Reflections on Measuring Recreation and Travel Spending

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This article reviews problems encountered in using visitor surveys to measure travel spending. Lack of consistency in question wording, spending categories, and units of analysis makes it difficult to compare results across studies. Spending results can be quite sensitive to a number of data-handling issues, in particular, the treatment of outliers, contaminants, and missing spending data. It is recommended that spending averages be estimated for narrowly defined visitor segments so they can be validated with engineering approaches and common sense. Further research evaluating alternative designs for measuring spending is needed to address a host of methodological issues.

Keywords: *recreation spending; visitor sampling; economic impact*

To estimate the economic impacts of recreation and tourism activity, one generally must begin with changes in visitor spending, typically estimated via visitor surveys. Changes in visitor spending can be applied to models of the local economy to convert spending to the associated changes in income, employment or tax receipts, and estimate multiplier effects (Frechtling 1994).

Although much attention has been given to impact models and multipliers, guidance for gathering and analysis of visitor-spending data is more limited. Accurate measures of spending are one of the most important inputs to an economic impact analysis. Spending measured in visitor surveys is subject to all of the errors inherent in survey designs, including measurement, sampling, nonresponse, and analysis errors.

Methods for measuring spending via visitor surveys include both on-site and household-survey designs using either self-administered or interview approaches (Frechtling 1987a). Diary and online approaches also have been used. Choices of the unit of analysis (person or party, day or trip), scope of spending covered (at home, en route, at the destination, trip spending, and durable-goods purchases), and the number and detail of spending categories varies widely, making it difficult to compare results across studies.

Analysis of spending data collected via surveys poses some special problems in the handling of outlier observations, reported zeros within individual spending categories, missing spending data, and skewed distributions. Spending averages in recreation and tourism studies are generally more than double median spending, and high variances can yield wide confidence intervals on the estimates. There rarely is an average visitor in terms of spending.

The measurement of spending may be as complex as the measurement of attitudes, yet the area lacks a corresponding methodological literature testing alternative approaches and providing guidance to researchers. There are few experiments that test or evaluate alternative survey designs or measurement approaches. Some notable exceptions include Long and Perdue (1990), Howard, Lankford, and Havitz (1991), Rylander, Propst, and McMurty (1995), and Champ and Bishop (1996).

The vast majority of spending studies, including our own, are applied studies that are not published in formal outlets. Research notes about spending that do appear in journals are frequently spin-offs of applied work rather than studies designed specifically to test particular hypotheses or alternative methods. Given the wide variety of spending studies and designs, few generalizations can be gleaned from the published literature. In this article, we review problems that we have encountered in more than 100 spending studies during the past 20 years, focusing on segmentation issues, units of analysis, spending distributions, and nonsampling errors. We draw from a recent survey of spending by visitors to USDA Forest Service-managed lands to illustrate.

ESTIMATING VISITOR SPENDING

The vast majority of recreation and tourism impact studies focus on visitor trip spending using survey approaches. The usual approach is to estimate spending averages that can be applied to the volume of travel activity to compute total spending, which in turn can be applied to an economic-impact model or set of multipliers. It is important that the approach for combining visits, spending averages, and economic multipliers be clearly mapped out in advance of sampling design and survey development so that the visitor survey data that are gathered are compatible with available visit estimates and multipliers.

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Sampling and Measurement Units

Most studies sample travel parties, measuring spending by all members of the group during their trip (e.g., Long and Perdue 1990; Vogt et al. 2000). Measuring spending for the entire party is the simplest approach when sampling vehicles entering or leaving an area or travel parties at destinations. The approach works well for families traveling together or when there is a single payer. Generally, the respondent is asked to identify the relevant spending party by asking how many people (adults and children) the reported expenses cover (e.g., Long and Perdue 1990; Rylander, Propst, and McMurty 1995; Stynes and Sun 2001). A couple coming as part of a bus tour, then, reports two people rather than 40 as its travel-party size. Average party spending then can be converted to a per-person basis by dividing by the average party size.

Studies that sample individuals and measure what one person spends frequently yield inflated spending estimates because of oversampling of primary payers and a tendency for group members each to report the same shared expenses (Gazel and Schwer 1997). In particular, couples and families likely have difficulty identifying what one individual is paying, because the money comes from the same pot. We highlight this problem in our case study later in this article. When measuring spending on an individual basis, one must be particularly careful in how children are handled in the sample design and survey. Multiplying average per-person spending (estimated from a sample of adults) by the number of total visitors (including children) will overestimate total visitor spending.

