



# Waste Management Behavior Study

Results from a Residential Recycling Study  
in the WUTC Areas of King and Snohomish Counties

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Prepared for Waste Management, King County Solid Waste Division, and Snohomish County Solid Waste Division

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## EXECUTIVE SUMMARY

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### Background

As part of the 2013 Washington Utilities and Transportation Commission (WUTC) Revenue Sharing Agreement, Waste Management, in partnership with King and Snohomish Counties, set out to conduct research to determine the barrier and motivation data needed to design and implement program strategies that lead to an increase in recycling among residents in single-family homes within the WUTC<sup>1</sup> areas.

Research conducted in the market in the past has shown the following:

- Self-reporting bias is very strong among county residents. Using phone surveys has not gathered an accurate picture of recycling behaviors (e.g., 94% of residents say they recycle very well, yet more than 50% of what is in garbage cans is recyclable).
- In-home recycling audits and in-person surveys conducted by King County in 2005 and 2007 have provided good insights into recycling barriers with *convenience* factors and the *ick* factor being identified as key barriers to recycling. However, these studies have only been done with small anecdotal sample sizes and the data gathered were not quantitative.
- A lot of research has been conducted countywide within the two counties; however, research of just the WUTC areas has not been conducted. The study team thought the population may be fundamentally different in their garbage and recycling behaviors. In addition, other studies have utilized different methods for collecting and categorizing waste materials and therefore, outcomes across studies may not be comparable.
- Little research had been done to identify ethnic sub-groups and identify unique attitudes, behaviors, or beliefs they have related to recycling.

The research goal for this study was to determine the barriers and benefits to recycling specific materials. The study was conducted in order to better understand garbage and recycling behaviors with the goal of increasing recycling rates among WUTC residents in single-family residences.

Specifically, the research goals were to:

- Identify current baseline recycling behaviors that allow for tracking change over time;
- Identify the values, attitudes, and beliefs that relate to recycling and the value of recycling;
- Identify barriers and effective motivations or incentives for desired behavior changes;
- Identify the most effective communications tools to achieve the desired behavior changes; and
- Identify needs of ethnic communities of interest.

In addition, the project team sought to provide Waste Management and their stakeholders with data to inform a pilot behavior change program and replicable study design methods that would allow for ongoing evaluation of recycling rates within King and Snohomish Counties.

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<sup>1</sup> The Washington Utilities and Transportation Commission (WUTC) regulates waste hauling services in unincorporated areas in King and Snohomish counties. These services are not covered under municipal waste hauling contracts. Areas subject to this regulation are considered to be "WUTC areas."

## Study Design and Methods

In order to achieve the research goals for this study the team conducted a waste characterization study of garbage carts and an in-person survey of households. The waste characterization study data (garbage-cart sorts) was linked to the household survey data. The combination of the garbage-cart sort data and household survey data provides a unique way to learn about recycling attitudes that are associated with the residents' actual behaviors.

These innovative research methods will allow Waste Management to (1) identify current baseline garbage and recycling behaviors, and (2) identify the values, attitudes, and beliefs related to recycling and garbage behaviors. Data on the barriers to proper disposal of recyclable materials were collected during the in-person visit to the household and were based on the recyclable materials found in each household's garbage cart. Study participants had garbage and recycling services, and may or may not have had yard waste service.

**The study design provides a representative sample of Waste Management customers who reside in single-family homes in the WUTC areas in King and in Snohomish Counties.** The sample for this study was stratified by county with one-third of the study households living in King County and two-thirds living in Snohomish County. The study goal was 400 completed garbage-cart sorts (King County, N=132 and Snohomish County, N=268). The sample design reflects the distribution of Waste Management's customers who live in the WUTC areas of each county.

In order to attain a representative sample of households in each county, customer addresses within garbage collection routes were randomly selected for participation in the study. This study was a stratified random sample of households. The customer list was stratified by route and garbage collection day of the week. In addition, routes within zip codes identified by the census as having fairly high proportions of the ethnic groups of interest were labeled as "ethnic routes."

The ethnic routes were weighted so that they comprised 25 percent of the randomly selected garbage collection routes in each county. The ethnic subgroups were defined as customers who spoke Chinese (Mandarin), Korean, Spanish, or Vietnamese.

A list of research terms and definitions can be found in Appendix E.

## Garbage-Cart Data Collection

Garbage carts from 411 households across King and Snohomish Counties (138 and 273 respectively) were collected and sorted from April 4 to May 2, 2013.

Representatives from Waste Management, and King and Snohomish Counties produced the materials framework that defined the sorting activity. The materials of interest for this study were those that belonged in the recycling- and yard-waste carts.

Garbage cart contents were bagged and tagged at each household, and held at the Shoreline Recycling and Transfer Station for sorting the next day. The garbage sorting procedure entailed: (1) sorting the garbage into separate baskets by material type; (2) photographing any unusual or foreign language materials in the sample; and (3) recording the weight of each material type in a customized database. The materials list and definitions can be found in Appendix A.



## Findings from All Households in the Sample

- Over 11,000 pounds of garbage was collected across the two counties.
- The average number of pounds per household in King County was 27.17.
- The average number of pounds per household in Snohomish County was 28.4.
- In both counties food scraps comprised a large proportion (by weight) of the garbage (30.4% in King County and 30.1% in Snohomish County).
- In both counties the various paper categories (i.e., newspaper and cardboard, mixed paper, and poly-coated containers) made up the largest proportion of garbage (by weight) that should have been disposed of in the recycling cart (12.2% in King County<sup>2</sup> and 10.5% in Snohomish County).

## In-Person Survey Data Collection

From the 411 garbage-cart sorts 225 in-person surveys were completed (76 in King County and 149 in Snohomish County). The stratified random sample study design ensures that the resulting sample is representative of Waste Management customers residing in single-family homes within the WUTC areas of King and Snohomish Counties. The sample size of 411 allows for statistical estimates at the +/- 6.5% margin of error (using the 95% confidence interval). The sample size for King County (N=76) allows for a ± 11% margin of error and the sample size for Snohomish County (N=149) allows for a ± 8% margin of error (using the 95% confidence interval).

The response rate for the in-person surveys was 60%. The favorable response rate for this study speaks to the strength of the study protocol (i.e., sending pre-notification letters and prompt follow-up with residents who were missed in the first visit to their home).

Sample Characteristics (See pages 36-39 of the full report.)

- The average age of survey respondents was 49.1 years (SD=12.8) for King County and 50.2 years (SD=14.0) for Snohomish County, with a range of 18 to 89.
- Survey respondents were more likely to be men (54.3% in King County and 59.6% in Snohomish County.)
- About 62% of households in Snohomish County and 42% of households in King County did not have children under 18 living at home.
- Of the households that had children living at home, the overwhelming majority had one or two.
- All 225 interviews were conducted in English, but 8% (N=20) of the respondents said that at least sometimes they spoke a language other than English in their home.
- Two respondents in King County and five respondents in Snohomish County identified themselves as Hispanic or Latino.
- The large majority of respondents in both counties were White<sup>3</sup>.

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<sup>2</sup> Results from the 2011 King County Waste Characterization and Customer Survey showed that 16% of the materials collected from residential garbage carts belonged in recycling carts. Forty-seven samples were taken from garbage- truck routes in the non-WUTC area of King County that were primarily single-family homes. The current study showed that 12.4% of the materials collected were comprised of recyclable materials. Because of the differences in sampling procedures (i.e., route truck collection versus curbside collection) findings, although interesting, should be interpreted with caution. A summary of the comparison can be found in Appendix D.

Outcomes from Garbage-Cart Sorts of Survey Respondents (See pages 34-35 of the full report.)

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Three recyclable and two yard-waste material types were found in garbage carts in high proportions across residents who completed the in-person survey.

- Nearly 90% of households had mixed paper, 85.3% had plastic, and 64.4% had poly-coated containers in their garbage carts.
- Nearly all of the households had food scraps (98.7%) and food-soiled paper (95.6%) in their garbage carts. For households with yard-waste service (N=87), 97.7% had food scraps and 96.6% had food-soiled paper in their garbage carts.
- Alternative disposal method materials disposed of in the garbage cart came largely from hazardous materials found in the garbage cart (24.9% of households).

Outcomes from the In-Person Surveys (See page 40 of the full report.)

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Overall, survey respondents reported that recycling was *very important* and that it was *not difficult* to do.

Attitudes about the importance of recycling were measured on a scale from 0 “Not at all important” to 10 “Very important.” Perceived difficulty of recycling was measured on a scale from 0 “Not at all difficult” to 10 “Very difficult.”

- The average or mean (*M*) rating scores show that respondents felt that recycling was “Very important” for both themselves (*M* = 9.2, *SD* = 1.2) and their neighbors (*M* = 8.9, *SD* = 1.6) and that recycling was “Not at all difficult” (*M* = 1.8, *SD* = 2.5).
- When asked what they do when their recycling cart is full, most respondents said that they either leave it until the next scheduled pick-up or arrange for a pickup. Only about 10% of respondents who had experienced a full recycling cart said that they either burned recyclables or put them in the trash when their cart was full.

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<sup>3</sup> White, rather than Caucasian is used throughout the report as survey respondents described themselves as *White*.



Overall, preparation for recycling, such as *removing caps or lids, rinsing, or shredding*, and *general confusion* about what can and cannot be recycled were found to be barriers to proper recycling.

Thirty percent of respondents stated that no one in the household was uncooperative with recycling; however, 55.6% of the residents with children under the age of 18 (N=98) reported that children were *least cooperative* with recycling.

Three recyclable material types (mixed paper, poly-coated containers, and plastics) were found in a high percentage of the garbage carts; therefore, all residents were asked about the barriers to recycling those three materials. Each survey form was customized to include questions about one additional type of recyclable material which was found in the garbage-cart sort data for that household. These materials were newspaper and cardboard, glass, aluminum, or tin.

➤ *Mixed Paper (N=225): 89.3% of households had mixed paper in their garbage carts.*

- The largest proportion of respondents indicated that they simply recycle mixed paper (35%) or experience no difficulties in recycling it (23.4%), yet 89.3% of households had mixed paper in their garbage carts.
- Among barriers or challenges to recycling this type of material, the most often cited factors were that it might contain personal information (15.4%) or that there was some confusion about whether or not this type of paper can be recycled (14.5%).

➤ *Plastic (N=225): 85.3% of households had plastic containers in their garbage carts.*

- About 40% of the residents referenced difficulties related to the need to rinse or clean the item before recycling it.
- Residents were not sure about whether or not some plastic containers were recyclable (26.4%).
- Nearly 20% of residents were not sure whether or not the caps or lids on the items could be included in the recycling.

➤ *Poly-coated containers (N=225): 64.4% of households had poly-coated containers in their garbage carts.*

- A relatively large percentage of respondents reported some challenges with recycling poly-coated containers.
- Specifically, residents mentioned the need to rinse or clean the package (39.1%) and some raised doubts about whether this type of package could be recycled (23.6%).

➤ *Glass (N=43), newspaper and cardboard (N=26), tin cans (N=22), and aluminum cans (N=11).*

The number of residents asked about the barriers to recycling glass (N=43), newspaper and cardboard (N=26), tin cans (N=22), and aluminum cans (N=11) was relatively small; however, we have included responses to those items here because they display patterns similar to the mixed paper, plastic, and poly-coated container items.

The small sample sizes mean that responses about barriers are less precise than responses to the other materials (i.e., mixed paper, plastic, and poly-coated containers).

- Challenges to recycling **glass** (N=43) included: *No difficulties/I just recycle it, I have to rinse or clean it out, confusion about what can be recycled, and it has a cap or lid.*
- Challenges to recycling **newspaper and cardboard** (N=26) included: *I have to break it down/flatten it, no difficulties/I just recycle it, confusion about what can be recycled, and it takes up too much space.*
- Challenges to recycling **tin cans** (N=22) included: *No difficulties/I just recycle it, I have to rinse or clean it out, I didn't know it could be recycled, it takes too much time or effort, and I just throw it away.*
- Challenges to recycling **aluminum cans** (N=11) included: *I have to rinse it out or clean it, I just recycle it, and confusion about what can be recycled.*

*Barriers to Recycling Yard-Waste Materials (See pages 54-61 of the full report.)*

For those who had yard waste service and stated that they did not recycle all of their food scraps and food-soiled paper (N=67), *inconvenience, laziness, forgetfulness, and smell or mess* were the most cited barriers to recycling food scraps and food-soiled paper.

When asked, 56.5% of King County residents and 46.3% of Snohomish County residents said they were aware that food scraps and food-soiled paper could be placed in the yard waste cart.

The most commonly mentioned reasons for not having yard waste service were that the resident composted the material themselves, or that they were concerned about the cost of the service.

➤ *Food Scraps (N=87): 97.7% of households with yard waste service had food scraps in their garbage carts.*

Most residents who had yard waste service (N=87) stated that they were disposing of at least some food scraps in their yard waste cart (61.7% in King County and 57.5% in Snohomish County). Approximately 16% of those in King County and 9% of those in Snohomish County stated that they put all of their food scraps in the yard waste cart each week; yet, 97.7% of households had food scraps in their garbage cart.

- Most residents who did not have yard waste service (N= 138) stated that they were disposing of food scraps in their garbage cart (62.1% in King County and 73.4% in Snohomish County).



➡ *Food-Soiled Paper (N=87): 96.6% of households with yard waste service had food-soiled paper in their garbage carts.*

Most residents with yard waste service reported putting their food-soiled paper in their yard waste carts (58.7% in King County and 55% in Snohomish County); yet 96.6% of households had food-soiled paper in their garbage cart.

- Those who did not have yard waste service were most likely to put food-soiled paper in the garbage cart (66.7% in King County and 66% in Snohomish County).
- Among those who said they did something else with food-soiled paper, the largest number in both counties said that they put it into their recycling cart.

#### *Recycling Benefits (N=224)*

- A large percentage of residents indicated that they recycled because it was *good for the environment* (46%).
- Some residents reported specific benefits such as it *reduced the amount of garbage* (21.4%), it *reduced the amount of trash in landfills* (17.9%), and that *it was the right thing to do* (17.9%).

#### *Finding Information about Recycling (N=225)*

- When asked where they would go to find information about recycling, most respondents indicated that they would use one of the resources currently provided by Waste Management: the website (38.3%); the guidelines distributed to residents (19.5%); or information located on their recycling cart (10.8%).

#### *Primary Responsibility for Recycling (N=225)*

- Very clearly, adults are in charge of recycling within the household.
- Over half of survey respondents (58.7%) stated that they were the ones who were most responsible for recycling.
- Women were somewhat more likely than men to say that they were most responsible (63.2% vs. 54.1%), but this difference was not statistically significant.
- If the response was other than self, men were more likely to say that the person primarily responsible was their spouse or partner (64.9%); women were more likely to say that they shared responsibility equally with their spouse or partner (37.5%).
- Noteworthy, was the response to the question about who in the household was *most uncooperative about recycling*: in households with children under the age of 18 (N=98), 56.1% stated that children were the most uncooperative.

## Recommendations

Importantly, residents are highly motivated to recycle: they consider recycling to be a very important thing for themselves and their neighbors to do. With the exception of food scraps and food-soiled paper, residents stated that recycling was not difficult. Therefore, behavior-change tools that leverage high motivations and low barriers are likely to be effective in increasing residential recycling rates in the WUTC areas.

The garbage-cart sort data revealed that there is considerable room for improvement, particularly in the cases of mixed paper, plastics, and poly-coated containers, which were found in a large majority of garbage carts. For this reason, examining the reasons that residents gave for times when they may not have recycled these items was instructive.

As noted earlier, there were two major barriers to recycling materials that belong in the recycling cart. First, they were less likely to recycle an item if it required some sort of preparation, such as rinsing or cleaning, or if they had to break it down. The second major reason was uncertainty about whether or not the item could be recycled. Respondents made it clear that being unsure about an item greatly increased the likelihood that it would simply be discarded in the garbage.

The target audience for a behavior-change program to increase residential recycling rates is those who are not currently engaged in the desired behaviors. Fortunately, all residents are engaging in recycling behaviors to some degree (with the exception of food scraps and food-soiled paper), and the program elements we are recommending entail increasing accuracy. About 60% of the households in King County and 40% of the households in Snohomish County included children under the age of 18. Although the analysis showed that there were not differences in households with and without children in terms of the barriers to recycling specific material types, for households with children, children were most often cited as least cooperative with recycling. Therefore, outreach materials and messages should include recognition of the varying context of resident's lives. In other words, extra burden may be placed on household members to correct recycling actions taken by children.

For example, residents may need to re-sort items that are mistakenly placed into the trash by a child or to process or clean items that are not thoroughly cleaned or processed by younger children. These questions could be addressed using focus groups or other small-sample qualitative research methods.

### Behavior Change Tools (See page 66 of the full report.)

Community-based social marketing (CBSM) provides a useful framework for changing recycling behavior. The community-based social marketing approach dictates that the specific behavior-change tools that will be most effective depend on the combination of barriers and benefits to the target behavior.<sup>4</sup> Drawing on behavioral science, CBSM utilizes strategies such as commitment, incentives, prompts, social modeling, and social norms to promote change. Importantly, each of these tools is matched to the behavior and the context, and some tools work better in some situations than others.

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<sup>4</sup> McKenzie-Mohr, D., & Schultz P.W. (2012). Choosing effective behavior change tools. Available on line at <http://media.cbsm.com/uploads/1/BECC.pdf>.



By examining where respondents fell on the continuum of barriers and benefits for each type of recyclable material based on their survey responses, we can make decisions about what type of approach will be most likely to produce meaningful behavior change.

### Behavior-Change Tools for Materials That Belong in the Recycling Cart (See pages 67-69 of the full report.)

The recyclable materials found in the garbage cart (except for food scraps and food-soiled paper), received high importance ratings (motivations) and low difficulty ratings from residents (barriers). The outreach approaches most closely linked to high motivations and low barriers are cognitive dissonance, education, feedback, and prompts. These approaches should be combined and utilize the specific reasons given by residents for not recycling these items in order to encourage the desired behavioral changes.

#### *Cognitive Dissonance*

Cognitive dissonance refers to a state of discomfort caused when an individual's attention is drawn to inconsistency between his or her behavior and important attitudes or values. He or she will then be motivated either to change either the behavior or the attitude or value. Residents in the present study told us that recycling was both *important* to them and *not difficult* to do. Approaches to behavior change that fall into this category would include information reminding residents that they consider recycling to be important and urging them to be consistent in carrying out the behavior. Further, research has shown that once people have performed an easier behavior (e.g., recycling mixed paper), efforts to encourage them to perform more challenging behaviors (e.g., recycling pet food cans) may be more successful.

#### *Education*

Education is an ongoing and important element in recycling programs. People who fail to recycle items even in the face of high motivation and low barriers may be encouraged to improve their recycling rate if they were provided targeted information about those items where there is lingering confusion about recycling rules. Several materials in the present survey fit this category, particularly poly-coated containers, mixed paper which might be coated or glossy or contain plastic parts, and plastic containers which come in a variety of types. Future education efforts should incorporate the specific feedback received from residents in this study.

#### *Feedback*

A substantial proportion of residents indicated that they believed they were already recycling the targeted materials. However, garbage-cart sort data revealed that they were not consistently doing so, especially in the case of mixed paper, plastics, and poly-coated

#### ***Integrating the Approaches***

*To be most effective, these four approaches should be utilized in concert with one another. For example, program materials and messages would highlight that residents feel that recycling is **important and easy**, but that recycling mixed paper **includes more materials**. Include an **educational** element that communicates the need to recycle envelopes with windows, as well as glossy paper. Call out that it is okay for residents to shred paper that includes personal information. Add **feedback** in the form of research findings: recent research showed that in their area 8 out of 10 households had mixed paper in their garbage carts and that the current campaign is an effort to substantially reduce the number of households with mixed paper in their garbage carts. Lastly, provide a sticker or magnet that **prompts** or reminds residents to place all of their mixed paper in the recycling cart.*

containers. CBSM research has shown that providing residents with information about how well they and their neighbors are really doing with respect to target behaviors can improve performance levels.

### *Prompts*

Residents cited *forgetting* as an important reason for failing to recycle. Prompts can help to reduce this type of error. Prompts are effective when they are noticeable and when they are used in close proximity to where and when the behavior should be performed.

### Behavior-Change Tools for Recyclable Materials That Belong in the Yard-Waste Cart (See page 70 of the full report.)

The barriers to recycling food scraps and food-soiled paper differed somewhat from those for other types of materials and, in general, tended to be higher. The outreach approaches most closely linked to high motivations and high barriers are *convenience* (make it easy) and *commitments*. In addition, the outcomes suggest that *education* and *prompts* should be included. These approaches should be combined and utilize the specific reasons given by residents for not recycling these items in order to encourage the desired behavioral changes.

In addition to *forgetting* and concerns about *convenience*, respondents told us that they were worried about *smell and mess*. A number of respondents mentioned that they did not have a *system* for recycling food scraps at home, such as a container set aside in the kitchen, and therefore just tended to put them in the garbage. When asked, respondents gave positive, but not highly positive estimates of their likelihood of recycling all of their food scraps and food-soiled paper in the future. For this reason, in choosing behavior change tools for recycling food scraps and food-soiled paper, we should include behavior change methods aimed at surmounting higher barriers.

### *Make it Easy*

Those respondents who had yard waste service told us that they did not recycle all of their food scraps because they currently had *no good system* for doing so while avoiding what they believed would be an increase in *smell or mess*. Information that emphasizes how easy it would be to switch from putting

### ***Integrating the Approaches***

*To be most effective, convenience, commitments, education, and prompts should be utilized collectively. For example, program materials and messages would ask residents to switch from disposing of these items in the garbage cart to the yard cart. The materials would demonstrate an effective system (the steps) for taking food scraps and food-soiled paper from the kitchen to the yard cart that reduces concerns over smell and mess. This demonstration should include information about frequency of disposal to reduce flying insects and mold, as well as what food types can be recycled (there was some skepticism about including dairy and meat). As an incentive to engaging in the desired behavior, the program could provide to residents the necessary kitchen containers. While the container may serve as a prompt for recycling food scraps, a refrigerator magnet may be effective in reminding residents to place unwanted food in their kitchen container. Lastly, ask residents to commit to recycling by placing a sticker on their yard waste cart. The commitment sticker would announce their commitment and pledge to recycling. Commitments are most effective when made in face-to-face settings (at a community outreach event) and made public (place on their yard-waste cart or on a poster displayed at ongoing events).*



food scraps in one container (garbage cart) to the other (yard cart) might alleviate this concern. In addition, providing or suggesting suitable containers for saving food scraps to recycle could be included in Waste Management's services to new and existing yard waste customers.

