased between 1988-89 and 2001-02 from 6.9 percent to 5.2 percent of total expenditures, respectively. The two significant differences in shares among the subcomponents were for footwear expenditures and for men's and boys' apparel expenditures: both had a significant decrease. Footwear expenditures also showed the only decrease in percent reporting for the welfare sample. Although there were not many significant changes, the welfare population showed similar trends to the spending patterns of the non-welfare population. For the non-welfare population, the percentage of CUs reporting and the shares of expenditures de-

creased for most of the apparel subcomponents.

Other

A number of other categories showed significant changes between the pre-TANF and post-TANF welfare period. The percent of CUs reporting spending on health insurance increased for the welfare and non-welfare populations between 1988-89 and 2001-02. For welfare recipients, the percent reporting health insurance rose from 14.9 percent in 1988-89 to 20.1 percent in 1997-98 and, then, to 24.6 percent in 2001-02. For the non-welfare group, these percentages were 57.0 percent, 63.8 percent, and 63.0 percent, respectively. The share of expenditures on health insurance also increased over that time period for both groups. The welfare group allocated 0.7 percent of their total expenditures to health insurance in 1988-89. This share went from 1.1 percent in 1997-98 to 1.6 percent in 2001-02. The non-welfare group allocated 2.0 percent of their total expenditures

to health insurance in 1988-89, 2.8 percent in 1997-98, and 3.0 percent in 2001-02. For expenditures on life and other personal insurance, the percent reporting decreased for both groups, and the expenditure shares also decreased for both groups.

Conclusion

Overall, there were some significant changes in spending by welfare recipients from the pre-TANF to post-TANF period. Many changes for the welfare population, such as the change from renting to owning, have followed the trends of the non-welfare population. Other changes in the spending patterns of welfare recipients, such as expenditures on food away from home, have been different from the trends of the non-welfare recipients. While it may not be possible to definitely attribute the reason for changes in spending to the introduction of TANF, CE data show that there were some significant changes from the pre-TANF to the post-TANF period. ■

Table 1. Characteristics of welfare and non-welfare sample, Consumer Expenditure Survey, 1988-89, 1997-98, and 2001-02, in percent

Characteristic	1988-89	1997-98	2001-02
Receiving public assistance:			
Any type			
Welfare	83.1	80.1	81.2
Non-welfare	11.3	10.3 *	12.0 +
Food stamps			
Welfare	78.0	73.1	66.8 *
Non-welfare	3.3	4.0 *	2.4 * +
Housing			
Welfare	28.2	34.2	38.3 *
Non-welfare	2.3	3.2 *	7.0 * +
Unemployment compensation			
Welfare	3.7	4.6	6.5 *
Non-welfare	4.0	2.8 *	2.9 *
Workers' compensation			
Welfare	1.6	1.8	3.1
Non-welfare	3.0	1.8 *	1.1 * +
Race ¹ :			
White			
Welfare	53.7	58.1	61.4 *
Non-welfare	87.7	84.7 *	83.6 * +
Black			
Welfare	41.6	36.4	31.3 *
Non-welfare	9.6	11.3 *	11.9 * +
Other			
Welfare	4.7	5.5	7.4
Non-welfare	2.7	4.0 *	4.5 * +
Hispanic origin ² :			
Hispanic			
Welfare	16.0	20.3	21.5
Non-welfare	5.7	8.1 *	8.8 * +
Non-Hispanic			
Welfare	84.0	79.7	78.5
Non-welfare	94.3	91.9 *	91.2 * +
Age ³ :			
Under 25			
Welfare	13.8	16.4	18.5
Non-welfare	7.6	7.2	7.7
25 to 34			
Welfare	32.8	26.2	20.8
Non-welfare	20.2	17.0	15.4
35 to 44			
Welfare	20.2	24.5	23.6
Non-welfare	18.8	20.7	20.0
45 to 54			
Welfare	11.4	11.8	16.4
Non-welfare	13.0	16.4	17.9
55 to 64			
Welfare	6.0	6.5	5.9
Non-welfare	12.0	10.6	11.8
65 to 74			
Welfare	3.8	1.8	3.2
Non-welfare	11.0	10.2	9.2
Over 75			
Welfare	2.3	1.0	3.3
Non-welfare	7.8	8.5	8.7
Family type:			
Single ⁴			
Welfare	11.3	9.0	11.0
Non-welfare	28.5	29.1	29.8 * +
Husband and wife, oldest child under 6 years			
Welfare	3.9	3.2	4.3
Non-welfare	6.4	5.2 *	4.8 *
Husband and wife, oldest child 6 to 17 years			
Welfare	7.3	7.3	4.2 *
Non-welfare	15.0	14.8	13.8 * +

Table 1. Characteristics of welfare and non-welfare sample, Consumer Expenditure Survey, 1988-89, 1997-98, and 2001-02, in percent—Continued

Characteristic	1988-89	1997-98	2001-02
Husband and wife, oldest child over 17			
Welfare	2.5	2.8	2.6
Non-welfare	8.7	7.4 *	7.2 *
Husband and wife, no children			
Welfare	1.3	1.9	3.2
Non-welfare	22.2	22.0	21.0 * +
Single mom			
Welfare	41.5	38.3	38.5
Non-welfare	4.0	4.6 *	4.8 *
Single dad			
Welfare	2.0	.8	2.45
Non-welfare .....	.7	.8	.8
Other family type			
Welfare	23.5	29.1	26.3
Non-welfare	10.8	12.3 *	13.8 * +
Family size:			
Single			
Welfare	11.3	9.0	11.0
Non-welfare	28.5	29.1	29.8 * +
2 persons			
Welfare	16.6	17.1	21.9 *
Non-welfare	30.8	31.2	31.0
3 persons			
Welfare	24.1	24.8	23.0
Non-welfare	16.4	15.7	15.2 *
4 persons			
Welfare	20.0	20.8	19.2
Non-welfare	14.3	14.2	14.0
5 persons			
Welfare	14.1	16.7	11.6 +
Non-welfare	6.4	6.3	6.3
More than 6 persons			
Welfare	13.9	11.6	13.3
Non-welfare	3.5	3.5	3.6

* Indicates statistical difference from 1988-89 at the 0.05 significance level

+ Indicates statistical difference from 1997-98 at the 0.05 significance level

¹ Race refers to race of the reference person.

² Hispanic origin refers to Hispanic origin of the reference person.

³ Age refers to the age of the reference person.

⁴ Even though AFDC and TANF are both intended for families with children, the question asks for income from public assis-

tance for the past 12 months. This question is also only asked during the second and fifth interview. If the person is in the fourth interview, then data from the second interview will be used. In this case, the CU could have received income from welfare up to 19 months prior. The family type of the CU will be current to the quarter.

If the CU, now listed as single, previously was listed with children, then the CU could have received AFDC or TANF. Furthermore, the welfare question also asks whether respondents received any income from Job Corp grants in 1997-98 and 2001-02. These are possible examples of singles with welfare.

Table 2. **Percent reporting expenditures for selected items, Consumer Expenditure Survey, 1988-89, 1997-98, and 2001-02, in percent**

Item	1988-89	1997-98	2001-02
Food total:			
Welfare	99.1	99.4	98.8
Non-welfare	99.2	99.4	99.5 * +
Food at home			
Welfare	98.4	98.6	98.6
Non-welfare	99.2	99.4 *	98.9 * +
Food away			
Welfare	56.5	64.4 *	69.6 *
Non-welfare	85.2	85.3	81.8 * +
Alcoholic beverages			
Welfare	30.1	22.8 *	22.8
Non-welfare	50.9	45.8 *	42.1 *
Housing:			
Welfare	47.0	52.2 *	48.8
Non-welfare	65.4	61.3 *	55.2 *
Shelter			
Welfare	95.5	99.3 *	96.9 +
Non-welfare	91.7	98.2 *	97.6 * +
Owned dwellings:			
Welfare	13.1	17.4	25.0 * +
Non-welfare	55.3	65.4 *	66.9 * +
Mortgage interest			
Welfare	8.3	9.0	13.7 *
Non-welfare	38.2	39.8 *	41.3 * +
Property tax			
Welfare	4.2	16.7 *	23.9 *
Non-welfare	18.8	64.8 *	65.6 * +
Maintenance, repairs, insurance, and other expenses			
Welfare	8.9	9.6	14.2 *
Non-welfare	36.8	39.3 *	39.0 *
Rented dwellings			
Welfare	82.7	82.0	72.2 * +
Non-welfare	35.5	33.4 *	31.6 * +
Other lodging			
Welfare	4.9	5.0	4.5
Non-welfare	26.8	23.0 *	21.4 * +
Utilities, fuels, and public services:			
Welfare	94.9	96.9	96.8
Non-welfare	98.1	98.3	97.9 +
Natural gas			
Welfare	50.1	48.2	47.2
Non-welfare	48.6	49.6	50.1
Electricity			
Welfare	78.2	81.5	85.0
Non-welfare	90.5	91.7 *	91.9 *
All other fuels			
Welfare	4.8	6.7	5.0
Non-welfare	14.0	11.6 *	9.9 * +
Telephone			
Welfare	79.8	89.2 *	87.5 *
Non-welfare	95.3	96.3 *	95.7 +
Water and public services			
Welfare	31.6	31.8	31.9
Non-welfare	57.9	59.2 *	62.7 * +
Household operations:			
Welfare	29.3	29.2	37.4 *
Non-welfare	41.8	43.6	54.3 * +
Domestic services			
Welfare	24.2	24.2	26.4
Non-welfare	35.0	33.5	31.1 *
Babysitting and daycare services			
Welfare	8.8	10.0	10.6
Non-welfare	10.0	8.8 *	8.1 *
Other household expenditures			
Welfare	6.7	7.0	17.3 * +
Non-welfare	12.1	18.7 *	39.3 * +

Table 2. Percent reporting expenditures for selected items, Consumer Expenditure Survey, 1988-89, 1997-98, and 2001-02, in percent—Continued

Item	1988-89	1997-98	2001-02
Household furnishings and equipment:			
Welfare	100.0	99.9	99.8 +
Non-welfare	99.8	99.8	99.6 * +
Household textiles			
Welfare	20.3	21.3	16.4 +
Non-welfare	26.6	22.2 *	19.4 * +
Furniture			
Welfare	10.9	13.1 *	12.9
Non-welfare	15.5	13.9 *	12.2 * +
Floor coverings			
Welfare	2.4	3.2	3.2
Non-welfare	4.0	3.8	3.3 *
Major appliances			
Welfare	6.6	8.0	8.7
Non-welfare	9.7	8.8 *	8.7 *
Small appliances			
Welfare	19.6	18.8	16.4
Non-welfare	22.8	19.7 *	17.4 * +
Miscellaneous household equipment			
Welfare	26.6	31.7	30.2
Non-welfare	48.2	45.5 *	40.4 * +
Apparel and services:			
Welfare	87.5	86.3	85.5
Non-welfare	89.4	86.1 *	80.1 * +
Men's and boys' apparel:			
Welfare	39.0	42.4	36.2
Non-welfare	52.3	47.9 *	43.1 * +
Men, 16 and over			
Welfare	16.4	19.5	16.8
Non-welfare	46.2	40.8 *	36.6 * +
Boys, 2 to 15			
Welfare	23.4	29.3	24.3
Non-welfare	16.1	15.4 *	13.2 * +
Women's and girls' apparel:			
Welfare	60.3	54.9	54.4
Non-welfare	64.6	59.2 *	52.8 * +
Women, 16 and over			
Welfare	47.9	42.3	44.3
Non-welfare	61.1	54.5 *	48.1 * +
Girls, 2 to 15			
Welfare	31.1	28.7	27.0
Non-welfare	16.9	16.4	14.0 * +
Children under 2			
Welfare	28.2	30.6	31.2
Non-welfare	17.4	17.6	14.9 * +
Footwear			
Welfare	44.6	40.6	38.4 *
Non-welfare	47.0	40.3 *	32.9 * +
Other apparel products and services			
Welfare	56.5	52.6	50.6
Non-welfare	63.4	55.8 *	46.2 * +
Transportation:			
Welfare	77.9	83.4 *	78.7
Non-welfare	94.8	94.7	94.0 * +
Cars and trucks, new (net outlay)			
Welfare .....	.2	.3	.5
Non-welfare	2.6	1.7 *	4.8 *
Cars and trucks, used (net outlay)			
Welfare	7.2	6.5	5.3 *
Non-welfare	5.9	5.1 *	4.8 *
Other vehicles			
Welfare .....	.3	n.a.	n.a.
Non-welfare .....	.3	.2 *	.2 *
Vehicle finance charges			
Welfare	11.6	14.2	14.4
Non-welfare	37.2	32.0 *	32.7 *

Table 2. Percent reporting expenditures for selected items, Consumer Expenditure Survey, 1988-89, 1997-98, and 2001-02, in percent—Continued

Item	1988-89	1997-98	2001-02
Gas and motor oil			
Welfare	53.8	58.4	62.1 *
Non-welfare	90.1	89.9	89.4
Maintenance and repairs			
Welfare	28.6	35.1	29.9
Non-welfare	60.7	61.2	56.6 * +
Vehicle insurance			
Welfare	19.8	30.0 *	33.2 *
Non-welfare	47.4	52.3 *	55.6 * +
Public transportation			
Welfare	33.4	32.3	25.0 * +
Non-welfare	23.2	22.2	19.8 * +
Intracity mass transit, taxis and limousines, and school buses ¹			
Welfare	-	4.4	2.9
Non-welfare	-	13.9	12.2 +
Health care:			
Welfare	38.1	38.6	39.8
Non-welfare	80.9	81.3	79.7 +
Health insurance			
Welfare	14.9	20.1 *	24.6 *
Non-welfare	57.0	63.8 *	63.0 *
Medical services			
Welfare	19.5	17.8	15.4
Non-welfare	54.7	48.7 *	45.5 * +
Prescription drugs			
Welfare	25.5	21.1	24.2
Non-welfare	52.9	46.4 *	49.3 * +
Entertainment:			
Welfare	70.2	82.1 *	83.5 *
Non-welfare	86.7	90.0 *	89.6 *
Fees and admissions			
Welfare	28.2	27.3	32.2
Non-welfare	57.9	56.9	51.0 * +
TVs, radios, and sound equipment			
Welfare	49.8	67.8 *	72.3 *
Non-welfare	70.0	81.6 *	81.8 *
Personal care products and services			
Welfare	47.2	49.4	48.4
Non-welfare	79.3	75.3 *	74.4 *
Reading			
Welfare	48.8	41.6 *	33.1 * +
Non-welfare	76.5	65.1 *	54
Education			
Welfare	12.6	17.7 *	14.8
Non-welfare	16.7	18.3	16.9 +
Tobacco			
Welfare	55.5	44.9 *	37.3 * +
Non-welfare	37.9	28.8 *	24.3 * +
Miscellaneous			
Welfare	20.7	25.3	31.3 *
Non-welfare	48.9	46.4 *	47.3
Personal insurance and pensions:			
Welfare	54.1	53.0	64.6 * +
Non-welfare	80.7	76.5 *	77.1 *
Life and other personal insurance			
Welfare	22.1	16.6	14.1 *
Non-welfare	45.5	41.6	39.5 * +
Retirement, pensions, and Social Security			
Welfare	41.1	47.4	59.3 * +
Non-welfare	70.6	64.7 *	66.4 *

* Indicates statistical difference from 1988-89 at the 0.05 significance level

+ Indicates statistical difference from 1997-98 at the 0.05

significance level

¹ Data on intracity mass transit, taxis and limousines, and school buses are only available for 1997-98 and 2001-02.

