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Do respondents report willingness-to-pay on a per person or per group basis? A high mountain recreation example

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Contingent valuation methodology (CVM) studies often use dichotomous choice willingness-to-pay (WTP) questions to measure the value that visitors place on recreation. This study assesses whether individuals respond to WTP questions on an individual or a group basis and whether reported WTP values are affected by changes in wording to address this issue explicitly. The authors' analysis reveals statistically significant differences in mean WTP when the payment vehicle is worded more generally, compared to specific language questioning respondents about increases in their share of the cost. Further, dividing the WTP from the standard CVM survey language by group size did not restore the equality of individual average WTP. These results indicate that payment vehicle language in recreation studies should go to great lengths to ask explicitly for either individual or group WTP, to ensure that accurate WTP estimates are obtained.

Keywords: payment vehicle; contingent valuation; willingness-to-pay; mountain recreation; Fourteeners

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Contingent valuation methodology (CVM) is often used to estimate the value visitors place on recreation by measuring visitor consumer surplus and willingness-to-pay (WTP) for non-consumptive uses (Hanley, 1994; Hanemann, 1994; Loomis, 2002; Christie *et al*, 2007). CVM is a stated preference approach, in that it creates a hypothetical market by asking visitors how much they would be willing to pay for the experience (Mitchell and Carson, 1989). This is different from revealed preference methodology, which may use visitor travel behaviour or number of trips made to a region to quantify recreation use values (Hanley *et al*, 1998; Stynes and White, 2006).

Numerous authors have noted the importance of selecting the appropriate wording of questions, in order to enhance the validity of the survey instrument (Carson and Mitchell, 1993; Kontogianni *et al*, 2001; Duke and Aull-Hyde, 2002; Loomis, 2002; Boyle, 2003; Holmes and Adamowicz, 2003; Kaplowitz *et al*, 2004). This is also noted in the National Oceanic and Atmospheric Administration's (NOAA) Contingent Valuation Panel (1996) guidelines for non-market valuation. However, these papers have not systematically measured differences that might result from nuances in verbiage. While general examples are presented in non-market valuation texts, such as 'A Primer on Nonmarket Valuation' by Champ *et al* (2003), and 'Valuing Environmental and Natural Resources' by Haab and McConnell (2003), there is still a need to measure systematic changes that verbiage might have on mean WTP.

This is relevant because there is an ongoing need to understand and refine contingent valuation methodology (Scarpa *et al*, 2008). Owing to the hypothetical nature of the market, it is commonly believed that in estimating the WTP (or consumer surplus) using a CVM model, individuals may overstate their true WTP values (Christie *et al*, 2007). Furthermore, several studies have shown a difference in 'actual' versus projected WTP values, and the magnitude of reported difference varies considerably by study. Results from Cummings and Taylor (1999) and Loomis *et al* (1996) indicate actual payments were generally lower than intended payments by a factor of two. Conversely, Carson *et al*, (1996) explore the relationship between contingent valuation estimates for recreation and estimates obtained from revealed preferences techniques. Overall, the Carson *et al* study found CVM estimates to be only slightly smaller than the responses of the revealed preferences counterparts. Although CVM continues to be an accepted and widely utilized method of gauging the value visitors place on outdoor recreation experiences, the content validity of CVM depends on proper wording of the payment vehicle, and proper wording of the payment vehicle is critical to minimizing CVM response bias.

Proper wording of the payment vehicle may be particularly important for tourism and recreation activities, such as hiking, where it is common to encounter couples or a group of people who may answer survey questions individually or as a group (Stynes, 2006). This study specifically tests differences in payment vehicle language for recreation on United States Department of Agriculture Forest Service (USDA Forest Service) lands in order to determine whether individual respondents provide individual or group WTP estimates when verbiage in the payment vehicle does not clearly specify whether cost increases would be paid on a per person or a per group basis. Results from this study indicate that respondents report WTP estimates for the group rather than just for themselves when asked about an increase in *their own* trip costs.

The paper proceeds as follows: (a) presentation of the relevant project background information; (b) the methodology; (c) presentation of data and statistical results; and (d) discussion and conclusion.