### *Commitments*

Individuals tend to be more likely to follow through on behaviors to which they have made a public commitment. One finding of the survey was that there was a substantial group of individuals who were already recycling some of their food scraps. One approach to improving behavior for this group might be to encourage them to make a public commitment to recycling all of their food scraps (e.g., signing a commitment card and placing a sticker about food scrap recycling on their property).

### Behavior-Change Campaigns (See page 71 of the full report.)

Tell people what to do. Be specific. Outcomes from the in-person survey show that residents in the WUTC areas of King and Snohomish Counties want to do the right thing. Specific behavior-based messages can be successfully situated within broad awareness campaigns; however, it is important to create specific messages that target one material at a time. In order to realize the desired effect and reduce confusion, the messages must target each behavior separately. Using material definitions from this study, small targeted waste characterization studies can be completed in order to evaluate outcomes for specific material classes. After the desired behavior change is reached for the targeted material type then move to the next material type.

### Ongoing Evaluation (See page 71 of the full report.)

We highly recommend ongoing evaluation of programs that measure *the desired behavior*. Resident interest in recycling programs is not sufficient to measure the overarching goal: increased disposal accuracy. Continued periodic garbage-sort studies that utilize the same material definitions and sampling protocol as this study will allow Waste Management to accurately gauge desired customer behaviors for specific material types. The studies can be small in scale and timed to be completed after the implementation of specific outreach activities.

### Ethnic Populations of Interest (See page 72 of the full report.)

Although there were some interesting findings from non-English speaking households in the study (e.g., requests for recycling materials in a variety of languages), the sample size for any specific group was not large enough to adequately describe the attitudes and behaviors of any of those groups. The results from the households that indicated *other language spoken at home* were from the routes identified as ethnic routes for the purpose of targeting ethnic populations (i.e., higher proportions of Asian and Hispanic households). In addition, the *language spoken at home* reported by residents corresponded to the specific ethnicity identified in the ethnic-route zip codes.

Future research in order to identify the needs of specific ethnic or non-English speaking groups should entail the following steps: (1) clearly define the target population; (2) clearly identify the size of the target population; (3) define the methods needed to gather data from the target population (the size of the target population drives the method used to reach them), (4) define sample sizes (the methods and size of the target population drive the sample sizes) and (5) use sound research methods that will glean

representative data of your target audiences. If the target audience is very small then devise methods to speak to households in that group. Gathering qualitative information from small subgroups is still of great value.



## INTRODUCTION

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### Background

As part of the 2013 Washington Utilities and Transportation Commission (WUTC) Revenue Sharing Agreement, Waste Management, in partnership with King and Snohomish Counties, set out to conduct research to determine the barrier and motivation data needed to design and implement program strategies that lead to an increase in recycling among residents in single-family homes within the WUTC<sup>5</sup> areas.

Research conducted in the market in the past has shown the following:

- Self-reporting bias is very strong among county residents. Using phone surveys does not gather an accurate picture of recycling behaviors (e.g., 94% of residents say they recycle very well, yet more than 50% of what is in garbage cans is recyclable).
- In-home recycling audits and in-person surveys conducted by King County in 2005 and 2007 have provided good insights into recycling barriers with *convenience* factors and the *ick* factor being identified as key barriers to recycling. However, these studies have only been done with small anecdotal sample sizes and the data gathered were not quantitative.
- A lot of research has been conducted countywide within the two counties; however, research of just the WUTC areas has not been conducted. The study team thought the population may be fundamentally different in their garbage and recycling behaviors. In addition, other studies have utilized different methods for collecting and categorizing waste materials and therefore, outcomes across studies may not be comparable.
- Little research had been done to identify ethnic sub-groups and identify unique attitudes, behaviors, or beliefs they have related to recycling.

### Research Goals

The research goal for this study was to determine the barriers and benefits to recycling specific materials. The study was conducted in order to better understand garbage and recycling behaviors with the goal of increasing recycling rates among WUTC residents in single-family residences.

Specifically, the research goals were to:

- Identify current baseline recycling behaviors that allow for tracking change over time;
- Identify the values, attitudes, and beliefs that relate to recycling and the value of recycling;
- Identify barriers and effective motivations or incentives for desired behavior changes;
- Identify the most effective communications tools to achieve the desired behavior changes; and
- Identify needs of ethnic communities of interest.

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<sup>5</sup> The Washington Utilities and Transportation Commission (WUTC) regulates waste hauling services in unincorporated areas in King and Snohomish counties. These services are not covered under municipal waste hauling contracts. Areas subject to this regulation are considered to be “WUTC areas.”

In addition, our project team sought to provide Waste Management and their stakeholders with data to inform a pilot behavior change program and replicable study design methods that would allow for the ongoing evaluation of recycling rates within King and Snohomish Counties.

## Target Audience

The target audience for this research was Waste Management customers living in single-family homes in the WUTC areas of King and Snohomish Counties. The study included the general population of customers who lived in these areas. In addition, there was a special interest in learning more about some ethnic subgroups. The ethnic subgroups were defined (based on population within the counties) as customers who spoke Chinese (Mandarin), Korean, Spanish, and Vietnamese. Study participants had garbage and recycling services, but may or may not have had yard waste service.

## Research Team

Colehour+Cohen, a consultant to Waste Management, issued an RFP to research firms to conduct the study. Proposals were evaluated for innovative research approaches that would provide both quantitative data on current recycling behaviors and segmentation of audiences, as well as qualitative information to help in the development of messages and outreach tactics. Campaigns developed from this research will use social marketing strategies that target specific barriers to recycling behaviors and measure changes in those behaviors.

Action Research was chosen as the lead subcontractor on the project. Their role was study design, including methods and sample selection, project management, and data analysis and reporting. The study team also included Cascadia Consulting Group, Pacific Market Research, and T.D. Wang Advertising Group. Cascadia Consulting Group conducted the waste characterization study, Pacific Market Research conducted the in-person survey of residents, and T.D. Wang translated study materials and integrated cultural competency and social equity principles in order to maximize participation from ethnic subgroups in King and Snohomish Counties.

## Study Design

In order to achieve the research goals for this study we conducted a waste characterization study of garbage carts and an in-person survey of households. The waste characterization study data was linked to the household survey data; thus, the proposed methods will allow Waste Management to (1) identify current baseline recycling behaviors, and (2) identify the values, attitudes, and beliefs related to recycling and garbage, as well as the barriers to proper disposal.

These innovative research methods will allow Waste Management to (1) identify current baseline garbage and recycling behaviors, and (2) identify the values, attitudes, and beliefs related to recycling and garbage behaviors. Data on the barriers to proper disposal of recyclable materials were collected during the in-person visit to the household and were based on the recyclable materials found in each household's garbage cart.



**The study design provides a representative sample of Waste Management customers who reside in single-family homes in the WUTC areas of King and Snohomish Counties.** The sample for this study was stratified by county with one-third of the study households living in King County and two-thirds living in Snohomish County. The study goal was 400 completed garbage-cart sorts (King County, N=132 and Snohomish County, N=268). The sample design reflects the distribution of Waste Management’s customers who live in the WUTC areas of each county. A more elaborate explanation of the research methods is included in the next section of this report. A listing of zip codes that encompass the Waste Management service territories for this study can be found in Appendix C.

## **How to Use This Report**

This report is divided into four sections:

- *Methods* which includes a description of the study population and how the study samples for the waste characterization study and in-person surveys were created;
- *Measures* which includes definitions of the variables under study in this project;
- *Results* which includes the study outcomes from the garbage-cart sorts and the in-person surveys; and
- *Recommendations* which includes graphics and text to explain the different outreach strategies likely to produce desired behavior change for specific materials. The recommendations section also includes a discussion of the research goals specific to the ethnic subgroups of interest.

There are five appendices at the end of this report:

- Appendix A contains study materials associated with the waste characterization study;
- Appendix B contains materials associated with the in-person survey of households;
- Appendix C contains general study information;
- Appendix D contains a comparison of waste characterization data from this study (WUTC in King County) to prior waste characterization data collected in the non-WUTC areas of King County; and
- Appendix E contains definitions for terms and abbreviations used in this report.

## METHODS

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For this study the Action Research Team completed two data collection activities: (1) a waste-characterization study of garbage carts; and (2) an in-person survey of households. The waste-characterization study data were linked to the household survey data in order to (1) identify current baseline recycling behaviors, and (2) identify the values, attitudes, and beliefs related to recycling and garbage, as well as the barriers to proper disposal. In order to accurately assess the barriers and benefits to recycling specific material types, we concentrated our research efforts on improper disposal of recyclable materials. In other words, we studied the behaviors and attitudes related to the disposal of items found in garbage carts.

In this section of the report we begin by describing the methods used to derive the garbage-cart sample and conduct the waste characterization of the garbage carts (cart sorts). Following the waste characterization, we explain the methods used to collect the household in-person survey data.

### Study Population

Waste Management provided a customer list of all single family residential addresses in the WUTC areas of King and Snohomish Counties. The customer list included collection route, customer services (i.e., whether or not the customer had garbage, recycling, and yard waste service), and garbage collection day of the week. Only customers who had garbage and recycling service were included in the study. Yard waste service did not determine inclusion in the study population. The list of customers with garbage and recycling service served as the total population from which the waste characterization sample was drawn.

### Study Sample Selection

The study goal was 400 completed garbage-cart sorts (King County, N=132 and Snohomish County, N=268). The sample design reflects the distribution of Waste Management's customers who live in the WUTC areas of each county. In order to attain a representative sample of households in each county, customer addresses within garbage collection routes were randomly selected for participation in the study. This study is a stratified random sample of households. The customer list was stratified by route and garbage collection day of the week. In addition, routes within zip codes identified by the census<sup>6</sup> as having fairly high proportions of the ethnic groups of interest (i.e., countries of origin, language other than English spoken at home, and language dependency) were labeled as "ethnic routes." The ethnic routes were weighted so that they comprised 25 percent of the randomly selected garbage collection routes in each county.

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<sup>6</sup> Information was provided by the 2010 Census and estimates from the American Community Survey, Selected Housing Characteristics, 2006-2010.



The table below displays the languages associated with the routes identified as “ethnic routes.”

**Table 1. Languages associated with the ethnic-identified routes.**

King County		Snohomish County	
City and Zip Code	Ethnicity	City and Zip Code	Ethnicity
<b>Kirkland 98034</b>	Chinese Hispanic	<b>Bothell/Mill Creek 98012</b>	Hispanic Korean
<b>Newcastle 98059</b>	Chinese Hispanic Vietnamese	<b>Brier 98036</b>	Hispanic Vietnamese
<b>Redmond 98052</b>	Chinese Hispanic	<b>Everett 98204, 98208</b>	Hispanic Korean Vietnamese
<b>Renton/Newcastle 98056, 98058</b>	Chinese Hispanic Vietnamese	<b>Lynnwood 98087</b>	Hispanic Korean Vietnamese
		<b>Mukilteo 98275</b>	Korean

In order to derive a sample size of 400 garbage-cart sorts (i.e., N=132 in King County and N=268 in Snohomish County), a list of assumptions was identified to guide the selection of household addresses. The assumptions are explained in the *sample selection process* section below.

## Sample Selection Process

We randomly selected 660 addresses from across all garbage collection routes (i.e., 220 in King County and 440 in Snohomish County). This allowed for customers who failed to set out their garbage carts and other issues that might arise in the field. It was determined that driving and collection times allowed for 20 to 25 garbage carts to be collected for sorting each day. At this rate, six to eight collection days were needed to achieve a sample size of 132 for King County and thirteen to fifteen days were needed to achieve a sample size of 268 for Snohomish County. Collection occurred on consecutive days (Monday through Friday), with two routes utilized per day, until the desired sample sizes were achieved.

In order to derive a final sample size of 400 garbage-cart sorts (i.e., N=132 in King County and N=268 in Snohomish County) the following protocol was used:

1. Routes were identified by garbage collection day of the week;
2. Routes were identified as “ethnic;”
3. Ethnic routes were randomly selected (three for King County and six for Snohomish County);
4. Remaining routes are randomly selected (eight for King County and sixteen for Snohomish County) and distributed across days of the week to fill the data collection calendar;
5. Addresses were sorted by address and street name, and placed in groups of five; and
6. Address groups were randomly selected (four groups per route for a total of 20 addresses per route).

The result was the sample frame for the project. A table of sample frames for each county can be found in Appendix A.

## Waste Characterization Study of Garbage Carts

### Completed Garbage-Cart Sorts

Garbage-cart sorts began on April 4, 2013 and were completed by May 2, 2013. The garbage-cart sorts took 20 days to complete. The sample collection team exceeded the sampling targets, collecting 138 samples from King County (needed 132) and 273 samples from Snohomish County (needed 268).

Figure 1 shows a photograph of the types of recycling cart items found in garbage carts.

The list of addresses selected for sampling was organized by garbage collection day and location then grouped them into batches of 25 addresses per day with the expectation that 20 of those addresses would be available for sampling each day. As the study progressed, the sample collection team increased the number of addresses included in each day’s batch to account for a lower-than-expected availability of samples along some routes.



**Figure 1. Photograph of disposed aluminum cans and recyclable paper**



## Garbage Cart Sample Collection

Each day the sample collection team mapped an efficient collection route and began sampling no earlier 7:00 am (when WM typically starts collection). When the sample collection team arrived at a sample address, they noted:

- the volume of waste present in the garbage cart,
- if there was a recycling cart and/or yard waste cart present,
- if there was evidence in the waste of a foreign language spoken at the residence, and
- which foreign language (if applicable).

The collection team collected all garbage placed at the curbside by rolling it up in a tarp or bagging it to prevent cross-contamination, labeling the material collected from each cart with a bright pink sample tag containing a unique sample ID number and sample date, and placing it in the back of the sampling vehicle. At the end of the day, the sample collection team drove the samples to the sort location (a local transfer station) where they were stored overnight. Figure 2 illustrates the sample collection and tagging procedures.

In order to attain reliable garbage behavior data, residents were not notified that their garbage would be collected and sorted. Residents who questioned the collection team were responded to appropriately. The collection team explained their association with Waste Management, the purpose of the study, and that their garbage would be sorted and then disposed of properly. In addition, residents were given a “Household Garbage Study” flyer that provided additional information and a phone number for reassurance. The flyer can be found in Appendix A.



**Figure 2. Photograph of sample collection and tagging.**

## Garbage Cart Sample Sorting

Before sorting commenced, representatives from Waste Management, and King and Snohomish Counties produced the materials framework that defined the sorting activity. Material types were categorized, defined, and identified with their proper disposal location (e.g., garbage cart, recycling cart, yard waste cart, or other collection method). The materials list and definitions can be found in Appendix A.

The sort crew operated a day after the sample collection team; for example, Monday samples were sorted on Tuesday. The sorting proceeded according to the following four steps:

1. The sort crew chief photographed each sample, ensuring that the sample tag containing the unique sample ID was visible in the photo.
2. The sort crew sorted the sample into separate baskets by material type. The individual members of the sort crew specialized in groups of materials, such as papers or plastics. The sort crew chief monitored the homogeneity of material in the baskets as they accumulated, rejecting any materials that were improperly classified.
3. The sort crew chief photographed any unusual or foreign language materials in the sample, ensuring that the sample tag containing the unique sample ID was visible in the photograph.
4. The sort crew chief verified the purity of each material as it was weighed in its basket (using a pre-calibrated scale) and recorded each material weight in a customized data entry database.



**Figure 3. Photograph of material sorting.**

At the end of each sorting day, the sort crew chief reviewed the data entry and rectified any obvious errors while the day's labor was fresh in their mind. Figure 3 shows an example of the sorting arrangement and sample material being sorted. Figure 4 shows an example of foreign-language material that was sorted and coded.



**Figure 4. Photograph of foreign language material.**



## In-Person Survey of Residents

The addresses from the completed garbage-cart sorts provided the sample for the in-person surveys.

### Completed Interviews

From the 411 garbage-cart sorts 225 in-person surveys were completed, 76 in King County and 149 in Snohomish County. The stratified random sample study design ensures that the resulting sample is representative of Waste Management customers residing in single-family homes within the WUTC areas of King and Snohomish Counties. The sample size of 411 allows for statistical estimates at the +/- 5% margin of error (using the 95% confidence interval). The sample size for King County (N=76) allows for a  $\pm 11\%$  margin of error and the sample size for Snohomish County (N=149) allows for a  $\pm 8\%$  margin of error (using the 95% confidence interval).

In-person surveys were conducted Saturdays and Sundays from 10am to 4pm. Data collection began on Saturday, May 4, 2013 and was completed on Saturday, June 15, 2013. In-person surveys were not conducted on Mother's Day (May 12<sup>th</sup>), or Memorial Weekend (May 25<sup>th</sup>, 26<sup>th</sup>). A table that displays the dates and number of completed in-person surveys by county can be found in Appendix B.

### Study Protocol

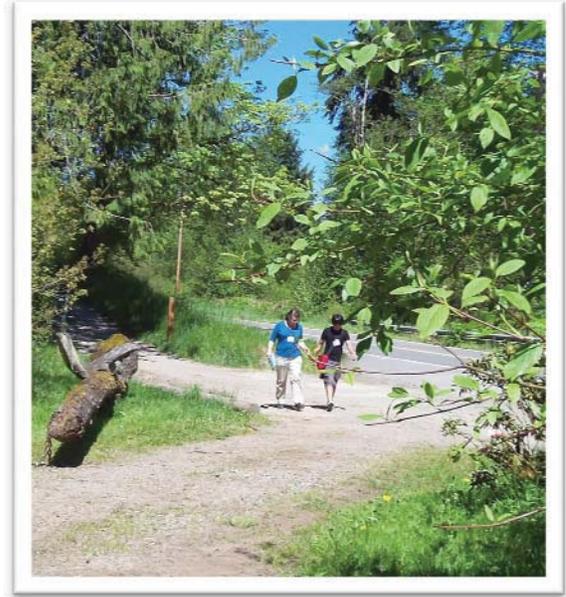
Residents were sent a survey pre-notification letter the week that the in-person interview was scheduled to be conducted. Once interviewers arrived at the doorstep, if no one was home at an address, interviewers left a door hanger on the door stating that they would return at another time. Addresses were visited up to three times across two different weekends in order to conduct the in-person survey. Residents received a \$10 Kroger gift card (redeemable at Fred Meyer stores) for completing the survey. Due to concerns over privacy, sample addresses found to be within gated communities were not visited. Interviewers did not enter areas with posted *No Trespassing* signs or yards with entryway gates (for fear of dogs within the yard). Figure 5 shows a photograph of a no-trespassing sign. A copy of the door hanger can be found in Appendix B.



**Figure 5. Photograph of no trespassing sign.**

The interviewer teams were responsible for conducting in-person surveys with residents and tracking outcomes from each of the addresses they visited. The interviewer teams traveled with English and Spanish versions of the survey instrument, door hangers, and gift cards. They recorded the date and time, and outcome from each visit at each address. Outcomes included one of six possibilities: (1) a completed interview, (2) no one at home, (3) resident home, but no adult available, (4) resident home, but other issue such as language barrier, (5) could not approach home, such as gated community or dog in the yard, and (6) refuse to participate. Interviewers did not enter homes to complete the interviews. The in-person surveys were completed on front doorsteps, in backyards, and driveways. Neighborhoods ranged from suburban in character to large multi-acre properties in rural areas.

If on the first visit a resident did not answer the door the interviewer left the door hanger that described the study and communicated that they would return at a later time or date. For all visits, if the resident was not home one more visit was made later that same day (if time allowed). A maximum of three visits was made to each sample address. The garbage-sort data that were collected from addresses where no in-person survey data were collected were used in this report (in the Results: Garbage-Cart Sorts) to explain garbage disposal behaviors; however, they were not used in the analyses that linked the behaviors to the in-survey data (Results: In-Person Surveys). The analyses in the in-person survey section were dependent upon data from both data collection activities. A photograph of an interviewer team on a rural property can be seen in Figure 6.



**Figure 6. Photograph of interviewer team on a rural property.**

### Survey Pre-Notification Letter

Residents were sent a pre-notification letter letting them know that they had been selected for an in-person survey regarding recycling attitudes and behaviors. The letter explained the project, and informed residents about when to expect interviewers at their door (i.e., the weekend and the timeframes on Saturday and Sunday). In addition, the letter provided residents with a phone number in order to opt-out of the study.

The pre-notification letter was translated into Chinese, Korean, Spanish, and Vietnamese. In addition to English, the translated letters were sent to the defined “ethnic routes” within each county. Residents along the “ethnic-identified routes” in King County received the letter in Chinese, English, Spanish, and Vietnamese. In Snohomish County they received the letter in English, Korean, Spanish, and Vietnamese. A copy of the English version of the study letter can be found in Appendix B.

### Language of Interview

Of particular interest in this study was the collection of garbage and recycling behavior data from populations with limited English proficiency. Therefore, the study design included the selection of “ethnic routes” where subgroups with limited English proficiency might be found.