Time is another important dimension when defining the unit of analysis for spending measures. Spending can be measured for the entire trip, for the time spent in the destination region up to the point of the interview (if an on-site survey), or for the most recent 24-hour period. Longer time periods introduce potential recall problems and shorter ones increase telescoping errors. Howard, Lankford, and Havitz (1991) found that those on trips of longer than 10 days were more likely to underestimate spending than those on shorter trips.

When sampling visitors during a trip or at the destination, complete coverage of spending requires the use of a mail-back survey or a means of projecting expenses for the remainder of the trip. Mail-back surveys completed after the trip better cover all expenses but introduce potential nonresponse bias (Rylander, Propst, and McMurty 1995). The most common approach when gathering spending data at travel destinations is to ask visitors to project anticipated expenses. Although lodging and meal expenses likely can be projected when the length of stay is known, there is considerably more uncertainty about discretionary purchases, such as souvenirs, frequently bought near the end of the stay.

An alternative to measuring trip spending is to ask visitors to report spending during the previous 24-hour period. This approach may reduce recall problems but likely increases potential telescoping errors. It also requires careful sampling of days within the trip, as spending likely will be different on the first day than the last. For example, overnight visitors sampled on their first day will not have incurred any lodging expenses yet.

Some household surveys have measured spending across multiple trips, for example, during a 3- to 12-month period (e.g., the national surveys of hunting, fishing, and wildlife-related recreation). These studies likely include substantial recall and telescoping errors. Household surveys that measure spending for a recent trip tend to overrepresent longer and more significant trips and also may involve significant recall errors. See Champ and Bishop (1996) for an analysis of multiple-trip diary and survey-expenditure data.

In on-site studies, we generally favor measuring spending for the entire travel party in a mail-back survey that covers all expenses during the trip within the study region. A short on-site survey is conducted to obtain agreement to complete the mail-back survey and to measure key trip characteristics. The trip characteristics are used to segment visitors into distinct trip types and to adjust for any nonresponse bias in the mail-back survey.

Length of stay and party size should be measured to be able to convert party trip spending to a per-person and/or per-day basis. The correct approach is to estimate the averages for spending, party size, and length of stay from the sample of party trips and then divide the averages to obtain per-day or per-person averages. Computing per-person (or per-day) spending for each case and then averaging these figures is incorrect unless cases are weighted for length of stay and party size (Sun and Stynes 2005).

Spending Categories

Expenditure categories serve to identify the kinds of spending that are relevant and the kinds of products and services being purchased. The number and types of spending categories will vary with the study purposes. For trip spending, we recommend the following minimum level of detail:

- Lodging divided between campgrounds and motel, hotel, and B&B
- Food and beverages divided between restaurant or bar meals and groceries
- Transportation divided between auto or RV gas and oil, other auto-related expenses (repairs, parts, etc.), and public transportation where appropriate (air, rail, taxi, bus, car rentals)
- Recreation and entertainment fees and admissions
- Souvenirs and other retail purchases

This amount of detail defines the key sectors directly affected and facilitates bridging the spending data to sectors in a regional economic model. Retail purchases may be broken down further to yield more complete reports of spending or to tie spending more directly to production sectors of interest (e.g., sporting goods, film, clothing, books, and maps) Where purchases of local arts, crafts, or agricultural products are significant, they should be measured as distinct categories (e.g., Long and Perdue 1990).

Although some studies have included spending on durable goods, such as boats, recreation vehicles, and seasonal homes, these purchases generally should not be included as trip expenditures. Durable goods (e.g., skis, boats, backpacks) typically are used on multiple trips and at multiple locations, that is, they do not represent a good or service consumed on a single trip to a single location. Including expenditures for durable goods in the spending averages of users at a specific recreation resource likely will overestimate the total direct visitor spending attributable to the recreation resource.

Segmentation Strategies

Spending should be estimated for subgroups of visitors with distinct spending patterns. An overall average spending profile covering all visitors will not apply very well to any particular segment of the visitor population. Segments can be defined in several distinct ways, but the important criteria are that the segments separate visitors with distinct spending patterns, are meaningful for marketing and management, and hopefully are identifiable in available visitation statistics. We have found the following six segments useful in general tourism applications:

- Local day trips
- Day trips from outside the local area
- Overnight visitors broken down by lodging types
  - Hotels, motels, cabins, condos, B&Bs, etc.
  - Campgrounds
  - Seasonal homes
  - Stays with friends or relatives (or other no-cost lodging)

Special segments for air travelers, business travelers, school groups, and recreation activities also can be useful. Segments must be chosen to fit the study purpose and available data.