Table 3. Shares of total expenditures spent on selected items, Consumer Expenditure Survey, 1988-89, 1997-98, and 2001-02, in percent

Item	1988-89	1997-98	2001-02
Food total:			
Welfare	27.4	23.4 *	22.1 *
Non-welfare	16.3	15.0 *	14.1 * +
Food at home			
Welfare	24.7	20.9 *	19.3 *
Non-welfare	11.7	10.9 *	10.3 * +
Food away			
Welfare	2.7	2.5	2.9
Non-welfare	4.6	4.2	3.8 * +
Alcoholic beverages			
Welfare .....	.9	.5 *	.5 *
Non-welfare	1.0	.9 *	.9 *
Housing:			
Welfare	36.7	38.5	48.8
Non-welfare	31.4	32.8 *	33.0 *
Shelter			
Welfare	21.9	23.8	22.3
Non-welfare	18.6	19.9 *	20.7 *
Owned dwellings:			
Welfare	2.7	3.9	5.2 *
Non-welfare	10.9	12.6 *	13.6 * +
Mortgage interest			
Welfare	1.6	2.2	3.0 *
Non-welfare	6.7	7.3 *	7.8 * +
Property tax			
Welfare .....	.6	.7	1.3 * +
Non-welfare	2.2	3.1 *	3.3 * +
Maintenance, repairs, insurance, and other expenses			
Welfare .....	.6	.9	.9
Non-welfare	2.1	2.3 *	2.5 *
Rented dwellings			
Welfare	18.8	19.6	16.8
Non-welfare	5.8	5.9	5.7
Other lodging			
Welfare .....	.4	.3	.2
Non-welfare	1.9	1.4 *	1.4 *
Utilities, fuels, and public services:			
Welfare	10.4	10.9	10.5
Non-welfare	7.1	7.4 *	7.3
Natural gas			
Welfare	2.0	1.5 *	1.8
Non-welfare .....	.9	.9	1.0 +
Electricity			
Welfare	4.0	4.2	4.0
Non-welfare	2.9	2.8	2.7 * +
All other fuels			
Welfare .....	.3	.2	.2
Non-welfare .....	.4	.3 *	.3 *
Telephone			
Welfare	3.3	4.1 *	3.7
Non-welfare	2.2	2.5 *	2.5 *
Water and public services			
Welfare .....	.8	.9	.9
Non-welfare .....	.7	.9 *	.9 *
Household operations:			
Welfare	1.2	1.2	1.5
Non-welfare	1.7	1.7	1.9 * +
Domestic services			
Welfare .....	.9	1.0	1.2
Non-welfare	1.4	1.4	1.4
Babysitting and daycare services			
Welfare .....	.2	.2	.3
Non-welfare .....	.2	.2	.2
Other household expenditures			
Welfare .....	.3	.2	.4 +
Non-welfare .....	.3	.3	.5 * +

Table 3. Shares of total expenditures spent on selected items, Consumer Expenditure Survey, 1988-89, 1997-98, and 2001-02, in percent—Continued

Item	1988-89	1997-98	2001-02
Household furnishings and equipment:			
Welfare	3.1	2.7	2.5
Non-welfare	4.0	3.8 *	3.2
Household textiles			
Welfare .....	.3	.2	.2
Non-welfare .....	.4	.2 *	.2 * +
Furniture			
Welfare	1.1	1.0	.9
Non-welfare	1.3	1.2 *	1.0 * +
Floor coverings			
Welfare	n.a.	.1	n.a.
Non-welfare .....	.2	.2 *	.1 * +
Major appliances			
Welfare .....	.7	.4 *	.4 *
Non-welfare .....	.6	.5 *	.5 * +
Small appliances			
Welfare .....	.2	.2	.1 *
Non-welfare .....	.2	.2 *	.1 * +
Miscellaneous household equipment			
Welfare .....	.7	.8	.8
Non-welfare	1.3	1.5 *	1.2 +
Apparel and services:			
Welfare	6.9	5.5	5.2 *
Non-welfare	5.2	4.2 *	3.6 * +
Men's and boys' apparel:			
Welfare	1.3	1.0	1.0 *
Non-welfare	1.3	1.1 *	1.0 * +
Men, 16 and over			
Welfare .....	.5	.3	.4
Non-welfare	1.1	.9 *	.7 * +
Boys, 2 to 15			
Welfare .....	.9	.7	.6 *
Non-welfare .....	.2	.2	.2 * +
Women's and girls' apparel:			
Welfare	2.4	1.9	1.8
Non-welfare	2.1	1.6 *	1.4 * +
Women, 16 and over			
Welfare	1.5	1.1	1.1
Non-welfare	1.8	1.3 *	1.2 * +
Girls, 2 to 15			
Welfare .....	.9	.8	.7
Non-welfare .....	.3	.3	.3 * +
Children under 2			
Welfare	1.1	.9	1.0
Non-welfare .....	.2	.2	.2 * +
Footwear			
Welfare .....	.8	.7	.6 *
Non-welfare .....	.5	.5 *	.3 * +
Other apparel products and services			
Welfare	1.3	1.1	.8 *
Non-welfare	1.1	.8 *	.7 * +
Transportation:			
Welfare	13.3	16.0	18.1 *
Non-welfare	20.5	20.0	20.4
Cars and trucks, new (net outlay)			
Welfare .....	.4	1.1	2.1 *
Non-welfare	5.3	4.1 *	4.5 * +
Cars and trucks, used (net outlay)			
Welfare	4.5	5.9	6.8
Non-welfare	4.0	4.6 *	4.9 * +
Other vehicles			
Welfare .....	.3	n.a.	n.a.
Non-welfare .....	.1	.1 *	.2 *
Vehicle finance charges			
Welfare .....	.4	.6	.7 *
Non-welfare	1.2	.9 *	1.0 * +

Table 3. Shares of total expenditures spent on selected items, Consumer Expenditure Survey, 1988-89, 1997-98, and 2001-02, in percent—Continued

Item	1988-89	1997-98	2001-02
Gas and motor oil			
Welfare	3.4	3.2	3.4
Non-welfare	3.9	3.3 *	3.4 *
Maintenance and repairs			
Welfare	1.5	1.5	1.8
Non-welfare	2.1	1.9 *	1.7 * +
Vehicle insurance			
Welfare	1.3	1.7	1.8 *
Non-welfare	2.2	2.3 *	2.3 *
Public transportation:			
Welfare	1.0	1.3	.7 * +
Non-welfare	1.1	1.3 *	1.1 +
Intracity mass transit, taxis and limousines, and school buses			
Welfare	-	.2	.1 +
Non-welfare	-	.0	.0 +
Health care:			
Welfare	2.3	2.7	2.7
Non-welfare	5.1	5.4 *	5.7 * +
Health insurance			
Welfare .....	.7	1.1 *	1.5 *
Non-welfare	2.0	2.8 *	3.0 * +
Medical services			
Welfare	1.0	1.0	.5
Non-welfare	2.2	1.7 *	1.6 *
Prescription drugs			
Welfare .....	.7	.4	.5
Non-welfare .....	.9	.7 *	.9 +
Entertainment:			
Welfare	3.9	4.1	4.4
Non-welfare	5.2	5.3	5.1
Fees and admission			
Welfare .....	.4	.4	.5
Non-welfare	1.5	1.5	1.5
TVs, radios, and sound equipment			
Welfare	2.1	2.3	2.4
Non-welfare	1.7	1.8 *	1.8 *
Personal care products and services			
Welfare .....	.9	.9	.6 * +
Non-welfare .....	.9	.9	.7 * +
Reading			
Welfare .....	.4	.3 *	.2 *
Non-welfare .....	.6	.5 *	.4 * +
Education			
Welfare .....	.4	.6	.9
Non-welfare	1.3	1.7 *	1.7 *
Tobacco			
Welfare	2.6	2.1	2.0
Non-welfare	1.0	.8 *	.8 *
Miscellaneous			
Welfare .....	.8	1.3	1.1
Non-welfare	1.2	1.5 *	1.5 *
Personal insurance and pensions:			
Welfare	3.3	3.8	4.6 * +
Non-welfare	9.5	10.2 *	10.2 *
Life and other personal insurance			
Welfare .....	.8	.5	.6
Non-welfare	1.3	1.2	1.1 * +
Retirement, pensions, and Social Security			
Welfare	2.5	3.2	4.0 *
Non-welfare	8.2	9.0 *	9.1 *

* Indicates statistical difference from 1988-89 at the 0.05 significance level
n.a. Not applicable.

+ Indicates statistical difference from 1997-98 at the 0.05 significance level

Table 4. Mean expenditures for selected items (adjusted to 2002 dollars), Consumer Expenditure Survey, 1988-89, 1997-98, and 2001-02

Item	1988-89	1997-98	2001-02
Food total:			
Welfare	\$4,553	\$ 4,443	\$ 4,465
Non-welfare	5,995	5,440 *	5,284 * +
Food at home			
Welfare	4,118	3,852	3,875
Non-welfare	4,318	3,826 *	3,849 *
Food away			
Welfare	441	485	581
Non-welfare	1,661	1,526 *	1,428 * +
Alcoholic beverages			
Welfare	157	89 *	98 *
Non-welfare	394	316 *	331 *
Rented dwellings ¹			
Welfare	3,297	3,965 *	3,434
Non-welfare	2,240	2,273	2,162 +
Reading			
Welfare	239	178 *	143 * +
Non-welfare	76	52 *	47 *
Tobacco			
Welfare	871	640 *	426 * +
Non-welfare	724	465 *	323 * +

¹ Mean expenditures for rent are based on all CUs (home-owners and renters).

* Indicates statistical difference from 1988-89 at the 0.05 significance level

+ Indicates statistical difference from 1997-98 at the 0.05 significance level

Spending Patterns of Older Consumers Raising a Child

ABBY DULY

The growing population of older Americans has been an important focus of researchers and policymakers for some time, with issues such as Social Security benefits, long-term care, and prescription drug costs at the forefront. Recent studies show that an increasing number of these older Americans are also facing issues involved in raising children, such as the rising costs of child care and higher education. For example, the U.S. Census Bureau reports that, in 2000, approximately 2.4 million grandparents were “responsible for the basic needs” of their co-resident grandchildren.¹ At the same time, the National Center for Health Statistics reports that the number of births to women aged 45-49 years has more than quadrupled since 1984, and births to women aged 50 and older have increased 13 percent annually since 1997.² This article seeks to examine the lifestyle and welfare of these older caregivers, using demographic characteristics and spending patterns derived from the Consumer Expenditure Survey (CE).

Study methodology

Data presented here were collected by the CE Interview Survey during the years 2000, 2001, and 2002. (Three years of data are necessary to provide sufficient sample sizes for analysis.) The Interview component of the CE is used rather than the Diary because the Interview Survey is estimated to cover 80 to 95 percent of total expenditures by consumer units (CUs).³ Specifically, the Interview Survey collects detailed data on an estimated 60 to 70 percent of total household expenditures. In addition, global estimates, that is, expense patterns for a 3-month period, are obtained for food and other selected items. These global estimates account for an additional 20 to 25 percent of total expenditures.

The sample selected for this study is divided into three groups, based primarily on the age of the reference person⁴ and the presence and age of children in the household. First, an “older with children” group is defined as having a reference person aged 60 or older and at least one child under the age of 18 years in the household. Furthermore,

¹ *Grandparents Living With Grandchildren: 2000*. U.S. Census Bureau, October 2003.

² Martin J.A., Hamilton B.E., Sutton P.D., Ventura S.J., Menacker F., Munson M.L. “Births: Final Data for 2002”, *National Vital Statistics Reports*; Volume 52, Number 10. National Center for Health Statistics, 2003.

³ The Consumer Expenditure Survey collects data for consumer units. In this article, *consumer units* and *households* are used interchangeably. See the glossary at the end of this anthology for the definition of *consumer unit*.

⁴ See the glossary at the end of this anthology for the definition of *reference person*.

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in order to ensure the role of the older person as caregiver, the sample is further restricted such that no other adults reside in the home, except the spouse of the reference person, if there is one. Additionally, only the reference person and spouse may earn income. (Presumably, some working teenagers may contribute significantly to the household budget.⁵) Two other groups are selected for comparative purposes. First, in order to determine if there are generational or age-related differences among households raising children, a “younger parents” group is selected, whose reference person is aged 35 to 49 years and for whom there is at least one child under the age of 18 years. Second, an “older without children” group, whose reference person is aged 60 or older with no children present, provides a measure of how dependent children in the household may change the lifestyle of the older generation. The additional criteria regarding other adults and earners are also applied to the younger parents and older without children groups for consistency. Finally, all three sample groups contain only persons related by blood, marriage, adoption, or other legal arrangements. The resulting sample sizes are: 9,869 younger parents; 18,056 CUs in the older without children group; and 206 older households with children.