The survey instrument was translated into four languages: Chinese, Korean, Spanish, and Vietnamese. Interviewer teams were made up of two interviewers. The two-person interviewer teams included a Spanish-language interviewer who went to all addresses on the “ethnic routes.” Our initial plan was to identify residents who spoke Chinese (Mandarin), Korean, or Vietnamese, and had difficulty or were unable to be interviewed in English, and return on another day with the appropriate Asian-language interviewer to conduct the interview. Outcomes from the visits were coded to reflect language difficulties; however, there was only one need to return with an Asian-language interviewer as only one

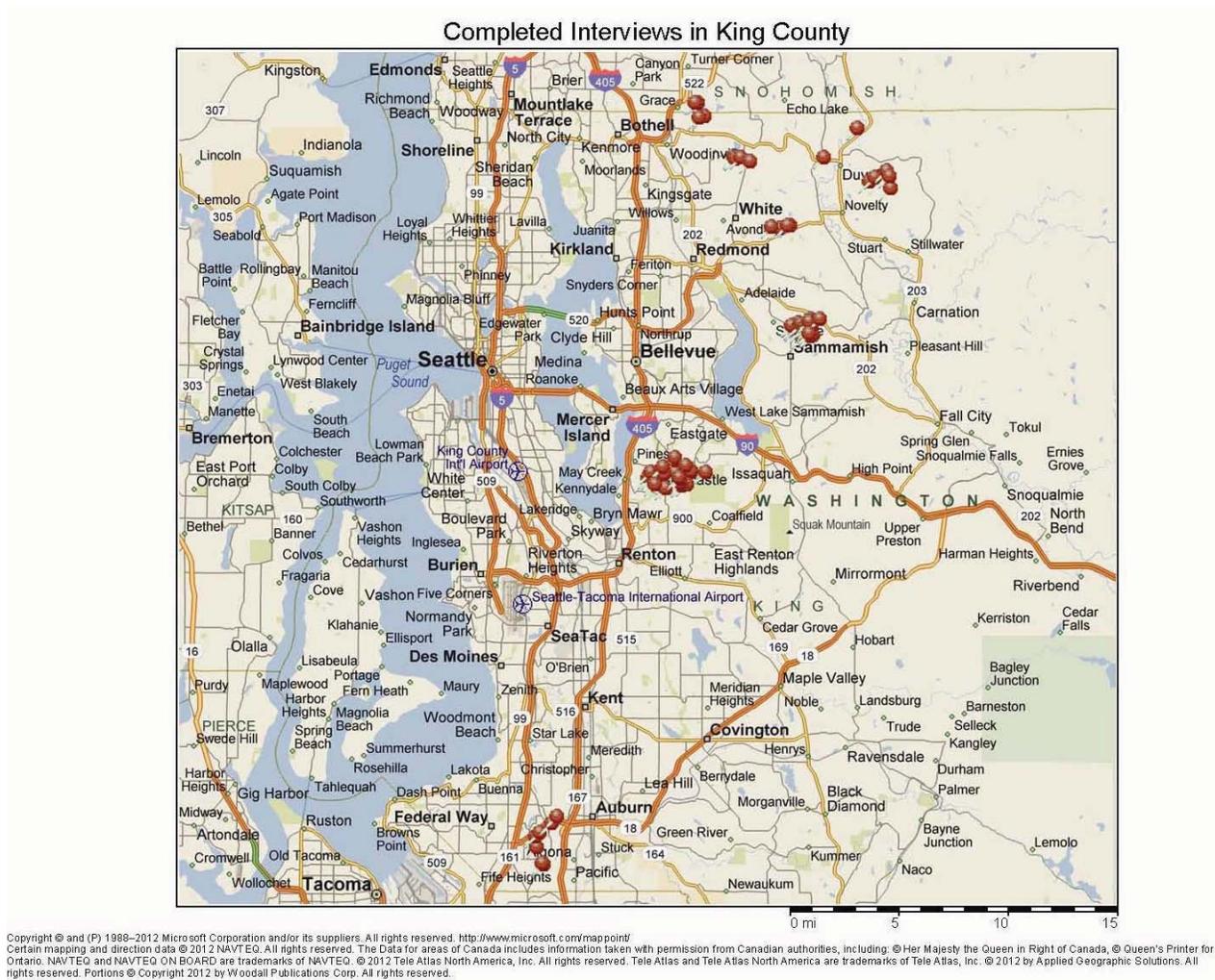


resident in the sample did not speak English comfortably enough to complete the survey in English. A copy of the English version of the survey instrument can be found in Appendix B.

## Scheduling and Mapping

Routes were placed in zones created for efficiency of data collection. Scheduled addresses were mapped in MS MapPoint and interviewers were provided with several detailed maps, as well as a turn-by-turn itinerary for each scheduled shift of interviews. Each schedule itinerary included 11 to 20 addresses. An example of an interviewer itinerary and maps can be found in Appendix B.

Respondents from a cross-section of both counties provided survey data for this study. The figure below displays the areas in which survey respondents lived in King County.



**Figure 7. Map of completed interviews in King County.**

The red dots symbolize completed in-person surveys in King County. In-person surveys were collected as far north as Bothell and as far south as Federal Way.

The figure below displays the areas in which survey respondents lived in Snohomish County.

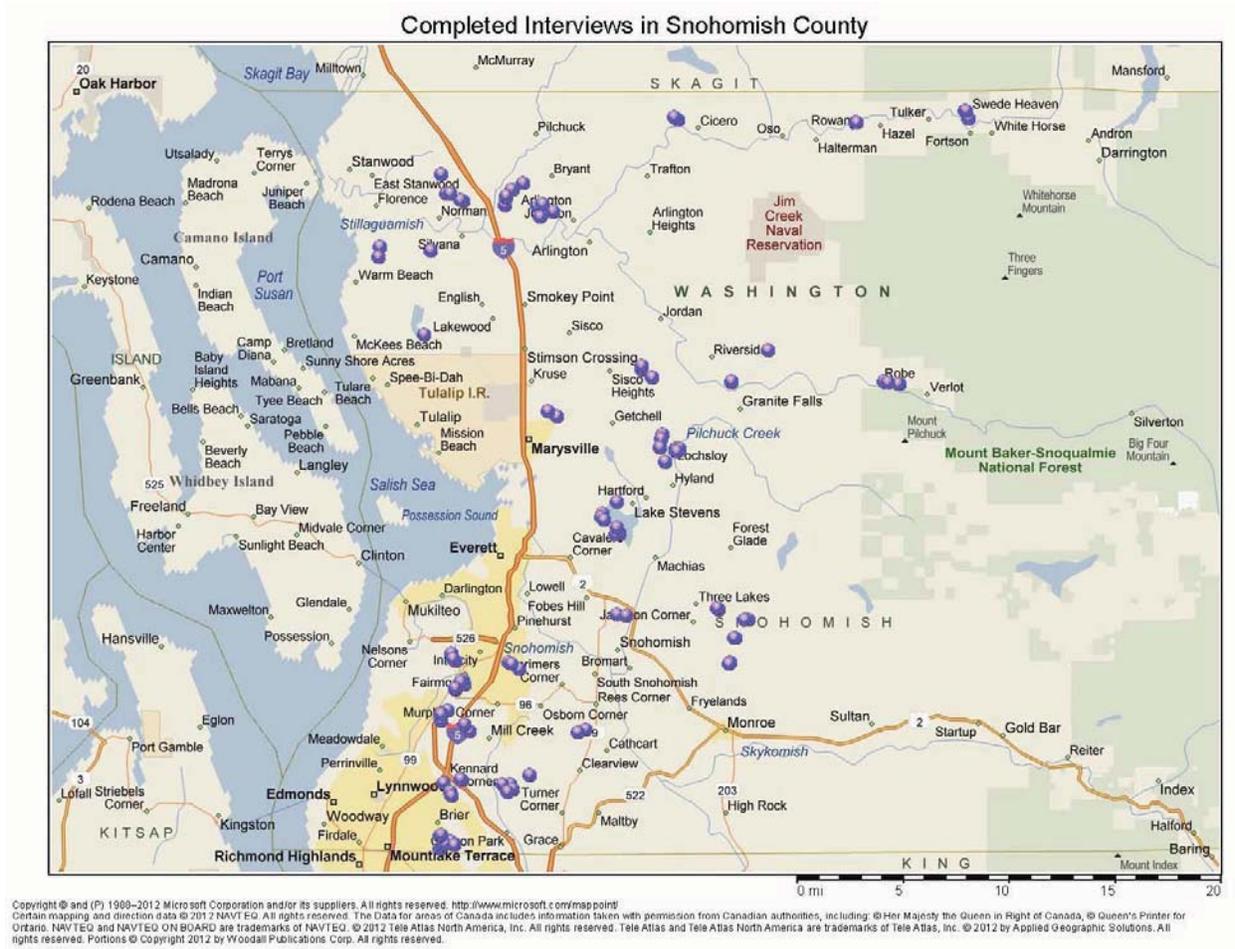


Figure 8. Map of completed in-person surveys in Snohomish County.

The purple dots symbolize the completed in-person surveys in Snohomish County. In-person surveys were conducted from Brier in the southern part of the county to Stanwood in the north, and Swede Heaven in the north inland area.

## Response Rate

There were 411 completed garbage-cart sorts. From the 411 garbage-cart sorts there were 225 completed in-person surveys. The response rate for the in-person surveys was 60%. The favorable response rate for this study speaks to the strength of the study protocol (i.e., sending pre-notification letters and prompt follow-up with residents who were missed in the first visit to their home), along with the positive relationship that customers have with Waste Management.

Final outcomes from the in-person visits are displayed in the table below.

**Table 2. Final outcomes from in-person visits to households.**

<b>Final Outcomes (Dispositions)</b>	<b>Overall</b>	<b>King County</b>	<b>Snohomish County</b>
<b>Completed Interview</b>	225	76	149
<b>Never Reached:</b> Not at Home at All Three Attempts	74	27	47
<b>Prior Contact:</b> Not Home or Available at Third Attempt	23	9	14
<b>Language or Other Communication Barrier</b>	2	1	1
<b>Refused</b>	55	21	34
<b>Could Not Approach Home:</b> Vacant, Gated Community, No Trespassing, Dogs	32	6	26

The response rate was calculated by removing the *language or other communication barrier* and *could not approach home* final outcomes from the number of completed garbage-cart sorts (i.e.,  $411 - 34 = 377$ ). The number of completed in-person surveys was divided by the remaining 377 garbage-cart sorts.

One notable outcome from the in-person visits were comments from residents about the garbage-cart sorts. On several occasions residents asked interviewers if the study was related to “the truck that pulled up and took away my garbage.” Interviewers replied appropriately by saying, “Yes.” In all instances the residents stated that they were upset because they didn’t know who was picking up their garbage and feared that they were being targeted for identify theft. They wanted reassurance that their garbage had been handled confidentially and disposed of properly. Staff at Colehour+Cohen followed up with customers who requested additional reassurance or a phone call. In spite of their remarks, the residents were polite to interviewers and did complete the in-person survey.

## MEASURES

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This section explains the measures that were used for the waste characterization and the in-person survey studies.

### Garbage-Cart Sorts

The main objective of the garbage-cart sort measurements was to quantify resident behavior by identifying specific types of materials in the garbage cart that should have been placed in the recycling cart. The analyses for this study:

- Calculated the average disposed pounds per household for each county and the counties combined;
- Calculated the composition of all materials in the garbage carts for each county and for the counties combined;
- Calculated the proportions of waste, recyclables, and organics in the garbage carts for each county and for the counties combined;
- For King County households, estimated the average pounds per household placed in diversion containers.

### In-Person Surveys

The main objective of the in-person survey was to identify the barriers and benefits of recycling specific types of materials. Attitudes, self-reported behaviors, and demographic data were collected. The survey forms that were used to collect the data from residents were customized for each household. The survey forms included the following information: (1) a unique ID number (which linked it to the garbage-cart sorts); (2) the service address, (3) whether or not the resident had yard waste service; and (4) recyclable material types identified through the garbage-cart sorts (for the barrier and benefit section of the survey). The survey instrument can be found in Appendix B.

**Attitudes and Beliefs about Recycling:** This section includes six questions.

- How important do you think it is for your household to participate in recycling?  
(0 to 10, 0 equals not at all important and 10 equals extremely important)
- How important do you think it is for your neighbors to participate in recycling?  
(0 to 10, 0 equals not at all important and 10 equals extremely important)
- How difficult is it for your household to participate in recycling?  
(0 to 10, 0 equals not at all difficult and 10 equals extremely difficult)
- Do you place your recyclable items in a plastic bag before putting them in your recycle cart?
- Why do you bag your recyclable items before putting them in the recycle cart?



**Barriers and Benefits of Recycling Specific Material Types:** This section includes four questions each about four recyclable material types identified from the garbage-cart sort study. We asked these questions in order to report the relationship between the importance and difficulty of recycling each of the garbage-cart sort items. We asked respondents in an open-ended manner about the difficulties and the household routines for each item.

- How difficult is it to recycle [bin sort item]?  
(0 to 10, 0 equals not at all difficult and 10 equals extremely difficult)
- Can you tell me about [challenges, confusion, frustrations, processes you take] when recycling things like [bin sort item]?
- Who in your household typically throws away this item?
- How important is it that your household recycles [bin sort item]?  
(0 to 10, 0 equals not at all important and 10 equals extremely important)

**Barriers and Benefits of Recycling in General:** We asked these questions to learn about attitudes toward recycling and the barriers to successful recycling. This section includes five questions.

- If there was a time when you did not recycle an item that you knew was recyclable, what would you say was the reason?
- Can you tell me, why does your household recycle?
- What do you do with your garbage when your garbage cart is full?
- What do you do with your recycling when your recycling cart is full?
- While at home, if you are holding an item in your hand that you need to dispose of and you're not sure if it's recyclable, what do you do with it?

**Knowledge about Recycling:** In this section, we examine the relationship between current food scrap and food-soiled paper behaviors (garbage-cart sorts), demographic variables, and yard waste service in order to learn about the attitudes toward and successful composting of these materials. The survey items in this section were analyzed separately for those who have yard waste service and those who do not.

- Where do you place your household food scraps?
- Where do you place your food-soiled paper, such as uncoated paper plates and pizza boxes?
- Before today, were you aware of that?  
**[ASK NEXT THREE QUESTIONS IF CURRENTLY HAS YARD WASTE SERVICE]**
- Why do you not recycle all of your food scraps and food-soiled paper in your yard waste cart?
- Now that you know food scraps and food soiled paper can be recycled in yard waste carts, how likely are you to start recycling these items in your yard waste cart?
- What would make you more likely to start recycling food scraps and food-soiled paper in your yard waste cart?  
**[ASK NEXT QUESTIONS ONLY IF CURRENTLY DOES NOT HAVE YARD WASTE SERVICE]**
- Why do you not have yard waste service?
- Now that you know food scraps and food soiled paper can be recycled in yard waste carts, how likely are you to start yard waste service?
- What would make you more likely to start yard waste service?

- In a given week, how much of your food scraps would you estimate you put in your yard waste cart?

**Communication Tools:** In this area of the report, we will look at the relationship between information gathering and demographic variables of interest. We asked these questions in order to determine the extent to which low-English proficiency may impact residential recycling participation. We will report frequencies for the language-related variables.

- Where do you go to find information if you have a question about recycling?
- Who in your household takes most of the responsibility for recycling?
- Who in your household is the least cooperative when it comes to recycling?
- What language is spoken most often in your home?
- Is English spoken in your home . . .
- Does the person most responsible for recycling speak English . . .
- Does the person most responsible for recycling read in English . . .
- Does the person most responsible for recycling write in English . . .
- Is there a language other than English that would help your household better understand how to recycle?

**Demographic Variables:** This section includes seven questions asked of the respondent. In addition to these questions, the interviewers recorded the language of the interview, the gender of the respondent, if the home was multi-level, and if the home had a garage. We asked these questions in order to determine if respondent age and other characteristics impact recycling attitudes and behaviors.

- In what year were you born?
- What is the highest grade or year of school you have completed?
- Including yourself, how many people live in your household?
- Number of children under 18 years of age:
- Number of children under 5 years of age:
- Are you of Hispanic or Latino origin?
- What race do you consider yourself to be?



## RESULTS

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Results for the garbage-cart sorts are presented in aggregate and then for each county separately. Results for the in-person survey data follow this section.

### Garbage-Cart Sorts

The outcomes reported here are for all 411 garbage-cart sorts collected as part of the waste-characterization study. The analyses are based on the material component percentages, by weight. These percentages are calculated by dividing the sum of the selected material component weights by the sum of the corresponding sample weights.

The current study showed that 12.4% of the materials collected were comprised of recyclable materials<sup>7</sup>. A breakdown of the composition of the materials collected across both counties is presented in Table 3.

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<sup>7</sup> Results from the *2011 King County Waste Characterization and Customer Survey* showed that 16% of the materials collected from residential garbage carts belonged in recycling carts. Forty-seven samples were taken from garbage-truck routes in the non-WUTC area of King County that were primarily single-family homes. The current study showed that 12.4% of the materials collected were comprised of recyclable materials. Because of the differences in sampling procedures (i.e., route truck collection versus curbside collection) findings, although interesting, should be interpreted with caution. A summary of the comparison can be found in Appendix D.

**Table 3. Summary garbage-cart sort data for King and Snohomish Counties combined.**

	Percentage				Percentage			
Material	CI <sub>90%</sub> + / -		Material	CI <sub>90%</sub> + / -				
Paper	<b>11.1%</b>		Metal	<b>3.4%</b>				
Newspaper and Cardboard	1.0%	0.3%	Aluminum Cans	0.2%	0.0%			
Mixed Paper	4.5%	0.8%	Tin/Steel Cans	0.5%	0.1%			
Aseptic and Polycoats	0.6%	0.1%	Other Curbside Recyclable Metals	1.0%	0.3%			
Food Soiled Paper	4.9%	0.4%	Clean Aluminum Foil and Containers	0.4%	0.0%			
Shredded Paper	0.1%	0.0%	Other Recyclable Metals	1.2%	0.6%			
Plastic	<b>6.8%</b>		Organics	<b>32.2%</b>				
Plastic Bottles, Jugs, Cups, Jars, and Tubs	2.1%	0.2%	Food Scraps	30.2%	2.2%			
Acceptable Bio-plastics	0.0%	0.0%	Yard Waste	2.0%	0.7%			
Plastic Trays, Clamshells, and Other Containers	1.0%	0.1%						
Plastic Lids	0.5%	0.0%	Other Materials	<b>43.1%</b>				
Clean Recyclable Film	1.5%	0.2%	Electronic Waste	0.7%	0.3%			
Expanded Polystyrene	0.6%	0.1%	Other Household Hazardous Waste	0.4%	0.2%			
Other Rigid Plastics	1.2%	0.2%	Latex Paint	0.1%	0.1%			
			Medical Waste	0.0%	0.0%			
Glass	<b>3.5%</b>		Pharmaceuticals	0.1%	0.0%			
Glass Bottles and Jars	3.5%	2.3%	Textiles	3.4%	0.7%			
			Other Materials*	38.3%	2.5%			
			<b>Total</b>	<b>100.0%</b>				
			<b>Sample Count</b>	<b>411</b>				
<i>Confidence intervals calculated at the 90% confidence level. Percentages for material types may not total 100% due to rounding.</i>								
<i>*Other materials include items like garbage bags, diapers, pet waste, construction materials, and other items not elsewhere defined.</i>								

Organics comprised a large percentage (32.2%) of the material found in the garbage carts.

**Table 4. Summary of garbage-cart sort data for King County.**

	Percentage				Percentage			
	CI 90% + / -		Material		CI 90% + / -			
	<b>12.2%</b>			<b>Metal</b>	<b>3.6%</b>			
<b>Newspaper and Cardboard</b>	0.9%	0.4%		Aluminum Cans	0.2%	0.1%		
<b>Mixed Paper</b>	5.6%	1.7%		Tin/Steel Cans	0.4%	0.1%		
<b>Aseptic and Polycoats</b>	0.6%	0.1%		Other Curbside Recyclable Metals	1.3%	0.6%		
<b>Food Soiled Paper</b>	5.2%	0.7%		Clean Aluminum Foil and Containers	0.4%	0.1%		
<b>Shredded Paper</b>	0.0%	0.0%		Other Recyclable Metals	1.3%	1.5%		
	<b>6.6%</b>			<b>Organics</b>	<b>31.9%</b>			
<b>Plastic Bottles, Jugs, Cups, Jars, and Tubs</b>	1.6%	0.3%		Food Scraps	30.4%	4.0%		
<b>Acceptable Bio-plastics</b>	0.0%	0.0%		Yard Waste	1.5%	1.0%		
<b>Plastic Trays, Clamshells, and Other Containers</b>	1.1%	0.2%						
<b>Plastic Lids</b>	0.5%	0.1%		<b>Other Materials</b>	<b>43.9%</b>			
<b>Clean Recyclable Film</b>	1.4%	0.3%		Electronic Waste	0.4%	0.3%		
<b>Expanded Polystyrene</b>	0.6%	0.1%		Other Household Hazardous Waste	0.3%	0.1%		
<b>Other Rigid Plastics</b>	1.4%	0.5%		Latex Paint	0.1%	0.2%		
				Medical Waste	0.0%	0.0%		
	<b>1.8%</b>			Pharmaceuticals	0.1%	0.1%		
<b>Glass Bottles and Jars</b>	1.8%	0.6%		Textiles	4.5%	1.7%		
				Other Materials*	38.4%	3.9%		
				<b>Total</b>	<b>100.0%</b>			
				<b>Sample Count</b>	<b>138</b>			
<i>Confidence intervals calculated at the 90% confidence level. Percentages for material types may not total 100% due to rounding.</i>								
<i>*Other materials include items like garbage bags, diapers, pet waste, construction materials, and other items not elsewhere defined.</i>								

**Table 5. Summary of garbage-cart sort data for Snohomish County.**

	Percentage		CI 90% + / -		Material	Percentage		CI 90% + / -	
	<b>10.5%</b>				<b>Metal</b>	<b>3.3%</b>			
<b>Newspaper and Cardboard</b>	1.1%	0.4%			Aluminum Cans	0.3%	0.1%		
<b>Mixed Paper</b>	3.9%	0.7%			Tin/Steel Cans	0.6%	0.1%		
<b>Aseptic and Polycoats</b>	0.6%	0.1%			Other Curbside Recyclable Metals	0.8%	0.2%		
<b>Food Soiled Paper</b>	4.8%	0.4%			Clean Aluminum Foil and Containers	0.4%	0.1%		
<b>Shredded Paper</b>	0.1%	0.1%			Other Recyclable Metals	1.1%	0.6%		
	<b>6.9%</b>				<b>Organics</b>	<b>32.3%</b>			
<b>Plastic Bottles, Jugs, Cups, Jars, and Tubs</b>	2.3%	0.3%			Food Scraps	30.1%	2.6%		
<b>Acceptable Bio-plastics</b>	0.0%	0.0%			Yard Waste	2.2%	0.9%		
<b>Plastic Trays, Clamshells, and Other Containers</b>	0.9%	0.1%							
<b>Plastic Lids</b>	0.5%	0.1%			<b>Other Materials</b>	<b>42.6%</b>			
<b>Clean Recyclable Film</b>	1.6%	0.3%			Electronic Waste	0.8%	0.4%		
<b>Expanded Polystyrene</b>	0.6%	0.1%			Other Household Hazardous Waste	0.4%	0.3%		
<b>Other Rigid Plastics</b>	1.1%	0.2%			Latex Paint	0.1%	0.1%		
					Medical Waste	0.1%	0.1%		
	<b>4.3%</b>				Pharmaceuticals	0.1%	0.0%		
<b>Glass Bottles and Jars</b>	4.3%	3.4%			Textiles	2.9%	0.5%		
					Other Materials*	38.3%	3.2%		
					<b>Total</b>	<b>100.0%</b>			
					<b>Sample Count</b>	<b>273</b>			
<p><i>Confidence intervals calculated at the 90% confidence level. Percentages for material types may not total 100% due to rounding.</i></p> <p><i>*Other materials include items like garbage bags, diapers, pet waste, construction materials, and other items not elsewhere defined.</i></p>									

## Outcomes from All Garbage-Sort Samples

King and Snohomish Counties showed similar patterns of disposal, except for glass and metal. Organics comprised the largest proportion by weight, followed by paper, plastic, glass and metal. Although glass and metal made up relatively small proportions of the garbage weight, King County residents disposed of less glass by weight than metal. Snohomish County residents disposed of glass and metal at almost the same rate by weight.

