Using Contingent Valuation to Measure User and Nonuser Benefits: An Application to Public Transit

Kathleen M. Painter, Robert Douglas Scott II, Philip R. Wandschneider, and Kenneth L. Casavant

The contingent valuation method (CVM) was used to measure the value of a community service, rural transit, that has both user and nonuser values. Traditional focus groups and a CVM questionnaire provide estimates of willingness to pay and willingness to accept. Tobit analysis was used to test relationships among the variables. Income was not related to the amount of perceived benefit, but the alternative desire to provide transit for others was statistically significant. Ranges for possible total benefits, user and nonuser, are provided for the test transit systems. Proper aggregation of benefits to the population was found to be critical.

Quantifying benefits for publicly provided services and goods is an essential but difficult task for determining optimum provision levels. What is the worth to society of public transit, a new park, better schools, or preservation of an endangered species? Often the arguments over provision of these public goods stem from measurement problems; we truly do not know the overall community benefits of providing free public transit, or the future impact of the loss of a particular species. If there are substantial nonuser benefits, nonmarket evaluation

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may be necessary to determine total public benefits. In this study, a contingent valuation survey method is used to measure user and nonuser benefits for publicly provided regional transit services in rural areas. The techniques we use could easily be adapted for evaluating the provision levels for other publicly provided goods and services.

Nearly all forms of travel, including public transit, receive government support in the form of financial subsidies, land allocation, and agency resources. The rationale for such support, from personal or institutional perspectives, relates to benefits that can be broadly classified as mobility and efficiency benefits (Litman). Mobility benefits result from increased travel options, particularly for people who have mobility limitations or are without access to any form of alternative transportation. Lack of alternative transportation is particularly common in rural areas. Efficiency benefits result from savings that result when transit is used in place of less efficient modes. In addition to these direct-use benefits, we discover that indirect and nonuser benefits of transit make significant contributions to total community-wide transit benefits. Transit systems contribute to the general social and economic infrastructure of a community, also known as its social capital.

Understanding and quantifying the total benefits of transit is critical now that Benefit-Cost Analysis (BCA) is required under the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA). The purpose behind the use of BCA is to evaluate the social efficiency of projects and programs by valuing all effects in terms of comparable monetized value measures.

The total benefits of two regional transit systems in rural areas in Washington State are quantified in this study. A novel method of collecting contingent valuation method (CVM) data is employed, one that may be particularly suitable for small-scale policy studies. Alternative estimates of the total benefits for the two regions under study are presented, based on different methods of aggregating the results. As some of the CVM are controversial, we compare the results of different approaches.

Research Design

To measure the total benefits of public transit for a community, we examined two regional transportation systems in Washington State—the LINK System in Chelan and Douglas counties and the Clallam County Transit System in Clallam County. Data measuring the benefits of rural transit were collected in different stages. The first stage involved conducting traditional focus groups to investigate the nature and extent of benefits to rural transit. In the second stage, a random sample telephone survey was conducted in the counties involved in the study. Citizens in these two regions were asked to participant in a panel on local transit issues. This phone survey also contained questions that provided useful information for aggregating data to be collected in the third phase. The third phase involved administering a CVM questionnaire to a panel of local residents. This survey measured the economic benefits participants received from public transit services in their area, as well as their attitudes and perceptions of the transit system in their area. The panel of participants included randomly selected citizens recruited from the telephone survey, plus a convenience subsample of citizens recruited through local church and community groups.
Traditional Focus Groups

A focus group consists of a small group of people led by a moderator that engages in an in-depth conversation on a particular topic. The group moderator follows a set script that leads the group through the research questions. Group discussions such as these are standard practice for identifying community perceptions and attitudes to use in the development of CVM questionnaires (Jones-Lee and Loomes). The primary purpose of the focus group sessions was to gain an understanding of the perceived benefits of public transit to local residents. A professional focus group moderator was hired to conduct the groups.

A test focus group was conducted in Pullman, Washington. This process was instrumental in developing a good script and identifying relevant topics for focus group discussion. In particular, the test focus group session revealed the difficulty participants would have in giving specific numbers when quantifying the benefits of transit.

The two focus group sessions conducted in the study areas included six to eight participants from various citizens’ advisory councils for each transit authority. Interestingly, over 80% of the group participants in the CVM survey were not users of the transit system. The community-wide benefits from public transit described by members of the focus group sessions fell into three main categories. The first included all the direct benefits of transit services, including an inexpensive, safe, reliable, and convenient mode of transportation that provided access to urban centers, higher education, jobs, and health services for residents. Participants mentioned that the regional transit system provides an economic link to other communities, giving area businesses a larger pool of potential employees and customers. The second category included social benefits of transit services. In particular, providing transportation for children, the elderly, and other non-drivers was considered highly valuable. Transit systems provide access to various activities for these individuals, as well as opportunities to socialize in transit. The first two categories of benefits are part of what is sometimes referred to as social capital—the infrastructure of services, social relations, and amenities that support the economic and social activities of a community. Environmental benefits of transit services make up the third category of benefits. These included a reduction in pollution and congestion, including parking congestion. Participants felt that riding the bus was “the right thing to do” from an environmental perspective.