The first part of the study is a comparison of the three sample groups by selected demographic characteristics. Selected sample demographics are displayed in table 1. Then, spending patterns are analyzed using expenditure shares, which are the proportions of total household expenditures allocated to specific categories of expense. Shares analysis has two important advantages in this study. First, using proportions of total spending allows for meaningful comparisons among groups of CUs with very different incomes, as is the case here. (See table 1.) Additionally, expenditure shares provide insight into the relative importance of one spending category over another,

⁵ See David S. Johnson and Mark Lino, “Teenagers: employment and contributions to family spending,” *Monthly Labor Review*, September 2000, p. 15.

indicating that some budgetary decisions are being made. In order to test the significance of observed differences in spending, the standard *t*-test formula is modified to account for the use of proportional measures.⁶ Before presenting any findings, it is important to note that the results of these analyses are not weighted to the general population.

Demographic comparisons

As previously mentioned, the average incomes of the three groups are quite different. Most notable is the roughly \$30,000-per-year gap between those older CUs with children and those without children. Not surprisingly, those with children are younger on average (67 years old compared with 73 years old) and more likely to have an earner in the household than their contemporaries without children. It seems that having a child to raise may affect the decision to retire or to obtain some employment to supplement retirement income. While almost two-thirds of older households without children have a retired reference person, only about 35 percent of older households with children are retirees. However, an additional 11 percent of the latter have reference persons who are not working for reasons other than retirement, including unemployment, disability, school attendance, or caring for the home and/or family.

While the average income of older caregivers may more closely resemble that of the younger parents group, educational attainment appears to be more generational. The distribution of households among educational levels are almost identical between the two older groups, with the most prevalent category being high school graduate. Younger parents, on the other hand, are more likely to have reference persons who are college graduates (36 percent of the sample) than any other educational designation.

⁶ See Geoffrey Paulin, “Consumer expenditures on travel, 1980-87,” *Monthly Labor Review*, June 1990, p.60. See also Geoffrey Paulin, “The changing food-at-home budget: 1980 and 1992 compared,” *Monthly Labor Review*, December 1998, p.32.

As shown in table 1, the sample contains different types of families. For older households without children, there are only two possible family types: 46 percent of these families are married couples, and 54 percent are single persons. Almost half of the older caregivers fall into the “other husband and wife” category, which includes those raising grandchildren or some other young relative, such as a niece or nephew. When comparing two-parent households, those with younger parents also are more likely to have younger children. (Approximately 12 percent have only children under the age of six, compared to just 1.5 percent of older households with children.) For both age groups, the majority of two-parent households have at least one child, the oldest being between the ages of 6 and 17 years. There are a greater percentage of single parents in the younger group (21 percent) than in the older group (roughly 5 percent).

In terms of housing tenure, table 1 shows that more than 75 percent of each of the groups studied are homeowners. However, while approximately two-thirds of younger parents own a home with a mortgage, 60 percent of older households without children and 46 percent of older households with children own homes with no mortgage.

Other demographic comparisons also reveal differences among the three groups of study. For example, the comparisons by race and origin of the reference person reveal that older caregivers are more likely to be Black and are more likely to be of Hispanic origin than either the younger parent group or the older without children group. Finally, while younger parent households and older households without children are similarly distributed across the United States by region, a greater percentage of older caregivers live in the South and West.

Analysis of expenditure shares

Not only is total annual spending different, and actually higher, for older households with children than either of the comparison groups, but the allocation of those dollars among selected item categories is also different. (See

table 2.) For example, older caregivers devote a smaller proportion of total expenditures to food (9 percent) than younger parents and older households without children, each of whom spends roughly 13 percent. Examining the sub-components of the food category reveals that the shares for both food at home and food away from home compare similarly to the category as a whole, although the differences are only significant⁷ for the proportions allocated to food away from home. (The difference in shares for food as a whole is also significant between older households with children and younger parents.)

Conversely to the food comparison, spending on housing accounts for a greater portion of the budget in households with an older reference person and children (approximately 40 percent, compared with 33 percent for younger parents and 29 percent for older households without children). In the CE Survey, the housing category is an aggregation of various subcategories. For this study, selected housing components are included either because they are predominant in the total housing measure, such as shelter and utilities, or because they are particularly relevant to the analysis, such as child care and other domestic services. Shelter, which includes mortgage interest, property taxes, rent, and various expenses related to the repair and maintenance of a dwelling, is similar to the total housing category, with older caregivers having the largest share of the three groups studied. Utility expenditures, on the other hand, make up a greater proportion of total spending by older households without children than by those with children (approximately 8 percent compared to 6 percent). Allocations of total spending to babysitting and daycare are close between younger parents and older households with chil-

dren at 1.9 percent and 1.2 percent, respectively. The same is true for other domestic services, for which older households without children devote a greater proportion of total spending (roughly 6 percent) than younger parents and older caregivers, who each devote only one-half of 1 percent to these services. (The category of “domestic services excluding child care” includes housekeeping services, gardening and lawn care, laundry and dry-cleaning, and care of the elderly or invalid, among other services.)

Another category of expense in which the subcategories are particularly relevant to this study is apparel. As one might expect, the older without children group spends a significantly lesser share for all three subcategories of children’s clothing than their contemporaries who have children in the home. Younger parents, however, spend a significantly greater share for young girls’ and infants’ clothing than the older caregivers spend. The expenditure shares for the apparel category as a whole are not significantly different among the groups, ranging from about 2.5 percent for older households without children to 3.7 percent for younger parents.

Perhaps, the most important spending category analyzed here is health care. Spending on medical insurance, services, supplies, and prescription drugs is a major budget concern for both older Americans and families raising children. In this study, age appears to have the stronger positive effect on health care expenditures. Older households without children, the group with the highest average age, devote significantly greater shares of their total spending to each component of health care than either of the other groups. In fact, the categorical shares of younger parents and older caregivers are almost identical, with the exception of prescription drugs, for which the share allocated by younger parents is significantly less.

Similar to health care, spending on personal insurance and pensions is also related to age and employment status. For example, retirees may no

longer make contributions to Social Security or other pensions, and life insurance premiums may cease beyond a certain age. So, it follows that younger parents, who are much more likely to be working, allocate a significantly greater proportion of their total spending to this category (roughly 11 percent, compared with 5 percent by older households without children and 4 percent for older households with children).

One major expenditure category for which older caregivers spend significantly less, as a percentage of total spending, than either of the comparison groups is cash contributions. Older caregivers allocate just 3 percent to this category, which includes contributions to religious organizations, educational or other institutions, political organizations, and cash support for college students, while older CUs without children allocate more than 15 percent of total expenditures. Younger parents devote just less than 7 percent of their total budget to contributions.

There are no significant differences in the allocations of total expenditures to transportation among the three types of households. The same is true for entertainment shares, even when specifically examining purchases related to children, such as pets, toys, and playground equipment. Although older households without children allocate less than one-half of 1 percent of total expenditures to educational expenses, compared with 1.8 percent by older households with children and 1.6 percent by younger parents, the differences are not statistically significant.

Conclusion

This article has presented sample demographic characteristics and spending patterns for older CUs raising children. The results show that, for the sample studied, older caregivers are different both from those in their generation who have no children at home and from younger parents. The demographic comparison reveals that older caregivers are younger on average and earn roughly \$30,000 more per year than

⁷ The *t*-test for significance is conducted in pairs—older with children compared to older without children and older with children compared to younger parents—such that “significantly different” means “significantly different from the older with children group.”

older households without children. When compared with younger parents, older caregivers are less likely to have a college education and more likely to own their homes without a mortgage. Older households with children are more likely to be Black and are more likely to be of Hispanic origin than either of the comparison groups.

The expenditure share analysis shows that older caregivers and younger parents allocate significantly different percentages of total spending to total food, food away from home, apparel for girls aged 2 to 15, apparel for children under 2 years old, prescription drugs, personal insurance and pensions, and cash contributions. Differ-

ences in expenditure shares among the older households with and without children are significant for food away from home, babysitting and daycare, apparel for boys and girls aged 2 to 15, apparel for children under 2 years old, total health care, as well as all health care components, and cash contributions. ■

Table 1. Selected demographic characteristics by type of consumer unit, Consumer Expenditure Survey, 2000-2002

Characteristic	Younger parents	Older with children	Older without children
Sample size	9,869	206	18,056
Averages:			
Income before taxes	\$55,790	\$53,175	\$23,164
Number of vehicles	2.2	2.1	1.5
Age of reference person	41.0	67.0	73.0
Family size	3.7	3.3	1.5
Number of children	2.0	1.4	n.a.
Number of earners	1.6	.8	.4
Percent of sample by:			
Family composition:			
Husband and wife only	n.a.	n.a.	45.8
Husband and wife with own children:			
Oldest child < 6 years	12.0	1.5	n.a.
6 years <= oldest child <= 17 years	67.0	44.7	n.a.
Other husband and wife ¹	n.a.	49.0	n.a.
Single parent	21.0	4.9	n.a.
Single person	n.a.	n.a.	54.2
Occupation of reference person:			
Retired .....	.1	35.0	65.7
Salaried	90.3	43.7	22.5
Self-employed	6.0	10.2	5.4
Other ²	3.6	11.2	6.4
Education of reference person:			
Less than high school	8.0	23.8	25.3
High school graduate	25.5	33.5	32.5
Some college	30.5	18.5	22.0
College graduate	36.1	24.3	20.3
Housing tenure:			
Owner with mortgage	66.8	35.0	18.6
Owner, no mortgage	10.2	46.1	60.5
Renter	22.5	18.9	20.6
Region of residence:			
Northeast	19.4	13.1	18.5
Midwest	22.6	18.5	25.8
South	31.8	38.4	33.6
West	26.2	30.1	22.0
Race of reference person:			
White	83.2	75.2	88.8
Black	11.1	18.9	8.1
Other ³	5.7	5.8	3.1
Origin of reference person:			
Hispanic	9.8	20.4	3.5
Non-Hispanic	90.2	79.6	96.5

¹ In this sample, "other husband and wife" families are those with children in the home who are not their own but are related, such as grandchildren, nieces, or nephews.

² "Other" occupation includes working without pay, unemployed, and not working due to disability, taking care of

the home/family, going to school, or doing something else. n.a. Not applicable.

³ "Other" race includes American Indian, Aleut, Eskimo, Asian, Pacific Islander, and others.

Table 2. Expenditure shares for selected categories by type of consumer unit, Consumer Expenditure Survey, 2000-2002

Characteristic	Younger parents	Older with children	Older without children
Total annual expenditures	\$53,523	\$82,211	\$29,498
Share (percent) of total expenditures:			
Total food:	*13.3	9.4	13.0
Food at home	9.8	7.4	9.7
Food away from home	*3.4	1.9	*3.3
Housing:	32.6	39.8	29.3
Shelter	20.4	21.9	16.9
Utilities	6.0	5.9	7.7
Domestic services, excluding child care .....	.5	.5	5.8
Babysitting and daycare	1.9	1.2	*n.a.
Apparel:	3.7	3.2	2.5
Men, 16 and over .....	.6	.9	.5
Boys, 2 to 15 .....	.5	.5	*n.a.
Women, 16 and over .....	.8	.8	1.0
Girls, 2 to 15	*.6	.2	*.1
Children under 2	*.2	n.a.	*.1
Transportation	17.7	13.5	15.3
Health care:	3.9	4.0	*10.7
Health insurance	2.1	2.0	*5.7
Medical services	1.3	1.2	*2.3
Medical supplies .....	.2	.1	*.4
Prescription drugs	*.4	.7	*2.4
Entertainment:	5.6	4.8	4.0
Pets, toys, and playground equipment .....	.9	.6	.6
Education	1.6	1.8	.3
Personal insurance and pensions	*11.2	3.5	4.8
Cash contributions	*6.7	3.2	*15.4

* Significantly different from "older with children" at the 95-percent confidence level
n.a. Not applicable.

Tobacco Expenditures by Education, Occupation, and Age

MARK VENDEMIA

Despite the heightened awareness of health problems associated with using tobacco products, Americans continue to spend large amounts of money on these items. Data from the U.S. Bureau of Labor Statistics (BLS or the Bureau) Consumer Expenditure Survey (CE) show that, in 2002, the average annual expenditure per consumer unit (CU)¹ for tobacco products and smoking supplies was \$320. This is more than a 25 percent increase over 1996, when the average annual expenditure per CU on the same items was \$255. (While the increase in expenditures was more than 25 percent, it did not match the 106-percent rise in the price of tobacco products and smoking supplies, as measured by the Bureau's Consumer Price Index (CPI) during the same time period.)

Methodology

This article looks at the amount spent on tobacco products and smoking supplies by CUs, as classified according to education, occupation, and age of the reference person. Tobacco prod-

ucts and smoking supplies consist of the following expenditure items: Cigarettes, other tobacco products, and smoking accessories. In 2002, spending on cigarettes accounted for 91 percent of expenditures on tobacco and smoking supplies. Published expenditure estimates for cigarettes and other tobacco products are derived from data collected in the CE's Interview Survey, while estimates for smoking accessories are derived from the Diary Survey. Because the expenditures collected from the Diary Survey represent less than 1 percent of total tobacco spending, percent reporting (the percent of CUs who report purchasing an item) is based on the Interview Survey only. In the Interview Survey, the mean expenditures are annualized figures, whereas the percent reportings are average quarterly figures. Published CE expenditure estimates for a particular item are averages for all CUs in each class, including both those who purchase the item and those who do not. The mean for those who actually purchase the item is higher than the mean averaged across purchasers and non-purchasers. For example, in 2002, the average expenditure for tobacco products per CU was \$320, while the average for those who actually purchased tobacco products was \$1,321. This article looks at mean expenditures for all CUs (purchasers and non-purchasers) and for CUs who reported purchasing

¹ A consumer unit is defined as members of a household related by blood, marriage, adoption, or other legal arrangement; a single person living alone or sharing a household with others but who is financially independent; or two or more persons living together who share responsibility for at least two out of three major types of expenses—food, housing, and other expenses.