The table below displays the weight of the garbage-cart materials in aggregate and by county.

**Table 6. Total weight garbage-cart materials of sampled households.**

<b>WUTC Area</b>	<b>Total Sample (lbs)</b>	<b>Households Sampled</b>	<b>Average lbs/Household</b>
King County	3,777.30	138	27.17
Snohomish County	7,753.02	273	28.40
Overall	11,530.32	411	27.99

There was no statistically significant difference between counties in the average number of pounds of garbage-cart materials per household.

## In-Person Surveys

### Statistics and Analyses

For survey items that were measured on continuous scales (0 to 10) we have reported medians, means, ranges, and standard deviations. The median represents the value at the center of a distribution of scores, such that half are above and half below it. The mean is the statistical average score, obtained by adding scores and dividing by the number of scores. The range is reported as the lowest and highest actual scores obtained in the sample. The standard deviation represents the “spread” of scores around the mean. A low standard deviation indicates that the data points tend to be very close to the mean; a high standard deviation indicates that the data points are spread out over a large range of values.

Analyses of Variance (ANOVAs) were conducted to compare means scores on continuously-scaled survey items between different subgroups in the sample, such as men versus women. Cross-tabulations with Chi-Square analyses were conducted to compare groups on survey items with categorical responses, such as where people go to find information about recycling. Terms are also defined in Appendix E.

**Analyses in this section present data combined across King and Snohomish Counties. Where there were statistically significant differences between counties, they are noted.**

### Garbage-Cart Sort Results for Survey Respondents

The three tables that follow break out outcomes from the garbage-cart sorts *for survey respondents*. The tables display the materials that belong in the recycling cart, the yard-waste cart, and that need to be disposed of at a collection site (respectively).

**Table 7. Materials that belong in the recycling cart**

Item	Percentage of households with material present (N=225)	Weight Range	Average (Mean) Weight (lb)	Average (Mean) Percent of Total Sample Weight
Mixed paper	89.3	0.05-42.45	1.19	3.38
Plastic	85.3	0.05-3.75	0.64	2.57
Polycoats	64.4	0.05-1.40	0.24	1.06
Newspaper	36.9	0.05-4.05	0.42	1.63
Tin cans	35.1	0.05-3.10	0.41	1.27
Aluminum cans	33.8	0.05-1.00	0.19	0.80
Glass	30.7	0.05-165.00	4.23	6.98
Other Curbside Metals <sup>8</sup>	35.6	0.05-8.75	0.91	3.28

<sup>8</sup> Although other curbside recyclable metals were present in a relatively high percentage of garbage-cart sorts, they were not included as one of the materials for the barrier and benefit survey items because of the difficulty in providing a comprehensive definition for residents in the context of the in-person survey.

Three recycling cart materials, mixed paper, plastic, and poly-coated containers, and two yard-cart materials, food scraps and food-soiled paper, were found in large percentages of the garbage carts.

Nearly 90% of households had mixed paper, 85.3% had plastic, and 64.4% had poly-coated containers in their garbage carts.

**Table 8. Materials that belong in the yard-waste cart.**

Item	Percent of Cases with Any (N=225)	Weight Range	Mean Weight (lb)	Mean Percent of Sample Weight
<b>Food scraps</b>	<b>98.7</b>	<b>0.05-51.8</b>	<b>8.61</b>	<b>31.34</b>
<b>Food-soiled paper</b>	<b>95.6<sup>9</sup></b>	<b>0.05-9.00</b>	<b>1.45</b>	<b>5.75</b>
Yard waste	30.2	0.05-24.25	1.44	4.99
Bioplastics	3.1	0.05-0.15	0.07	0.44

The highest proportion of compostable materials incorrectly placed in the garbage cart came from two material types: (1) food scraps, and (2) food-soiled paper.

**Table 9. Materials that require alternative disposal methods**

Item	Percent of Cases with Any (N=225)	Weight Range	Mean Weight (lb)	Mean Percent of Sample Weight
<b>Hazardous materials</b>	<b>24.9</b>	<b>0.05-10.45</b>	<b>0.55</b>	<b>2.32</b>
Electronics	12.4	0.05-17.60	1.63	3.45
Pharmaceuticals	8.0	0.05-0.75	0.18	0.86
Medical waste	4.4	0.05-2.95	0.43	1.33
Paint	1.8	0.10-5.05	2.34	5.60

The highest proportion of alternative method disposal materials incorrectly placed in the garbage cart came from hazardous materials.

<sup>9</sup> The percent of residents with food-soiled paper was significantly lower in King County (90.8%) than in Snohomish County (98.0%). The range, average weight and average percent of sample weight for food-soiled paper did not differ across counties.

## Sample Characteristics

This section describes key demographics for the sample of individuals who completed the in-person survey. Again, results have been combined across King and Snohomish Counties, unless there was a statistically significant difference between them.

### *Age, Gender, and Race*

The average age of survey respondents was 49.1 years (SD=12.8) for King County and 50.2 years (SD=14.0) for Snohomish County, with a range of 18 to 89. Survey respondents were more likely to be men (54.3% in King County and 59.6% in Snohomish County.) The large majority of respondents were White. For this reason, no analyses were conducted breaking down recycling behaviors by race for this report. Table 10 shows a comparison of the survey sample for race and Hispanic/Latino ethnicity in King and Snohomish Counties.

**Table 10. Race of respondent.**

Race/Ethnicity	King County		Snohomish County	
	Number	Percentage	Number	Percentage
Hispanic/Latino Origin	2	2.7	5	3.4
White	51	67.1	132	88.6
Asian	17	22.4	9	6.0
Black	2	2.6	0	0.0
Amer. Indian/Alaska Native	0	0	2	1.3
Mixed Race	0	0	4	2.7
Other	6	7.9	0	0

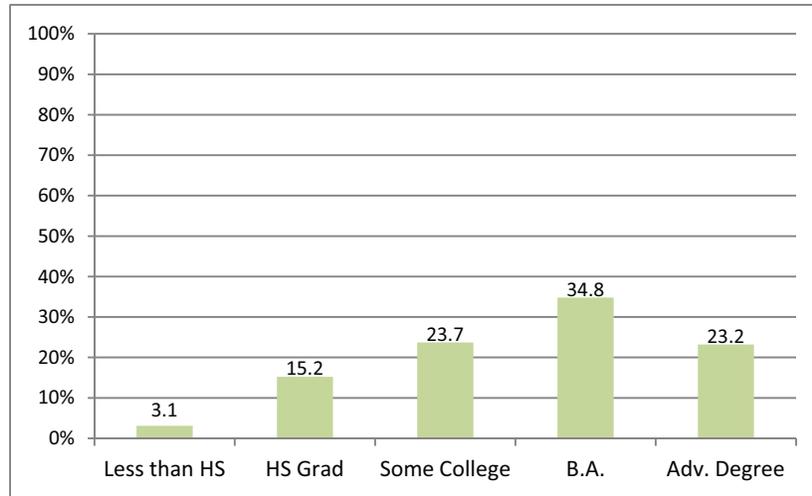
U.S. Census data for King County show the percentage of individuals reporting race as: 71.3% White; 6.5% Black, 9.2% Hispanic, 1% American Indian/Alaskan Native, 15.5% Asian, .8% Pacific Islander, and 4.7% Other. The data for Snohomish County show the percentage of individuals reporting race as: 81.2% White; 2.9% Black, 9.3% Hispanic, 1.6% American Indian/Alaskan Native, 9.6% Asian, .5% Pacific Islander, and 4.3% Other.

We report these percentages as they are of interest; however, no direct comparison can be made between our sample of households by county and total population (individuals) statistics by county from the U.S. Census. Our sample of households represents only the Waste Management service areas of the WUTC areas of King and Snohomish Counties, and any estimates made (i.e., Census) of individuals or households would be made of the county as a whole.



### Education and Language

The majority of respondents (97%) were high school graduates and over half were college graduates or had advanced degrees. See Figure 9. This rate was slightly higher than Census figures for King and Snohomish Counties, which list those with a high school education or higher at about 91%.



**Figure 9. Respondent education.**

All 225 in-person surveys were conducted in English, and 91% of the respondents said that English was the primary language spoken in their home. Other primary languages mentioned were Arabic (2), Bengali (1), Chinese (2), Hindi (1), Korean (2), Mandarin (4), Punjabi (1), Samoan (1), Spanish (2), Tamil (2), and Vietnamese (2). When residents whose primary language was other than English were asked how often English was spoken in their home ten residents said “Often,” eight said “Sometimes,” and one said “Rarely.”

For the most part, interviewees whose household spoke a language other than English felt that the person responsible for recycling was proficient in speaking, reading and writing English. See Table 11.

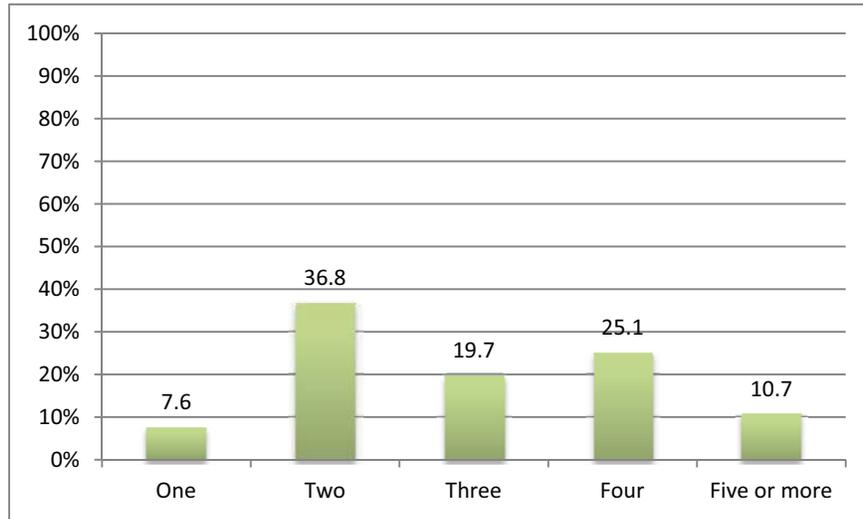
**Table 11. English proficiency frequencies for person most responsible for recycling.**

How well does the person responsible for recycling...			
	Speak English (N=20)	Read English (N=19)	Write English (N=19)
Very well	11	14	12
Well	7	4	6
Not very well	2	1	1

However, in spite of the high levels of self-reported English proficiency, over half of these respondents (55%) said that having materials in a language other than English would be helpful in understanding how to recycle. The alternate languages requested during the in-person surveys were Arabic (1), Chinese (3), Hindi (1), Korean (1), Mandarin (1), Spanish (2), and Vietnamese (1).

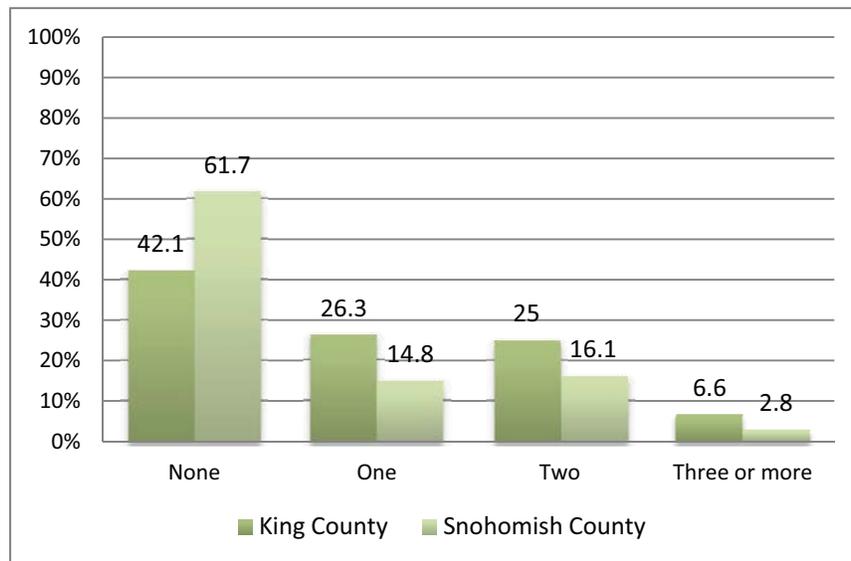
*Household Composition*

This section describes the composition of households where in-person interviews were conducted. Results for King and Snohomish Counties presented separately where there were statistically significant differences. Most households where in-person surveys were conducted consisted of at least two persons. See Figure 10.



**Figure 10. Number of persons in household. (N=223)**

About 62% of households in Snohomish County and 42% of households in King County did not have children under 18 living at home. Of the households that had children living at home, most had one or two. See Figure 11.

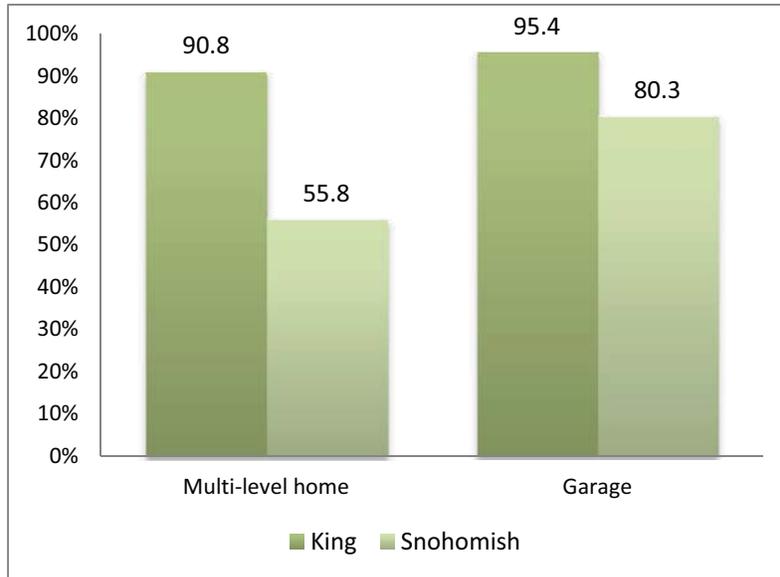


**Figure 11. Number of children under 18 in household. (N=225)**

Approximately 18% of the households with children included a child under the age of five.

*Characteristics of the Residence*

Interviewers also made a note of whether the respondent lived in a single or multi-level residence and whether or not they had a garage. The majority of respondents lived in a home with more than one level and had a garage on their property. See Figure 12.



**Figure 12. Home characteristics. (N=202)**

## General Recycling Attitudes

Overwhelmingly, survey respondents reported that in general recycling was *very important* and that it was *not difficult to do*.

Attitudes about the importance of recycling were measured on a scale from 0 “Not at all important” to 10 “Very important.” Perceived difficulty of recycling was measured on a scale from 0 “Not at all difficult” to 10 “Very difficult.” Table 12 shows descriptive statistics for these survey items. The median responses show that at least half of respondents felt that recycling was “Very important” for both themselves and their neighbors and that at least half felt that recycling was “Not at all difficult.”

**Table 12. General importance and difficulty of recycling.**

Attitudes Towards Recycling	N	Median	Mean	Standard Deviation	Range
How important is it for your household to recycle?	225	10	9.21	1.20	3 to 10
How important is it for your neighbors to recycle?	217	10	8.92	1.67	0 to 10
How difficult is it for your household to recycle?	225	0	1.80	2.58	0 to 10

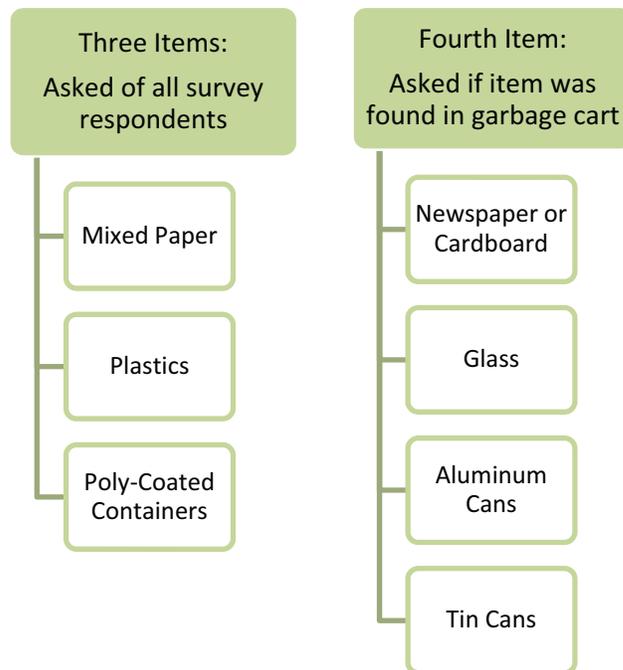


## Barriers and Benefits to Recycling Garbage-Cart Sort Materials

All residents were asked about three of the recyclable materials collected from garbage-cart sorts whether or not the sort for the household included that material. These were: mixed paper, poly-coated containers, and plastics. These three items were chosen when early examination of the garbage-cart sort data revealed that they were present in the garbage of the majority of sample households.

Each in-person survey form was customized to include questions about one of four additional types of recyclable material which had been found in the garbage-cart sort data for that household. These materials were newspaper or cardboard, glass, aluminum, or tin. This fourth item was selected for each household because it was found in the largest quantity (not the heaviest weight) after mixed paper, poly-coated containers and plastics. See Figure 13.

**Figure 13. Garbage-cart sort material items asked of survey respondents.**



*Perceived Difficulty and Importance of Recycling Specific Materials*

For all materials, survey respondents reported that recycling was *not difficult* and that it was *extremely important* to do. The highest difficulty rating was for poly-coated containers.

Exploratory analyses were conducted in order to look at whether or not there were differences in the perceived difficulty of recycling mixed paper, poly-coated containers, or plastics, or differences in the reasons given as barriers to recycling those materials based on the following:

- County;
- Gender;
- Household composition
- Home characteristics
- Whether or not the respondent was the one most responsible for recycling in that household and;
- Whether or not the material was found in the resident’s garbage-cart sort.

No relationships were found across those combinations of variables.

In order to learn more about recyclable material barriers, residents were first asked to rate how difficult it was to recycle each type of material on a scale from 0 “Not at all difficult” to 10 “Very difficult.” Table 13 shows the descriptive statistics for the difficulty ratings.

For most items, more than half of respondents rated the material as “Not at all difficult” to recycle.

**Table 13. Descriptive statistics for difficulty of recycling ratings**

How difficult is it to recycle...	N	Median	Mean	Standard Deviation	Range	Percent giving “Not at all difficult” rating
Poly-coated containers	217	1	2.80	3.42	0 to 10	43.8
Tin	22	0	1.68	3.04	0 to 10	54.5
Aluminum	11	1	1.64	1.96	0 to 5	45.5
Plastic	223	0	1.35	2.30	0 to 10	58.3
Newspaper and cardboard	27	0	1.11	2.19	0 to 8	66.7
Glass	44	0	1.05	2.34	0 to 10	65.9
Mixed paper	224	0	0.69	1.49	0 to 10	71.0

The ratings for all materials were fairly low: the highest difficulty rating was for poly-coated containers ( $M=2.8$ ,  $SD=3.42$ ).

After residents described barriers to recycling the garbage cart items, they were asked to rate the importance of recycling each of those items, on a scale of 0 to 10, where 0 was “Not at all important” and



10 was “Extremely important.” These ratings were used as an estimate of the motivation residents have to recycle and of their perception of the benefits of recycling.

The median importance rating for all garbage cart sort items was “10,” indicating that at least half of respondents rated it as “extremely important” for their household to recycle that item. See Table 14.

**Table 14. Importance ratings for recycling of garbage cart sort items.**

<b>How important is it that your household recycles...</b>	<b>N</b>	<b>Median</b>	<b>Mean</b>	<b>Standard Deviation</b>	<b>Range</b>	<b>Percent giving “Extremely important” rating</b>
Mixed paper	225	10	9.12	1.74	0 to 10	65.8
Plastic	224	10	9.16	1.67	0 to 10	67.0
Poly-coated containers	225	10	8.32	2.64	0 to 10	56.0
Glass	44	10	9.23	1.33	5 to 10	65.9
Newspaper and cardboard	27	10	9.11	2.02	1 to 10	74.1
Tin	21	10	8.19	3.36	0 to 10	66.7
Aluminum	11	10	9.18	1.54	5 to 10	63.6

The lowest average importance ratings were for poly-coated containers and tin containers. Poly-coated containers and tin containers received the lowest importance ratings. These two materials had also been rated as somewhat more difficult to recycle (See Table 13.)