While focus group participants felt strongly that their areas needed public transit and that transit availability made a substantial difference in their quality of life, they had a difficult time placing a dollar value on the benefits of transit on an annual basis. Respondents indicated that the amount was actually fairly substantial and they would need more time to reflect on an actual amount. Group participants were unanimous in feeling that public transit benefited everyone and that, without transit services, smaller communities would become isolated from the flow of economic activity in the larger towns.

The focus group discussions played a vital role in developing the CVM questionnaire. A comprehensive picture of the perceived benefits of transit accruing to both users and nonusers of transit services in each region was obtained from these small sessions with informed participants. More importantly, researchers learned that the valuation questions needed to be refined to make them easier to answer. A shorter, open-ended monthly payment format was developed to make
the valuation scenario similar to other types of public utility payments. Thus, the payment vehicle would be a fixed monthly household payment, totally independent from transit usage, and therefore a net addition to any tolls paid by riders. (One area had a fare-free system.)

Another implication of the focus group results for the contingent valuation study deserves some discussion. Within the field of nonmarket valuation, there is considerable debate about the merits of using CVM to estimate nonuse values. In particular, critics argue that “existence” (sometimes called passive use) values cannot be reliably measured (see, e.g., Diamond and Hausman). Whatever the merits of this debate, it would seem that the nonuser benefits for transit programs differ, for example, from the existence values for blue whales or sea otters. This transit nonuser benefit seems to be a diffuse social amenity, which many nonusers feel contributes to their quality of life. This is not quite the same thing as a pure existence value, which derives from mere contemplation of the existence of the value object. In the transit case, respondents are expressing the belief that, even if they do not use the service, its existence improves their life in a number of direct and indirect ways. One criticism of using CVM to estimate existence values is that respondents do not have much experience with the commodity. This is not the case in this study, as many participants will have a fair bit of knowledge about the transit and transportation system in their community.

Random Sample Phone Survey

A list of randomly drawn names from the telephone directories in the two study areas was purchased from Survey Sampling, Inc., of Westport, Connecticut. The Social and Economic Sciences Research Center at Washington State University was hired to perform a short, random-sample phone survey on public transit preferences and usage in the general population of the two study areas while recruiting participants for the CVM survey. Results from the survey were later used in developing an aggregate estimate of the benefits of rural transit for the two study areas. Overall, 54 of the CVM session (below) participants were randomly selected through the telephone survey.

CVM Panel Groups

The final stage of the project involved a survey with a panel of area residents in both regions under study. The survey was designed to measure the benefits that transit provides to both users and nonusers, as well as to obtain information on attitudes and preferences on public transit issues. The Wenatchee, Washington, session had a total of 81 participants, while the Port Angeles, Washington, session had 89 participants. All 170 participants received $25 for attending. The use of a panel of paid respondents helped in recruiting the panel, enhanced the dedication of participants and therefore the likelihood of useable results, and rewarded participants for their time and effort.

Tell-Back, Inc., of Spokane, Washington, was hired to conduct the two CVM panel sessions. Tell-Back has developed a computerized data collection system in which session participants respond to questions using a hand-held dialer. The
The moderator reads a structured questionnaire to the group, but the group can stop the moderator and ask questions or modify a question at any time. The questionnaire contained approximately 120 questions and took slightly over an hour and 15 minutes to complete. All responses are anonymous since they are recorded blind into the computer. This type of forum retains some of the flexibility of traditional focus groups, in that participants are free to voice their opinions, while it collects hard data for quantitative analysis from structured questions. The data are immediately ready for analysis, and data entry errors are eliminated.

Panel groups of this sort are frequently plagued by a large number of no-shows. Participants were recruited for the sessions from the random sample telephone survey described above. Individuals were also recruited (in a nonrandom fashion but with the intent of broad representation) from a variety of local churches and service organizations including a Presbyterian church, a Lutheran church, the YWCA, a Highway Patrol service group, the local Chamber of Commerce, a homeless shelter, local political parties, and from recommendations of citizen advisory council members. A total of 116 additional individuals were selected through this nonrandom process, making up 68% of the total participants on the CVM panels.