By identifying local visitors or seasonal residents as distinct segments, their spending can be included or not, depending on the intended uses of the spending data in an impact analysis (Tyrrell and Johnston 2001). Disaggregating visitors into segments makes it easier to track changes in spending that frequently are tied to a changing mix of visitors (e.g., day users vs. overnight visitors) or changes in resource management (e.g., campground closures, hunting restrictions, etc.).

Segmenting visitors into groups with similar spending patterns also can yield more efficient sampling designs, as sample sizes can be apportioned to obtain larger samples from subgroups with higher spending (and hence, higher variance). In many situations, a small percentage of visitors accounts for the majority of spending. In these cases, simple random samples of visitors will yield inadequate samples to characterize the most important segments.

To carry through a segmented analysis, it must be possible to divide total use into the segments of interest. In a segmented analysis, total spending is estimated using the following basic formula:

$$S = \sum_{j=1}^{J} S_j = \sum_{j=1}^{J} \left[\sum_{i=1}^{m} N M_i s_{ij} \right] \qquad (1)$$

where

S = total spending
S_j = total spending in spending category j, j = 1, ... J
N = total number of visitors
m = number of segments, J = number of spending categories
M_i = segment i's share of total visits, i = 1, . . . m.
s_{ij} = average spending of a member of segment i on spending category j

Equation 1 identifies the three key pieces of information to estimate total spending: (1) total visitors or trips (N), (2) segment shares (M), and (3) spending profiles for each segment (s_{ij}).

ERRORS IN VISITOR SPENDING SURVEYS

All of the usual sources of error in surveys must be considered when estimating spending via surveys. Accurate estimates of spending averages from sample surveys require reliable and valid measurements from a representative sample of the population. There are four general sources of error in spending surveys:

1. Measurement error
2. Errors because of unrepresentative samples
3. Sampling errors
4. Analysis and reporting errors

Measurement Error

Measurement error is the difference between the spending reported by subjects on the survey instrument and what they actually spent. Wording of spending questions as well as the survey format (e.g., diary vs. recall) and sequencing of questions all can influence the reliability and validity of the spending data gathered in surveys (see Rylander, Propst, and McMurty 1995; Champ and Bishop 1996). The accuracy of spending data rests on a common understanding between the participant and researcher as to what spending should be reported and the participants' ability to recall their spending accurately and follow the survey instructions to record it.

Recall and telescoping errors are common sources of measurement error in spending studies. Recall errors can be reduced by surveying subjects very soon after the spending takes place (typically, when leaving the area or immediately after the trip) and having clear spending categories that help the respondent recall different expenses. Telescoping errors occur when the subject reports expenses that are not supposed to be included, for example, reporting expenses outside the study region, beyond the time frame defined, or even for a different trip. There are trade-offs between different types of errors across the different survey approaches. For example, asking participants to report expenses only in the previous 24 hours will reduce recall errors but generally will increase telescoping errors. When focusing on spending within a destination region, it sometimes is useful to separate spending within the region from spending outside the region to avoid a tendency of subjects to report spending for the entire trip.

Errors Caused by Unrepresentative Samples

To estimate the average spending for a particular population of visitors, it is essential to have a sample that is representative of that population. Errors caused by unrepresentative samples in spending studies are difficult to detect if the study does not define the study population carefully, describe the sample, and demonstrate the sample's representativeness.

Nonrepresentative samples can result from sampling biases (e.g., disproportionate sampling of visitors or parties on long trips) or different response rates among visitor subgroups that vary in their spending patterns. Local visitors

and those not spending money tend to have lower response rates to spending surveys, which will bias spending estimates upward if not corrected (Rylander, Propst, and McMurty 1995). Difficulties of sampling visitors at open-access destinations often make it difficult to obtain representative samples.

Segmented approaches can help to reduce sampling biases. For example, it is easier to obtain a representative sample of campers or of visitors staying in motels than a representative sample of all visitors to an area. A common source of bias in spending averages from surveys is an unrepresentative mix of visitor types (e.g., a higher percentage of overnight visitors or visitors staying in hotels or campgrounds). If the sampling procedures can obtain representative samples within each type, the appropriate mix of visitors sometimes can be estimated from secondary sources.