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tobacco. This paper focuses on the ratios of spending on tobacco, rather than the aggregate dollar amounts, because of suspected underreporting for this type of expenditure. For CUs who report tobacco expenditures, this analysis assumes consistent reporting (and underreporting) levels across three demographic groups—education, occupation, and age.

Spending and share data

This section examines tobacco expenditures, share allocation, and percent reporting, and compares tobacco expenditures with other selected expenditure items classified by education, occupation, and age of the CU. Tobacco expenditures are compared with expenditures for food and alcoholic beverages to examine consumer spending on necessary items, such as food, and on elective items, such as alcoholic beverages. These ratios are based on average annual tobacco expenditures, as compared with average annual food expenditures and with average annual alcoholic beverage expenditures for all CUs within each group.

Education. In the CE Survey, education levels are divided into two major categories—less than college graduate and college graduate. Less than college graduate is further subdivided into four groups: Less than high school graduate, high school graduate, high school graduate with some college, and associate degree. College graduate is subdivided into two groups: bachelor's degrees and master's, professional, or doctoral degrees. For those CUs whose reference persons had less than a college degree, the average annual expenditure for tobacco was \$375 in 2002. (See table 1.) In contrast, the average annual tobacco expenditure for those CUs whose reference person had a college degree was nearly half at \$167. High school graduates had the highest average annual tobacco expenditure at \$441, while those with a master's, professional, or doctoral degree had the lowest at \$130—a difference of 239 percent.

When comparing all CUs (both households that do and do not report

tobacco expenditures), there is less variation in the average annual tobacco expenditures among the different education levels when the analysis is restricted to those consumers who actually reported tobacco expenditures. The average annual tobacco expenditure for those who reported such expenditures was \$1,321 per year, with the highest average for the high school group at \$1,453 and the lowest average for the bachelor's degree group at \$1,161—a 25-percent difference.

Less than 1 percent of total average annual CU expenditures was spent on tobacco in 2002. The percent share of the average annual amount spent on tobacco varies among those households with less than a college degree. For those households with less than a high school degree, the tobacco share of average annual expenditures was 1.4 percent, compared with 1.3 percent for those with a high school degree, 0.9 percent for high school graduates with some college, and 0.7 percent for those households with an associate degree. The share spent on tobacco was lower for those households with a college degree—0.4 percent for those with a bachelor's degree and 0.2 percent for those with a master's, professional, or doctoral degree. On average, when looking at all CUs, including those CUs not reporting tobacco expenditures, as CUs achieve higher levels of education, the share that they spend on tobacco becomes smaller. However, as noted in the previous paragraph, the differences in average annual tobacco expenditures by CUs who reported tobacco expenditures show less variation among education levels.

Twenty-four percent of CUs reported tobacco expenditures in 2002. Thirty percent of high school graduates with no college—the highest of all educational groups—reported making tobacco purchases, followed by the group with less than a high school degree and those high school graduates with some college, both at 27 percent, and the group with an associate degree at 24 percent. On the other hand, fewer college graduates reported tobacco purchases with 16 percent of

those CUs with a bachelor's degree and 10 percent of those with a master's, professional, or doctoral degree reporting such expenditures.

The amount spent on tobacco compared with the amount spent on food and alcohol is also interesting. Overall, for all CUs, the amount spent on tobacco averaged about 6 percent of that spent on food; but for those with a high school degree, the amount was 9 percent, whereas it was only 2 percent for those with a master's, professional, or doctoral degree. The amount spent on tobacco averaged about 85 percent of that spent on alcoholic beverages for all CUs. For those with less than a high school degree, the amount was 191 percent; for those with an associate degree, the amount was 67 percent; and for those with a master's, professional, or doctoral degree, the amount was only 22 percent. (See table 2.)

Households with less than a college degree made up 74 percent (this group's population share) of all CUs but accounted for 86 percent of total tobacco expenditures in 2002, while those with a college degree made up 26 percent of all CUs but accounted for only 14 percent of tobacco expenditures.

Occupation. CE Survey data are published for the following occupation groups: Self-employed workers; CUs with retired reference persons; wage and salary earners, which includes five occupation groups—managers and professionals; technical, sales, and clerical workers; service workers; construction workers and mechanics; and operators, fabricators and laborers—and all others, including those not reporting. CUs with retired reference persons had the lowest average annual tobacco expenditures at \$163. The two more traditional blue-collar occupation groups, construction workers and mechanics, and operators, fabricators, and laborers, had the highest average annual tobacco expenditures at \$582 and \$482, respectively. In comparison, managers and professionals spent \$251, and self-employed workers spent \$315.

There is less variation in average annual tobacco expenditures among occupation groups for those CUs who reported tobacco expenditures, when compared with the average for all CUs in the demographic group. The average annual tobacco expenditure for those who reported tobacco expenditures was \$1,321 per year, with the highest average expenditure for the construction workers and mechanics group at \$1,464 and the lowest for the retired group at \$1,189.

The percent share of the average annual amount spent on tobacco also varies greatly among occupation groups. Managers' and professionals' share of average annual tobacco expenditures was 0.4 percent, compared with 0.6 percent for CUs with retired reference persons, and 0.7 percent for self-employed workers. The share was higher for the more traditional blue-collar households, with a share of 1.1 percent for service workers, and 1.4 percent for both construction workers and mechanics, and operators, fabricators, and laborers.

Forty percent of the construction workers and mechanics group—the highest of all occupational groups—reported tobacco expenditures in 2002, followed closely by operators, fabricators, and laborers at 35 percent, and service workers at 30 percent. In contrast, 19 percent of managers and professionals and 14 percent of the retired group reported tobacco expenditures.

As noted above, for all CUs, the amount spent on tobacco averaged 6 percent of that spent on food; but for construction workers and mechanics, the amount was 11 percent, compared with only 4 percent for managers and professionals, as well as CUs with retired reference persons. The amount spent on tobacco averaged 137 percent of that spent on alcoholic beverages for operators, fabricators, and laborers, compared with 117 percent for service workers, 63 percent for self-employed workers, and only 45 percent for managers and professionals.

In 2002, the households of managers and professionals made up 24 percent of CUs but accounted for 19 per-

cent of total tobacco expenditures. The households with retired reference persons made up 17 percent of all CUs and accounted for 9 percent of tobacco expenditures. In contrast, the households of construction workers and mechanics, and operators, fabricators, and laborers made up 4 percent and 10 percent of all CUs, respectively, but accounted for 8 percent and 15 percent of tobacco expenditures.

Age. The CE Survey publishes data for the following age classes: Under the age of 25, 25 to 34 years, 35 to 44 years, 45 to 54 years, age 65 and over, 65 to 74 years, and age 75 and over. Households headed by someone 45 to 54 years of age had the highest average annual tobacco expenditure at \$415, whereas the 75-and-over households had the lowest at \$81—a difference of 412 percent. In comparison, the average annual tobacco expenditure for the under-25 group was \$286, compared with \$376 for the 35-to-44 age group, and \$220 for the 65-to-74 age group.

There is less variation in average annual tobacco expenditures among age groups for those CUs who reported tobacco expenditures when compared to the average annual expenditures for all CUs (including those who did not report having tobacco expenditures). The group with the highest average expenditure was the 45-to-54 age group at \$1,413, and the group with the lowest was the under-25 group at \$1,100—a 28 percent difference.

For the 75-and-older group, the share of average annual expenditures for tobacco was 0.3 percent, compared with 0.5 percent for the 65-and-older group, and 0.8 percent for the 25-to-34, 35-to-44, and 55-to-64 age groups. The share of average annual expenditures on tobacco was highest for the youngest households, with a share of 1.2 percent for the under-25 group.

As previously mentioned, 24 percent of all CUs reported tobacco expenditures in 2002. Twenty-nine percent of the 45-to-54 age group—the highest of all age groups—reported tobacco expenditures, followed closely by the 35-to-44 age group at 27 percent and by the 25-

to-34, 55-to-64, and under-25 age groups at 26 percent. In contrast, only 12 percent of the 65-and-over age group, 17 percent of the 65-to-74 age group, and 7 percent of the 75-and-over age group reported tobacco expenditures.

A comparison of the amount spent on tobacco with the amount spent on food shows that, for the under-25 group—the highest of all age groups—the amount spent on tobacco was 8 percent, compared with only 3 percent for the 75-and-over group. The amount spent on tobacco averaged 103 percent of that spent on alcoholic beverages for the 35-to-44 group, 89 percent for the 45-to-54 group, 80 percent for the 25-to-34 group, 73 percent for the under-25 group, 68 percent for the 65-to-74 group, and 56 percent for the 75-and-over group.

In 2002, households headed by someone aged 65 and over made up 20 percent of CUs but accounted for only 9 percent of total tobacco expenditures, whereas those households headed by someone under 25 years old made up 8 percent of all CUs and accounted for 7 percent of tobacco expenditures. In contrast, the 35- to 44-year-old group and the 45- to 54-year-old group made up 22 percent and 20 percent of all CUs, respectively, but accounted for 26 percent of the tobacco expenditures.

In summary, CE 2002 data shows that, as CUs achieve higher levels of education, the amounts and shares that they spend on tobacco becomes smaller. Among occupation groups (excluding retired households), households of managers and professionals and self-employed workers spend a smaller amount and have the lowest share of tobacco expenditures. Construction workers and mechanics as well as operators, fabricators, and laborers spend a larger amount and share on tobacco. As age increases among groups, the amounts and the shares that they spend on tobacco becomes smaller. While the percent of CUs who purchase tobacco differs by age, education, and occupation, the average annual expenditure on tobacco by CUs who purchase tobacco does not differ as widely by these factors. ■

Table 1. Average annual expenditures and spending on tobacco for all consumer units, by education level, occupation, and age of reference person, Consumer Expenditure Survey, 2002

Item	Number of consumer units (in thousands)	Average annual expenditures per consumer unit	Average annual tobacco expenditures per consumer unit	Average quarterly percent reporting (percent)	Average annual tobacco expenditures (consumer units who reported tobacco expenditures)	Average annual tobacco share of average annual expenditures (percent)	Total share of tobacco expenditure (percent)	Population share of consumer units (percent)
All consumer units	112,108	\$40,677	\$320	24.2	\$1,321	0.8	100.0	100.0
Education level:								
Total less than college graduate:	82,690	34,631	375	27.9	1,346	1.1	86.3	73.8
Less than high school graduate	17,075	24,930	354	27.2	1,301	1.4	16.8	15.2
High school graduate	31,961	33,708	441	30.4	1,453	1.3	39.2	28.5
High school graduate with some college	23,260	38,654	340	26.6	1,277	.9	22.0	20.8
Associate degree	10,395	44,406	289	24.0	1,205	.7	8.3	9.3
Total college graduate:	29,417	57,384	167	14.1	1,189	.3	13.7	26.2
Bachelor's degree	19,082	53,732	186	16.0	1,161	.4	9.9	17.0
Master's, professional, or doctoral degree	10,335	64,118	130	10.4	1,248	.2	3.8	9.2
Occupation:								
Total wage and salary:	74,695	45,296	354	26.6	1,332	.8	73.6	66.6
Managers and professionals	27,104	57,200	251	19.3	1,303	.4	18.9	24.2
Technical sales and clerical workers	20,964	42,069	354	26.8	1,321	.8	20.7	18.7
Service workers	10,704	34,515	377	30.1	1,254	1.1	11.2	9.5
Construction workers and mechanics	4,885	40,711	582	39.8	1,464	1.4	7.9	4.4
Operators, fabricators, and laborers	11,038	34,601	482	34.9	1,382	1.4	14.8	9.8
Self-employed workers	5,106	46,880	315	21.8	1,447	.7	4.5	4.6
Retired	19,204	27,535	163	13.7	1,189	.6	8.7	17.1
All others, including not reporting	13,102	31,099	363	27.3	1,330	1.2	13.2	11.7
Age:								
Under 25	8,737	24,229	286	26.0	1,100	1.2	6.9	7.8
25 to 34	18,988	40,318	315	25.9	1,218	.8	16.7	16.9
35 to 44	24,394	48,330	376	27.2	1,384	.8	25.5	21.8
45 to 54	22,691	48,748	415	29.4	1,413	.9	26.2	20.2
55 to 64	15,314	44,330	361	26.1	1,384	.8	15.4	13.7
65 and over	21,983	28,105	152	12.3	1,237	.5	9.3	19.6
65 to 74	11,216	32,243	220	17.2	1,278	.7	6.9	10.0
75 and over	10,767	23,759	81	7.2	1,128	.3	2.4	9.6

Table 2. Percent ratio of average annual expenditures on tobacco to average annual expenditures on food and on alcoholic beverages, by education level, occupation, and age of reference person, Consumer Expenditure Survey, 2002

Item	Ratio of amount spent on tobacco to amount spent on food (percent)	Ratio of amount spent on tobacco to amount spent on alcoholic beverages (percent)
All consumer units	6.0	85.1
Education level:		
Total less than college graduate	7.8	123.8
Less than high school graduate	8.6	191.4
High school graduate	9.4	161.5
High school graduate with some college	6.7	91.4
Associate degree	5.1	66.7
Total college graduate:	2.5	29.8
Bachelor's degree	2.8	34.6
Master's, professional, or doctoral degree	1.8	21.5
Occupation:		
Total wage and salary:	6.1	81.2
Managers and professionals	3.7	45.3
Technical sales and clerical workers	6.4	94.7
Service workers	7.4	116.7
Construction workers and mechanics	10.6	136.0
Operators, fabricators, and laborers	9.8	130.6
Self-employed workers	5.3	63.0
Retired	4.3	78.4
All others, including not reporting	7.5	162.1
Age:		
Under 25	7.9	72.6
25 to 34	5.8	79.7
35 to 44	6.0	102.5
45 to 54	6.7	89.2
55 to 64	6.5	86.0
65 and over	3.9	64.1
65 to 74	4.9	67.9
75 and over	2.5	56.3

Spending by Singles

MEAGHAN DUETSCH

Do single women spend their money differently than single men do? If so, can their spending differences be attributed to differences in characteristics between the two groups? In addition, have the spending patterns of single men and single women changed over the past decade? These are some of the questions that can be answered with data from the Consumer Expenditure Survey. Given that people are choosing to marry at a later age and that the life expectancy of women continues to be greater than that of men, more people are single now than ever before, so the answers to the preceding questions loom large in the economic life of a significant proportion of the Nation's population.