This nonrandom process of recruiting participants is referred to as a convenience sample. The resulting mix of a random sample and a convenience sample does not comprise a scientific randomly drawn sample, reducing the ability to draw inferences from the entire panel group to the general population in the pilot study areas. While the use of a convenience sample may be expedient, it is not a typical practice in CVM studies; results will be more useful to policy makers if typical random sample procedures can be used. However, it can be time-consuming and expensive to obtain a large random sample for such a survey. In this case, we decided to accept the nonrandomness of a convenience sample to gain the benefits of a larger sample size, which would reduce the sample variance of the responses. While not statistically representative, the convenience sample in this study included a broad group of general citizens and should provide a fairly reasonable indication of the preferences of the general population.

A series of valuation questions were used to arrive at a range of estimates for the value of transit in these areas. First, participants were asked to imagine a local transit system that closely reflected their idea of an efficient transit system. This question attempted to forestall any protest bidding, in which respondents refuse to acknowledge any benefits because of some minor irritation with the current system. This approach was used to separate any frustrations with the current system from their opinion of public transit in general. Participants were reminded that the system had to be realistic, that is, if service frequency were to increase, the system would be more expensive. Respondents were then asked how much they would be willing to pay each month to have this modified system (V-GOOD SYSTEM). With this hypothetical scenario, the fare structure for each system remained the same; any money the respondents agreed to pay was above any fares currently being charged. (One transit system in the study charges fares while the other is free, funded instead by sales tax.)

The second valuation question asked respondents how much they would be willing to pay to have this modified system if they were unable to use it (V-GOOD
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The third valuation question asked respondents to place a value on their current public transit system (V-CURRENT SYSTEM). Again, this value was in addition to any fares currently being paid. Clallam County respondents were asked an additional question regarding what they would be willing to pay to get a fare-free bus system (V-NO FARE SYSTEM).

The final valuation question (V-COMP. FOR NO SYSTEM) asked respondents how much they would need to be compensated each month for giving up access to public transit. This is a willingness-to-accept compensation question, whereas all other valuation questions are in the willingness-to-pay format.

Use of a willingness to accept (WTA) compensation question is infrequent in nonmarket valuation, therefore raising questions about whether its use in this instance is justified. In principle, most economists would agree that whether WTA compensation should be used is fundamentally an issue of property rights: Is the good in question one which the respondent does not own and therefore must buy, or does the respondent “own” the right to the good, and so should be compensated for losing (selling) the good? Thus, for a case in which transit exists and the question is whether to abandon it, the correct measure is WTA compensation for the loss of the system. For a case in which the system is to be introduced or expanded and, most importantly, for which there is no preexisting right to the system (e.g., a right established by the Americans with Disabilities Act (ADA)), then the correct measure is WTP. We inquired into WTA compensation because access to public transit currently exists in the sampled communities and it can often be argued to be a preexisting right in other communities.

The second point concerns whether or not it is necessary to estimate WTA compensation, even where it is the correct measure. According to an old argument (Willig), WTP and WTA compensation should only differ by a small amount. This value is termed the income effect, as it concerns the proportion of income spent on the commodity and its income elasticity. If differences were small, then WTP could be used as an approximation for WTA. However, empirical and experimental evidence over the years has shown that the differences between WTP and WTA compensation can be great, even in cases where actual payments are made.1 Hanemann (1991) showed theoretically that the difference in WTP and WTA compensation for quantity changes of a public good depends very strongly on the availability of substitutes for the good, as well as on the price elasticity of income. Where there are few substitutes for a good, the difference can be large—theoretically infinite if there are no substitutes. Scholars have also proposed other reasons for differences between the two measures.2

While these arguments provide good reasons for attempting to measure the WTA compensation, caution still is warranted. Some authors (and common sense) suggest that incentives for strategic answers are greater in the WTA compensation situation than in the WTP situation (Hoehn and Randall; Mitchell and Carson). In the end, the current situation in the nonmarket valuation community is unsettled, with some authorities suggesting that one proceed cautiously with WTA compensation measures where they are appropriate (Mitchell and Carson), while
some authorities caution against its use altogether (Arrow et al.). Mitchell and Carson also argue that, in some cases, one can view an apparent WTA property rights structure as a willingness to pay to maintain a current right.

Because the communities surveyed in this study currently have transit systems, it seemed appropriate to measure the WTA compensation for the loss of the system. Estimating both measures gives policy makers some idea of the force of opinions behind two perspectives on transit systems: the willingness to pay to obtain a system and the compensation required for its loss. In policy analysis, it may be necessary to take both property rights perspectives into account. For instance, it may be that policy makers want to treat these two measures as bounds for the value.

**Study Results**

**Phone Survey Results**

As part of the recruiting process for the Tell-Back survey, a short random-sample telephone survey was conducted. In addition to requesting participation in the Tell-Back survey, respondents were asked questions regarding transit usage and their attitudes and perceptions of public transit. A total of 287 individuals in the two study areas participated in the phone survey.