*Common Barriers*

Overall, preparation for recycling, such as *removing caps or lids, rinsing, or shredding*, and *general confusion* about what can and cannot be recycled were found to be barriers to proper recycling. Interestingly, 30% of respondents stated that no one in the household was uncooperative with recycling; however, 55.6% of the residents with children under the age of 18 (N=98) reported that children were *least cooperative* with recycling.

Respondents were asked to tell the interviewer about any challenges or barriers they found in recycling each type of material. The figures below show the percentages of all residents who mentioned each specific type of barrier. Barriers are included if they made up more than 2% of all responses for a given material. Note that individual residents may have mentioned more than one barrier, so percentages may total more than 100%. In a fairly large percentage of cases, residents said that there were no particular challenges and that they did recycle that item.

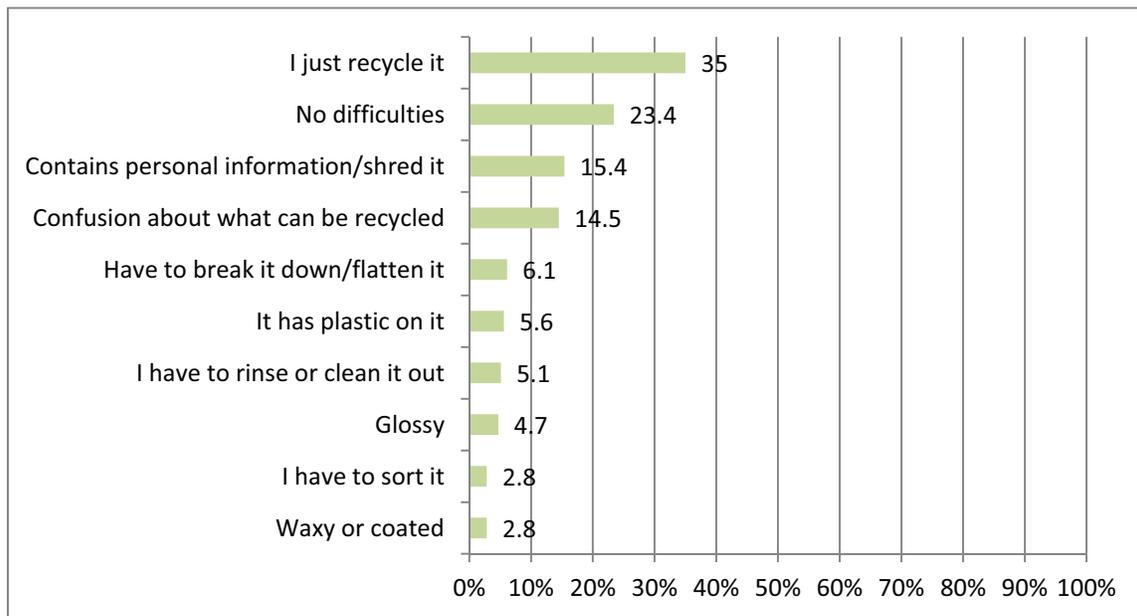
The following figures (Figure 14 to Figure 15) describe results for survey items asking residents why they might fail to recycle mixed paper, plastics, and poly-coated containers. Following this is a description of the responses to the remaining items about which respondents were asked. Included is a detailed definition of each material, as well as the specific examples used by interviewers to describe each material to residents. Material definitions were provided by representatives from King and Snohomish Counties.



## Mixed Paper

- Nearly all households (89.3%) had mixed paper in their garbage carts.
- Residents stated that recycling mixed paper was *extremely important* ( $M=9.12$ ,  $SD=1.74$ ) and that it was *not at all difficult* to do ( $M=.69$ ,  $SD=1.49$ ).
- Having to *shred* paper that contains personal information and *confusion* about what is recyclable were the biggest barriers to recycling mixed paper.

Mixed paper was described to residents as: *mixed paper, such as junk mail, magazines or detergent boxes*<sup>10</sup>.



**Figure 14. Can you tell me about challenges when recycling mixed paper? (N=214)**

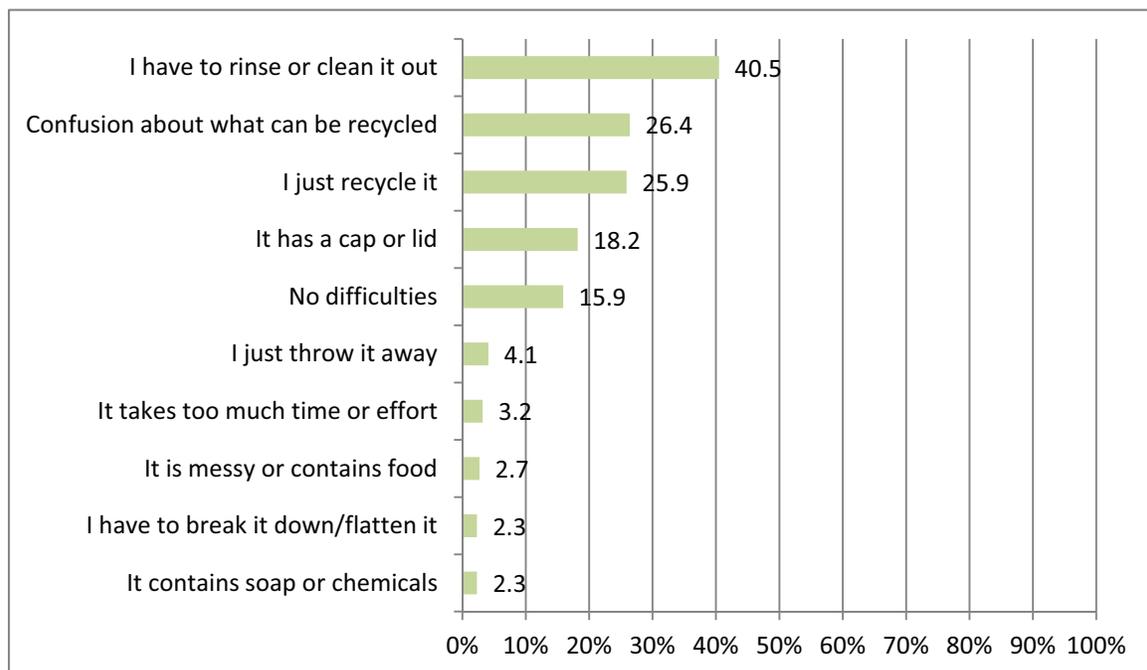
The largest proportion of respondents indicated that they simply recycle mixed paper or experience no difficulties in recycling it. This included those who had mixed paper found in their garbage cart. Among barriers or challenges to recycling this type of material, the most often cited factors were that it might contain personal information or that there was some confusion about whether or not this type of paper can be recycled.

<sup>10</sup> A full description of the mixed paper material category can be found in Appendix A.

## Plastic

- Nearly all households (85.3%) had plastic in their garbage carts.
- Residents stated that recycling plastic was *extremely important* ( $M=9.16$ ,  $SD=1.67$ ) and that it was *not at all difficult* to do ( $M=1.35$ ,  $SD=2.30$ ).
- Having to *rinse or clean* plastic containers and *confusion* about what is recyclable were the biggest barriers to recycling plastics.

Plastics were described to residents as: *plastics, such as plastic water bottles, yogurt, or liquid soap containers*<sup>11</sup>.



**Figure 15. Can you tell me about challenges when recycling plastic containers? (N=220)**

Similar concerns were voiced about plastic containers, with about 40% of responses referencing the need to rinse or clean the item before recycling it. Again, residents were not sure about whether or not plastic containers are recyclable. One specific reason mentioned was that residents were not sure whether or not the caps or lids on the items could be included in the recycling. Caps and lids were cited as a challenge or source of confusion by 22 residents.

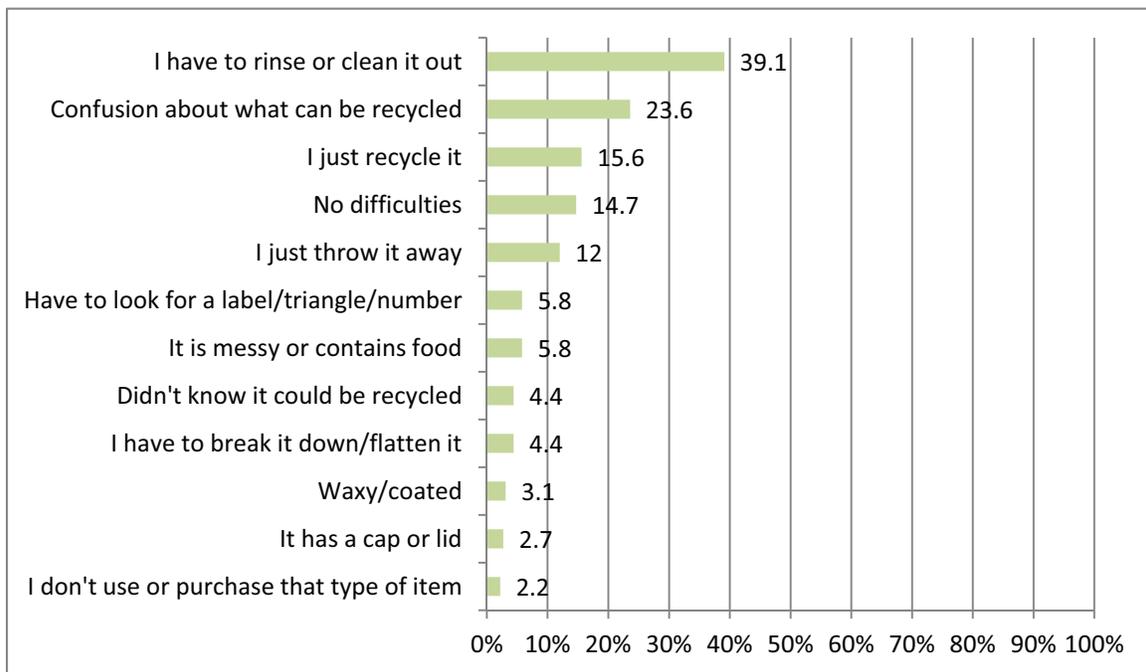
<sup>11</sup> A full description of the plastic container material category can be found in Appendix A.



## Poly-Coated Containers

- A large number of households (64.4%) had poly-coated containers in their garbage carts.
- Residents stated that recycling poly-coated containers was *important* ( $M=8.32$ ,  $SD=2.64$ ) and that it was *not difficult* to do ( $M=2.80$ ,  $SD=3.42$ ), although it was the highest difficulty rating reported.
- Having to *rinse or clean* poly-coated containers and *confusion* about what is recyclable were the biggest barriers to recycling plastics.

Poly-coated containers were described to residents as: *poly-coated containers, such as ice cream, soy milk, or juice box containers*<sup>12</sup>.



**Figure 16. Can you tell me about challenges when recycling poly-coated containers? (N=225)**

In contrast, a relatively large percentage of respondents reported some challenges with recycling poly-coated containers. Specifically, they mentioned the need to rinse or clean the package and expressed some doubts about whether this type of package can be recycled.

<sup>12</sup> A full description of the poly-coated containers material category can be found in Appendix A.

## Barriers to Recycling Other Garbage-Cart Sort Materials

- The number of households asked about newspaper and cardboard, glass, aluminum cans, and tin was relatively small. The small sample sizes mean that responses about barriers are less precise than responses to the other materials (i.e., mixed paper, plastic, and poly-coated containers).
- Responses are worth noting as they display patterns similar to those found with mixed paper, plastic, and poly-coated containers.
- The barriers reported had to do with *preparation* of the materials and *confusion* about what can be recycled (i.e., removal of caps or lids on glass containers).

In addition to the three types of materials included in all surveys, each resident received a series of questions about one additional type of material found in the household garbage-cart sort; newspaper and cardboard, glass, aluminum cans, or tin<sup>13</sup>. Because the number of residents who were asked about each of these materials was too small to be precise, responses to the challenge questions are presented without percentages. However, responses about those materials are listed because they display patterns similar to those found with mixed paper, plastic, and poly-coated containers. Only those challenges mentioned by more than one resident are listed.

As was the case with the three most common materials, challenges to recycling newspaper and cardboard, glass, aluminum and tin revolved around the need to process the material in some way before recycling it, either by cleaning it out or compacting it. However, at least some residents also expressed confusion about whether or not these items can be recycled in all instances.

### Newspaper and Cardboard

Newspaper and cardboard was described to residents as: *newspaper, cardboard boxes, or paper bags*.

Challenges to recycling **newspaper and cardboard** (N=26) included:

- I have to break it down/flatten it
- No difficulties/I just recycle it
- Confusion about what can be recycled
- It takes up too much space

<sup>13</sup> A full description of the material category for these items can be found in Appendix A.



## **Glass**

Glass was described to residents as: *glass beer or soda bottles; pasta sauce jars.*

Challenges to recycling **glass** (N=43) included:

- No difficulties/I just recycle it
- I have to rinse or clean it out
- Confusion about what can be recycled
- It has a cap or lid

## **Aluminum Cans**

Aluminum cans were described to residents as: *aluminum soda or pet food cans.*

Challenges to recycling **aluminum cans** (N=11) included:

- I have to rinse it out or clean it
- I just recycle it
- Confusion about what can be recycled

## **Tin Cans**

Tin cans were described to residents as: *tin soup or vegetable cans.*

Challenges to recycling **tin cans** (N=22) included:

- No difficulties/I just recycle it
- I have to rinse or clean it out
- I didn't know it could be recycled
- It takes too much time or effort
- I just throw it away

## General Household Attitudes and Habits Concerning Recycling

- Overall, residents reported environmental reasons for recycling, such as, *it's good for the environment* and *it reduced or keeps garbage out of landfills*. Many also stated that it was *the right thing to do*.
- Residents reported that they might not recycle an item out of *laziness* or when the item *needs cleaning* or *the bin is full*.

Residents were asked to describe why their household recycles. The survey also asked residents to think of a time when they did not recycle an item that they knew was recyclable and to describe the reason. They were further asked what they might do with an item if they were not sure whether or not it could be recycled. Finally, they were asked what they do when their garbage or recycling cart is full.

### Why Residents Recycle

Most residents indicated that they recycle because it was good for the environment, including specific benefits such as reducing the amount of garbage disposed of in landfills, and saving energy. The remainder of residents indicated that it was the right thing to do, that it was easy and convenient, or that it was what they were accustomed to doing. See Figure 17.

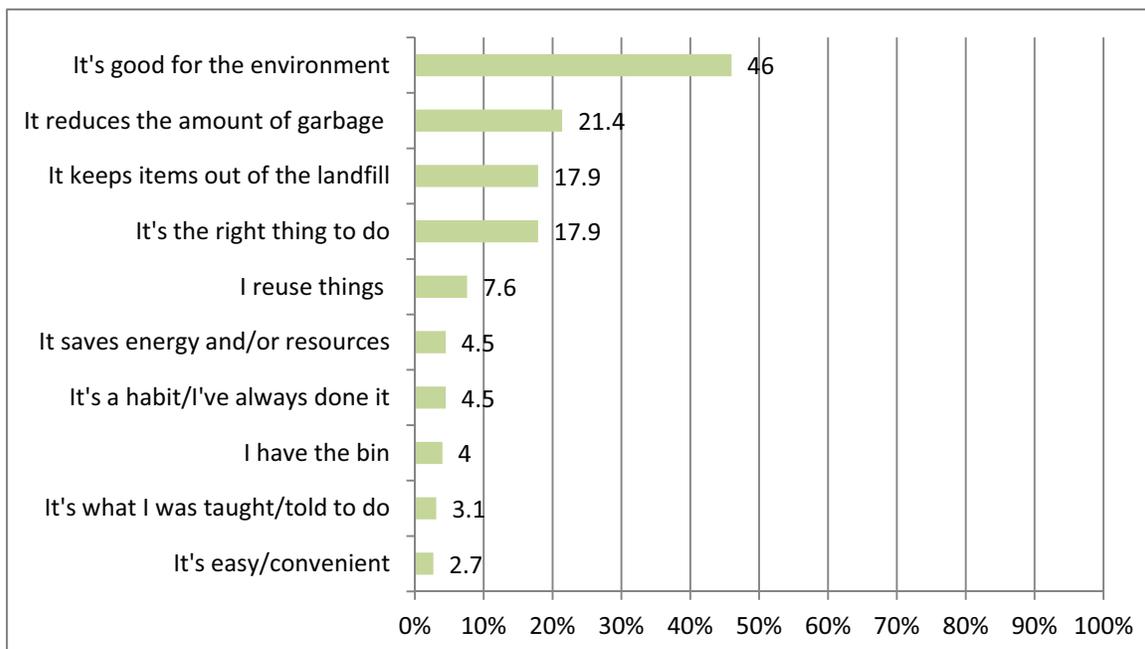
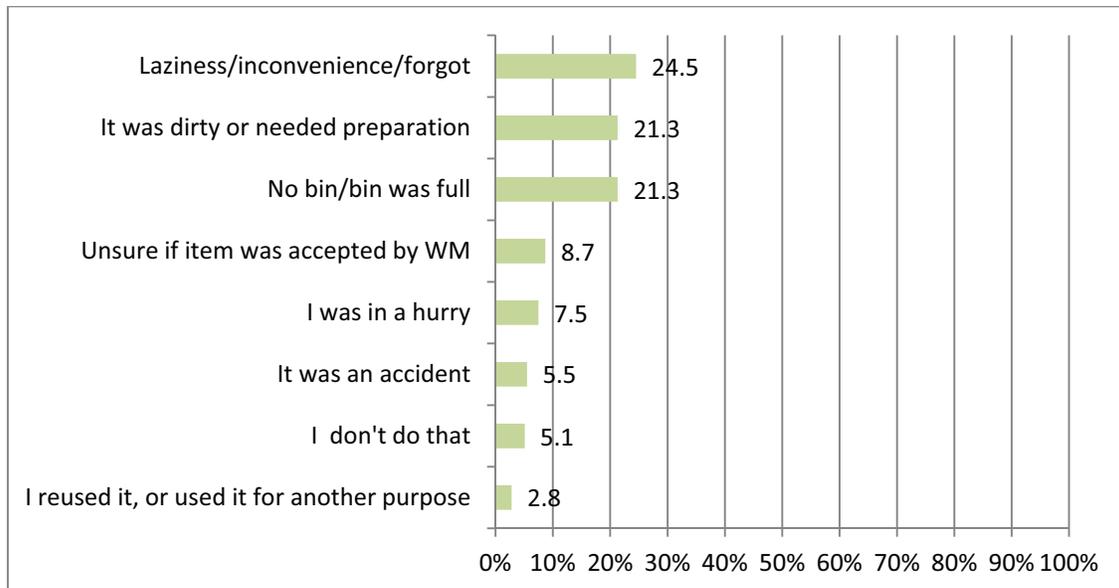


Figure 17. Why does your household recycle? (N=224)



### Why Residents Might Not Recycle

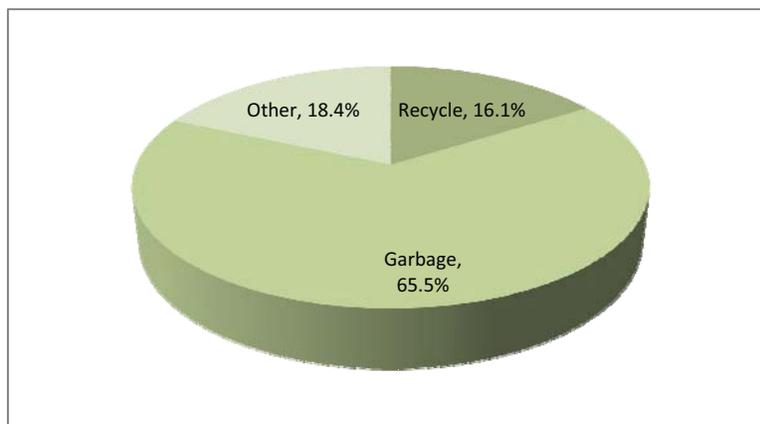
Most residents reported that they did not recycle items because it was inconvenient or because they needed to prepare the item for recycling in some way. See Figure 18.



**Figure 18. If you ever did not recycle an item you knew could be recycled, what was the reason? (N=220)**

Respondents were also somewhat more likely to throw away an item if their recycling cart was full.

The majority of people who were asked what they do with an item they were unsure about said that they put it in their garbage cart. See Figure 19.

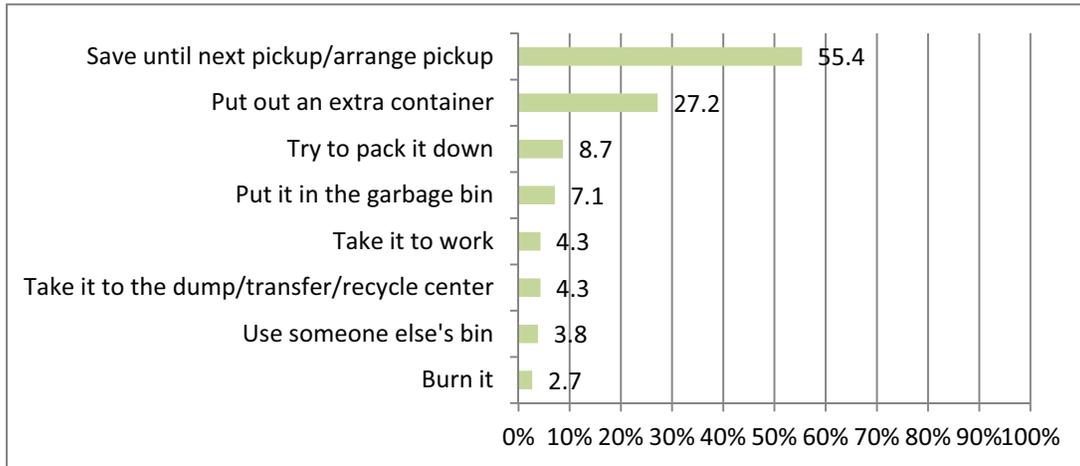


**Figure 19. What do you do with an item you are unsure about? (N=223)**

Approximately 18% of respondents reported that they did “other” things with items that they were unsure about. The most common responses in the “Other” category were checking the item for a label or other information (N=20), or looking at printed information provided by Waste Management on a flyer or on the cart itself (N=14). A few individuals also mentioned asking other people (N=8), just guessing (N=7), or looking for information on the Internet (N=3).