This article examines the expenditures of single-person consumer units, both men and women. A single-person consumer unit may differ slightly from a single-person, or one-person, household. Financial independence is a criterion used to determine consumer unit status. A one-person household is a single-person consumer unit; but if two people are living together and are financially independent of one another, as in a roommate situation, then the two people are two separate single-person consumer units. Single parents with children present are not single-person consumer units. Using data for 1991–92 and 2001–02 from the interview and

diary portions of this Consumer Expenditure Survey, this article compares expenditures and demographic characteristics between and during those two periods. Two years of data are used for each period, in order to obtain a sufficient sample for examining expenditures by age and gender. Only single men and single women are compared, as opposed to all men and all women, due to the way data are collected. The Consumer Expenditure Survey collects data on expenditures for the consumer unit as a whole, with no distinction as to who made the expenditures. Therefore, in a consumer unit of more than one person, it cannot be determined who made the expenditures, whereas that is not the case in a single-person consumer unit. Expenditures are examined to determine whether they changed for each gender over the period from 1991–92 through 2001–02 and also to determine whether the expenditure relationship between genders changed during that time. Finally, expenditures are examined for a specific age group, to analyze the role of age in expenditure decisions.

Characteristics

The average age of single women was about 13 years older than the average age for single men for the 1991–92 period (56.6 years and 43 years, respectively) and about 11 years older for the

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2001–02 period (56.3 years and 45.3 years, respectively). (See table 1.) Since men and women’s birthrates are approximately equal and women have a longer life expectancy, there are more older women than older men. This difference could also explain the higher homeownership rates for single women, 48 percent in 1991–92, compared with 36 percent for single men. Both groups had increased homeownership rates in 2001–02, with women at 56 percent and men at 45 percent. Across the two periods, more female homeowners were without a mortgage than with, a statistic again most likely attributable to the longevity of women, which results in many older widows. Male homeowners were fairly evenly split between those with a mortgage and those without, and this ratio stayed constant over the two periods, despite an increase in men’s homeownership. Both groups experienced an increase in the percentage with a college education: in 1991–92, 46 percent of single women and 54 percent of single men had a college education—figures that increased to 54 percent for single women and 61 percent for single men in 2001–02.

Single men had higher average incomes than did single women for both 1991–92 and 2001–02, and the difference increased over the period. Men’s income grew from \$20,615 to \$31,688, (an increase of 54 percent), while women’s rose from \$16,432 to \$22,930 (an increase of 40 percent). Although single men still owned more vehicles than did single women, the men’s rate of ownership remained constant. On average, men had 1.3 vehicles in both periods, while women had 0.8 vehicles in 1991–92 and 0.9 in 2001–02.

Expenditures

Single men and single women allocate their expenditures differently. Expenditure patterns were examined by looking at shares of total expenditures, because nominal dollar amounts of the expenditures, as well as the nominal amount of average annual expenditures, change over time. The difference in shares held for both periods. Single men spent a larger share of annual ex-

penditures on food than did single women (13.5 percent as opposed to 12.6 percent in 1991–92, and 12.5 percent compared with 11.6 percent in 2001–02). The genders also allocated their spending differently between food at home and food away from home, with men apportioning a larger share of their food dollar to food away from home and women a larger share to food at home. This distinction may be explained by the fact that single women as a group are older than single men and, therefore, take more meals at home. Also, traditionally, women cook more than men. In addition, only about half of all single women are earners. (See table 1.) This fact may contribute to women allocating a larger share of expenditures to food at home, because food at home is usually less expensive. Single women spent a larger share of their expenditures on housing than did single men (38 percent and 33 percent, respectively). The reason could be the higher homeownership rate for single women, or it may be that single women had lower incomes and, thus, spent a larger proportion on necessities. Single women allocated a larger share to apparel and services, while single men allocated a larger share to transportation. This larger share that men allocated to transportation is attributed to the higher average number of vehicles owned by men, together with the associated costs, such as gasoline, maintenance, and insurance. Single women allocated a larger share to health care, compared with single men, while single men spent a larger share of annual expenditures on entertainment than did single women. Both groups spent about the same share on cash contributions.

There were several similarities in the trends of expenditure shares for men and women between 1991–92 and 2001–02. Over the 10-year interval, each group decreased its share spent on food, including food at home and food away from home. The shares allocated for housing, shelter, and utilities remained relatively constant. Both groups spent a smaller share on apparel in 2001–02 than in 1991–92. By con-

trast, both groups allocated a larger share to transportation in 2001–02 than in 1991–92. The expenditure share spent on health care rose slightly for both men and women, while the shares spent on entertainment and cash contributions remained relatively unchanged.

The preceding discussion of single men and single women encompasses all singles, ranging from young adults to those who have reached retirement age and beyond. Many differences in the spending patterns described can be attributed to the average difference in age between single men and single women. The analysis that follows compares income levels and spending patterns between men and women in a specific age group to see if the spending differences between the genders remain for men and women of a similar age. The 25- to 34-year-old age group is examined because it represents those often thought of when the word “singles” is used. The men and women of this group have similarities and differences. In 1991–92, single women and single men had similar average incomes (\$24,721 and \$24,719, respectively) and similar average annual expenditures (\$21,312 and \$21,858, respectively). However, in that same period, the single men allocated a larger share to food (13.4 percent compared with 11.8 percent), but both the men and the women allocated about the same share to food at home (5.6 percent and 5.2 percent, respectively). (See table 2.) Single men allocated a larger share to food away from home (7.7 percent as opposed to 6.6 percent). Single women in this group allocated a slightly larger share to housing overall (36.4 percent compared with 34.2 percent) and also allocated a slightly larger share to shelter (25.4 percent versus 23.8 percent). By contrast, and unlike the situation for all age groups taken together, single women aged 25 to 34 years had a lower homeownership rate (17 percent) than did single men (24 percent). Women and men in the group allocated about the same share to utilities (5.6 percent and 5.4 percent, respectively), even though the women were a higher percentage

of renters (83 percent) than were the men (76 percent). (Because utilities are often included in rent payments, it is not possible to capture the true expenditure for utilities by renters.) Single women aged 25 to 34 years allocated a larger share to apparel and services (7.6 percent) than did single men in the same age group (4.5 percent). In the 1991–92 period, the 25- to 34-year-old men spent a larger share on transportation (17.9 percent) than did the 25- to 34-year-old women (15.7 percent). Men had an average of 1.4 vehicles; women an average of 0.9 vehicles. Also in 1991–92, single women allocated a larger share to health care (3.1 percent) than did single men (2.1 percent). However, single men spent a larger share (2.5 percent) on cash contributions than did single women (0.9 percent).

The picture for singles 25 to 34 years old changed some by 2001–02. In that period, single men had average incomes of \$38,936 and average annual expenditures of \$29,736, while single women had lower incomes (\$31,432) and lower average annual expenditures (\$27,110). Also in 2001–02, 90 percent of single women were earners, compared with 100 percent of single men. The homeownership rate increased over the 1991–92 figures for both men and women, to 33 percent and 30 percent, respectively. Also, more women in this age group had a college education (80 percent) than did men (75 percent), although the differences between the groups were narrower than in 1991–92

(77 percent of women and 70 percent of men).

Although there were some differences from the 1991–92 period, in 2001–02 single men still allocated a larger share to food (12.9 percent) than did single women (11.8 percent), as well as a larger share to food away from home (8.8 percent compared with 6.0 percent). Single women still allocated a larger share to housing overall (37.7 percent as opposed to 33.7 percent), even though a larger percentage of 25- to 34-year-old single men were homeowners. In addition, single women allocated a larger share to shelter (25.9 percent) than did single men (23.8 percent). In 2001–02, the share allocated to apparel and services by all singles 25 to 34 years decreased from the 1991–92 figure; however, the share spent by single women decreased more, to 5.7 percent, compared with single men's share of 4.1 percent. As in the 1991–92 period, 25- to 34-year-old single men spent a larger share on transportation (20.4 percent) than did single women (17.7 percent) in 2001–02. Single men had slightly fewer vehicles, 1.2, compared with 1.4 vehicles in 1991–92; single women had 1.0 and 0.9 in the respective periods. Single men continued to allocate a larger share—more than twice as much—to cash contributions (2.9 percent) than did single women (1.4 percent), possibly due to child support payments that single men make, as they may be fathers of young children who live elsewhere.

Summary

Single women overall are older than single men and have higher rates of homeownership. Single men have a larger number of vehicles. However, both groups had an increase in the rate of homeownership from 1991–92 to 2001–02. Both groups also had an increase in the number of college educated among them from the first period to the second. Both single men and single women spent less of their total expenditures in 2001–02 on food and apparel and services, although men spent more on food and women more on apparel and services. As incomes increase, people tend to spend less on necessities, such as food. Also, the decrease in the costs of apparel and services relative to other goods, coupled with increasing incomes, across the two periods, has enabled consumers to allocate less of their total expenditures to apparel and services. Single men and single women aged 25 to 34 years exhibited spending patterns more similar to each other than did the overall groups of single men and single women. The 25- to 34-year-old men and women had similar rates of homeownership and similar levels of education and also spent similarly on shelter, as well as on entertainment. However, single men spent more on transportation and single women more on apparel and services. Overall, single men and single women had different spending patterns that changed little from 1991–92 to 2001–02. ■

Table 1. **Characteristics, average annual expenditures, and expenditure shares, all single women and men, Consumer Expenditure Survey, 1991–92 and 2001–02**

Item	Single Women				Single Men			
	1991–92	Expenditure share	2001–02	Expenditure share	1991–92	Expenditure share	2001–02	Expenditure share
Number of consumer units (thousands)	15,583		18,316		12,531		14,603	
Average age	56.6		56.3		43		45.3	
Income before taxes	\$16,432		\$22,936		\$20,615		\$31,688	
Number of earners .....	.5		.5		.8		.7	
Number of vehicles .....	.8		.9		1.3		1.3	
Percent distribution:								
Housing tenure:								
Homeowner	48		56		36		45	
with mortgage	15		21		18		22	
without mortgage	32		35		19		23	
Renter	52		44		64		55	
Highest level of education:								
Elementary school	14		8		10		7	
High school	39		39		35		32	
College	46		54		54		61	
Average annual expenditures	\$16,440	100.0	\$22,209	100.0	\$19,118	100.0	\$25,904	100.0
Food	2,074	12.6	2,583	11.6	2,582	13.5	3,230	12.5
Food at home	1,309	8.0	1,598	7.2	1,210	6.3	1,482	5.7
Food away from home	765	4.7	985	4.4	1,372	7.2	1,749	6.8
Housing	6,337	38.5	8,434	38.0	6,208	32.5	8,576	33.1
Shelter	3,766	22.9	5,111	23.0	4,139	21.6	5,671	21.9
Utilities	1,356	8.2	1,844	8.3	1,133	5.9	1,645	6.4
Household operations, housekeeping supplies, household furnishings and equipment	1,214	7.4	1,478	6.7	936	4.9	1,260	4.9
Apparel and services	1,030	6.3	1,030	4.6	852	4.5	725	2.8
Transportation	2,081	12.7	3,223	14.5	3,217	16.8	4,863	18.8
Health care	1,238	7.5	1,772	8.0	770	4.0	1,118	4.3
Entertainment	649	3.9	986	4.4	1,040	5.4	1,345	5.2
Cash contributions	700	4.3	915	4.1	853	4.5	1,175	4.5
Other expenditures	2,331	14.2	3,266	14.7	3,596	18.8	4,872	18.8

Table 2. **Characteristics, average annual expenditures, and expenditure shares, single women and men aged 25–34 years, Consumer Expenditure Survey, 1991–92 and 2001–02**

Item	Single Women, 25–34				Single Men, 25–34			
	1991–92	Expenditure share	2001–02	Expenditure share	1991–92	Expenditure share	2001–02	Expenditure share
Number of consumer units (thousands)	1,917		1,674		3,076		2,612	
Average age	29.1		29.4		29.5		29.4	
Income before taxes	\$24,721		\$31,432		\$24,719		\$38,936	
Number of earners	1.0		.9		1.0		1.0	
Number of vehicles .....	.9		1		1.4		1.2	
Percent distribution:								
Housing tenure:								
Homeowner	17		30		24		33	
with mortgage	15		23		21		25	
without mortgage	2		7		3		8	
Renter	83		70		76		67	
Highest level of education:								
Elementary school	1		1		2		1	
High school	22		19		28		24	
College	77		80		70		75	
Average annual expenditures	\$21,312	100.0	\$27,110	100.0	\$21,858	100.0	\$29,736	100.0
Food	2,507	11.8	3,202	11.8	2,926	13.4	3,831	12.9
Food at home	1,107	5.2	1,562	5.8	1,233	5.6	1,459	4.9
Food away from home	1,400	6.6	1,640	6.0	1,693	7.7	2,372	8.0
Housing	7,762	36.4	10,218	37.7	7,477	34.2	10,021	33.7
Shelter	5,412	25.4	7,029	25.9	5,210	23.8	7,078	23.8
Utilities	1,199	5.6	1,803	6.7	1,186	5.4	1,727	5.8
Household operations, housekeeping supplies, household furnishings and equipment	1,151	5.4	1,385	5.1	1,081	4.9	1,216	4.1
Apparel and services	1,613	7.6	1,536	5.7	985	4.5	1,206	4.1
Transportation	3,338	15.7	4,797	17.7	3,905	17.9	6,061	20.4
Health care	655	3.1	875	3.2	451	2.1	604	2.0
Entertainment	1,026	4.8	1,221	4.5	1,168	5.3	1,667	5.6
Cash contributions	182	.9	375	1.4	549	2.5	875	2.9
Other expenditures	4,229	19.8	4,886	18.0	4,397	20.1	5,471	18.4

Trends in Airfare Expenditures

GEORGE JANINI

According to published reports by the Air Transport Association,¹ the airline travel industry is looking to rebound from the September 11, 2001, (9/11) terrorist attacks. As reported, Americans were traveling in record numbers before 9/11 but decreased their traveling considerably after 9/11. In addition to customers' wariness regarding flying just following 9/11, a sluggish economy in late 2001 and 2002 contributed to this decrease. This article examines trends in spending on travel in the years prior to and just after 9/11, using data from the U.S. Bureau of Labor Statistics Consumer Expenditure Interview Survey. The focus is specifically on airfare expenditures, which are compared across age groups and regions of residence. Age was selected because of the different lifestyles among the various age groups, as well as the income differences among them. Region was selected, to see if there was a larger effect in those regions that were the primary focus of the attacks.