To be eligible to participate in the survey, the individual answering the phone needed to be 18 years of age or older and a resident of the survey area for the last 2 years. This short survey contained a total of 15 questions. First, respondents were asked the number of vehicles available to members of their household. Then, a series of questions were posed on usage of the transit system in their region by members of their household, including a breakdown by broad age groups. Questions in the survey covered such topics as the number of motor vehicles available to household members, transit usage by household, and ridership frequency by age group. The final eight questions in the survey quizzed respondents on their reasons for not using the transit system in their region.

The most important result of the phone survey for this study was the proportion of users to nonusers in the general population for the two study groups. This information was vital to determining the final dollar valuation of the benefits of transit. These two groups, users and nonusers, had the largest differentials in valuing transit in their areas. The average value of each group was used to aggregate to the whole population based on the proportion of this group in the population. The telephone survey also provided input for the CVM script, such as reasons for not using transit.

**CVM Survey Results**

As noted by Loomis, the ultimate use of CVM value information in BCA is to provide an estimate of the aggregate benefits, reflecting the total economic benefit to the general population. Information taken from a sample of respondents that is representative of the target population is generalized to provide these aggregate estimates of benefits. Although the sample in this study has a scientifically random component, the random component is relatively small, and there are a
greater number of nonrandomly selected participants (68%). Comparisons of survey characteristics and general population characteristics from U.S. Census data revealed that survey participants were more likely to be female, wealthier than average, and better educated than the general regional population. Therefore, results may be slightly biased in the direction reflecting the preferences of these participants.

The first question asked participants to imagine a local transit system that closely reflected their idea of an efficient, realistic transit system for their area. (For the full text of the CVM questionnaire, see Tell-Back, Inc.) The average value they would be willing to pay for this ideal transit system, which is over and above any amount currently being paid for their existing system, was $9.30 per month (V-GOOD SYSTEM). Definitions of the economic valuation variables as well as the overall mean responses are provided in table 1.

Next, participants were asked what they would be willing to pay for this hypothetical transit system with the restriction that they would be not be using it. The average monthly mean value of this modified system that the participant could not use was $7.10 (V-GOOD SYSTEM, NONUSER). This nonuse value provides a measure of community benefits, as opposed to personal benefits, of a transit system.

The next valuation question asked participants to value their current transit system. The monthly mean value for this question was $7.06 (V-CURRENT SYSTEM). Also, respondents in the area that charges fares were asked how much they would be willing to pay to have a fare-free transit system. They gave an average monthly value of $14.17 (V-NO FARE SYSTEM) to get a fare-free transit system.

Table 1. Overall survey means and standard deviation for economic valuation (WTP and WTA) variables, CVM surveys, Washington State, 1999

<table>
<thead>
<tr>
<th>Economic Variables</th>
<th>Variable Definition</th>
<th>Mean</th>
<th>Std. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>V-GOOD SYSTEM: Value of a good transit system</td>
<td>WTP per month for a modified transit system in which any minor irritants that trouble the respondent have been removed.</td>
<td>$9.30</td>
<td>10.93</td>
</tr>
<tr>
<td>V-GOOD SYSTEM, NONUSER: Value of a good transit system for a nonuser</td>
<td>WTP per month for a modified transit system, which the respondent does not use.</td>
<td>$7.10</td>
<td>10.14</td>
</tr>
<tr>
<td>V-CURRENT SYSTEM: Value of current transit system</td>
<td>WTP per month for the present transit system.</td>
<td>$7.06</td>
<td>10.85</td>
</tr>
<tr>
<td>V-NO FARE SYSTEM: Value of a fare-free system</td>
<td>WTP per month for a fare-free system (Port Angeles only).</td>
<td>$14.17</td>
<td>16.07</td>
</tr>
<tr>
<td>V-COMP. FOR NO SYSTEM: Necessary compensation for removal of transit</td>
<td>WTA per month if public transit were no longer provided.</td>
<td>$45.42</td>
<td>40.48</td>
</tr>
</tbody>
</table>
Table 2. Mean values (dollars per month) for economic valuation (WTP and WTA) variables by four subgroups, CVM surveys, Washington State, 1999