We commonly use a short on-site exit interview to determine the percentage of local visitors, day trips, and the percentages of overnight visitors staying in motels, campgrounds, or with friends and relatives. Selected subjects within each segment then are asked to complete a mail-back spending survey. Biases in the mail sample caused by differential sampling or different response rates across these segments may be corrected by weighting cases in the mail-back sample based on the on-site survey segment mix. This procedure also permits the mail-back survey to oversample groups that are more important to the study or have larger variances in their spending.

Sampling Errors

Like any sample survey, confidence intervals can and should be reported for spending estimates. It should be noted, however, that sampling errors only capture the likelihood of obtaining a somewhat unrepresentative sample by chance. They do not capture sampling bias, nonresponse bias, or the many potential sources of measurement error noted above. In some cases, these other sources of error may be much larger than sampling errors. Statistical confidence intervals, therefore, may exaggerate the actual accuracy of spending estimates.

Analysis Errors

Additional errors can occur during data entry and analysis of spending data. The reporting of data handling in recreation- and tourism-spending surveys is generally inadequate to assess the presence or magnitude of most of these kinds of errors.

Self-administered spending questionnaires often are not fully completed by respondents. Results can vary significantly depending on how these missing data are handled and whether blanks on written spending surveys are to be treated as zeros or missing data. Many respondents only enter numbers in spending categories in which they have incurred expenses. If categories that are left blank are not filled with zeros, the means for each spending category will be based on a different number of respondents, and the averages will be inflated. As part of the data-cleaning process, we routinely fill blanks with zeros if spending is reported in any other expenditure category.

A more difficult choice is how to treat observations in which the respondent omitted the spending question entirely. Did these respondents choose not to answer the question, or did they not spend any money? This decision can alter the spending averages significantly. The percentage of blank spending reports varies widely across studies, as does the treatment of blanks. One consistent pattern in our studies is a higher incidence of blank spending reports for local visitors and day trips (those most likely to have no trip spending) compared to overnight visitors (those least likely to have no trip spending). Rylander, Propst, and McMurty (1995) found that individuals making few expenditures were less inclined to return mail-back surveys. Given these considerations, we generally treat most blank reports as zero spending unless other questions after or around the spending question also are left blank. A good practice is to ask subjects if they have spent any money on the trip in the local area before requesting the actual expenses. This more clearly identifies cases not spending any money.

SPENDING DISTRIBUTIONS

Statistical analysis of spending data assumes the data are a representative sample of observations from a given population. Statistics rely on assumptions about the underlying distribution in the population. Spending averages developed for all visitors represent a mixture of distributions with distinct means and variances. For example, day-trip spending comes from a different distribution than overnight-trip spending, and spending by visitors in hotels is generated by a different process than spending by visitors staying with friends or relatives. A better picture of visitor spending is obtained by sorting out the distinct distributions and estimating the percentage of visitors in each group. This is an important role of visitor segments.

Spending distributions typically are not normal. Frequently, they include a spike of observations at zero (visitors who spent nothing), and the nonzero values are skewed by a few large values that tend to pull the mean upward. These high spending observations are sometimes legitimate values and sometimes not. The median spending in visitor surveys typically is less than half the average spending. The mean is affected significantly by individual high-spending observations, whereas the median and mode are relatively stable across independent samples. The mean does not capture what a typical visitor spends, but it is the appropriate statistic by which to multiply visits to obtain total spending. Nevertheless, some studies have used spending medians when the means seemed inflated (Gazel and Schwer 2001). One difficulty in using the medians to determine total recreation-visitor spending is that median values in expenditure categories with low average spending often may be zero (see Long and Perdue 1990).

Outliers and Contaminants

A careful examination of outliers should precede any analysis of spending data. An outlier generally is defined as a case that belongs to the given distribution but whose value (spending, in this case) is extreme. For example, a visitor spending more than three or four standard deviations above or below the mean may be considered an outlier. The concern with outliers is that they may distort the mean, and in small samples, can make the sample average sensitive to one or two cases (Barnett and Lewis 1984).

A contaminant is a value that does not belong to the given distribution. Cases with significant measurement or data-entry errors may be considered contaminants. Some observations that appear to be outliers likely are contaminants that should be omitted on the basis that they do not belong to the intended population distribution.

For example, in analyzing data from a survey of USDA Forest Service recreation visitors, some of the spending outliers were consistently rounded numbers in hundreds of dollars across all spending categories. These observations could have resulted from misplaced decimal points, for example, with $10.00 being entered as $1,000. Other large spending reports represented visitors who had rented homes or condos for a month or more. Should such visitors be included in the study population? How accurate are spending reports for such extended stays? Is all of this spending related to a national forest visit?