Methodology

Travel expenditures in the Consumer Expenditure Survey (CE) are broken down into five main groups: transportation, food, lodging, entertainment, and purchase of gifts. Transportation

expenditures include all costs traveling to and from the destination, as well as transportation costs incurred while on the trip. This study focused on spending on airfares. Data are reported as aggregate and average expenditures per consumer unit² for each of the spending groups. Average expenditures per consumer unit are used in comparing regions, due to varying population counts among them. Quarterly data from the Consumer Expenditure Interview Survey are used for the period 1998 through 2002. Aggregate amounts were estimated with weights derived from the survey. Excluded are all business-related expenditures for which the consumer unit was reimbursed.

Trends in airfare expenditures

All consumer units

Consumer Expenditure data show that spending on airfare is cyclical, with the highest expenditures posted in the spring and summer months (the second and third quarters). The third quarter of 2001 showed a peak in the data for the 5-year period.³ (See chart 1 and table 1.) Aggregate airfare expenditures

² See the glossary in the appendix for the definition of a *consumer unit*.

³ This figure could have been even higher if not for the fact that the events of 9/11 took place in the third quarter and the subsequent closures of airports and restrictions immediately crippled the industry.

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¹ See Keith L. Alexander, "Flights Filling Up, Airlines and Hotels Hiking Prices." *The Washington Post*, May 23, 2004, p. F.01.

reached almost \$9 billion that summer. This was followed by a downturn in which the lowest aggregate expenditure of the period, \$5 billion, was reported in the first quarter of 2002. Although the first quarter is typically the slowest quarter for any given year, the average expenditure for the first quarter of the previous years (1998–2001) was \$6 billion. The percentage of consumer units who reported taking a trip by airplane also declined. From 1998 through 2001, an average of 32 percent of travelers got to their destination by flying. By 2002, that number had slipped to 28 percent. The latter part of 2002 saw a rebound, with \$8 billion spent by consumers in the summer of 2002 and the percentage of travelers going by plane edging back up to 32 percent.

Age Groups⁴

Under 25. The events of 9/11 appear to have had a large effect on airfare expenditures for the under-age-25 group. The years 1998 through 2001 saw a steady cyclical pattern of spending, with the exception being a robust 1998 summer. (See chart 2 and table 1.) Another peak in the summer of 2001 showed expenditures matching the 1998 summer figure of \$420 million. This peak was followed by a decrease in the fourth quarter of 2001, just after 9/11, in which expenditures fell to the 5-year low of \$150 million, marking a larger decrease in expenditures than could be explained by the typical cyclical dropoff in the fourth quarter. To put the decline in perspective, spending on airfare for the fourth quarters from 1998 through 2000 by those under 25 averaged \$215 million, while in the fourth quarter of 2001, it was \$150 million.

Age 25 to 44. Compared with the 25-and-under group, 25- to 44-year-olds reported airfare expenditures that had less volatile swings. The summers of 1998 and 2000 had the biggest peaks, with the former topping out at \$3.2 bil-

lion and the latter reaching \$3.4 billion. (See chart 3 and table 1.) Surprisingly, there was not much of a decrease in the fourth quarter of 2001, when expenditures dropped just \$200 million from the previous quarter, to 2.6 billion dollars. A bigger drop was felt in the first quarter of 2002, when expenditures fell to 2 billion dollars. The age group, consisting of 25- to 44-year-olds, spends more, on average, and is a larger group, than the under-age-25 group, so even a small change between quarters may have a greater effect on total aggregate expenditures. For example, the dropoff in expenditures from the fourth quarter of 2001 to the first quarter of 2002 was \$600 million, a figure greater than the highest expenditure reported—\$420 million—for any quarter by the less-than-25 age group.

Age 45 to 64. As with the 25-to-44-year age group, airfare expenditures for the 45- to 54-year group showed the cyclical pattern common to the data. The highest expenditures of any quarter were in the summers of 2001 and 2002, \$3.3 billion for both. (See chart 4 and table 1.) The fourth quarter of 2001, just after the events of 9/11, saw an \$800 million dropoff in expenditures from the previous quarter's figure; the decline was the biggest from any given quarter to the next.

Age 65 and older. At \$2.3 billion, spending on airfares in the summer of 2001 by the age-65-and-older group was the highest of any quarter for the group for the 5-year period. (See chart 5 and table 1.) There was a sharp decline in the fourth quarter, when expenditures fell to \$780 million. This fall off is of note because those 65 years and older posted strong fourth quarters in 1998 and 2000, spending \$300 million more in the fourth quarter than they did in the previous third quarter, which is typically the quarter in which airfare expenditures are highest. It is possible that this age group tends to travel more in the holiday season to be with families, whereas the other age groups spend more on summer leisure travel. By the first quarter of 2002, expenditures by

those age 65 and older were at the lowest level for the 5-year period, 650 million dollars. This figure marked a 1.65 billion dollar decrease in total expenditures from the summer of 2001—the biggest decrease in total expenditures among the age groups for the pre- and post- 9/11 period.

Regions

Northeast. Because the events of 9/11 were centered primarily in the Northeast, it would be reasonable to think that that region would be most affected in the aftermath. As was the case for the country as a whole, the summer of 2001 set a 5-year-period high for the Northeast region, slightly more than \$2 billion spent on airfares. (See table 2 and chart 6.) This quarter also had the highest average expenditures per consumer unit among any of the regions, \$310. (See table 3.) After 9/11, the fourth quarter of 2001 saw a 35-percent decline in average expenditures, to \$200. This decline is significant compared with changes during the other 4 years in the study, which saw increases in average expenditures in the fourth quarter for the Northeast. Spending on airfare slid even further in the first quarter of 2002, to \$174, the second-lowest average in the 5-year period, apart from the first quarter of 1998. By the summer of 2002, average expenditures were a little higher, at \$206, but this figure still marked a 34-percent decrease from that of the previous summer. The drop was the biggest percentagewise among the regions.

Midwest. The events of 9/11 seemed to have less of an effect on airline travelers in the Midwest region, which posted the steadiest set of data in the 5-year period. (See chart 7.) In the Midwest, average annual expenditures per consumer unit dropped 11 percent from the summer of 2001 to the summer of 2002—the smallest decrease among the regions over that period.

South. Like the Midwest, the events of 9/11 seemed to have less of an effect on airline travelers in the South. It is of

⁴ Age classifications are by the age of the reference person. See the glossary in the appendix for a definition of *reference person*.

note that the summer of 2001 was the only quarter in the 5-year period to post an average expenditure per consumer unit above \$200, namely, \$214. In the summer of 2002, average expenditures fell to \$179, a 16-percent drop. (See table 3 and chart 8.)

West. The West was the region second highest to the Northeast in average quarterly expenditures per consumer unit for the entire 5-year period, at \$207, compared with \$226 for the Northeast. (See table 3 and chart 9.) At \$162, average quarterly expenditures per consumer unit were at the second-lowest point of the 5-year period in the fourth quarter of 2001, just after 9/11, a 34-percent decrease from the third quarter. Expenditures did not rebound until

the summer of 2002, when average quarterly expenditures per consumer unit were back above \$200. Average annual expenditures from the summer of 2001 to the summer of 2002 fell 18 percent, the second-highest percentage drop after that of the Northeast region's.

Conclusion

The data presented here show that spending on airline fares was at a high point just prior to the events of 9/11. Thereafter, a sharp decrease ensued. Total airfare spending by all consumer units dropped from \$8.9 billion in the third quarter of 2001 to \$6.1 billion in the fourth quarter, a 31-percent decrease. The 8.9 billion dollars spent in the third quarter of 2001 was 14 percent higher than the 7.8 billion dollars

spent a year later, in the third quarter of 2002. The most affected age groups were the oldest and the youngest, and the most affected region was the Northeast, followed by the West. This slowdown, which continued into 2002, can be attributed primarily to the shock of 9/11, but also to a weak economy. Excluding airfare, expenditures involving other modes of transportation (train, ship, or car) also went down. Spending by all consumer units dropped from roughly \$2.8 billion in the third quarter of 2001 to \$1.7 billion in the fourth quarter of 2001. The drop was significant, as expenditures in the fourth quarter of 2000 were \$3.3 billion. By the fourth quarter of 2002, expenditures had rebounded back up to approximately \$3 billion. ■

Table 1. Quarterly airfare expenditures, in billions of dollars, by age of reference person, Consumer Expenditure Interview Survey, 1998–2002

Year and quarter	All consumer units	Under 25 years	25–44 years	45–64 years	65 years and older
1998					
Quarter 1	5.60	0.25	2.30	2.10	0.89
Quarter 2	6.30	.22	2.20	2.90	1.00
Quarter 3	8.00	.42	3.20	2.80	1.50
Quarter 4	7.70	.16	2.50	3.20	1.80
1999					
Quarter 1	5.90	.19	2.10	2.60	.90
Quarter 2	5.90	.16	2.00	2.20	1.20
Quarter 3	7.00	.26	2.70	2.70	1.20
Quarter 4	5.30	.24	2.00	2.60	1.00
2000					
Quarter 1	6.30	.19	2.60	2.20	1.20
Quarter 2	6.60	.26	2.40	2.80	1.10
Quarter 3	8.20	.26	3.40	3.00	1.40
Quarter 4	7.60	.22	2.80	2.80	1.70
2001					
Quarter 1	6.20	.16	2.40	2.60	0.89
Quarter 2	6.00	.32	2.60	2.00	.97
Quarter 3	8.90	.42	2.80	3.30	2.30
Quarter 4	6.10	.15	2.60	2.50	.78
2002					
Quarter 1	5.00	.16	2.00	2.20	.65
Quarter 2	5.80	.27	2.30	2.50	.69
Quarter 3	7.80	.26	2.90	3.30	1.10
Quarter 4	6.90	.24	2.70	2.90	1.00

Table 2. Quarterly airfare expenditures, in billions of dollars, by region of residence, Consumer Expenditure Interview Survey, 1998–2002

Year and quarter	Northeast	Midwest	South	West
1998				
Quarter 1	1.00	1.10	1.30	2.00
Quarter 2	1.70	1.40	1.30	1.80
Quarter 3	1.60	1.20	2.00	3.10
Quarter 4	1.90	1.30	2.00	2.40
1999				
Quarter 1	1.20	1.40	1.40	1.70
Quarter 2	1.60	1.40	1.30	1.40
Quarter 3	1.40	1.20	2.20	2.00
Quarter 4	1.10	1.00	1.30	1.80
2000				
Quarter 1	1.20	1.80	1.40	1.90
Quarter 2	1.80	1.60	1.50	1.60
Quarter 3	1.60	1.60	2.30	2.60
Quarter 4	1.60	1.90	1.90	2.10
2001				
Quarter 1	1.10	1.10	1.40	2.30
Quarter 2	1.50	1.40	1.40	1.60
Quarter 3	2.10	1.70	2.50	2.50
Quarter 4	1.50	1.20	1.60	1.70
2002				
Quarter 1 .....	.99	1.10	1.40	1.50
Quarter 2	1.40	1.40	1.30	1.40
Quarter 3	1.50	1.50	2.40	2.10
Quarter 4	1.70	1.40	1.70	2.10

Table 3. Average quarterly airfare expenditures per consumer unit, by region of residence, Consumer Expenditure Interview Survey, 1998–2002

Year and quarter	Northeast	Midwest	South	West
1998				
Quarter 1	\$157	\$139	\$115	\$214
Quarter 2	242	166	121	200
Quarter 3	200	114	146	278
Quarter 4	232	115	158	223
1999				
Quarter 1	218	178	129	180
Quarter 2	268	168	127	150
Quarter 3	186	119	165	192
Quarter 4	200	128	135	227
2000				
Quarter 1	204	221	138	218
Quarter 2	298	181	163	190
Quarter 3	197	157	183	247
Quarter 4	238	188	158	213
2001				
Quarter 1	226	139	144	264
Quarter 2	261	160	152	190
Quarter 3	310	173	214	247
Quarter 4	200	129	148	162
2002				
Quarter 1	174	145	137	167
Quarter 2	249	178	127	169
Quarter 3	206	154	179	202
Quarter 4	247	146	149	207

