

Elderly and their Valuation of the Convenience of Curbside Recycling

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This research examines the willingness to pay of the elderly for curbside recycling programs in three small cities. Willingness to pay to maintain (or implement) a curbside collection program was most significantly influenced by the age of the respondent. The older the respondents the lower the support and willingness to pay (value) of either maintaining or implementing a new recycling system after controlling all other variables. For the elderly that do not have curbside but have access to the depots there was an overwhelming vote against change to curbside recycling. These findings bring into light the importance of the convenience, and the price, of the curbside recycling system, for younger households relative to the older demographic.

INTRODUCTION

Changing societal views of the environment, among other factors, have prompted many governments to implement stricter waste reduction targets to minimize negative environmental effects (Vining & Ebreo 1992 and Harder et. al. 2006). The diversion of recyclable wastes is seen as one means for meeting such targets (Vining & Ebreo 1992) and numerous municipalities have put curbside recycling programs into place to divert waste from landfills (Woodard et. al. 2006). The effectiveness of these programs, and many others like them, is dependent partly upon the value residents place on these programs. Although there is a large body of literature that examines curbside recycling, its focus seems to be around participation rates in large cities. Ofori-Amoah (2007), points out that relatively little attention has been given to small cities in urban (city) geography literature, and Bell and Jayne (2006) note a woeful neglect of the small city in the literature on urban systems, or ‘systems of cities’ (Simmons & McCann 2006). Since, as Bell and Jayne point out, small cities are, “numerically speaking, the typical size of urban form the world over”, this research will focus on three small cities within the B.C. interior with varying recycling programs.

The aim of this research is to determine the extent to which willingness to pay to maintain a curbside program where one exists or to implement a curbside program where one is not available is influenced by age of the respondent after accounting for all other influences such as income, environmental attitudes, family size, gender, education, and location of system. The views of the elderly relative to households in the younger demographic are important for planning communities where a large fraction of the population is composed of seniors. Examining willingness to pay for a curbside recycling system by the elderly in relation to the younger demographic can provide information on the convenience of the curbside

recycling systems relative to depots. Convenience of the recycling system is likely more important to younger households as they have less time to allocate towards collecting and dropping off recyclable materials. We hypothesize that convenience of system is less important to the elderly and thus elderly are willing to pay less for maintaining or implementing a curbside recycling system when depots are available. The three B.C. interior cities that we examined are attractive to seniors as retirement locations. A large influence to this retirement decision is the climate which is considered semi-arid with winters that are relatively short and mild. The proportion of the population that is age 65 and older is 14, 16 and 22 percent in Kamloops, Merritt and Vernon respectively. This is expected to double within the next decade given to proportion that are age 55 and over is 27, 29 and 35 percent respectively.

Aadland and Caplan (2006) estimated that the net social benefit of curbside recycling was almost zero. Some cities were found to have positive net benefits, whereas others were found to have negative net benefits. Across 40 communities in the sample the average willingness to pay was \$2.97. The most common indicators of high willingness to pay were if the respondents were: young, female, highly educated, ethically motivated, members of an environmental organization and rated their community curbside recycling program as good or excellent. Blaine et. al. (2005) examined Lake County Ohio residents' willingness to pay in order to have curbside recycling program continue in the face of budget cuts. They found that respondents were willing to pay least \$1.00-\$2.00 per month to maintain curbside recycling. City council decided on a fee of \$1.50 per household per month or \$18 per household per year. Sproule and Cosulich (1988) found that most of the 2,000 people in the village (of Newport, New York) especially recycling participants, the elderly and small families, benefit from the (curbside recycling) program. Palatnik et. al. (2005) found that age also was a significant factor in explaining the volume of waste generated; elderly people were willing to invest more time in recycling and composting. Ando et. al. (2010) pointed out that the elderly and women were more likely to engage in reducing waste. Matsumoto (2011) noted that previous studies have found that older people enthusiastically participate in recycling programs. As described above past research has demonstrated that the retirees are willing and able to participate in recycling activities but their willingness to pay for the conveniences of environmental services has not been addressed. This paper attempts to fill in this gap in the literature.