*When the Recycling Cart is Full*

When asked what they do when their recycling cart is full, most respondents said that they either leave it until the next scheduled pick-up or arrange for a pickup. Only about 10% of respondents who had experienced a full recycling cart said that they did not arrange for the excess items to be recycled it some way and instead chose to burn recyclables or put them in the trash when their cart was full. See Figure 20.

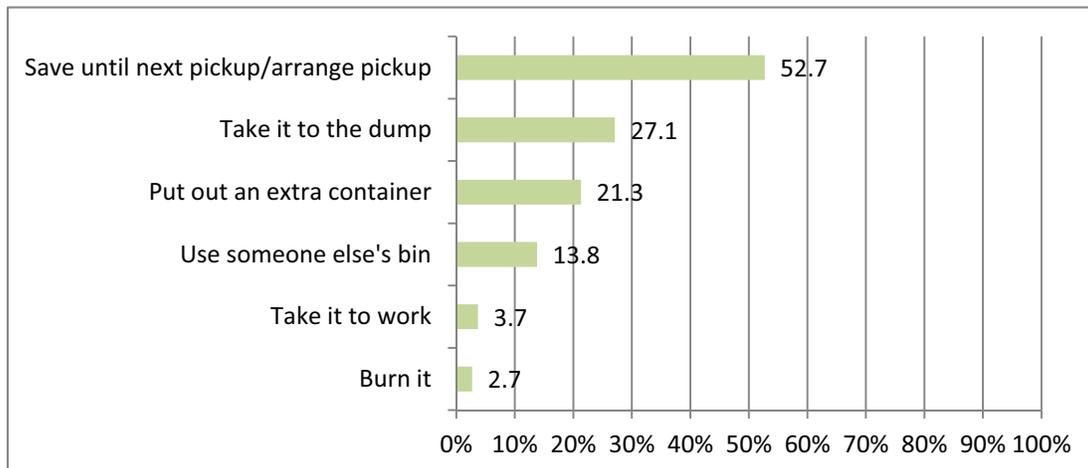


**Figure 20. What do you do when your recycling cart is full? (N=188)**

About 16% of residents said they had never experienced an occasion when their recycling cart was full.

*When the Garbage Cart is Full*

Residents gave similar responses when asked what they did when their garbage cart was full, although they were more likely in that case to take the garbage to an alternate site themselves. See Figure 21.



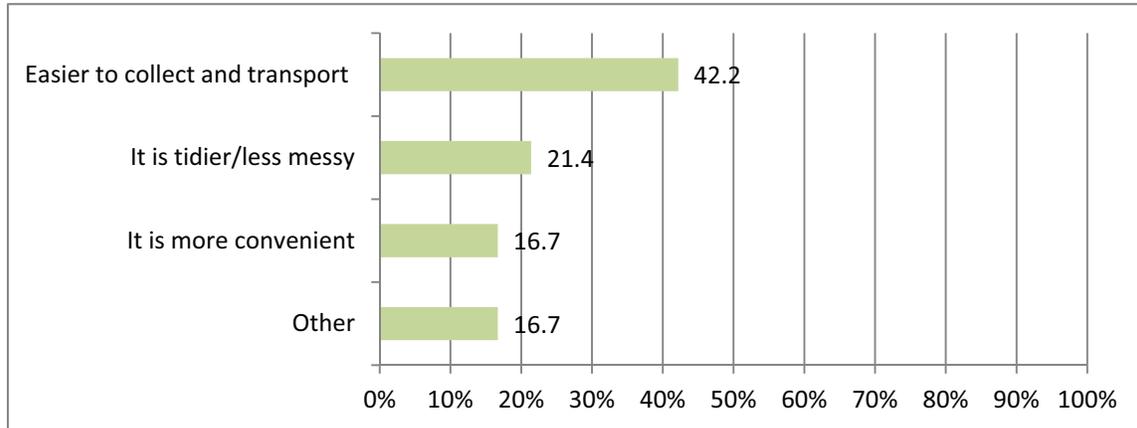
**Figure 21. What do you do when your garbage cart is full? (N=184)**

Again, about 16% said they had never experienced a full garbage cart.



### Bagging Recyclables

Residents were asked if they bag their recyclable before placing them in the recycling cart. Over 82% of those surveyed said they did not bag their recyclables before placing them in their cart.



**Figure 22. Why do you bag your recyclables? (N=40)**

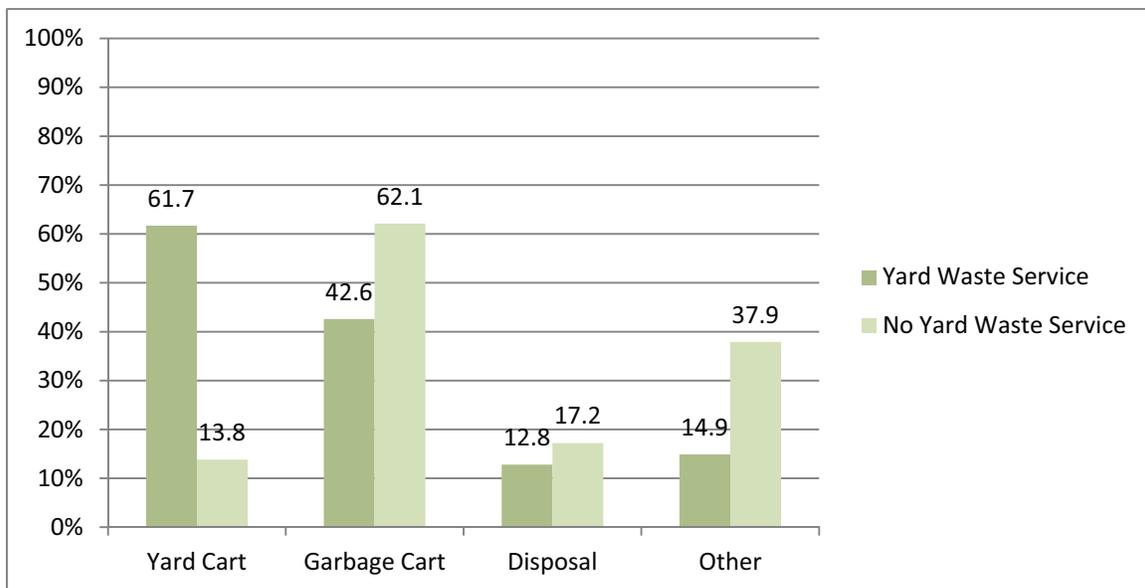
Among the 18% who did, the most common reason was that bagging items makes it easier to collect and transport them to the cart and, to a lesser extent, to keep the cart or collection area cleaner. See Figure 22.

## Recycling of Food Scraps and Food-Soiled Paper

In a separate section of the survey, residents were asked about what they typically did with food scraps and food-soiled paper. They were also asked about their awareness of the fact that these materials could be recycled in their yard waste carts. Residents were first asked what they did with their food scraps and food-soiled paper.<sup>14</sup> Where appropriate, results are presented separately for respondents who were currently listed as having yard waste service and those who were not<sup>15</sup>. At the time of the in-person survey, approximately 62% of King County respondents and 27% of Snohomish County respondents were listed as having yard-waste service.

### Food Scraps

Most residents who had yard waste service (N=87) stated that they were disposing of at least some food scraps in their yard waste cart (61.7% in King County and 57.5% in Snohomish County). Approximately 16% of those in King County and 9% of those in Snohomish County stated that they put all of their food scraps in the yard waste cart each week; yet, 97.7% of households had food scraps in their garbage cart. Across both counties, those who stated they did something else with their food scraps mentioned composting, feeding it to animals, or dumping it on their land. See the figure below.



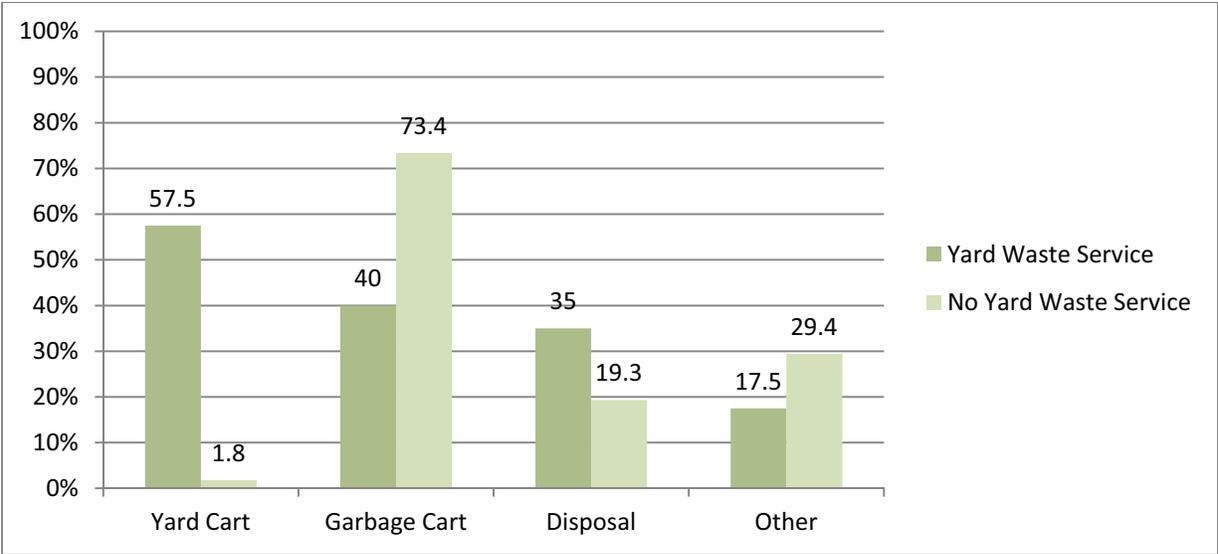
**Figure 23. Where do you place your household food scraps? (King County, N=76)**

Nearly two-thirds (62.1%) of the residents in King County who did not have yard waste service stated that they were disposing of food scraps in their garbage cart.

<sup>14</sup> Because only 3 residents did not have food scraps and only 10 residents did not have food-soiled paper found in their garbage cart sorts, all residents were included in analyses for these materials.

<sup>15</sup> In each county, a few residents who were not coded as having yard waste service reported placing food scraps and/or food soiled paper in their yard cart. It may be that these residents had recently begun yard waste service.



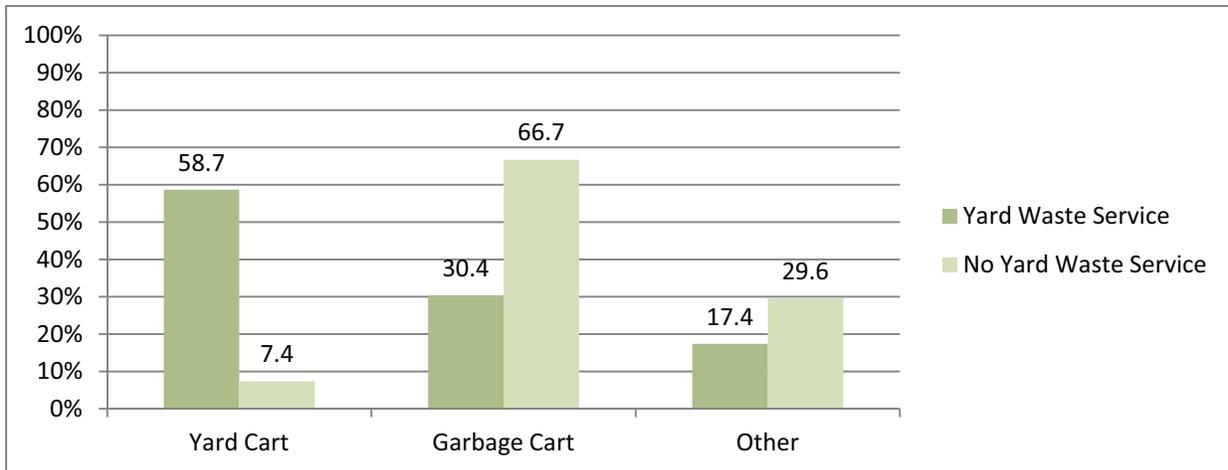


**Figure 24. Where do you place your household food scraps? (Snohomish County, N=149)**

Nearly three-quarters (73.4%) of the residents in Snohomish County who did not have yard waste service stated that they were disposing of food scraps in their garbage cart. See the figure above.

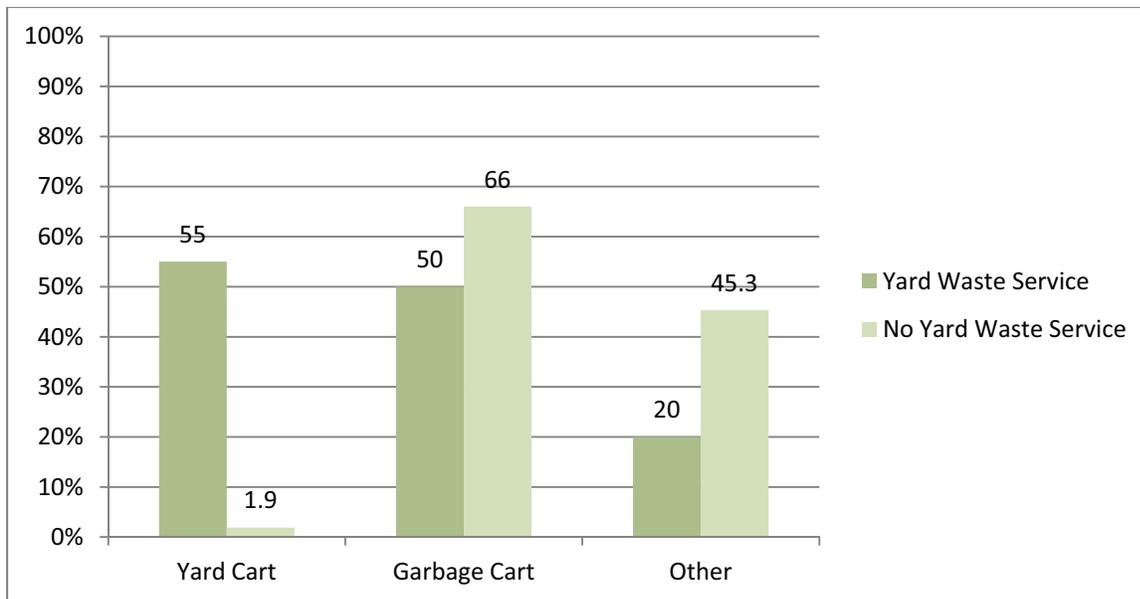
*Food-Soiled Paper*

Most residents with yard-waste service reported putting their food-soiled paper in their yard waste carts (58.7% in King County and 55% in Snohomish County); yet 96.6% of households had food-soiled paper in their garbage cart. Those who did not have yard waste service were most likely to put food-soiled paper in the garbage cart. Among those who said they did something else with food-soiled paper, the largest number in both counties said that they put it into their recycling cart. See Figure 25 and Figure 26.



**Figure 25. Where do you place your food-soiled paper? (King County, N=76)**

In King County, those who did not have yard waste service were most likely to put food-soiled paper in the garbage cart (66.7%).

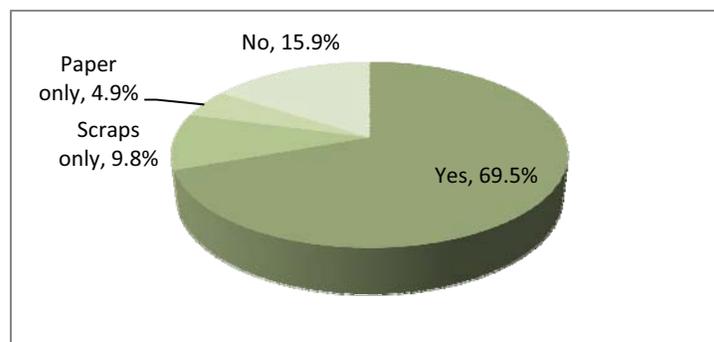


**Figure 26. Where do you place your food-soiled paper? (Snohomish County, N=149)**

In Snohomish County, those who did not have yard waste service were most likely to put food-soiled paper in the garbage cart (66%).

*Awareness of Recycling of Food Scraps and Food-Soiled Paper*

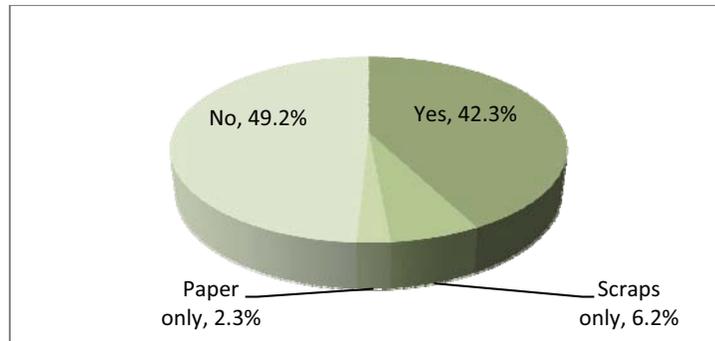
After residents were informed that Waste Management encourages them to recycle food scraps and food-soiled paper, they were asked if they had been aware that both of these could be placed in their yard waste cart. The results are displayed for those with yard-waste service and those without yard-waste service. See Figure 27 and Figure 28.



**Figure 27. Awareness of food scrap and food-soiled paper recycling for those with yard waste service (N=82).**

The majority of residents who currently had yard waste service were aware that both food scraps and food-soiled paper could be recycled in their yard waste carts.

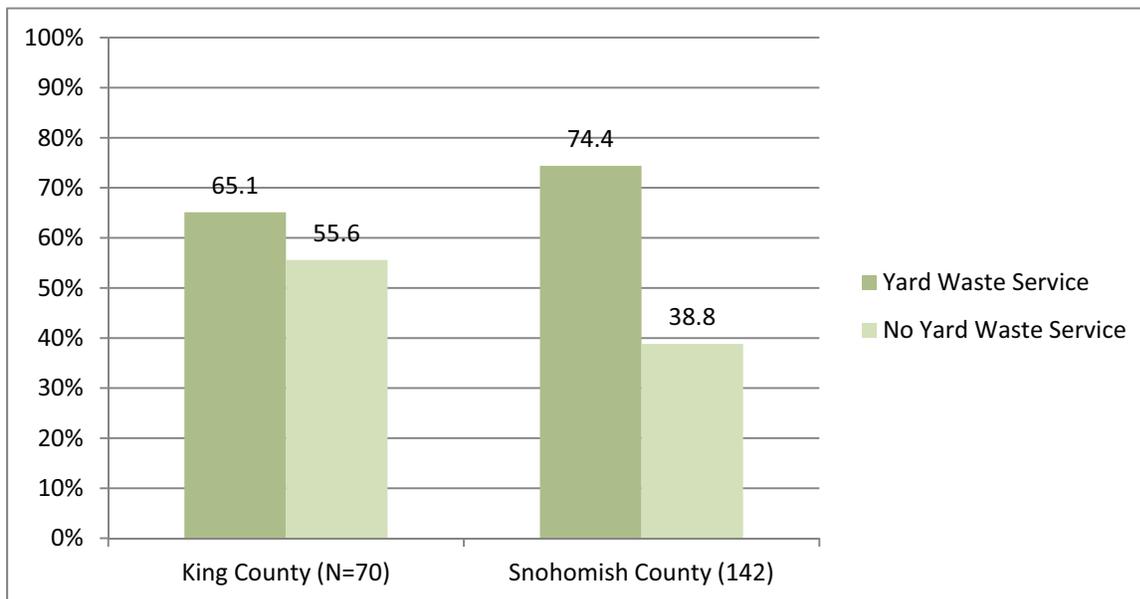




**Figure 28. Awareness of food scrap and food-soiled paper recycling for those with no yard waste service (N=130)**

Almost half of those who did not have yard waste service were not aware that yard waste carts could be used to recycle food scraps and food-soiled paper.

A breakdown of “Yes” responses showed that awareness was higher in Snohomish County among those who had yard waste service than among those who did not, but that over half of King County residents knew about food waste recycling whether or not they had yard waste service. See Figure 29.



**Figure 29. Percentage of residents aware of both food scrap and food-soiled paper recycling by county.**

Over half of King County residents (55.6%) and over one-third of Snohomish County residents (38.8%) without yard-waste service stated they were aware that food scraps and food-soiled paper could be placed in the yard waste cart.

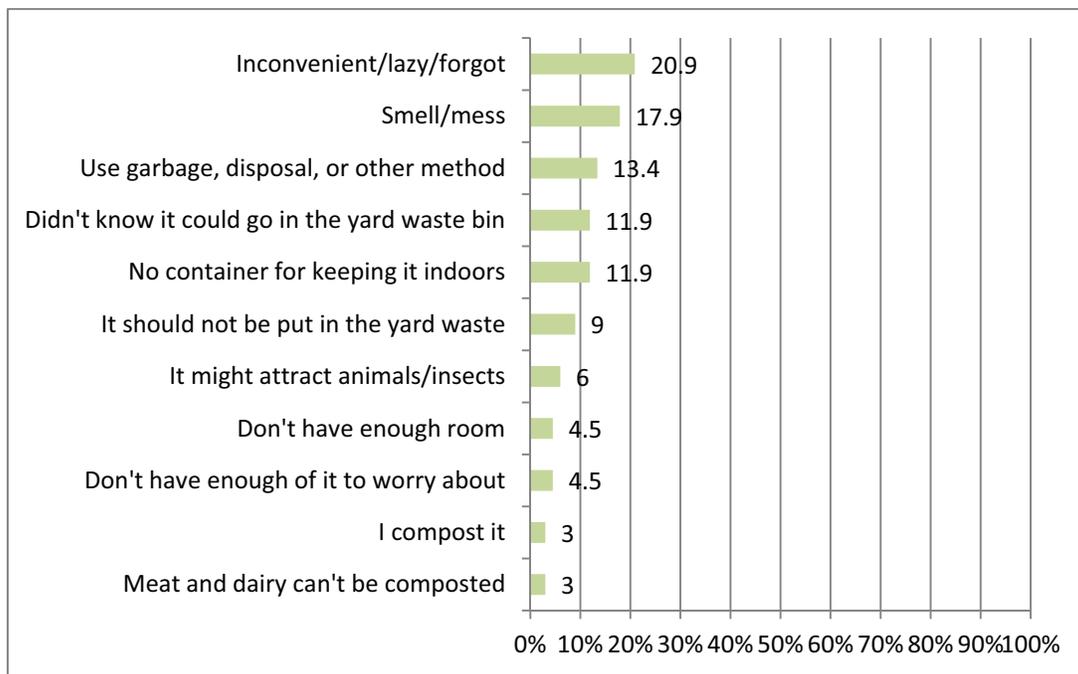
*Estimates of Food Scrap Recycling by Residents*

Those who reported putting food scraps in their yard waste cart were also asked to estimate how much was placed in the yard cart in a given week, where 0 was “None” and 10 was “All.” The median estimate for King County was 7 and the median estimate for Snohomish County was 3.5. Approximately 16% of those in King County and about 9% of those in Snohomish County said that in a given week they put “all” of their food scraps in the yard waste cart.