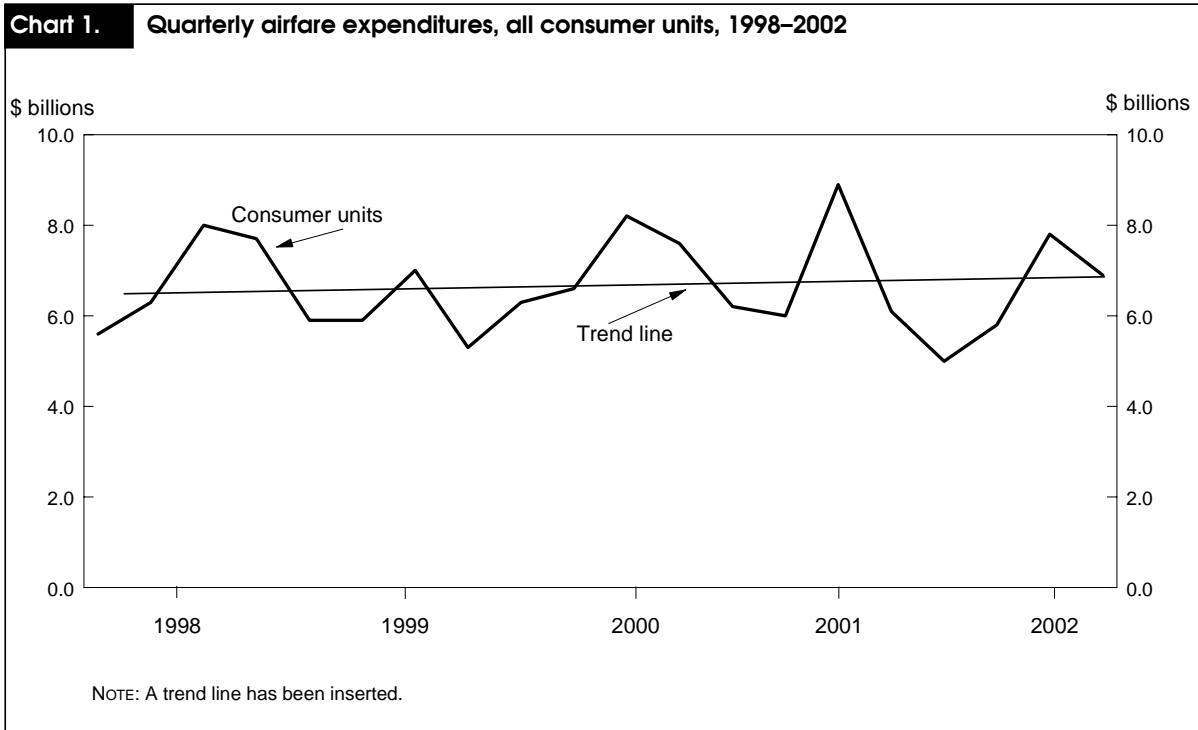


Chart 2. Quarterly airfare expenditures, persons under age 25, 1998–2002

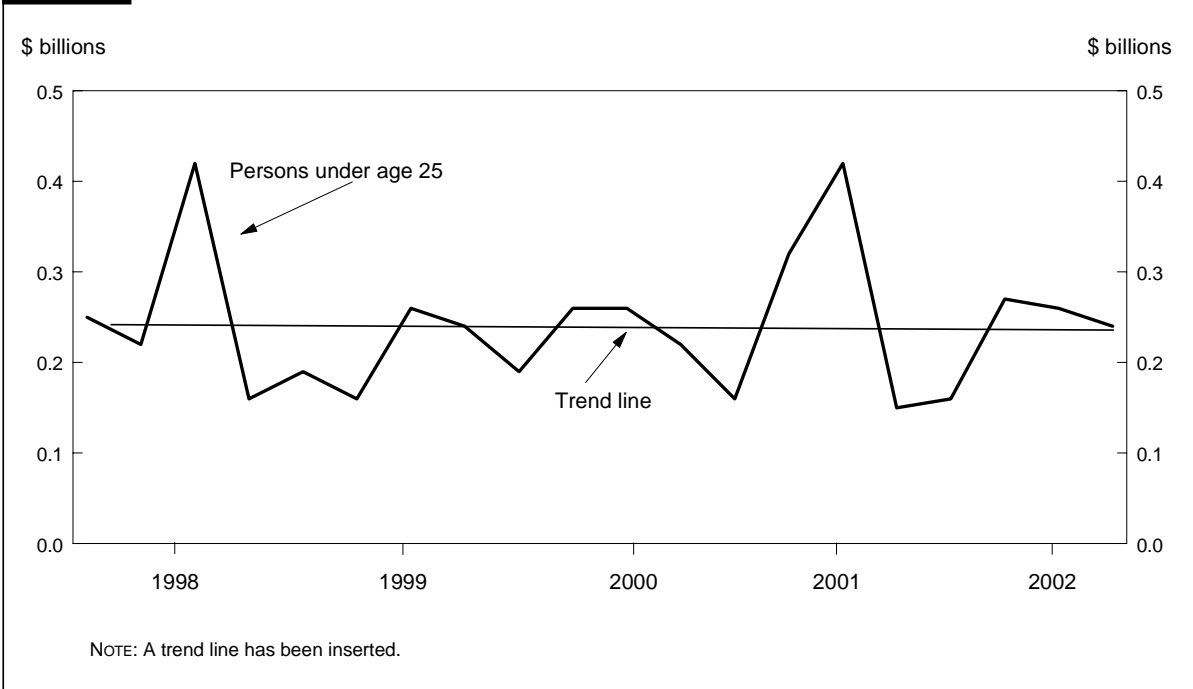


Chart 3. Quarterly airfare expenditures, persons aged 25–44 years, 1998–2002

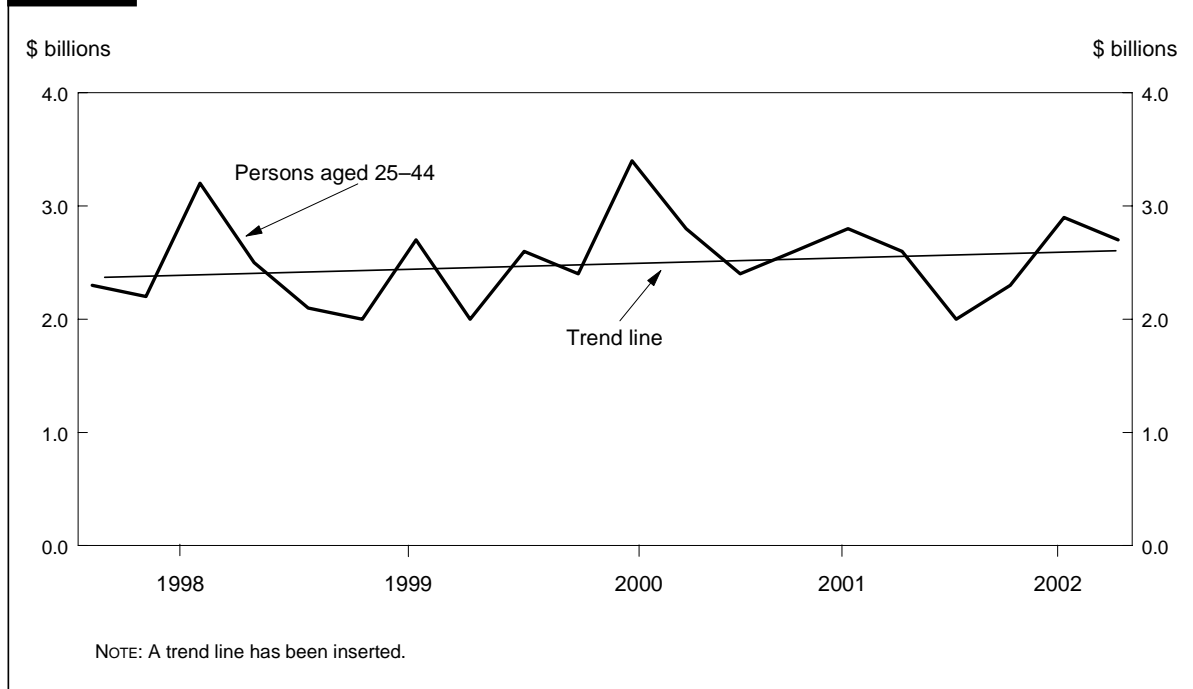


Chart 4. Quarterly airfare expenditures, persons aged 45–64 years, 1998–2002

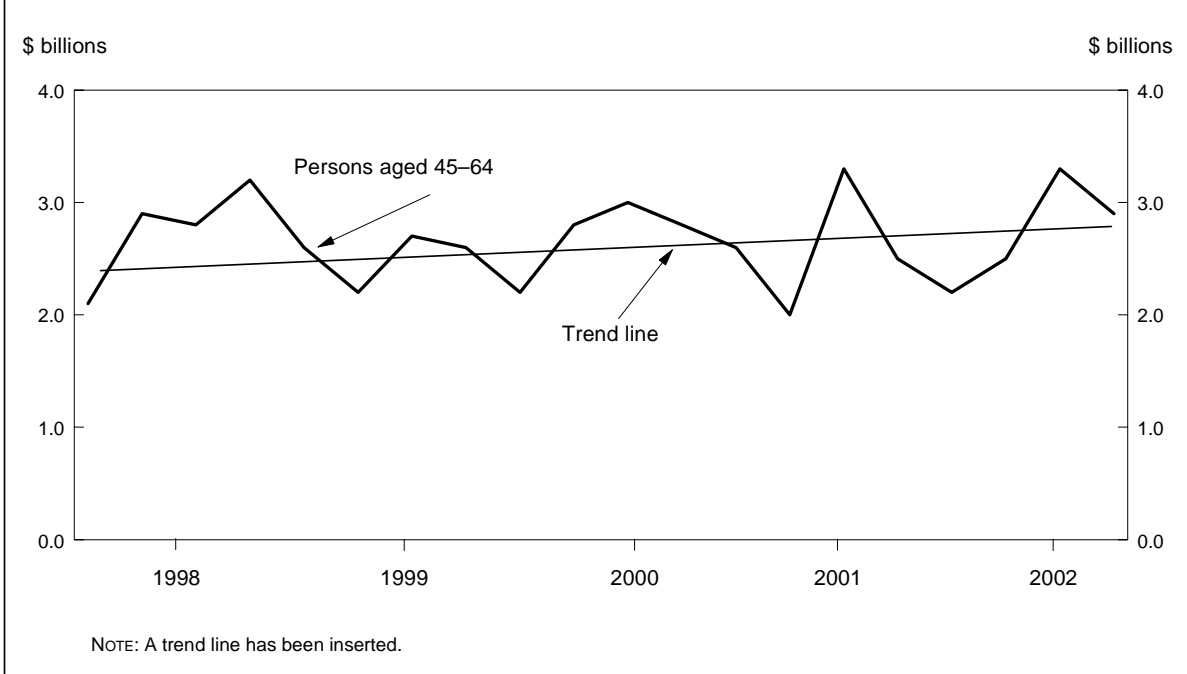


Chart 5. Quarterly airfare expenditures, persons aged 65 years and older, 1998–2002