In large data sets and when the analysts may not have access to the original written surveys, one can use trimmed or censored means as an alternative to examining each case individually. A 5% trimmed mean estimates the mean by dropping 2.5% of the cases at the lower and upper end of the distribution. Censored means replace the high or low values with a chosen maximum or minimum. In many cases, these statistics are a reasonable alternative to several weeks of data cleaning.

We generally favor making conservative choices in analyzing spending data, as many of the biases associated with spending surveys tend to be upward (e.g., overrepresentation of overnight visits and underrepresentation of those having no expenditures).

SAMPLING ISSUES

For a segmented analysis, the visitor population should be stratified by segment (i.e., local day trip, nonlocal motel, overnight, etc.). The most efficient sampling design for estimating spending will apportion sample sizes across segments according to the expected variation in spending within each segment. There is, however, a tradeoff if the same survey is used to estimate both the proportion of visitors falling within each segment and visitor spending. Simple random samples often are needed to estimate the former, and disproportionate sampling across segments often is called for to estimate the latter efficiently.

A common situation is having large numbers of visitors with low spending (local visitors and day users) and small numbers of visitors with relatively high spending. In this case, a simple random sample yields very good estimates of day-user and local spending but does not contain enough overnight visitors to estimate their spending adequately. If one targets overnight visitors, for example, by sampling in motels and campgrounds, one can gather larger samples of the higher spending segments, but there may be no way to estimate the proportion of all visitors that these segments represent.

The solution usually is to use distinct sampling designs to estimate average spending versus the proportion of visitors from each segment. If segment shares can be estimated from secondary sources, then the spending survey can be designed to estimate segment spending profiles efficiently. If segment shares are not known, one can use a simple random sample to estimate segment shares and, after screening for segment, gather spending information only from a subsample of each segment according to a quota system.

SIMULATION OR ENGINEERING APPROACHES

Because of the problems in measuring spending via visitor surveys, Frechtling (19876) recommends a simulation approach. This is the method used by the Travel Industry Association of America (TIA) in their travel economic impact model. We would call this an engineering approach as it estimates trip spending by itemizing the quantities of goods and services that must be purchased to produce the trip and then applies per-unit prices to each input to estimate total trip cost.

The TIA uses household surveys to estimate the number of room nights, meals, auto and air miles, and other travel inputs and then applies average room rates, cost of meals, auto mileage, gas prices, and so on to estimate the associated spending. Using this approach, surveyed travelers must recall key trip characteristics such as distance, transportation mode, lodging types, overnight stays, and party size accurately. Secondary data then are used to estimate the per-unit costs of each input. The engineering approach works better for lodging, meals, and transportation costs than for entertainment, souvenirs, and other, more discretionary trip purchases.

The TIA applies the engineering approach primarily to aggregate state and national travel statistics. The approach also can be used in local applications or to estimate spending for individual trips. This requires that trips be segmented into distinct types, defined by differences in the mix of inputs. Using segments like those we propose above permits spending to be estimated with an engineering approach or a combination of survey and simulation methods.

VALIDATING SPENDING ESTIMATES

There are several ways that the validity, or reasonableness, of spending estimates can be addressed. The specific survey questions used to measure spending should be reported so that readers assess face validity and evaluate potential biases in the measures. Studies should report spending averages in units and categories that can be compared to independent sources and common sense. For example, if spending on lodging is reported on a per-night basis for visitors staying in motels or hotels, it can be compared with local room rates. Such an evaluation is not possible when lodging expenses are reported on a trip basis (without a known average number of nights per trip) or when a single average lodging expenditure is reported for all visitors-including an unknown mix of day trips and overnight trips with unknown lodging types.

We prefer to report spending averages on a per-party, per-night basis, developing distinct averages for different trip and lodging types.' Average length of stay and party sizes for these segments also should be reported so that spending can be converted for comparison with other studies that may use different units. Lack of consistency across studies makes it difficult, if not impossible, to compare spending estimates from different studies.

Studies that estimate total visitor spending in an area often can use independent estimates of sales or taxes to partially validate the spending averages. The hotel sector is a relatively clean tourism sector for which room revenues often can be estimated fairly reliably from secondary sources such as room taxes or reports of hotel sales. For example, if a spending study covers all visitors who stay in hotels or motels in the area, the average spending on hotels, estimated in the survey, when multiplied by the number of visitors staying in hotels, should equal total hotel-room receipts for the area.