Project background

Despite the apparent agreement on the importance of payment vehicle language in minimizing bias, current guidelines focus on the importance of content, rather than specificity of payment vehicle language. The general process of developing survey questions has been addressed by Dillman (1991), who stresses the need to select and phrase questions in ways that reduce confusion and increase response rates. Similarly, a comprehensive publication by Champ *et al*, (2003) details the development of survey questions. Champ *et al* emphasize the importance of using common vocabulary and appropriate language for the respondent population, choosing appropriately between open- versus closed-ended questions, avoiding confusion by not using double-barrelled questions and considering a proper order and format of questions. While Champ *et al* include several natural resource examples, the authors do not offer guidelines about how to specifically structure the payment vehicle in recreation studies, where cost increases are often sustained on a per group, rather than a per person basis (Stynes, 2006).

A few studies directly address wording and framing effects of dichotomous choice questions to reiterate the importance of neutral wording so as to not inflate the WTP values. Boyle (1989) examines how the wording and description of the item being valued can influence CVM estimates, but does not explicitly describe the per person or per group issue. Flachaire and Hollard (2008) explore individual sensitivity to framing effects and anchoring, finding that respondents are in fact sensitive to the way in which questions are framed. González-Cabán *et al* (2007) examine the importance of minimizing protest responses with forest policy activities. While these studies effectively show that framing effects exist in the dichotomous choice CVM questions, there has been little empirical research testing for the effects of alternatively worded dichotomous choice questions. Many of the previously cited studies used surveys that were received, answered and returned solely by one person. However, in the case of recreational outings, such as hiking, it is common to encounter couples or a group of people who may answer survey questions individually or for the group. Therefore, the issue of whether visitors answer dichotomous choice questions as an individual or as a member of a group should been explicitly documented. Respondents answering a WTP question from a group, rather than an individual perspective, may produce seemingly higher WTP estimates if the assumption is that the costs are split among the group, even if this is not explicitly stated.

In order to address this gap in the literature, control and experimental surveys were distributed to recreationists on Quandary Peak, one of Colorado's Fourteeners. A Fourteener is a peak that rises more than 14,000 feet above sea level. There are 54 such Fourteeners in the state of Colorado, which has the majority of the Fourteeners in the continental USA. Nearly all of the Colorado Fourteeners are located at least in part on USDA Forest Service lands.

The experimental design was a sub-set of a larger project to assess the expenditures and consumer surplus of recreation on Colorado Fourteeners in 2006 and 2009. Research published from the 2006 study by Keske and Loomis (2007) and Loomis and Keske (2009) found considerably higher consumer surplus for Fourteener recreation, compared to typical hiking experiences. The authors attributed the high consumer surplus to research indicating that Fourteeners are considered synonymous with Colorado's identity (Blake, 1999, 2002, 2008), and that Fourteener references are ubiquitous, appearing on everything from Chamber of Commerce information and local festivals to print advertisements and postcards. Blake (2002) indicates that more easily recognizable Fourteeners such as Long's Peak in Rocky Mountain National Park and Pikes Peak in Colorado Springs also provide a national identity.

A high WTP might be consistent with other disciplines that have recognized that there is something unique about both specific and the collection of Fourteeners. Place attachment theory research prevails in the sociology (Cross *et al* 2011), environmental psychology (Kyle *et al*, 2004), and geography literature (Manzo and Perkins, 2006). The central concept is that there can be a psychological connection between a community and a natural resource.

The study site was Quandary Peak, a recreation area on USDA Forest Service lands that is approximately 100 km southwest of Denver, Colorado, and approximately 10 km directly south of the resort town of Breckenridge. Quandary Peak was selected for the experiment because it served as one of the stratified peaks in the original 2006 study, and it has been part of a mountain ecosystem recreational carrying capacity study since that time.