<table>
<thead>
<tr>
<th></th>
<th>V-GOOD SYSTEM</th>
<th>V-GOOD SYSTEM (NONUSER)</th>
<th>V-CURRENT SYSTEM</th>
<th>V-NO FARE SYSTEM</th>
<th>V-COMP. FOR NO SYSTEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>More than one person attending Tell-Back session from the same household</td>
<td>8.34</td>
<td>6.21</td>
<td>5.36</td>
<td>12.93</td>
<td>36.60</td>
</tr>
<tr>
<td>Only one person attending Tell-Back session from the same household</td>
<td>9.82</td>
<td>7.57</td>
<td>7.90</td>
<td>15.01</td>
<td>49.41</td>
</tr>
<tr>
<td>Chelan-Douglas (LINK) region (81 participants)</td>
<td>9.47</td>
<td>6.73</td>
<td>6.90</td>
<td>NA</td>
<td>42.88</td>
</tr>
<tr>
<td>Clallam County region (89 participants)</td>
<td>9.15</td>
<td>7.44</td>
<td>7.20</td>
<td>14.17</td>
<td>47.74</td>
</tr>
<tr>
<td>Transit users (80 participants overall)</td>
<td>12.53</td>
<td>10.03</td>
<td>9.79</td>
<td>19.5</td>
<td>62.36</td>
</tr>
<tr>
<td>Transit nonusers (90 participants overall)</td>
<td>6.43&lt;sup&gt;a&lt;/sup&gt;</td>
<td>4.50&lt;sup&gt;a&lt;/sup&gt;</td>
<td>4.63&lt;sup&gt;a&lt;/sup&gt;</td>
<td>9.81&lt;sup&gt;a&lt;/sup&gt;</td>
<td>30.37&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Randomly selected participants (54 overall)</td>
<td>8.13</td>
<td>5.10</td>
<td>6.02</td>
<td>11.27</td>
<td>33.98</td>
</tr>
<tr>
<td>Nonrandomly selected participants (116 overall)</td>
<td>9.85</td>
<td>8.03</td>
<td>7.54</td>
<td>15.37</td>
<td>50.75&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>a</sup>Subgroup means for these variables were significantly different based on a Duncan’s test of group means. Bold/regular indicates groupings by row.

Finally, respondents were asked how much they would have to be compensated if their transit system were removed. (This is the WTA compensation question.) The mean value for receiving compensation to forgo transit was $45.42 per month (V-COMP. FOR NO SYSTEM).

Mean values for the valuation questions for selected subgroups are presented in table 2. The first two rows differentiate between respondents who attended the session with someone else in their household and those who were the only representatives from their household. The third and fourth rows differentiate...
responses by region. Users are separated from nonusers in the fifth and sixth rows, and those who were selected at random are grouped separately from those who were selected by some other means in the seventh and eighth rows.

All the group means were subjected to the Duncan’s mean comparison test to determine if there were any statistical differences in means between each group. The tests indicated that respondents who had at least one transit user in the household were significantly more likely to pay greater amounts across all the valuation questions. The only other comparison in which the differences were statistically significant occurred in the responses to the WTA payment valuation (V-COMP. FOR NO SYSTEM) by random versus nonrandom selection. The mean compensation value for the randomly selected respondents was $34 per month, whereas all other respondents would accept an average of $51 per month. This result indicates that the nonrandomly selected participants place a greater value on transit services than the randomly selected group and confirm our suspicion of some bias due to the inclusion of the convenience subsample.

The group comparisons do indicate that users of the transit system place a higher value on transit than nonusers, a result that agrees with a priori expectations. In addition to the fact that they are direct consumers, users may well have a greater sense of the range of benefits that transit provides. Therefore, it is reasonable to use these group means, as different values, to represent the respective proportions of the population that are users. These means are then used to estimate the aggregate benefit of public transit to the total population.

An estimate of the proportion of users to nonusers was obtained in the recruiting telephone survey reported earlier. For Clallam County, users of the transit system make up 24% of the population; in Chelan/Douglas counties, users are 31% of the population. The number of users that participated in the CVM surveys is higher, at 47%. (Users are defined as households with at least one person who uses the transit system, regardless of frequency.) Therefore, users are overrepresented in this convenience sample. This provides additional justification for aggregating benefits to the population as a whole by weighting the sample means of users and nonusers by the proportion of these groups to the total population.

Data needed to aggregate the sample mean responses to the general populations of the respective study areas include the number of households and the population of the case study areas. Based on an estimate from the 1990 Census updated by the rate of growth from 1990 to 1998, there are an estimated 33,913 households in the Link service area and 27,336 in the Clallam Transit System area. Based on the results from the telephone recruiting survey, 31% of households in the LINK service area have at least one user (10,513 households). For Clallam County, 24% of the households had at least one user (6,561 households). Values for the number of persons aged 20 and over per household were used to estimate the population of adult users (18,986 for the Link area and 11,855 for Clallam County), although this value is probably a more conservative estimate than the actual population percentage due to the fact that households may have more than one user and because users may be under age 20.