Other validators often can be built into a spending survey. If one or more spending categories can be made to coincide with a category of receipts for which a total is available, this category can be used to extrapolate from the sample to all visitors or to help validate the spending averages. For example, in studies of museum visitors, we have asked visitors to report spending in the museum gift shop as a separate category. When total gift-shop sales are known, the ratio of total gift-shop sales to gift-shop spending reported by the sample (in total) provides an expansion factor that can be applied to estimate total visitor spending for all other categories (e.g., Stynes 2002). If the sample expansion factor is known (for example, if every 10th visitor is interviewed), the total spending by the sample can be compared with actual receipts to validate the spending average.

THE NATIONAL VISITOR USE MONITORING PROGRAM (NVUM)

A recent study by the USDA Forest Service is used here to illustrate many of the data challenges that are encountered when analyzing spending surveys. A thorough discussion of the National Visitor Use Monitoring program (NVUM) spending analysis and the resulting spending profiles is available in Stynes, White, and Leefers (2002) and Stynes and White (2005a).

The NVUM program was designed primarily to estimate visits to national forests, but it included questions to estimate spending (English et al. 2002). Roughly one-fourth of the national-forest visitors surveyed between 2000 and 2003 completed a set of economic questions measuring their spending within 50 miles of the site in which they were sampled. Spending patterns were estimated from the data set of more than 21,000 cases covering visitors to all national forests (NF) during the 4-year sample period (Stynes and White 2005a).

The initial NVUM survey instrument attempted to measure spending of individual visitors. Visitors were sampled randomly within travel parties and asked if (1) they were sharing expenses with other people, (2) they were paying just for their own expenses, (3) they were paying for themselves and others, or (4) someone else was paying for them. Half of the visitors stated they were paying just for themselves, 29% were paying for themselves and others, 19% were sharing expenses, and only 2% claimed others were paying for them. Visitors paying for themselves and others included, on average, 2.4 other adults in the travel party, so one would expect the percentage reporting that someone else was paying for them to be more than double the percentage reporting that they were paying for others. The low percentage reporting that someone else was paying for them could be because of overrepresenting payers when sampling individuals within travel parties or confusion about who was paying for what.

Based on analysis of reported spending and the sharing question, we concluded that most respondents were reporting expenses of the entire travel party even when the question asked just to report their own expenses (Stynes, White, and Leefers 2002). When the spending question subsequently was modified in 2003 to measure spending of everyone in the travel party, the per-party spending averages were not significantly different than the per-person averages measured previously. With an average party size of 2.3, this decision yields spending averages that are less than half of what we would estimate, assuming spending was reported for individual visitors.

The USDA Forest Service historically has developed spending profiles for particular recreation-activity segments. Recreation activities, however, explained less than 3% of the variation in visitor spending pattern, and therefore, were not very useful for predicting spending (Stynes, White, and Leefers 2002). A set of visitor segments based on trip types, therefore, was developed to estimate spending. The five principal segments were local day trips, nonlocal day trips, overnight trips involving a stay on or off the national forest, and nonprimary purpose trips. Locals are defined as living within roughly 50 miles of the national forest. The nonprimary purpose segment covers trips in which the visit to the national forest was not the primary trip purpose. Twelve percent of national-forest visits were classified as nonprimary purpose trips (Stynes and White 2005b). By identifying distinct local and nonprimary purpose segments, spending associated with these visits can be included or excluded in economic impact analyses.

The trip segments helped to identify very distinct distributions in the spending data. The day-trip distributions were highly skewed. Spending means for day trips were roughly twice as large as the medians (Figure 1, Table 1). The overnight-trip distributions were skewed even more, with a long tail extending well beyond $1,000 (Figure 2). Compared to off-forest overnight visitors, the on-forest distribution had a higher peak and dropped off more steeply.

In 2003, questions were added to the NVUM survey to distinguish between lodging types. The spending distributions for visitors staying in campgrounds, hotels or lodges, or private homes were very different (Stynes and White 2005b). Mixing visitors staying with friends or relatives with campers and visitors staying in hotels, cabins, and B&Bs does not capture the unique spending patterns these lodging types entail.

Spending averages were sensitive to decisions about the handling of missing spending data and zeros. Respondents who did not complete any of the questions on the economics section of the NVUM survey were dropped, but there remained more than 2,000 respondents (10%) who completed parts of the economics survey but reported no spending. Seventeen percent of visitors on day trips and 7% of visitors on overnight trips reported no spending. If these cases are treated as missing responses, the spending means are 20% higher for day trips and 8% higher for overnight trips. It is likely that some cases with no reported spending are legitimate zeros and some represent a refusal, but there is no way to tell. Favoring conservative choices when estimating spending, we treated the missing data as zeros.