**Barriers to Recycling Food Scraps and Food-Soiled Paper**

For those who had yard waste service and stated that they did not recycle all of their food scraps and food-soiled paper (N=67), *inconvenience, laziness, forgetfulness, and smell or mess* were the most cited barriers to recycling food scraps and food-soiled paper.

Those who did not say they were recycling all of their food scraps and food-soiled paper were then asked to explain why. Responses to this item are shown in Figure 30.

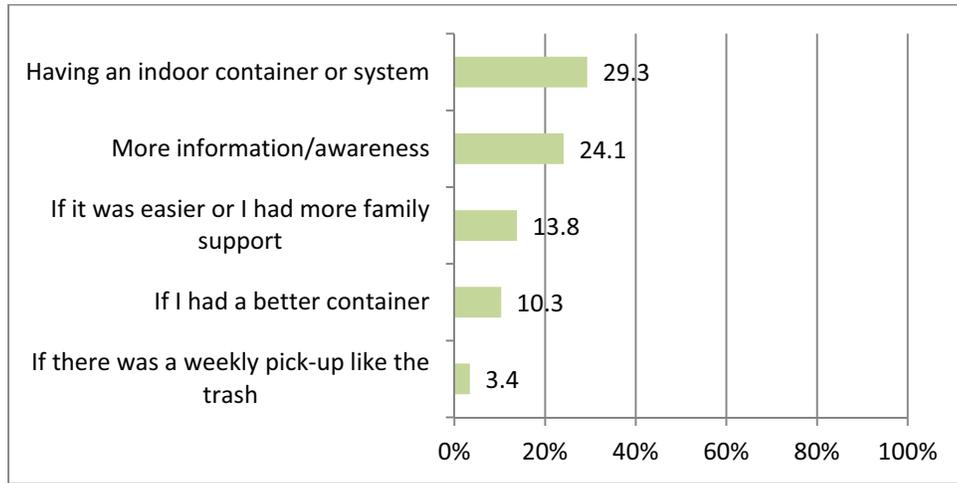


**Figure 30. Why don't you put all of your food scraps and food-soiled paper in your yard waste cart? (N=67)**



### *Likelihood of Recycling Food Scraps and Food-Soiled Paper*

Those who were not fully aware of food scrap and food-soiled paper recycling before the survey were asked to give a numeric rating of how likely they would be to recycle in the future, where 0 was “Not at all likely” and 10 was “Very likely.” The mean response was 7.16 (SD=2.99). Respondents who had rated their likelihood of recycling food scraps and food-soiled paper as low (“0” to “6”) were asked to describe what might make it more likely for them to do so. Figure 31 shows the responses to this question.



**Figure 31. What would make you more likely to put your food scraps and food-soiled paper in your yard waste cart? (N=58)**

Attitudes Toward Using Yard Waste Services

Cost was shown to be a significant reason why residents don't obtain yard-waste service.

About 61% of all residents included in the survey did not have yard waste service.<sup>16</sup> Three survey questions were included to explore the reasons for this and to find out if knowing about the option of recycling food scraps and food-soiled paper in their yard waste cart would have any impact on this decision.

The most commonly mentioned reasons for not having yard waste service were that the resident composted the material themselves, or that they were concerned about the cost of the service. See Figure 32.

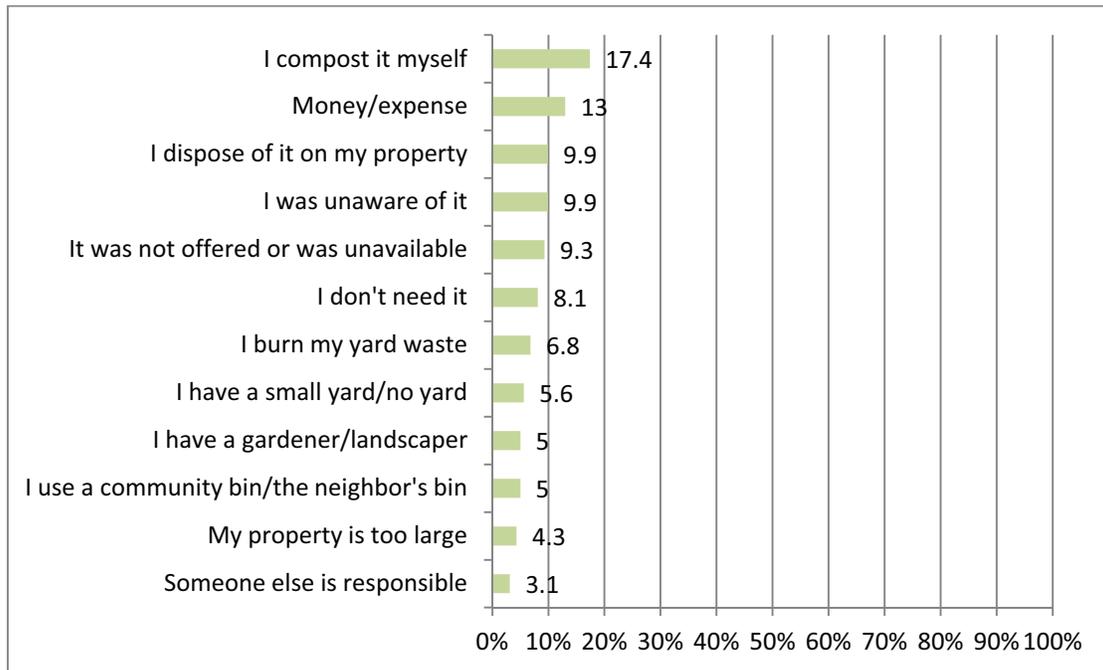


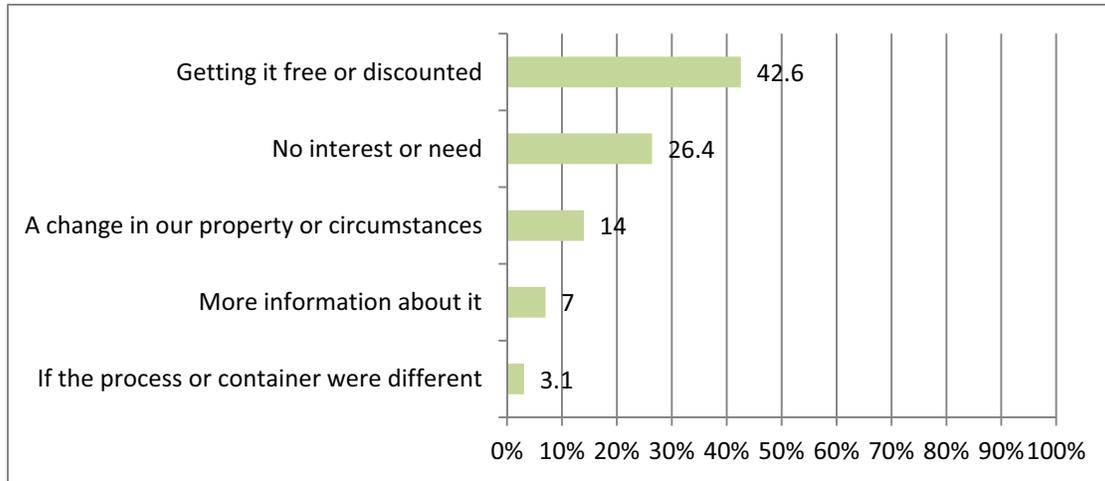
Figure 32. Why don't you currently have yard waste service? (N=129)

<sup>16</sup> Percentages of those having yard waste service differed significantly across counties. About 62% of King County residents have the service compared to about 27% of Snohomish County residents. However, reasons for not having the service and factors that would make it more likely to start the service did not differ between counties.



### Likelihood of Starting Yard-Waste Service

Respondents were moderately favorable about the likelihood of starting yard-waste service, now that they know about the option for recycling food scraps and food-soiled paper: On a scale where 0 was “Not at all likely” and 10 “Very likely,” half of residents rated their likelihood at “7” or higher.<sup>17</sup>



**Figure 33. What would make you more likely to start yard service? (N=121)**

The most important factor was again *cost*. However, over a quarter of responses related to *not currently having a need for the service*.

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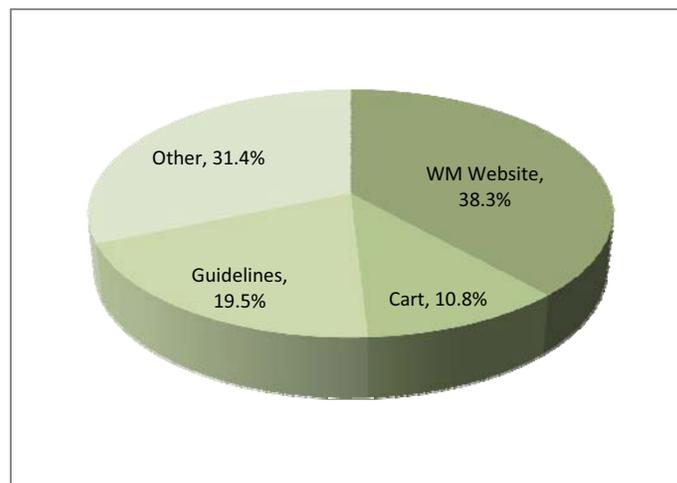
<sup>17</sup> Mean=7.16, SD=2.99

## Seeking Information about Recycling

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Materials provided by Waste Management were utilized most often by residents seeking information about recycling.

The final section of the survey asked respondents to describe how recycling was handled in their household and how they prefer to get information about recycling. First, they were asked to describe where they would go to find information about recycling. Most respondents indicated that they would use one of the resources currently provided by Waste Management: the website, the flyer distributed to residents or information located on their recycling cart. However, some residents did mention other resources. See Figure 34.



**Figure 34. Where do you go if you have a question about recycling? (N=225)**

The most popular “other” responses were “Googling” or searching the Internet for information, calling Waste Management, or asking someone.

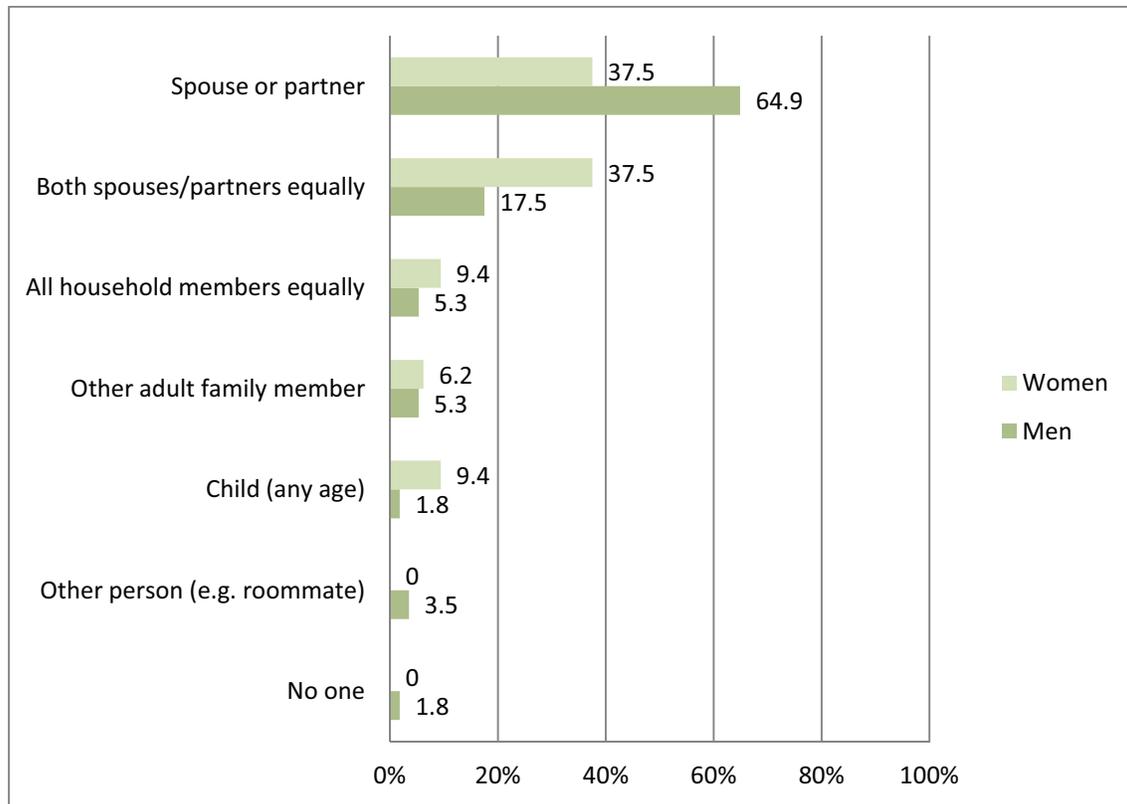


## Responsibility for Recycling in the Household

Very clearly, adults are in charge of recycling within the household. Noteworthy, was the response to the question about who in the household was *most uncooperative about recycling*: In households with children under the age of 18 (N=98), 56.1% stated that children were the most uncooperative.

Over half (58.7%) of survey respondents said they were the one who was most responsible for recycling. Women were somewhat more likely than men to say that they were most responsible (63.2% vs. 54.1%), but this difference was not statistically significant.

The figure below shows a breakdown of responses for those who stated the person responsible was not themselves.

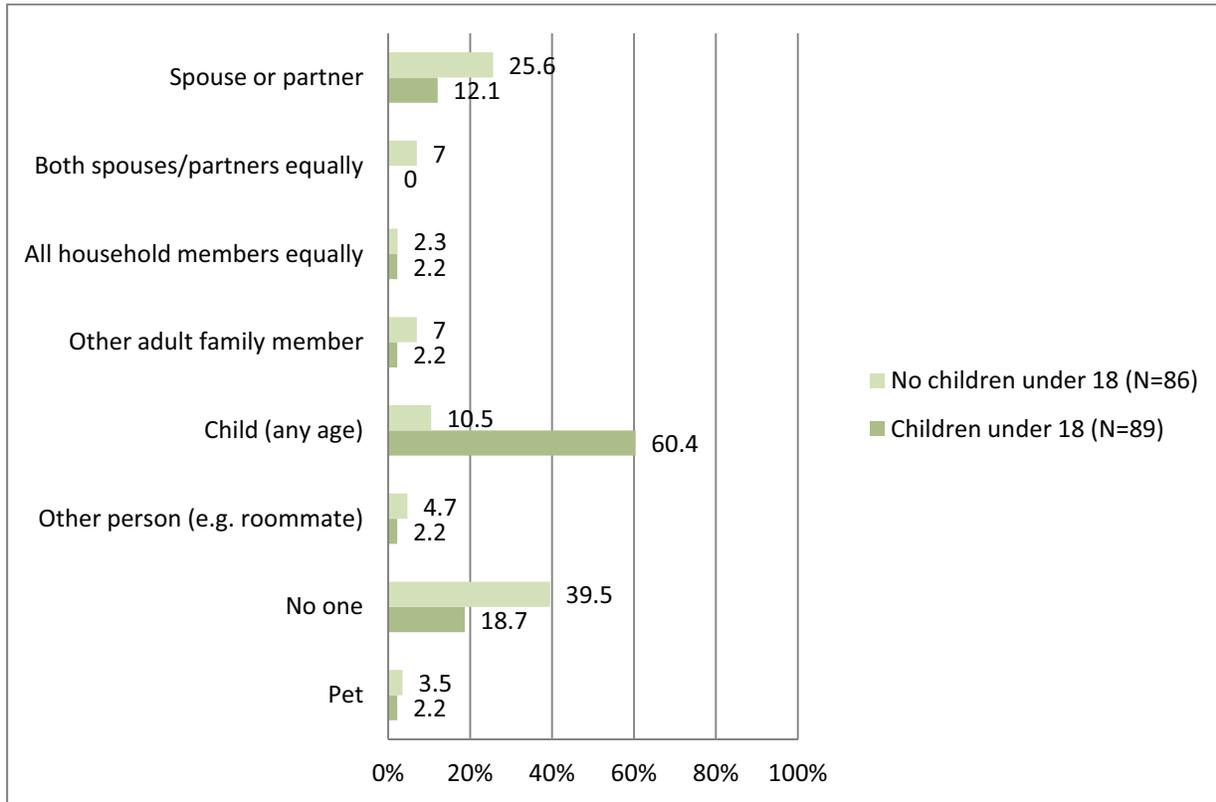


**Figure 35. Who is most responsible for recycling (excluding respondent) (N=89)?**

If the response was other than self, men were more likely to say that the person primarily responsible was their spouse or partner (64.9%); women were more likely to say that they shared responsibility equally with their spouse or partner (37.5%).

*The Presence of Children*

The figure below shows a breakdown of responses for those who stated the least cooperative person was not themselves, by whether or not there were children under 18 in the household. When there were children under 18 in the household, a child or children were most likely to be cited as the least cooperative with respect to recycling.



**Figure 36. Who is least cooperative when it comes to recycling (excluding respondent)?**

When asked who in the household was least cooperative, only 13.3% of respondents chose themselves. Men were more likely than women to say that they were the least cooperative person (17.9% vs. 6.5%). In households where there was no child under 18, respondents were more likely to say either that no one was uncooperative (39.5%), or that their spouse or partner was least cooperative (25.6%).



## RECOMMENDATIONS

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Most notably, residents are highly motivated to recycle: they consider recycling to be a very important thing for themselves and their neighbors to do. With the exception of food scraps and food-soiled paper, residents stated that recycling was not difficult. Therefore, behavior-change tools that leverage high motivations and low barriers are likely to be effective in increasing residential recycling rates in the WUTC areas.

### Data-Driven Results

The findings from this research are quite promising. The quantitative analyses from the garbage-cart sorts and in-person surveys combined with qualitative comments from the interviewers indicate that there are ways to greatly improve proper disposal of specific material types in the WUTC areas of King and Snohomish Counties. The research goals for this project were reached with the exception of *identifying the needs of the ethnic populations of interest*. The research goals were to:

- Identify current baseline recycling behaviors that allow for tracking change over time (this was accomplished through the waste characterization study);
- Identify the values, attitudes, and beliefs that relate to recycling and the value of recycling, identify barriers and effective motivations or incentives for desired behavior changes, and identify the most effective communications tools to achieve the desired behavior changes (these were achieved through administration of the in-person survey); and
- Identify needs of ethnic populations of interest.

As noted earlier in the report, there were two major barriers to recycling materials that belong in the recycling cart. First, they were less likely to recycle an item if it required some sort of preparation, such as rinsing or cleaning, or if they had to break it down. The second major reason was uncertainty about whether or not the item could be recycled. Respondents made it clear that being unsure about an item greatly increased the likelihood that it would simply be discarded in the garbage.

The target audience for a behavior-change program to increase residential recycling rates is those who are not currently engaged in the desired behaviors. Fortunately, all residents are engaging in recycling behaviors to some degree (with the exception of food scraps and food-soiled paper), and the program elements we are recommending entail increasing accuracy.

About 60% of the households in King County and 40% of the households in Snohomish County included children under the age of 18. Although the analysis showed that there were not differences in households with and without children in terms of the barriers to recycling specific material types, for households with children, children were most often cited as least cooperative with recycling. Therefore, outreach materials and messages should include recognition of the varying context of resident's lives. In other words, extra burden may be placed on household members to correct recycling actions taken by children.

For example, residents may need to re-sort items that are mistakenly placed into the trash by a child or to process or clean items that are not thoroughly cleaned or processed by younger children. These questions could be addressed using focus groups or other small-sample qualitative research methods.

## Behavior Change Tools

CBSM is an effective framework for understanding, designing, and evaluating the programmatic steps that can be taken to increase recycling behavior.<sup>18</sup> CBSM begins with the careful selection of a target audience and a specific target behavior, and then uses a four-step process to foster sustainable behavior change. These four steps are (1) identifying the barriers to the targeted behavior, (2) selecting behavior change tools to overcome the barriers, (3) piloting the selected tools using an empirical research methodology and a control group, and (4) evaluating the project upon implementation. The scope of this project will proceed through the first two steps of CBSM (identifying barriers and selecting behavior-change tools), which will generate recommendations for conducting a behavior change pilot program.

Community –based social marketing (CBSM) provides a useful framework for changing recycling behavior. The community-based social marketing approach dictates that the specific behavior change tools that will be most effective depend on the combination of barriers and benefits to the target behavior.<sup>19</sup> Drawing on behavioral science, CBSM utilizes strategies such as incentives, commitment, prompts, social modeling, and social norms to promote change. Importantly, each of these tools is matched to the behavior and the context, and some tools work better in some situations than others. Figure 37 summarizes what tools have been shown to be most effective, based on each combination of low versus high barriers and benefits.