Methodology

WTP payment questions were developed in a dichotomous choice format. The utility theoretic foundations of the dichotomous choice model are well developed (see Hanemann, 1984, 1989); and are only summarized here. It is assumed that an individual's utility is a function of a recreation experience at site R and the consumption of all other goods (represented by income I). The utility function is represented as:

$$U = f(R, I). \tag{1}$$

Utility from visiting a recreation site also depends on an individual's personal preferences that are known only to that individual, so a portion of the utility function is not observable to the researcher. Therefore, some components of each individual's utility function are treated as stochastic, resulting in an indirect utility function and a random term, as follows:

$$U = f(R, I) = v(R, I) + e, \tag{2}$$

where e represents an error term.

With the dichotomous choice WTP question format, survey respondents are asked whether or not they would still take their most recent trip to the recreation site if travel costs were \$Bid higher. The respondent is predicted to

answer 'YES', if utility from the recreation experience, along with the associated reduction of $Bid in income, is greater than the individual's original utility level without taking the trip. The 'YES' respondent would take the trip ($R = 1$) at the higher travel cost ($I - \$Bid$), and the 'NO' respondent would choose not to take the trip ($R = 0$). Therefore, the probability of a 'YES' response is represented as:

$$P(\text{YES} \mid \$\text{Bid}) = P[v(R = 1,\ I - \$\text{Bid}) + e_1 > v(R = 0,\ I) + e_2], \tag{3}$$

where e_1 and e_2 are error terms with means of zero (Hanemann, 1984).

In the random utility framework, a visitor is predicted to respond 'Yes', if the gain in the deterministic part of the utility function (the indirect utility difference) is larger than the difference in the stochastic part ($e_1 - e_2$). If the difference of the errors ($e_1 - e_2$) is logistically distributed, this gives rise to the parametric logit model. The stylized version of the model estimated is:

$$\text{Log}[(\text{Prob YES})/(1-\text{Prob YES})] = \beta_0 - \beta_1(\$\text{Bid}) + \beta_2 X_2 \ \ldots \ + \beta n(Xn) + \varepsilon, \tag{4}$$

where $Bid is the increase in trip cost the visitor is asked to pay, *X*s are other independent explanatory variables, and ε is the error term.

Data

In order to test for differences in question wording, a total of 370 surveys were distributed over three non-holiday weekends in July and August 2009. The mail back survey booklet was designed along the lines of Dillman's Tailored Design Method (Dillman, 2000). Hikers were approached at trail heads and in parking areas at the conclusion of their recreation activity. After providing the visitors with the survey and a postage paid return envelope, names and addresses were also collected so that a second survey could be mailed to non-respondents. The response rate of the control surveys was 72% and the response rate of the experimental surveys was 61%.

Individual visitor WTP data for 114 experimental surveys were compared to 223 control observations, for which the WTP question was more generally worded. Both surveys included seven questions concerning trip specifics, a section addressing expenditures, a dichotomous choice WTP question, as well as a final section regarding demographics of respondents (including as recreation history and preferences, such as affiliation with outdoor organizations, recreation goals, etc). Expenditure questions asked respondents to report how much they spent for the following categories: access, entrance, guide or camping fees; equipment rental or purchases; food; fuel; hotels; permits; guidebooks; shuttle fees; camping provisions; tolls; voluntary donations; and other expenditures. A copy of the expenditure questions is presented in the Appendix. Analysis revealed no statistical difference in expenditure data between the experimental and control groups.

The dichotomous choice WTP question format asks whether the visitor would pay a specific increase in trip cost (the magnitude of which is varied across the sample). This model is deemed more market-like and analogous to

the price taking behaviour familiar to consumers than asking an open-ended question of what the maximum amount a visitor would pay (Loomis and Walsh, 1997). In this experiment, two surveys were distributed that only differed slightly in payment vehicle language. Respondents were asked to circle a 'yes' or 'no' answer. Bid amounts ($X), ranged from US$2 to US$950. The control survey was worded like a standard CVM WTP question, motivating the increase in trip costs as being related to gasoline, campground fees and hotel prices. The individual was asked whether 'you' would still make this trip if the trip cost increased. While this wording is intended to elicit individual WTP, the examples of increased trip costs can be interpreted as group costs, rather than paid on a per person basis:

> 'As you know, some of the costs of travel such as gasoline, campgrounds, and hotels often increase. If the *total cost* of this most recent trip to the recreation area where you were contacted had been $X *higher*, would you have made this trip to *this* 14'er?' (Control survey, emphasis in original.)