Spending averages were quite sensitive to the choice of a measure of central tendency and decisions about outliers

FIGURE 1
SPENDING DISTRIBUTIONS BY VISITOR SEGMENT

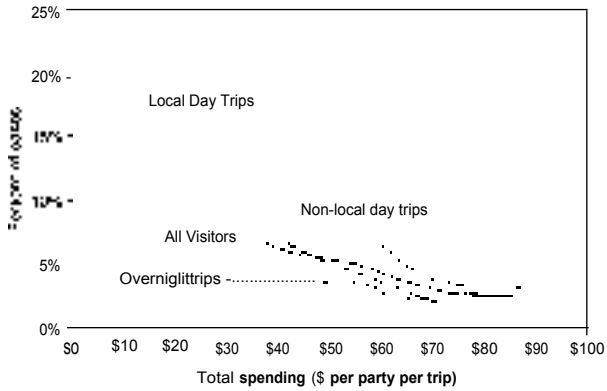

FIGURE 2
SPENDING DISTRIBUTION FOR OVERNIGHT TRIPS

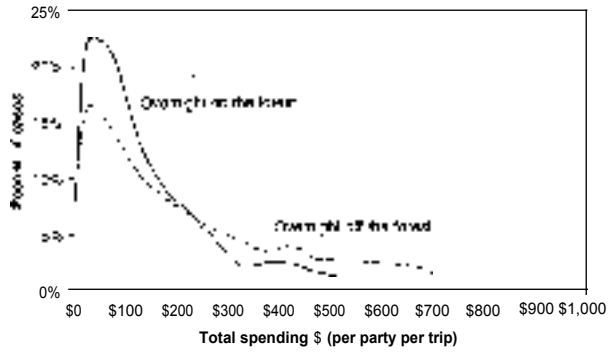

TABLE 1
SPENDING AVERAGES AND STANDARD DEVIATIONS BY TRIP SEGMENT UNDER FIVE ANALYSIS ALTERNATIVES

	All Cases	Excluding Outliers-1	Excluding Outliers-1 Weighted	Excluding Outliers-2	Excluding Outliers-2 Weighted
Local day trip					
N of cases	7,373	7,241	6,151	7,241	6,708
Mean	53	33	32	33	33
Median	16	16	15	16	16
Trimmed mean (5%)	24	23	22	23	23
Standard deviation	328	65	64	65	64
CV	6.22	1.94	1.99	1.94	1.96
Percent error (95%)	14%	4%	5%	4%	5%
Nonlocal day trip					
N of cases	1,632	1,600	1,285	1,600	1,399
Mean	68	52	51	52	52
Median	31	30	30	30	30
Trimmed mean (5%)	41	39	39	39	39
Standard deviation	211	85	81	85	82
CV	3.13	1.62	1.58	1.62	1.59
Percent error (95%)	15%	8%	9%	8%	8%
Overnight stay on forest					
N of cases	3,125	2,845	1,662	2,893	1,849
Mean	285	178	161	200	180
Median	116	106	96	108	99
Trimmed mean (5%)	196	153	136	164	144
Standard deviation	574	201	186	260	241
CV	2.02	1.13	1.16	1.30	1.34
Percent error (95%)	7%	4%	6%	5%	6%
Overnight stay off forest					
N of cases	3,442	2,840	1,969	2,956	2,230
Mean	543	254	248	305	291
Median	212	167	157	179	167
Trimmed mean (5%)	365	233	226	264	251
Standard deviation	1,138	249	249	347	336
CV	2.10	0.98	1.00	1.14	1.16
Percent error (95%)	7%	4%	4%	4%	5%

NOTE: Outliers-1 excludes all cases with total spending of $1,000 or more. Outliers-2 excludes day-trip cases spending more than $1,000 and overnight-trip cases reporting $1,000 or more in any single spending category. CV is the coefficient of variation = standard deviation/mean. Percent error reflects a 95% confidence interval.

and weights (Table 1). Removing large outliers significantly reduced the variances of the distributions and yielded smaller sampling errors. Outliers posed particular problems when the sample was broken down into finer subgroups, as subgroup means were quite sensitive to the presence of outliers. Resistant statistics like the trimmed mean are less sensitive to the inclusion or exclusion of a small number of cases (Hoaglin, Mosteller, and Tukey 1983). The 5% trimmed mean computes the average by dropping 2.5% of the cases at either end of the distribution.