The City of Kamloops located in the south central British Columbia with an approximate population of 85,000, implemented on March 2008 a curbside collection program for all single family dwellings. Meanwhile the City of Vernon, also located in the south central region of BC with a population of approximately 36,000, has had such a curbside program for many years. Finally, the City of Merritt closest in proximity to Kamloops with a population of approximately 7000 people has a depot system. Depots are a set of locations where residents may drop off recyclable materials which each city maintains and collects from, as opposed to a curbside collection system where materials are collected from each household's curbside.¹ A summary of the recycling program characteristics in each of the three small cities we examined can be found in Table 1.

TABLE 1
RECYCLING PROGRAM OF EACH OF THE THREE SMALL CITIES

	Kamloops	Vernon	Merritt
Sorting required	No	No	Yes
Pick-up	Yes, weekly	Yes, bi-weekly	No
Container	Wheeled bins	Blue bags	N/A
Limits	One full bin per week	None	None
Penalties	Non-recyclable items left behind	Non-recyclable items tagged and left behind	N/A

Residents of Kamloops are not charged an extra fee of any kind (over and above city utilities) to use the city recycling depots in contrast to the curbside collection program, which at the time of this research cost each household to which it is provided \$33 per year (current costs are \$ 36.30). In Vernon and Merritt there is also no direct fee associated with recycling at depots, but of the two, only Vernon has curbside pickup, whose costs break down to \$22 per year.²

Households that do not have access to curbside collection and still choose to recycle are spending their time, effort and money (on fuel) to return recyclables to the depots. If the amount that people are willing to pay for curbside recycling is significantly greater than the amount of time and effort they were willing to spend on depot recycling, then that is a reflection of the value that residents of these three small cities place on convenience. If the opposite is true then convenience of the recycling system may not be an issue and depots might suffice as a recycling system in a community.

SURVEY METHODOLOGY TO ELICIT WILLINGNESS TO PAY

A survey based upon the contingent valuation method (C.V.M.) was mailed randomly to 300 households in each of the three cities. The survey was broken into 6 main sections with headings including: attitudes and concerns, recycling overview, depot participation, curbside participation (if in Kamloops or Vernon), willingness to pay and socioeconomic determinants. The first section was designed to determine the overall tone of each city's view towards the environment. The recycling overview section discussed the general costs and benefits of recycling programs in order to give all of the respondents the same basis of information. The depot and curbside participation sections probed the participation frequency and extent in each area. We will be focusing predominantly on the willingness to pay portion of the survey in this paper which will be discussed in further detail below. The last section was designed to collect information on a wide range of socioeconomic variables which may influence decisions to pay and to participate.

Willingness to pay for recycling was examined in two different contexts, either willingness to pay to maintain a curbside program that is already in place (Kamloops and Vernon), or willingness to pay to implement a curbside program where none exists (mainly Merritt with a small Kamloops contingent). A CVM referred to as the payment card method was employed (Blaine et. al., 2005). This approach offers a range of bids for respondents to choose from with set top and bottom limits. Results from the payment card method can be biased by the distribution of bids offered and set end points (Boyle, 2003). Although there are difficulties associated with the payment card method it was chosen as the most appropriate method for use in this study.

The respondents were broken into two groups, those with access to curbside recycling and those without access to curbside recycling. They were then asked if they would be willing to pay to maintain services or implement new ones. Then, if they were willing to pay they were asked to choose how much from the list of payment options provided. The following questions were asked of those who currently have access to curbside recycling.

Would you be willing to accept an increase in your households city utility fees, beyond the current fee charged per year, in order to maintain the current curbside recycling program?