The experimental survey dropped the examples of the increased trip costs, and explicitly referred to 'your share' of the total costs. The examples of trip costs were previously depicted in both surveys within a table of trip expenditures (see Appendix), and therefore these were dropped in the experimental WTP question in order to make the question more concise and to highlight the importance of the difference between the wording with regard to cost sharing. However, everything else about the WTP question was the same as in the control:

> 'As you know, some of the costs of travel often increase. *If your share* of the total cost of this most recent trip to the recreation area where you were contacted had been $X *higher*, would *you* have made this trip to *this* 14'er?' (Experimental survey, emphasis in original.)

Statistical tests of differences would likely reveal a greater WTP for the control versus experimental group if respondents were answering for the group in the control survey. The corresponding hypothesis test is:

$$Ho_1: \text{Mean } WTP_{control} = \text{Mean } WTP_{experimental}$$

versus

$$Ha_1: \text{Mean } WTP_{control} > \text{Mean } WTP_{experimental}$$

Should a statistically significant difference exist between WTP of the experimental and control group, a logical follow-up question is whether the control survey mean WTP can be divided by the group size, in order to yield individual WTP comparable to the experimental survey. In anticipation of the possibility that individuals answered control survey WTP questions on a per group basis, a second hypothesis is:

$$Ho_2: \text{Mean } WTP_{control/group\ size} = \text{Mean } WTP_{experimental},$$

versus:

$$Ha_2: \text{Mean } WTP_{control/group\ size} \neq \text{Mean } WTP_{experimental}.$$

The first hypothesis test was evaluated by estimating a logit regression model. The coefficients were then used to calculate mean WTP as given in Hanemann (1989) and adapted here:

$$\text{Mean } WTP_i = [\ln(1 + \text{Exp}(\beta_o + \beta_2 \mathbf{X}_2))/|\beta_1|], \quad (5)$$

where β_1 is the coefficient of \$X and $\mathbf{X}_2$ is the travel distance recorded for each survey. For Mean $WTP_{experimental}$, the transformation in Equation (5) was performed for every survey response, resulting in a WTP value for each survey returned. Individual WTP values were then summed and averaged over the number of observations to obtain the mean WTP value. Results were compared to Mean $WTP_{control}$, which used average travel distances to calculate mean WTP.

The same Mean $WTP_{experimental}$ procedure was used for the second set of hypothesis tests. In order to test whether WTP control responses could be adjusted for group data, individual WTP values were divided by group size in order to obtain individual WTP ($WTP_{control/group\ size}$). These transformed WTP values were then averaged to obtain mean WTP values.

Differences in WTP values were tested as to whether the confidence intervals of the mean WTP values overlapped (Creel and Loomis, 1991). Confidence intervals were calculated for the mean WTP using the variance-covariance matrix and a procedure developed by Krinsky and Robb (1986) and applied to dichotomous choice CVM by Park *et al* (1991).

Given our relatively small sample sizes, especially on the experimental individual version, the issue of high variance leading to wide confidence intervals could be an issue for detecting significant differences in WTP between versions. This problem is not unique to our study, as a study in the Italian Alps by Scarpa *et al* (2008) compares the more traditional WTP utility coefficient approach with a re-parameterized model that reflects marginal WTP parameters, with the purpose of reducing variances. Thiene and Scarpa (2009) expand upon this methodology with a random utility model to evaluate site changes in alpine recreation sites. In both cases, the authors indicate that further refinements in WTP and contingent valuation methodology are necessary to improve the efficiency of WTP estimates.

Results

Table 1 shows the regression results for control and experimental surveys. As expected, the key price coefficient, the \$Bid Amount, is negative and statistically significant. This serves as a validity check, indicating respondents took the dollar amount they were asked to pay seriously; the higher the dollar amount respondents were asked to pay, the lower the probability they would pay. In terms of the first hypothesis test, all coefficients are statistically significant and robust, to either the 5% or the 1% level of significance. Using these coefficients, the mean WTP values were calculated as described in Equation (5). The WTP values for the control (unadjusted) and experimental

Table 1. Logit WTP model results.