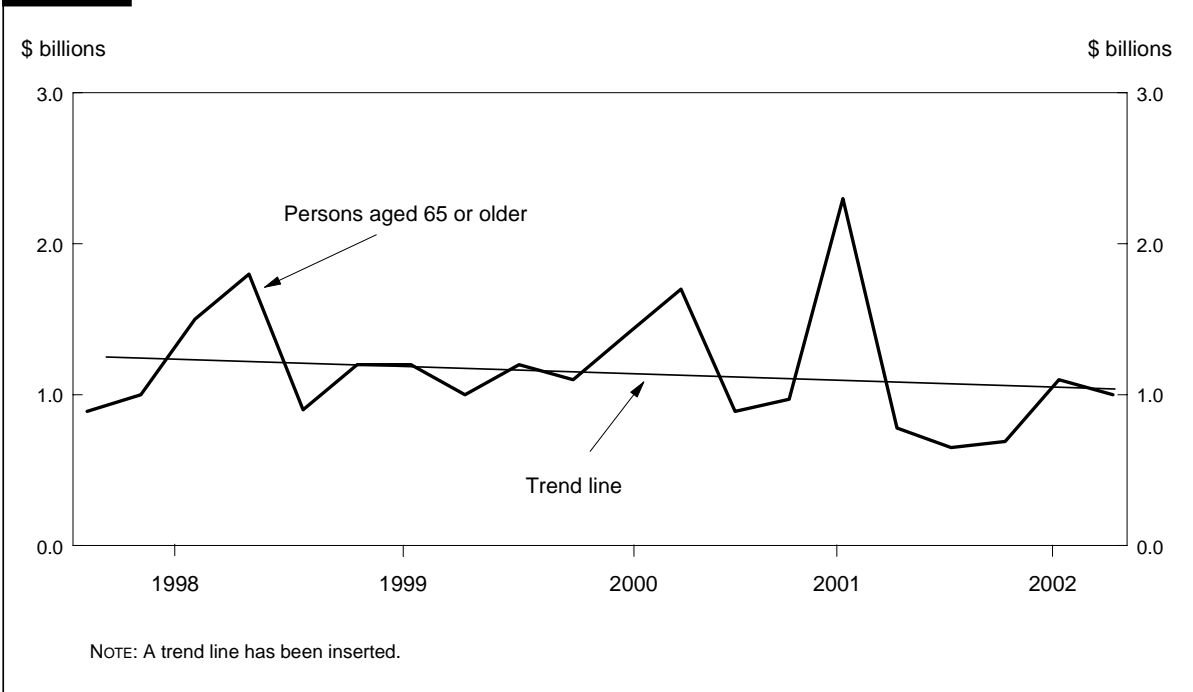


Chart 6. Quarterly airfare expenditures, Northeast region, 1998–2002

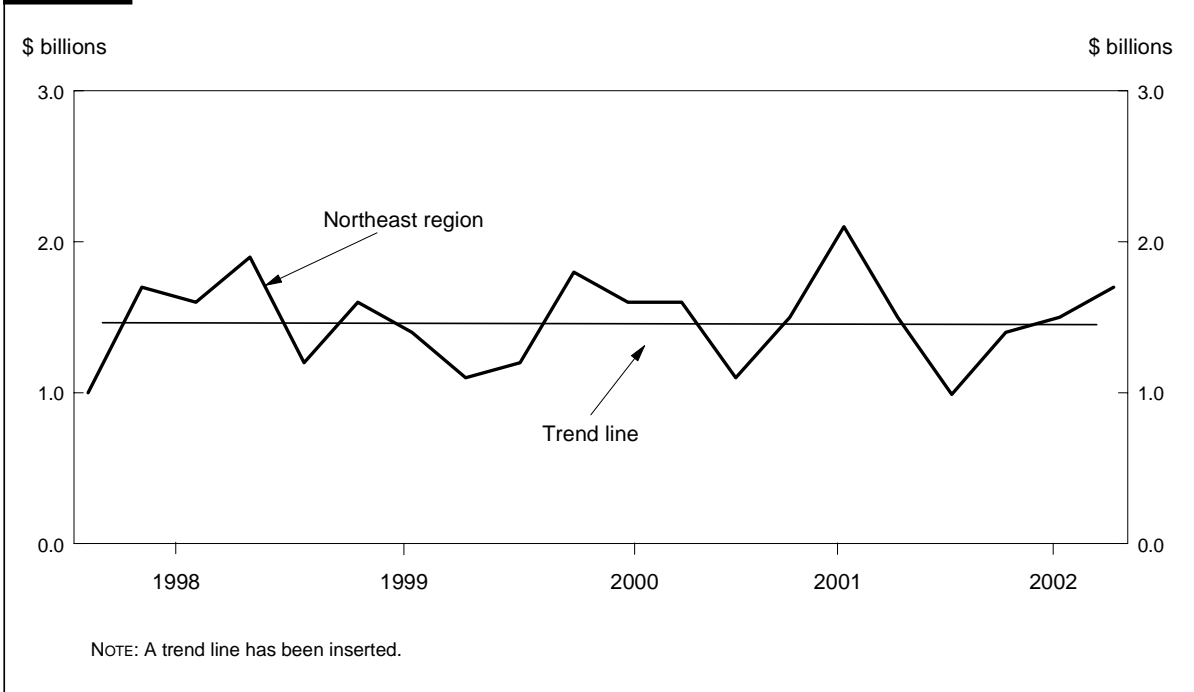


Chart 7. Quarterly airfare expenditures, Midwest region, 1998–2002

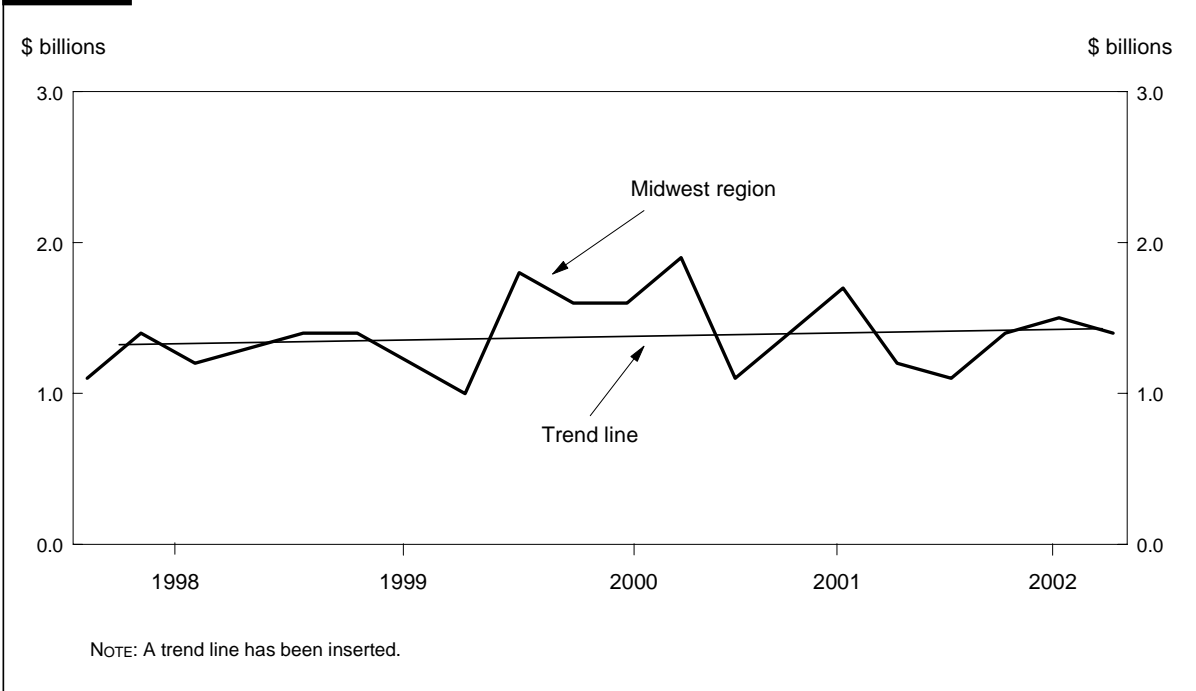
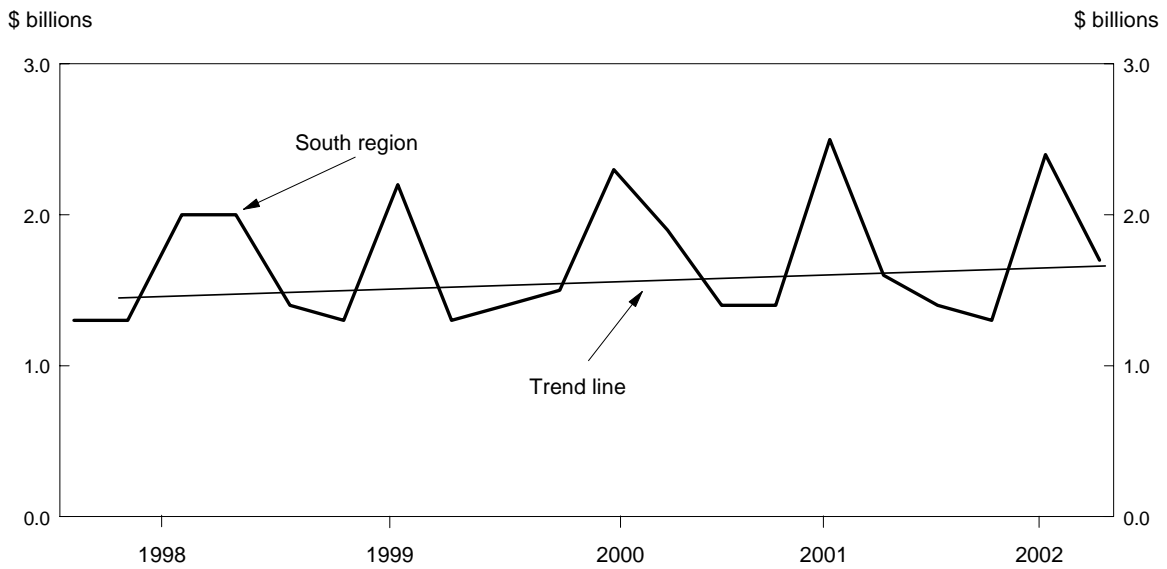
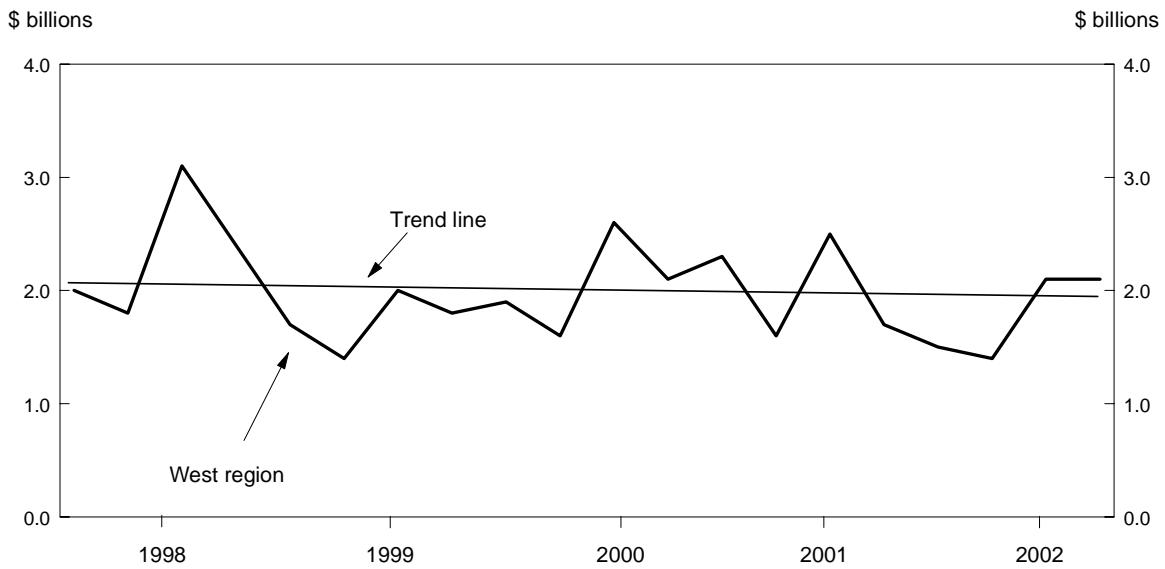


Chart 8. Quarterly airfare expenditures, South region, 1998–2002



NOTE: A trend line has been inserted.

Chart 9. Quarterly airfare expenditures, West region, 1998–2002



NOTE: A trend line has been inserted.

Appendix A: Description of the Consumer Expenditure Survey

The current Consumer Expenditure Survey (CE) program began in 1980. Its principal objective is to collect information on the buying habits of American consumers. Consumer expenditure data are used in various types of research by government, business, labor, and academic analysts. Additionally, the data are required for periodic revisions of the U.S. Bureau of Labor Statistics (BLS) Consumer Price Index (CPI).

The CE, which is conducted by the U.S. Census Bureau for the U.S. Bureau of Labor Statistics, consists of two components: A diary, or recordkeeping survey completed by participating consumer units for two consecutive 1-week periods, and an interview survey, in which expenditures of consumer units are obtained in five interviews conducted at 3-month intervals.

Survey participants record dollar amounts for goods and services purchased during the reporting period, regardless of whether payment is made at the time of purchase. Expenditure amounts include all sales and excise taxes for items purchased by the consumer unit for itself or for others. Excluded from both surveys are all business-related expenditures and expenditures for which the consumer unit is reimbursed.

Each component of the survey queries an independent sample of consumer units that is representative of the U.S. population. In the Diary Survey,

about 7,500 consumer units are sampled each year. Each consumer unit keeps a diary for two 1-week periods, yielding approximately 15,000 diaries a year. In the Interview Survey, the sample is selected on a rotating panel basis, surveying about 7,500 consumer units each quarter. Each consumer unit is interviewed once per quarter, for five consecutive quarters. Data are collected on an ongoing basis in 105 areas of the United States.

The Interview Survey is designed to capture expenditure data that respondents can reasonably recall for a period of 3 months or longer. In general, data captured include relatively large expenditures, such as spending on real property, automobiles, and major appliances, and expenditures that occur on a regular basis, such as spending on rent, utilities, and insurance premiums. Also included are expenditures incurred on leisure trips. Expenditures on nonprescription drugs, household supplies, and personal care items are excluded. The Interview Survey collects detailed data on an estimated 60 to 70 percent of total household expenditures. Global estimates, that is, expenditures for a 3-month period, are obtained for food and other related items, accounting for an additional 20 to 25 percent of total expenditures.

The Diary Survey is designed to capture expenditures on small, frequently purchased items that are normally difficult for respondents to recall.

Detailed records of expenses are kept for food and beverages—both at home and in eating places—tobacco, house-keeping supplies, nonprescription drugs, and personal care products and services. Expenditures incurred away from home overnight or longer are excluded from the Diary Survey. Although the diary was designed to collect information on expenditures that could not be recalled easily over a period of time, respondents are asked to report *all* expenses (except overnight travel expenses) that the consumer unit incurs during the survey week.

Integrated data from the BLS Diary and Interview Surveys provide a complete accounting of consumer expenditures and income, which neither survey component alone is designed to do. Data on some expenditure items are collected in only one of the components. For example, the Diary Survey does not collect data on expenditures for overnight travel or information on third-party reimbursements of consumer expenditures, as the Interview Survey does. Examples of expenditures for which reimbursements are excluded are medical care; automobile repair; and construction, repairs, alterations, and maintenance of property.

For items unique to one or the other survey, the choice of which survey to use as the source of data is obvious. However, there is considerable overlap in coverage between the surveys. Because of this overlap, integrating data presents the problem of determining the appropriate survey component from which to select expenditure items. When data are available from both survey sources, the more reliable of the two (as determined by statistical methods) is selected. As a result, some items are selected from the Interview survey and others from the Diary Survey.

Population coverage and the definition of components of the CE differ from those of the CPI. Consumer expenditure data cover the total population, whereas the CPI covers only the urban population. In addition, home ownership is treated differently in these two surveys. Actual expenditures of homeowners are reported in the CE,

whereas the CPI uses a rental equivalence approach that attempts to measure the change in the cost of obtaining, in the rental marketplace, services equivalent to those provided by owner-occupied homes.

Interpreting the data

Expenditures are averages for consumer units with specified characteristics, regardless of whether a particular unit incurred an expense for a specific item during the recordkeeping period. The average expenditure for an item may be considerably lower than the expenditure by those consumer units that actually purchased the item. The less frequently an item is purchased, the greater the difference between the average for all consumer units and the average for those purchasing the item. Also, an individual consumer unit may spend more or less than the average, depending on its particular characteristics. Factors such as income, ages of family members, geographic location, taste, and personal preference influence expenditures. Furthermore, even within groups with similar characteristics, the distribution of expenditures varies substantially. These points should be considered when relating reported averages to individual circumstances.

In addition, sample surveys are subject to two types of errors: sampling and nonsampling. Sampling errors occur because the data are collected from a representative sample rather than the entire population. Nonsampling errors result from the inability or unwillingness of respondents to provide correct information, differences in interviewers' abilities, mistakes in recording or coding, or other processing errors.

Glossary

Consumer unit. Members of a household related by blood, marriage, adoption, or some other legal arrangement; a single person living alone or sharing a household with others, but who is financially independent; or two or more persons living together who share responsibility for at least two out of three

major types of expenses: Food, housing, and other expenses. Students living in university-sponsored housing are also included in the sample as separate consumer units.

Reference person. The first member mentioned by the respondent when asked to "Start with the name of the person or one of the persons who owns or rents the home." It is with respect to this person that the relationship of other members of the consumer unit is determined.

Total expenditures. The transaction costs, including excise and sales taxes, of goods and services acquired during the interview period. Estimates include expenditures for gifts and contributions and payments for pensions and personal insurance.

Income. The combined income earned by all consumer unit members 14 years or older during the 12 months preceding the interview. The components of income are wages and salaries; self-employment income; Social Security and private and government retirement income; interest, dividends, and rental and other property income; unemployment and workers' compensation and veterans' benefits; public assistance, Supplemental Security Income (SSI), and Food Stamps; rent or meals or both as pay; and regular contributions for support, such as alimony and child support.

Complete income reporters. In general, a consumer unit that provides values for at least one of the major sources of its income, such as wages and salaries, self-employment income, and Social Security income. Even complete income reporters may not provide a full accounting of all income from all sources.

Quintiles of income before taxes. Complete income reporters are ranked in ascending order of income value and divided into five equal groups. Incomplete income reporters are not ranked and are shown separately in the quintiles of income tables. ■