Yes No

What is the maximum increase, over and above the current fee, that would be acceptable for your household to pay each year to maintain the current curbside recycling program?

- Less than \$5 per year (please specify) _____
- \$5 - \$9 more per year
- \$10 - \$14 more per year
- \$15 - \$19 more per year
- \$20 - \$24 more per year
- Greater than \$24 per year (please specify) _____

The next two questions are asked of those who do not currently have access to curbside recycling.

Would you be willing to accept an increase in your households' city utility fees in order to implement a curbside recycling program?

- Yes No

What is the maximum amount that your household would be willing to pay each year to implement a curbside recycling program?

- Less than \$10 per year (please specify) _____
- \$10 - \$19 per year
- \$20 - \$29 per year
- \$30 - \$39 per year
- \$40 - \$49 per year
- Greater than \$50 per year (please specify) _____

If a respondent indicated that he or she was not willing to pay to maintain or implement, they were then directed to another question which collected information on why they were not willing to pay.

For what reason are you not willing to pay more for curbside recycling?

- Income/financial situation of my household
- City utilities are already too high
- The depots are sufficient
- Would rather see money spent on other services
- The current fee \$XX per year is sufficient
- Other _____

Once the survey and database were completed all of the addresses for each city were transferred to label format in Publisher, printed in duplicate on self adhesive backed paper, cut and stuck onto the mail out and return envelopes. Each envelope was stuffed with a cover letter, the appropriate survey and a return envelope. The hand signed general cover letter was included with every survey to explain the survey length, return procedure, anonymity of responses and goals. Finally, it provided the approval of the Human Ethics Committee and researchers contact information for anyone with questions or concerns about the project. A general reminder card was sent out to all addresses after two weeks, with the exception of those which had been returned marked as an incorrect address or resident moved. The card

noted that the addressee had received a survey a few weeks ago, and that it would be greatly appreciated if they would fill it out and return it if they had not yet done so.

SURVEY RESPONSE AND DESCRIPTIVE EVIDENCE

The average survey response rate within the literature surveyed was 40 percent.³ Some observe a lower response rate around 30 percent (Androkovich et al. 2009). Our response rate fell at the lower end but is still considered acceptable within the literature. This is likely due to the fact that many of the studies noted above had not used mail out survey methodology as some were done via telephone which increases the response rate.

A total of 256 completed surveys were returned and recorded: 97 from Kamloops, 89 from Vernon and 70 from Merritt. Of the 900 surveys that were mailed out 806 are assumed to have made it to their intended destinations, as 94 were returned and noted to have incorrect addresses, resident who moved, etc. Of those 94, 19 were from Kamloops, 32 from Vernon and 43 from Merritt. Percent return rates were better than expected for all three cities with a response rate of 34.5% for Kamloops, 33.2% for Vernon and 27.2% for Merritt. The overall response rate for all three cities works out to 31.8%.

The next two tables provide some descriptive statistics on support and willingness to pay to maintain curbside recycling and also to implement curbside recycling. The average willingness to pay (median) over and above what is currently paid in order to maintain curbside recycling is much lower in Kamloops than in Vernon. The fact that in Kamloops residents already paid \$33 per month while in Vernon they paid much less (\$22 a month) is probably a large factor to consider for such differences in willingness to pay. On the other hand, Merritt is willing to pay approximately \$16 on average to implement a curbside recycling and much below what Kamloops respondents are willing to pay to implement curbside when they have no such system in place. Furthermore, Merritt's average willingness to pay to implement curbside recycling is below the amount Vernon respondents are currently paying. It is interesting to observe a large fraction of people (45 percent) in Merritt are not willing to pay to have curbside recycling. The number one reason given for not being willing to pay is that they find depots sufficient for their recycling activity. In Kamloops, only 4 respondents (6.5 percent) were not willing to pay over and above what they currently pay to maintain. This is significantly lower than Vernon respondents of approximately 19 percent. A possible explanation is that the curbside system is new in Kamloops while it has been established in Vernon for some time and is thus driven by enthusiasm.