	Control	Experimental
Constant	0.8835***	0.6014***
(*t*-statistic)	(4.201)	(1.927586)
$ BID	–0.00599***	–0.0080**
(*t*-statistic)	(–6.576)	(–4.127057)
Travel Distance	0.00235**	0.0029***
(*t*-statistic)	(3.984)	(2.639503)
McFadden *R*-squared	0.307	0.3308
Log likelihood	–111.938	–51.6974
LR statistic	99.026	51.1157
Probability (LR stat)	0.000	0.000
N	233	114

Note: **Statistical significance at 5% confidence level; ***statistical significance at 1% confidence level.

Table 2. Mean WTP per person per trip and 90% confidence intervals.

	Mean WTP	Lower CI	Upper CI
Control unadjusted	$275.47	$260.63	$290.30
Experimental	$181.07	$164.85	$197.28

Table 3. Mean WTP per person per trip and 90% confidence intervals.

	Mean WTP	Lower CI	Upper CI
Control/group size (adjusted to reflect individual responses)	$124.41	$111.40	$137.42
Experimental	$181.07	$164.85	$197.28

surveys are statistically different, as shown by non-overlapping confidence intervals presented in Table 2. Results for the control survey that are not adjusted to reflect individual data are thus termed, 'Control Unadjusted'. The null hypothesis can be rejected, in that there are statistically significant differences in WTP between the control unadjusted and experimental surveys. In other words, the language of the control surveys affects the reported WTP, and it appears as though individuals answer the control surveys from the perspective of an increase to the group costs, rather than individual costs, when this individual versus group distinction is not made explicitly and forcefully enough.

This lack of comparability prompts the second hypothesis test, as to whether the control surveys can be 'corrected' to reflect individual responses, by dividing the control WTP amount and the miles travelled by group size. However, as shown in Table 3, this transformation of the control WTP also fails to yield WTP equivalent to the experimental WTP as shown by the non-overlapping confidence intervals. Thus, the null hypothesis of equality is rejected. There is a statistical difference between WTP values of control surveys versus experimental surveys even when adjusting for group size. In this case, dividing by the number in the group over corrects and also does not yield an accurate estimate of individual WTP.

Discussion and conclusion

Rejection of the first null hypothesis indicates that some respondents may be confused as to whether WTP questions apply to a group versus individual travel expenses. When WTP values are divided by group size, the mean WTP is more reflective of the experimental survey individual values, although the confidence intervals are still non-overlapping but in the opposite direction. Rejection of the second null hypothesis indicates that it may be difficult to correct group WTP by dividing by group size to reflect individual WTP. In other words, it is important to clearly and forcefully distinguish in the wording of the payment vehicle explicitly whether the increase in costs would be paid by an individual or a group.

It is also important to note that there is the possibility that those responding to questions about changes in 'your share' of the expenses might still consider their expenses as inclusive of other family members on the same trip. However, the results seem to indicate that individuals respond differently to the increased language specificity presented in the experimental survey. Clearly, there is opportunity for additional research to further refine the language of WTP payment vehicles.

While the sample size of 370 observations is not large, the non-overlapping confidence intervals indicate that difference in verbiage yield statistically significant differences. The distinct confidence intervals are particularly relevant in the context of a binary logit model, which commonly yield large WTP variances. The problem of large variances has led other researchers to seek high alpine recreation as a venue to refine contingent valuation methodology (Scarpa *et al*, 2008; Thiene and Scrapa, 2009). However, our results show non-overlapping confidence intervals that are not affected by the potential downside of large variances. In fact, despite the wide confidence intervals reducing the ability to detect differences in WTP, we found that the two estimates were significantly different.