Typical of other spending distributions that we have examined, trip-spending means were approximately double the medians and standard deviations were greater than the mean, yielding coefficients of variation (CV) greater than 1 (Table 1). Computing spending averages from all cases without consideration of outliers will yield inflated averages if the data include cases with significant measurement errors or other contaminants. Although large values that belong to the intended distribution should be included when computing means, many outliers in spending data are frequently contaminants that represent reporting or recording errors or cases that do not belong to the intended population.

Three criteria were selected for excluding cases in the NVUM study. First, we dropped cases reporting party sizes of more than seven people or lengths of stay (days away from home) of more than 30 days. Large parties tend to involve multiple spending units. Accurate recall of spending for very long stays is questionable, and these trips often involve other stops and trip purposes. See Rylander, Propst, and McMurty (1995) for a discussion of how party size and length of stay influence the perceived accuracy of self-reported trip expenditures. After dropping large parties and long stays and examining the spending distributions, two rules for spending outliers were developed. Rule #1 drops all cases reporting $1,000 or more in total expenses. Rule #2 modifies the criteria for overnight trips, dropping cases if any individual spending category is $1,000 or more.

The $1,000 rule was selected for this study in part to screen out cases with misplaced decimal points (e.g., $10.00 being recorded as $1,000). Inspection of the data identified a number of cases reporting $1,000 or $2,000 in gas purchases and no other expenses. As we did not have access to the original completed survey instruments, we could not verify what appeared to be data-entry errors.

Spending averages under the two rules for identifying outliers are shown in Table 1. Weighted averages adjust for higher probabilities of selection of visitors who stopped at multiple sites on the forest. Multiple stops are associated with longer stays and higher spending, so weighting reduces the spending averages compared to unweighted figures.

Except for the inflated raw sample averages in column two, the day-trip spending averages are consistently about $33 for local day trips and $52 for nonlocal day trips. Sampling errors on these means are roughly 4% and 8%, respectively. The 5% trimmed mean on the raw sample yields somewhat lower averages for day trips as the $1,000 outlier cutoff excludes only 2% of the day-trip cases and trimming cuts 2.5% from the high end of the distribution.

The less strict outlier rule #2 for overnight trips yields spending averages that are 12% higher than the averages under rule #1 for on-forest stays and 17% higher for off-forest stays. These differences are much greater than the errors one might infer from sampling errors of 4% to 6% for overnight trips. The 5% trimmed means for overnight-trip spending are higher than the spending means using rule #1 or #2 to identify outliers. Using rule #2, 7% of on-forest overnight cases and 14% of off-forest cases are classified as outliers.

The general spending patterns observed in the NVUM data are fairly typical of those we have found in analyzing many recreation and travel-spending datasets.

RECOMMENDATIONS

Spending studies should report data gathering and analysis methods in greater detail to facilitate comparisons across studies and provide guidance for future studies. Spending averages should be reported for distinct visitor segments including sample sizes, standard deviations, and confidence intervals. It should be possible to convert spending averages to a per-party and per-day basis using reported average party sizes and lengths of stay for each segment. The handling of missing data and outliers also should be addressed. A more complete picture of the distribution of spending values in the sample should be conveyed. In some cases, it is useful to report the percentage of visitors spending money in each category and the averages for spenders.

A number of methodological issues related to spending studies deserves further research. Experimental designs are needed to evaluate various survey design and measurement alternatives and to shed light on recall, telescoping, nonresponse, and other errors common to spending studies. Is spending better measured on a per-person or per-party basis? Which and how many spending categories should be included in spending questions? Should visitors be sampled before, after, or during their trip? Do visitors include taxes and tips when they report lodging and other expenses? When visitors are sampled on site at destination areas, is the error from projecting additional expenses before leaving the area greater than nonresponse and recall errors from using a mail-back survey returned at the end of the trip? What are the patterns of spending through time on individual trips? These questions often must be addressed in designing spending studies, yet, in general, previous studies do not provide a solid basis for making these choices. The wide variation in research designs for measuring spending makes it difficult to generalize from one study to another or to compare results. The applied nature of most spending studies also contributes to the limited methodological and theoretical development.

NOTE

1. We prefer reporting spending of overnight visitors on a per-night rather than per-day basis so that lodging expenses correspond with average nightly room or camping rates in the area. This is another example of a seemingly minor decision that can lead to confusion and errors in applying the results. See Frechtling (1978).

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