TABLE 2
DESCRIPTIVE STATISTICS ON WTP

	KAMLOOPS MAINTAIN	VERNON MAINTAIN	MERRITT IMPLEMENT	KAMLOOPS IMPLEMENT
Average	\$11.90	\$15.51	\$15.92	\$31.92
Median	7.00	12.00	15.00	35.00
Mode	7	22	0	35.00
Standard deviation	10.14	16.40	16.96	26.73
# of responses	62	73	60	13
# not in favour of WTP	4	14	27	3
% not willing to pay	6.45	19.2	45	23.1

Note: The responses analyzed are lower than the total response rate due to the fact that some surveys were incomplete in information submitted and hence removed from the sample.

**TABLE 3
REASONS FOR NOT IN FAVOUR OF WTP**

	KAMLOOPS MAINTAIN	VERNON MAINTAIN	MERRITT AND KAMLOOPS IMPLEMENT
Income/Financial Situation of my household	1	6	7
City Utilities already too high	3	4	9
<i>Depots are sufficient</i>	1	2	19
Would rather see money spent on other services	0	0	5
Current fee is sufficient	3	5	6
Total	8	17	46

Note: Some respondents provided more than one reason hence the discrepancy with table 2.

Table 4 below brings to light the respondents' age and willingness to pay. As stated above, the survey contained a referendum question as to whether the household is willing to pay in terms of increased fee to maintain or implement a curbside program. How is this related to the respondent's age and other socioeconomic factors? Here we find one of the most interesting results of the study. Elderly belonging to a lower income group are willing to pay less to either maintain or implement a curbside recycling system relative to the younger demographic. Retirees are overwhelmingly not willing to pay, 68 percent, to implement a curbside system when they already have access to depot system. The average willingness to pay, of those ages 65 and over, is \$11, while those of age 64 or less are double this amount in terms of implementation. A similar pattern exists if we use age 55 and over as the cut off. This is a first indication that convenience is very important factor with younger households and not for the elderly.

**TABLE 4
WTP AND THE ELDERLY**

	KAMLOOPS MAINTAIN	VERNON MAINTAIN	MERRITT AND KAMLOOPS IMPLEMENT
AGE 64 OR LESS			
Average WTP	\$13.25	\$19.00	\$22.0
# of responses	52	43	51
% not WTP	4	16	29
Average # of members in household	3.23	2.79	3
Average household gross income (000s)	\$97	\$77	\$72
AGE 65 AND OVER			
Average WTP	\$4.90	\$10.43	\$11.14
# of responses	10	30	22
% not WTP	20	23	68
Average # of members in household	2	2	1.9
Average household gross income (000s)	\$47	\$40	\$44

Note: total implement includes Kamloops and Merritt respondent that did not have curbside available.

MODEL SPECIFICATIONS AND EVIDENCE

This section develops a methodology that estimates the possible influence of a number of socio-economic variables (i.e., income, size of household, education, etc) on the willingness to pay to maintain (or implement) curbside recycling, y . Let the following linear population model describe the relationship:

FIGURE 1 REGRESSION MODEL

$$y = \beta'x + \varepsilon$$

where x is a vector of independent variables that may influence an individual's willingness to pay to maintain (or implement) curbside recycling, β is a vector of parameters to be estimated, and ε is a normally distributed random error term with mean zero and constant variance. The expected willingness to pay of individual i given x_i is: $E(y_i|x_i) = \beta'x_i$ since $E(\varepsilon_i|x_i) = 0$. In order to estimate (1) the researchers face the problem of data being censored.