Using the population and household proportions and applying the mean value responses provide the basis for the calculations in table 3. As an example, the aggregate benefits for the LINK service area using (1) the mean values of users and nonusers for V-GOOD SYSTEM, and (2) the number of user and nonuser
Table 3. Table of demographic characteristics,\(^a\) CVM surveys, Washington State, 1999

<table>
<thead>
<tr>
<th>Location</th>
<th>Total Number of Households</th>
<th>Total Number of User/Nonuser Households</th>
<th>Total Population (Age 20 and over)</th>
<th>Population of Users/Nonusers (Age 20 and over)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LINK Service Area (Chelan/Douglas counties)</td>
<td>33,913</td>
<td>10,513 users (31%)</td>
<td>61,246</td>
<td>18,986 (users) (31%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>23,400 nonusers (69%)</td>
<td></td>
<td>42,260 nonusers (69%)</td>
</tr>
<tr>
<td>Clallam County</td>
<td>27,336</td>
<td>6,561 users (24%)</td>
<td>49,395</td>
<td>11,855 users (24%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20,775 nonusers (76%)</td>
<td></td>
<td>37,540 nonusers (76%)</td>
</tr>
</tbody>
</table>

\(^a\)The number of households used is an estimate based on adjusting the 1990 Census estimate by the rate of growth of the population age 20 or above from 1990 to 1998 (State of Washington Office of Financial Management). The LINK service area does not cover all of Chelan/Douglas counties, so the household number (and also the population number) was decreased by 7% to accurately reflect total households and total population for this area. The calculations used to determine the number of user and nonuser households is based on the self-reported use or nonuse of transit from the WSU recruiting survey. The percentage of users for each area is 24% for Clallam County and 31% for Chelan/Douglas counties.

households, are calculated as follows:

- User households: \(10,513 \times \$150.33 = \$1,580,419\) Total user WTP
- Nonuser households: \(23,400 \times \$77.16 = \$1,805,544\) Total nonuser WTP

Total User WTP + Total Nonuser WTP = \$3,385,963 Total WTP

All of the other aggregated household benefits in table 4 are calculated in the same manner.

Similarly, aggregated estimates of the benefits are also derived based on the population estimates of users and nonusers age 20 and over in the two study areas (see table 3). Given that a convenience sample was used to collect data, the sampling process was not focused on obtaining value information specifically on a household basis (as is typically done in CVM studies). As shown in table 2 (first two rows), some panel participants came to the session with another household member. However, the mean values of these participants, although lower than participants who came alone, were not significantly different. This result opened a debate over whether it might be more appropriate to aggregate using population as the unit of aggregation. A follow-up phone survey was performed specifically to ask participants whether their valuation was for their household or for themselves as an individual.

Asking one individual to estimate the total utility for households with multiple members, particularly for public goods with nonuse values such as altruism, may be problematic. Interestingly, preliminary results from a follow-up study
Table 4. Annual aggregated values for transit by region and by variable, CVM surveys, Washington State, 1999

<table>
<thead>
<tr>
<th>Variable</th>
<th>Annual WTP</th>
<th>Aggregate Annual WTP by Household</th>
<th>Aggregate Annual WTP by Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean of stated WTP (users and nonusers) from V-GOOD SYSTEM</td>
<td>User: $150.33</td>
<td>$3,385,963 (LINK)</td>
<td>$6,114,947 (LINK)</td>
</tr>
<tr>
<td></td>
<td>Nonuser: $77.16</td>
<td>$2,589,314 (Clallam)</td>
<td>$4,678,748 (Clallam)</td>
</tr>
<tr>
<td>Mean of stated WTP (users and nonuser) from V-GOOD SYSTEM, NONUSER</td>
<td>User: $120.36</td>
<td>$2,528,945 (LINK)</td>
<td>$4,567,195 (LINK)</td>
</tr>
<tr>
<td></td>
<td>Nonuser: $54.00</td>
<td>$1,911,532 (Clallam)</td>
<td>$3,454,028 (Clallam)</td>
</tr>
<tr>
<td>Mean of Stated WTP (users and nonusers) from V-CURRENT SYSTEM</td>
<td>User: $117.48</td>
<td>$2,535,171 (LINK)</td>
<td>$4,578,441 (LINK)</td>
</tr>
<tr>
<td></td>
<td>Nonuser: $55.56</td>
<td>$1,925,045 (Clallam)</td>
<td>$3,478,447 (Clallam)</td>
</tr>
<tr>
<td>Mean of stated WTP (users and nonusers) from V-NO FARE SYSTEM</td>
<td>User: $234</td>
<td>$3,980,907 (Clallam)</td>
<td>$7,193,279 (Clallam)</td>
</tr>
<tr>
<td></td>
<td>Nonuser: $117.72</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean of stated WTA (users and nonusers) from V-COMP. NO SYSTEM</td>
<td>User: $748.32</td>
<td>$16,394,984 (LINK)</td>
<td>$29,608,838 (LINK)</td>
</tr>
<tr>
<td></td>
<td>Nonuser: $364.44</td>
<td>$12,840,968 (Clallam)</td>
<td>$22,552,412 (Clallam)</td>
</tr>
</tbody>
</table>

showed about half the respondents said their bids should be tallied as an individual amount while half said their amount represented the entire household. It should be emphasized here that, because of the uncertainty associated with using this type of sample, the “true” aggregate benefit probably lies somewhere between the household-aggregated benefits and the population-aggregated benefits. Therefore, values are expressed as ranges rather than point estimates.