It is worth noting that the values obtained on the Fourteener study were substantially higher than the WTP of other recreation studies, in general. This is also consistent with the 2006 findings by Loomis and Keske (2009). We compare our findings to other studies, adjusting for inflation and presenting the values in 2010 dollars. Ekstrand (1994) asked rock climbers at Eldorado Canyon outside of Boulder, Colorado what they would pay to do similar climbs but at remote wilderness locations. His value of US$38 per day in real dollars

is substantially below the mean WTP of both control groups and the experimental group. In other studies, Grijalva and Berrens (2003) estimate a value of rock climbing in Texas at between US$56 and US$67 per day trip in real dollars, and Grijalva *et al* (2002) find a WTP of only US$24 to US$30 per person to avoid closing several climbing sites in several National Forest, National Park and BLM Wilderness areas. In a count data TCM model for climbing in the Italian Alps, Scarpa *et al* (2003) estimates (in euros, which have been converted to real dollars) a consumer surplus of US$27 to US$45 per day trip. Even when adjusting for inflation, the values of comparable outdoor recreation studies are clearly below the confidence intervals of this study.

Colorado Fourteeners yield a high WTP irrespective of lack of precision in wording of the payment vehicle. However, our findings show that if researchers desire individual visitor WTP for recreation studies, then the language must be explicitly emphasized in drafting the payment vehicle. These findings can also be transferred to the development of contingent valuation surveys, as well as survey language, in general. For example, verbiage is an important consideration for the development of both closed-ended and open-ended WTP questions. Likewise, it is important to be as precise as possible when providing a description of a good being valued.

As shown in this paper, slight differences in wording can 'trip' even experienced visitors to a site. When valuing major destination tourism sites most people only visit once a year or perhaps once in their lifetimes, our past experience on other projects suggests the need for both focus groups and pre-tests of the information provided in the survey to ensure it isunderstandable to infrequent visitors. With visitors with little prior experience with the site, nothing can be taken for granted.

This concept is further exemplified by the fact that CVM is increasingly being used by agencies that are responsible for recreation and tourism management fees, like the USDA Forest Service (Loomis and González-Cabán, 2008). Findings from our study reinforce the importance of verbiage specificity and survey pre-testing. For example, when focus groups are used to test respondent reaction to fee implementation, a debriefing session should take place to ensure that respondents interpreted questions as expected. This is important for establishing 'face validity' of the survey, and to ensure that the agency is valuing what the agency intends to value for the benefit–cost analysis.

In addition, if the CVM exercise is being used to 'test the waters' for fee increases as has been done for Colorado Fourteener recreation (*Denver Post*, 2010; Quillen, 2010), then the means of payment in the survey must match how the entry fee will be charged. Often the entry fee is per vehicle or group, so in that case means of payment that apply to the entire group are appropriate.

Should agencies charge a perperson fee, then valid inferences about response to the hypothetical payment must be framed on an individual, rather than a group, basis. Furthermore, attempts to correct for group size can lead to under estimation of WTP values, and the potential for misallocation of resources. Ultimately, the results of this study show that in the case of distributing surveys in a recreation setting, it is imperative for payment vehicle language to reflect that responses reflect the individual WTP.

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Appendix

Section B. Group Trip Expenditures

Please indicate the amount **you and members of your group** with whom you shared expenses (for example, other family members, travelling companions) spent on each category on the **trip** where you were given the survey.

Trip Expense	**Column A Amount Spent in Alma, Fairplay, Breckenridge or Frisco Areas for This Trip (See map)**	**Column B Amount Spent Elsewhere in Colorado for This Trip (Do NOT include Column A)**
Access or entrance fees	$	$
Camping fees	$	$
Equipment/gear rental	$	$
Equipment/gear purchase	$	$
Food/drink: grocery or convenience stores	$	$
Food/drink: restaurants	$	$
Gas and oil for auto or ATV	$	$
Guide fees	$	$
Hotel/motel	$	$
Licences or permits	$	$
Maps/guidebooks	$	$
Rental car	$	$
Shuttle fees	$	$
Supplies: camping and hiking provisions (for example, batteries)	$	$
Tolls	$	$
Voluntary donations	$	$
Other; Please List_____	$	$