Estimating model (1) results in censoring of the willingness to pay variable. This occurs when the willingness to pay variable is censored at zero not allowing a negative willingness to pay to be observed amongst the non-protest responses.⁴ If the survey allowed negative willingness to pay to occur the response could have the individual agree to maintain or allow the implementation of the curbside recycling system if (s)he was given a certain amount of payment instead of paying to maintain it or implement it. Alternatively, negative willingness to pay can occur if the person was asked if willing to pay some amount in order to not implement or to remove the recycling system in place. Since the survey conducted excluded such a possibility, negative values are not observed in the sample and this causes censoring to occur. Usage of ordinary least squares regression will lead to biased and inconsistent estimated coefficients, since the distribution of the error term is truncated and thus depends on the parameters, the explanatory variables as well as the variance of the error term.⁵

The censoring problem can be dealt with by using Tobit's regression method, instead of ordinary least squares to estimate model (1). The Tobit model can be represented by the following system:

FIGURE 2 TOBIT MODEL

$$\begin{aligned} y^* &= \beta'x + \varepsilon \\ y_i &= 0 \quad \text{if } y_i^* \leq 0 \\ y_i &= y_i^* \quad \text{if } y_i^* > 0 \end{aligned}$$

where, y^* is the $n \times 1$ unobserved (latent) willingness to pay vector, x is a $n \times k$ matrix of n observations on the k explanatory (socio-economics) variables, β is a $k \times 1$ vector of parameters to be estimated, y_i is the i^{th} observed value of willingness to pay, y_i^* is the i^{th} unobserved element of the willingness to pay vector y^* and ε is a vector of independently, and identically distributed errors with mean zero and variance σ^2 . The next table provides a list of factors that could influence willingness to pay:

TABLE 5
INDEPENDENT VARIABLES USED TO EXPLAIN WTP

Variable Acronym	Description	Values	Construction	Relation to WTP
MODINC	moderate income	40,000 – 79,000	Dummy, 1 if yes, 0 otherwise	Positive
HIGHINC	high income	Over 80,000	Dummy, 1 if yes, 0 otherwise	Positive
POSTSEC	Respondent completing post secondary education	0 or 1	Dummy, 1 if yes, 0 otherwise	Positive
HOWN	ownership or rental of household	0 or 1	1 if owner, 0 otherwise	Neutral
A65OVER	high age	Over 65	Dummy, 1 if yes, 0 otherwise	Negative
GENDER	Gender	0 or 1	Dummy, 1 if female, 0 otherwise	Neutral
ENVRATING	priority placed on environmental issues	1-5	value of 1 (lowest) through 5 (highest)	Positive
CK	City of Kamloops	0 or 1	1 if Kamloops, otherwise 0	Neutral

Table 6 presents Tobit regressions on willingness to pay to maintain and separately to implement curbside recycling. Willingness to pay to maintain curbside recycling (when curbside and depots are both available) was found to have a significant positive relationship to high educational attainment of the respondent. Elders are willingness to pay less to maintain curbside recycling, by approximately \$7, than the younger households controlling for other socio-economic variables. Tobit regression for willingness to pay to implement curbside recycling in Merritt and Kamloops (for those respondents who do not currently have access) jointly was also estimated. The results indicate that willingness to pay to implement curbside recycling, when depots are available, was positively influenced by environmental rating and by moderate income of the respondents. Households in the low income and high income were willing to pay less than those in the moderate income range. Implementation was found to have a significant negative relationship to home ownership and again the elderly. Elderly are willing to pay approximately \$19 less than respondents in the lower age group. The results indicate that elderly that are homeowners on average are in fact willing to accept a payment to allow the implementation of a curbside recycling system.