Of these various valuation questions, those that could be considered most consistent with BCA are questions V-GOOD SYSTEM (the value of a modified transit system) and V-GOOD SYSTEM, NONUSER (the value of a modified transit system where use is restricted). These questions ask the respondent to consider a hypothetical change in the current transit system, and thus they are ex ante values, which is consistent with BCA. Question V-GOOD SYSTEM provides a measure of the total annual benefits of having public transit. As shown in table 4, the range of annual benefits associated with V-GOOD SYSTEM are $3.4 million (household-aggregate benefit) to $6.1 million (population-aggregate benefit) for LINK, and $2.6 million (household-aggregate benefit) to $4.7 million (population-aggregate benefit) for Clallam County (remembering that this is an aggregated
payment above any fares users are already paying). Question V-GOOD SYSTEM, NONUSER is a measure of the broader community level benefits resulting from transit, separate from any benefits resulting from direct use. The range of annual benefits associated with V-GOOD SYSTEM, NONUSER is $2.5 million (household-aggregate benefit) to $4.6 million (population-aggregate benefit) for LINK, and $1.9 million (household-aggregate benefit) to $3.5 million (population-aggregate benefit).

Question V-CURRENT SYSTEM (value of the current system) and V-NO FARE SYSTEM (the value of having a fare-free bus system in Clallam County) represent values of the current transit systems. The range of annual benefits associated with V-CURRENT SYSTEM is from $2.5 million (household-aggregate benefit) to $4.6 million (population-aggregate benefit) for LINK and from $1.9 million (household-aggregate benefit) to $3.5 million (population-aggregate benefit) for Clallam County. The Clallam County participants were also asked how much they would pay to get a fare-free bus system (V-NO FARE SYSTEM) with the annual benefit ranging between $3.9 million (household-aggregate benefit) and $7.2 million (population-aggregate benefit).

Statistical Analysis of Survey Responses

A statistical limitation to using the stated WTP/WTA responses from the CVM survey (see Scott, Painter, and Casavant) exists because survey participants are free to express a zero value. This means that the WTP data are censored (restricted) to values of zero and above. This type of data is problematic for the typical statistical procedures that assume a normal distribution, such as ordinary least squares regression (OLS). To more accurately test for relationships underlying willingness to pay for public transit, a Tobit regression model was run for each of the economic valuation questions. This estimation procedure is designed to provide estimations from data that are censored (contains zeros) and can produce more efficient estimates than OLS (Kennedy).

The general empirical model is of the following form:

\[
WTP/WTA = f(USE, a, d),
\]

where USE is defined as a user or nonuser of the transit system (1 = user, 0 = nonuser), \(a\) represents variables reflecting attitudes and preferences concerning public transit, and \(d\) is the sociodemographic variables of the participants. Three independent variables, USE (user or nonuser), INCOME98 (household income for 1998), and ALTRUISM (altruistic motives for paying for public transit, such as providing transit for those who are unable to drive), were included in all of the WTP/WTA models because of their potential importance in explaining the level of the WTP/WTA expressed. It is assumed that the WTP/WTA variables follow a censored normal distribution. It should be noted that, unlike OLS parameter estimates, the estimated parameters from the Tobit model are not directly interpretable. However, the signs on these coefficients and the corresponding chi-squared test statistics indicate the direction of the relationship (positive or negative) on WTP/WTA and whether the relationship is statistically significant. A negative sign indicates that the higher the participant rated the independent variable, the smaller the WTP/WTA payment.
Income was not a significant factor in explaining the WTP/WTA values in any of the models, implying that public transit is an inferior good. Since most people who can afford it prefer to drive their own vehicles, this result is not surprising. The signs on the parameter estimates for income across the models are positive with the exception of V-COMPENSATE (WTA value). The negative value for V-COMPENSATE implies that the less income participants made, the greater the compensation they would require to forgo public transit, probably reflecting their greater reliance on transit services.

The variable representing the altruistic desire to provide transit to others outside of family and friends who cannot afford their own transit (ALTRUISM) is a statistically significant predictor of WTP/WTA. Except for the model for V-NO FARES, the estimated coefficient is positive and strongly significant. Regarding V-NO FARES (paying to get a fare-free transit system in Clallam County), the estimated coefficient is positive but not significant, indicating that altruism was not a statistically significant factor in paying to get a free system. Since many of the participants were recruited from church and community service groups, a higher degree of altruism may be present in the sample than in the population as a whole.

Another variable that is also a statistically significant predictor of WTP/WTA is USER, the variable representing whether the participant uses the transit system. Again, in every model except for V-NO FARES, the coefficient is negative and strongly significant, indicating that nonusers would pay less for transit than users. For V-NO FARES, this variable is not significant, which might indicate that people who are currently nonusers and who would pay more to get a fare-free service would use a free system.