TABLE 6
RESULTS FOR WTP TO MAINTAIN AND TO IMPLEMENT
USING TOBIT REGRESSIONS

Variables	MAINTAIN CURBSIDE			IMPLEMENT CURBSIDE		
	Estimated Coefficients	t-values		Estimated Coefficients	t-values	
INTERCEPT	6.97	1.11		4.67	0.32	
ENVRATING	0.08	0.92		4.92	1.69	*
A65OVER	-7.37	-2.90	**	-18.78	-2.68	**
HOWN	4.56	0.99		-21.65	-2.58	**
MODINC				12.04	1.96	**
HIGHINC	-3.07	-1.33				
POSTSEC	7.29	3.27	***	8.41	1.19	
CK	-3.59	-1.78	*	8.60	1.08	
GENDER	10.12	1.50		10.12	1.50	
Standard Error of the estimate		10.54			22.45	
Mean Absolute Error		6.99			13.03	
Squared Correlation Observed and Expected Values		0.21			0.32	
Observations		128			66	

Note: Levels of significance shown as: * 10%, ** 5%, *** 1%.

CONCLUDING REMARKS

This study examined the factors that influence willingness to pay to maintain and to implement a curbside recycling program relative to a depot recycling program in three small cities in the interior of British Columbia paying particular attention to the elderly. Our hypothesis was that the elderly would be willing to pay less than the younger households in order to maintain or implement a curbside recycling program. We based this hypothesis on the fact that elderly have more leisure time to allocate to such an activity relative to the younger working households who find curbside recycling to be much more convenient. We find strong empirical support of this hypothesis. Support is stronger with the implementation than with maintenance of a curbside program. In the case of implementation the evidence indicates that the elderly could accept curbside recycling only if they were paid to have such a convenience available to them as seen from the estimated coefficient of age 65 and over in table 5.

One weakness of this study is the small sample size returned from each city. Although 300 surveys were sent to each of the three cities returns averaged around 30 percent, under 100 surveys were returned from each city. Furthermore, a number of surveys returned were incomplete and hence not incorporated into the evidence. One way that this issue was compensated for was grouping by access to curbside recycling for willingness to pay in order to increase sample sizes being tested. Another issue was that of selectivity bias, it is likely that the survey responses received tend more towards respondents giving

positive or constructive feedback and lacking in those giving negative feedback. This is due to the fact that potential respondents who received the survey and are involved and interested in recycling are more likely to return the survey with positive feedback than those who do not have an interest. If a potential respondent has no real interest in recycling they will be less apt to be bothered to fill out and returning a survey regarding recycling, unless protest is the aim. Finally, a spike of zero responses representing those not willing to pay (to maintain or implement) is found in both data sets but is more prevalent in the willingness to pay to implement data. However, using Tobit regressions in the analysis dealt with this issue.

Many municipalities have put curbside recycling programs into practice to divert waste from landfills (Woodard et al, 2006). This study produced results that are useful and implementable within the local policies of the three small cities it examined and ultimately transferrable to other small cities. Another important issue in recycling is to examine the participation rates of the different systems within small cities.

In conclusion we believe that having access to both systems can increase participation rates across all households. As one of the seniors living in Merritt said: "As a senior I like to bring all recyclables to the depots it keeps the house neat." Another, also from Merritt stated: "Curbside is not viable at this time due to nearness of drop off depot." While a senior from Kamloops commented: "As long as I can drive to recycle depots I will..." We think that having access to both, curbside and depots is the way to proceed when planning especially in communities with an aging demographic.

ENDNOTES

1. See Statistics Canada 2006 community profiles at www.statcan.gc.ca.
2. Recycling at depots is not "free" as the operation requires resources which are paid from municipality taxes. However, residents do not pay a fee specific to depots
3. See for example, Blaine et. al. (2005), Jenkins et. al. (2003), Aadland & Caplan (2006), Kurz et. al. (2007), Barr (2007) and Ando & Gosselin (2005).
4. Excluding protest responses can lead to sample selection bias as this may not randomly represent the underlying population. However, there were only a few protest responses as table 3 indicates. These were the respondents that were not willing to pay because they considered city utilities already too high. We removed these from the sample as their survey was incomplete.
5. On the other hand, if the response of the individual in the survey was that of not willing to pay due to income/financial situation of the household, it constitutes a valid zero bid response.

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