The final valuation model in this study is the compensation that participants would have to be paid to forgo access to public transit (V-COMP FOR NO SYSTEM). Variables that are positively related to WTA include: participants that tended to place greater importance on public transit stated a higher WTA value; participants who would be more likely to give rides to others outside their household if transit was not available tended to state a higher WTA value; participants who tended to agree that buses reduce traffic and parking congestion also tended to state a higher WTA value; and finally, participants who were recruited to the sessions by a random phone call tended to have a lower WTA value. In general, the randomly recruited participants placed a lower value on transit than the nonrandomly recruited participants.

**Summary and Discussion**

The overall purpose of this article is to present a method for measuring the value of a community service that has both user and nonuser values. This method may be useful for evaluating many regional and local community programs that involve both direct benefits and more diffuse community benefits. Policy makers in Washington State were interested in determining the total value of public transit in rural areas. A CVM approach, commonly used to measure the value of changes in the provision of public goods, was applied to two test areas in Washington State that currently have countywide rural transit systems, LINK in Chelan and Douglas counties and Clallam Transit in Clallam County. Traditional focus groups were held in both areas to help provide information used to design a CVM survey.
A CVM questionnaire containing 128 questions was later administered to panels of residents from both areas to elicit the nonuse benefits from transit, both to users and nonusers of public transit services.

The use of the small panel format with a mixed random and convenience sample is typical of what might be feasible for a state government agency or even a local community. Even if the number of randomly sampled respondents is too small for statistically definitive results, a carefully chosen representative sample with as large a random component as possible should give useful answers for policy purposes. The small group/panel format has some advantages for local policy, which might offset its statistical disadvantages: it can be relatively inexpensive, it allows for more intensive probing of citizen-respondents, it encourages well-considered responses, and it is flexible in allowing citizen-respondent input. Our study shows the promise of this method and suggests some avenues for research to improve the technique.

Keeping in mind the possibilities of bias from a mixed random/convenience sample, some statistical analysis was done to examine the results. Due to the statistical problem associated with responses equal to zero in the data, Tobit analysis was used to test significant relationships among the variables. The most striking result of this analysis is the fact that income was not a significant factor in explaining the WTP/WTA values in any of the models. An insignificant income term is cause for some concern with any demand study. However, in this case, there are some reasons to expect a very low-income elasticity. In fact, use values are likely to have negative income effects, as transit is an inferior good. It is not clear what the relationship between income and nonuser values should be. However, our results show that users have higher nonuse values for transit than do those who do not use the transit system, indicating that familiarity with the good positively impacts nonuse as well as use values.

One variable that is a statistically significant predictor of WTP/WTA is the variable representing the altruistic desire to provide transit to others outside of family and friends who cannot afford their own transit. Except for the model for V-NO FARE SYSTEM (paying to get a fare-free transit system in Clallam County), the estimated coefficient is positive and strongly significant. Individuals who feel compassion for those lacking mobility have higher WTP/WTA for transit services.

Due to the nature of the sample selection method used to recruit the CVM questionnaire participants, the information collected should not be interpreted as definitive. This study does provide a potential range and magnitude of values that area residents place on this public good. Regarding the broader community-wide benefits that public transit provides, including the benefits to nonusers of transit, a possible range of benefits for the LINK system is $2.5 million to $4.6 million annually and the range for the Clallam County Transit System is $1.9 million to $3.4 million annually (based on responses to V-GOOD SYSTEM, NONUSER). A range of the possible total benefits from public transit (including user and nonuser values and all other possible benefits) for the LINK System is $3.4 million to $6.1 million annually, while the range for Clallam County is $2.6 million to $4.7 million annually (above what users pay in fares).

We believe that other programs with diffuse community benefits (social capital) may have substantial nonuser benefits and we conclude that CVM—and the
panel method used in this study—can be useful for many questions of community policy. This experiment showed that the CVM survey elicited values that provide internally consistent and reasonable information for a benefit-cost analysis of rural transportation projects. One important lesson resulting from this work involves the aggregation of benefits from the study sample to the larger population. The typical practice in CVM studies is to elicit a value from a single representative of the household, and then aggregate that information using households as the unit of aggregation. Evidence from this study suggests that the aggregate value for a public good may be more accurately determined by an aggregation of individual adults in some survey formats, and particularly when nonuse values are involved. Future work using CVM to measure benefits needs to develop strategies to address this important question.

Acknowledgments
The authors acknowledge the support of the Washington State Department of Transportation.

Endnotes
1 See, for example, Bishop and Heberlein regarding actual payments in the field and Shogren et al. for an experimental result, and a brief survey in Mitchell and Carson, p. 31.
2 See, for example, Knetsch and discussion in Mitchell and Carson.

References