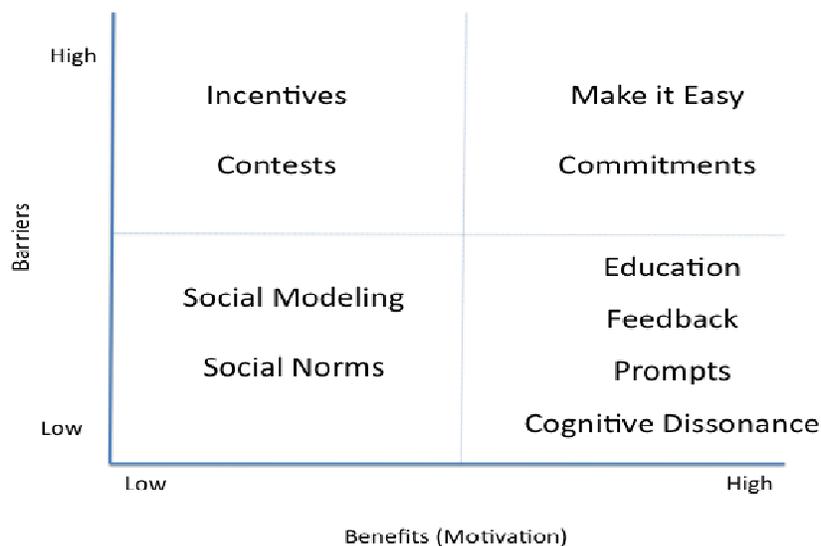


Figure 37. Behavior change tools<sup>20</sup>

<sup>18</sup> McKenzie-Mohr, D., et al (2012). *Social Marketing to Protect the Environment: What Works*. Los Angeles: SAGE Publications.

<sup>19</sup> McKenzie-Mohr, D., & Schultz P.W. (2012). Choosing effective behavior change tools. Available on line at <http://media.cbsm.com/uploads/1/BECC.pdf>.

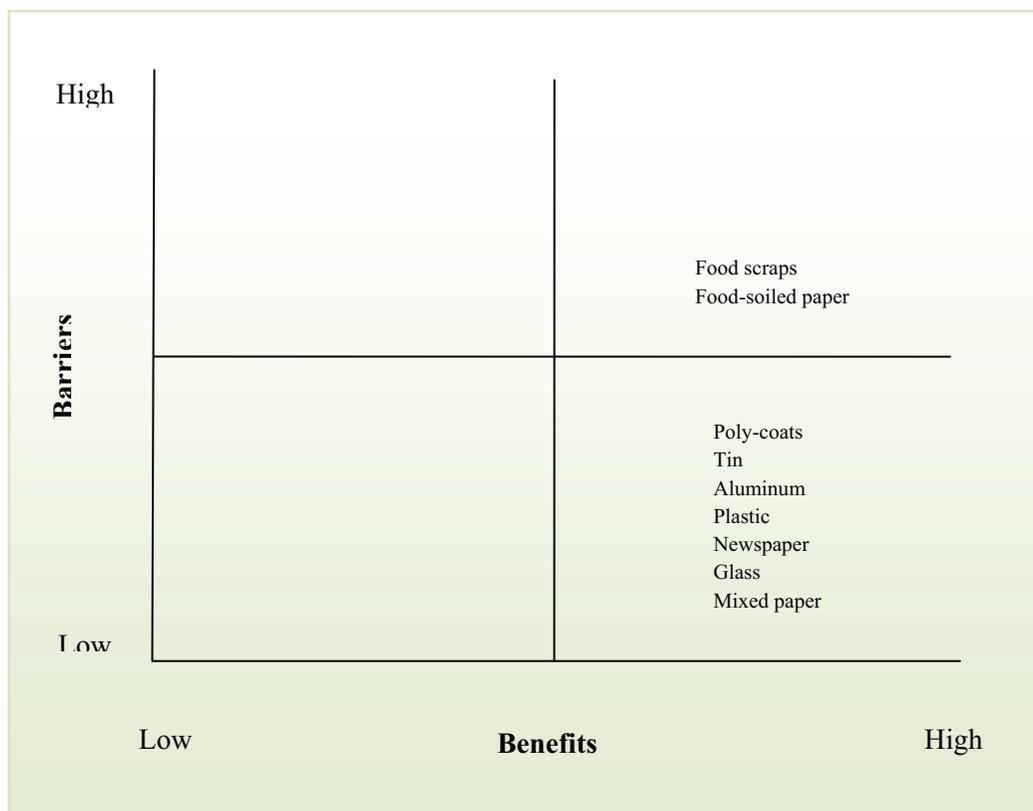
<sup>20</sup> From Schultz (2013). Strategies for promoting proenvironmental behavior: Lots of tools but few instructions. Used by permission of the author.



By examining where respondents fell on the continuum of barriers and benefits for each type of recyclable material based on their survey responses, we can make decisions about what type of approach will be most likely to produce meaningful behavior change.

### Behavior-Change Tools for Materials That Belong in the Recycling Cart

The survey indicated that for mixed paper, plastics, poly-coated containers, newspaper and cardboard, glass, aluminum cans and tin cans, residents saw high value to the environment in recycling them (High Benefits) and little difficulty in doing so (Low Barriers). Residents rated recycling as over “9” on scale of importance from “0” to “10” and rated the difficulty of recycling as less than “3” for all seven garbage-cart sort materials on a similar scale. For these items, then, benefits are high and barriers to recycling are relatively low. See the figure below.



**Figure 38. Plot of barriers and benefits to recycling garbage-cart sort items.**

For these reasons, we should look to the behavior change tools located in the lower right hand quadrant of Figure 41. The outreach approaches most closely linked to high motivations and low barriers are cognitive dissonance, education, feedback, and prompts. These approaches should be combined and utilize the specific reasons given by residents for not recycling these items in order to encourage the desired behavioral changes.

### *Cognitive Dissonance*

Cognitive dissonance refers to a state of discomfort caused when an individual's attention is drawn to inconsistency between his or her behavior and important attitudes or values. He or she will then be motivated either to change the thought or the behavior. Residents in the present study told us that recycling was both important to them and easy to do. Approaches to behavior change that fall into this category would include information reminding them that they consider recycling to be important and urging them to be consistent in carrying out the behavior. Further, research has shown that once people have performed an easier behavior (e.g., recycling mixed paper), efforts to encourage them to perform more challenging behaviors (e.g., recycling pet food cans) may be more successful. This approach could therefore be used to help overcome the barrier of cleaning or preparing items for recycling. Messaging to residents would ideally include information about recycling behaviors they are already doing well, tied to a request to extend that behavior to items where recycling is less consistent.

### *Education*

People who fail to recycle items even in the face of high motivation and low barriers may be encouraged to improve their recycling rate if they were provided targeted information about those items where there is lingering confusion about recycling rules. Several items in the present survey fit this category, particularly poly-coated containers, mixed paper which might be coated or glossy or contain plastic parts, and plastic containers which come in a variety of types. Residents indicate that they do go to Waste Management's resources for information about how to recycle and these sources of information could highlight the recommendations about materials customers are least familiar with recycling.

### *Feedback*

A substantial proportion of residents indicated that they believed they were already recycling the targeted materials. However, garbage-cart sort data revealed that they were not consistently doing so, especially in the case of mixed paper, plastics and poly-coated containers. CBSM research has shown that providing residents with information about how well they and their neighbors are really doing with respect to target behaviors can improve performance levels. For example, a study which provided residents with levels of energy usage for their neighborhood produced improvements in energy conservation for those residents who were above the norm. However, it is important to keep in mind that this type of information can have the opposite effect on those who are already performing the target behavior at higher than average levels. These individuals need to be reminded of the value of the behavior and encouraged to maintain it.<sup>21</sup>

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<sup>21</sup> Schultz, P.W., Nolan, J.M., Cialdini, R.B., Goldstein, N.J. & Griskevicius, V. (2007). The constructive, destructive, and reconstructive power of social norms. *Psychological Science*, 18(5), 429-434.

Schultz, P.W., (1999). Changing behavior with normative feedback interventions: a field experiment on curbside recycling. *Basic and Applied Social Psychology*, 21 (1) 25-36.



## *Prompts*

Residents cited *forgetting* as an important reason for failing to recycle. Prompts can help to reduce this type of error. Prompts are effective when they are noticeable and when they are used in close proximity to where and when the behavior should be performed. Examples of prompts might be stickers or magnets to be placed in their home recycling area reminding people to sort particular items, such as poly-coated containers.

### ***Integrating the Approaches***

*To be most effective, these four approaches should be utilized in concert with one another. For example, program materials and messages would highlight that residents feel that recycling is **important and easy**, but that recycling mixed paper **includes more** materials. Include an **educational** element that communicates the need to recycle envelopes with windows, as well as glossy paper. Call out that it is okay for residents to shred paper that includes personal information. Add **feedback** in the form of research findings: recent research showed that in their area 8 out of 10 households had mixed paper in their garbage carts and that the current campaign is an effort to substantially reduce the number of households with mixed paper in their garbage carts. Lastly, provide a sticker or magnet that **prompts** or reminds residents to place all of their mixed paper in the recycling cart.*

## Behavior-Change Tools for Recyclable Materials That Belong in the Yard-Waste Cart

The barriers to recycling food scraps and food-soiled paper differed somewhat from those for other types of materials and, in general, tended to be higher. See Figure 42. The outreach approaches most closely linked to high motivations and high barriers are *convenience* (make it easy) and *commitments*. In addition, the outcomes suggest that *education* and *prompts* should be included. These approaches should be combined and utilize the specific reasons given by residents for not recycling these items in order to encourage the desired behavioral changes.

### *Convenience (Make it Easy)*

Those respondents who had yard waste service told us that they did not recycle all of their food scraps because they currently had no good system for doing so while avoiding what they believed would be an increase in smell or mess. Information that emphasizes how easy it would be to switch from putting food scraps in one container (garbage cart) to the other (yard cart) might alleviate this concern. In addition, providing or suggesting suitable containers for saving food scraps to recycle could be included in Waste Management's services to new and existing yard cart customers.

### *Commitments*

Individuals tend to be more likely to follow through on behaviors to which they have made a public commitment. One finding of the survey was that there was a substantial group of individuals who were already recycling some of their food scraps. One approach to improving behavior for this group might be to encourage them to make a public commitment to recycling all of their food scraps (e.g., signing a commitment card and placing a sticker about food scrap recycling on their property.)

### ***Integrating the Approaches***

*To be most effective, convenience, commitments, education, and prompts should be utilized collectively. For example, program materials and messages would ask residents to switch from disposing of these items in the garbage cart to the yard cart. The materials would demonstrate an effective system (the steps) for taking food scraps and food-soiled paper from the kitchen to the yard cart that reduces concerns over smell and mess. This demonstration should include information about frequency of disposal to reduce flying insects and mold, as well as what food types can be recycled (there was some skepticism about including dairy and meat). As an incentive to engaging in the desired behavior, the program could provide to residents the necessary kitchen containers. While the container may serve as a prompt for recycling food scraps, a refrigerator magnet may be effective in reminding residents to place unwanted food in their kitchen container. Lastly, ask residents to commit to recycling by placing a sticker on their yard waste cart. The commitment sticker would announce their commitment and pledge to recycling. Commitments are most effective when made in face-to-face settings (at a community outreach event) and made public (place on their yard-waste cart or on a poster displayed at ongoing events).*



## Behavior Change Campaigns

Tell people what to do. Be specific. Outcomes from the in-person survey show that residents want to do the right thing. Specific behavior-based messages can be successfully situated within broad awareness campaigns; however, it is important to create specific messages that target one material at a time. In order to realize the desired effect and reduce confusion, the messages must target each behavior separately. Using material definitions from this study, waste characterization studies can be completed in order to evaluate outcomes for specific material classes. After the desired behavior change is reached for the targeted material type then move to the next material type.

For example, for plastic containers the following approaches might be taken:

- Address the barrier of confusion about what can be recycled through direct mail (flyer, guidelines) and information on the WM website. The information should be specific to plastics and include information about what to do with caps and lids.
- Address the barrier of washing or rinsing plastic containers by communicating how important residents said recycling was to them (cognitive dissonance), and by providing information about how thoroughly items need to be rinsed before recycling.
- Address residents' belief that they are already recycling plastics by providing feedback about neighborhood garbage cart sort results and overall rates of plastics recycling for their area.
- Provide a prompt such as sticker to be placed on the recycling cart reminding residents to recycle their plastic containers.

## Ongoing Evaluation

We highly recommend ongoing evaluation of programs that measure *the desired behavior*. Resident interest in recycling programs is not sufficient to measure the overarching goal: increased disposal accuracy. Continued periodic garbage-sort studies that utilize the same material definitions and sampling protocol as this study will allow Waste Management to accurately gauge desired customer behaviors for specific material types. The studies can be small in scale and timed to be completed after the implementation of specific outreach activities.

As part of the waste characterization protocol we would suggest providing customers with a garbage-cart hangtag at the time their garbage is collected. The hangtag would communicate the study purpose and alleviate customer fears of identity theft. During the in-person interviews, interviewer teams reported that several residents were upset about their garbage being taken by an unmarked truck. They stated that they just wanted to know who was taking their garbage and that it was being properly disposed of.

## Ethnic Populations of Interest

In King County, the adoption of the *King County Strategic Plan 2010-2014: Working Together for One King County* has transformed the county's work on equity and social justice. The Equity & Social Justice Ordinance establishes definitions and identifies the specific approaches necessary to implement and achieve the "fair and just" principle that is embedded as a core element of the goals, objectives and strategies of the countywide strategic plan. Therefore, King County has determined that ethnic subpopulations should be included in the WUTC behavior study because of this important initiative.

Although there were some interesting findings from non-English speaking households in the study (e.g., requests for recycling materials in a variety of languages), the sample sizes for any specific language group were not large enough to adequately describe the attitudes and behaviors of any one of those groups. We recommend that future studies of non-English speaking households be conducted with attention toward development of a survey instrument that includes culturally relevant measures. For example, age, educational attainment, household language, and household composition may influence the household dynamics and therefore, recycling practices.

We strongly recommend taking time early in the research process to define your target audiences. Estimates from the American Community Survey<sup>22</sup>, show that 64% of residents in King County and 56% of residents in Snohomish County who are of Hispanic or Latino origin are in renter-occupied housing. Estimates for renter-occupied housing for those who identify themselves as Asian are 40% in King County and 28% in Snohomish County. U.S. Census data for those two groups show King County population estimates are 9.2% Hispanic, and 15.5% Asian, and Snohomish County population estimates are 9.3% Hispanic, and 9.6% Asian. In combination, those data suggest that a significant number of residents of Hispanic or Latino origin and a fair number of Asian residents reside in multifamily units, making the numbers of single-family households residing in the WUTC area of the counties available for sampling somewhat small.

Future research that aims to identify the needs of specific ethnic or non-English speaking groups should entail the following:

- Clearly define the target population; for example, are you interested in race, ethnicity, or language preference?
- Clearly identify the size of the target population; for example, are there 20 monolingual Vietnamese single-family households in the county or 20,000? Collaborate with county demographers and other experts for this task. County agencies that need very specific demographic information for resident health and social service needs should be able to help with this task.
- Define the methods needed to gather data from the target population. *The size of the target population drives the method used to reach them.*
- Define sample sizes. The methods and size of the target population drive the sample sizes.
- Use sound research methods that will glean representative data of your target audiences.
- When the target audience is very small then devise methods to speak to households in that group. Qualitative information from small subgroups is still of great value.

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<sup>22</sup> Estimates are from the American Community Survey, Selected Housing Characteristics, 2006-2010.



## APPENDIX A

### SAMPLE FRAMES BY COUNTY

The Cascadia Team utilized the resulting sample frame to sort, map, and schedule customer addresses for garbage-cart collection. The table below displays the sample frame for the project. The table shows the municipalities associated with the selected routes by garbage collection day and county. It also shows the number of addresses selected within each route.

King County									
Monday		Tuesday		Wednesday		Thursday		Friday	
<b>Auburn</b>	20	<b>Newcastle</b>	20	Auburn Federal Way	12 8	Redmond Sammamish	2 18	Duvall	20
<b>Redmond</b>	20	<b>Newcastle</b>	20	Woodinville	20	Redmond Sammamish	5 15	Woodinville	20
Newcastle	20								
Snohomish County									
Monday		Tuesday		Wednesday		Thursday		Friday	
Everett	20	Lake Stevens	20	Lake Stevens	20	Arlington Granite Falls	15 5	Arlington Stanwood	10 10
Everett	20	<b>Lynnwood</b>	20	Arlington	20	Granite Falls	20	Snohomish	20
<b>Marysville</b>	20	<b>Lynnwood</b>	20	Lake Stevens	20	Everett	20	Snohomish	20
<b>Stanwood</b>	20	<b>Lynnwood</b>	20	Bothell Brier Lynnwood	10 7 3	<b>Bothell</b>	20	Snohomish	20
						Arlington	20		
						Stanwood	20		

Note: Municipalities in **bold** were randomly selected “ethnic routes.”

GARBAGE-SORT DATA COLLECTION DATES

There was no collection on April 11<sup>th</sup> due to a communication issue. The table below displays number of carts collected on each day by county.

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
3/31	<b>4/1</b>	<b>4/2</b>	<b>4/3</b>	<b>4/4</b> King = 23	<b>4/5</b> King = 22	<b>4/6</b>
4/7	<b>4/8</b> King =20	<b>4/9</b> King =17	<b>4/10</b> King =18	<b>4/11</b> No Sampling	<b>4/12</b> Snohomish =23	<b>4/13</b>
4/14	<b>4/15</b> Snohomish =18	<b>4/16</b> Snohomish =15	<b>4/17</b> Snohomish =19	<b>4/18</b> Snohomish =23	<b>4/19</b> Snohomish =17	<b>4/20</b>
4/21	<b>4/22</b> Snohomish =17	<b>4/23</b> Snohomish =20	<b>4/24</b> Snohomish =27	<b>4/25</b> Snohomish =26	<b>4/26</b> Snohomish =17	<b>4/27</b>
4/28	<b>4/29</b> King =11 Snohomish =9	<b>4/30</b> King =17	<b>5/1</b> Snohomish =27	<b>5/2</b> King =10 Snohomish =15	<b>5/3</b>	<b>5/4</b>



GARBAGE CART DATA COLLECTION: KING COUNTY  
HOUSEHOLD GARBAGE STUDY FLYER PRESENTED TO RESIDENTS (IF NEEDED)



### Household Garbage Study

Waste Management is collecting household garbage carts along randomly selected garbage collection routes. The household garbage study provides Waste Management and King County with information which we will use to plan services for residents. The sampling will take place during April and May 2013.

**Why sample household garbage?**

In this study Waste Management will sample household garbage to gain a better understanding of what is being sent to our landfill. We will use the information to identify common materials that could be recycled but are being put in the garbage cart instead.

**Why was your household selected for the sampling?**

Your household is one located along one of several collection routes which we are randomly selecting to be part of this study. By randomly selecting households we will be able to collect data which better represents your community.

**Who is doing the sampling?**

Staff from Cascadia Consulting Group, on behalf of Waste Management and King County Solid Waste Division.

**How do I get more information?**

Please call 206-696-4084 for more information.

*Thank you for your help with this important study.*

Translate into Spanish.

Translate into Vietnamese.

Translate into Chinese.

GARBAGE CART DATA COLLECTION: SNOHOMISH COUNTY  
HOUSEHOLD GARBAGE STUDY FLYER PRESENTED TO RESIDENTS (IF NEEDED)



**Household Garbage Study**

Waste Management is sampling household garbage carts along randomly selected garbage collection routes. The household garbage study provides Waste Management with information which we will use to plan services for residents. The sampling will take place during April and May 2013.

**Why sample household garbage?**

In this study Waste Management will sample household garbage to gain a better understanding of what is being sent to the landfill. We will use the information to identify common materials that could be recycled but are being put in the garbage cart instead.

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Your household is one located along one of several collection routes which were randomly selected to be part of this study. By randomly selecting households we will be able to collect data which better represents your community.

**Who is doing the sampling?**

Staff from Cascadia Consulting Group, on behalf of Waste Management.

**How do I get more information?**

Please call 206-696-4084 for more information.

*Thank you for your help with this important study.*

Translate into Spanish.

Translate into Vietnamese.

Translate into Korean.



## MATERIALS DEFINITION LIST

Material Type	Definition/Example of Materials Included	Belongs in Garbage Can?	Where Does it Go?
Newspaper and Cardboard	Printed groundwood newsprint and other minimally bleached groundwood as well as Kraft linerboard, containerboard cartons and shipping boxes made with corrugated paper medium. This material type includes Kraft (brown) paper bags, cardboard boxes, newspaper, and newspaper inserts. Does not include waxed or coated cardboard.	No	Recycling
Mixed Paper	Mixed recyclable paper includes office paper, junk mail, magazines, colored papers, boxboard, mailing tubes, and paperback books. May also contain white or lightly colored sulfite/sulfate bond, copy papers, computer printouts, and envelopes. Includes paper packaging made primarily of paper but with a non-paper attachment. Examples include laundry detergent boxes with plastic handles, paper bags with plastic handles, and boxboard salt containers with plastic or metal spouts.	No	Recycling
Aseptic and Polycoats	Containers and packaging comprised primarily of paper but including plastic and/or metal layers usually to improve product shelf-life or to decrease the chance of the product wetting through. Examples include soy milk containers, ice cream containers, and clean paper cups.	No	Recycling
Plastic Bottles, Jugs, Cups, Jars, and Tubs	Plastic containers of any resin type typically designed to hold liquids and gels and typically with a detachable lid. Examples include plastic single serving water bottles, liquid laundry detergent containers, peanut butter jars, picnic cups, yogurt and other dairy containers. Does not include serving trays/platters or clamshells.	No	Recycling
Glass Bottles and Jars	Glass food, beverage, and other liquid containers of any color. Examples include beer bottles, pickle jars, soda bottles, and pasta sauce jars. Does not include drinking glasses, candle holders, or other non-recyclable glass products.	No	Recycling
Aluminum Cans	Aluminum cans and bi-metal cans made mostly of aluminum. Examples include soda cans and some pet food cans.	No	Recycling
Tin/Steel Cans	Clean tin-plated steel cans (food cans) and attached lids where the container weight exceeds the weight of any food or other contamination.	No	Recycling

Material Type	Definition/Example of Materials Included	Belongs in Garbage Can?	Where Does it Go?
Other Curbside Recyclable Metals	Other packaging and products made primarily from metal less than 2 feet on the longest dimension and less than 35 pounds. Items must be clean and not sharp. Examples include doorknobs, pots, clean auto parts, small metal appliances. These items meet the curbside recycling guidelines.	No	Recycling
Food	Leftovers and wastes from food preparation and consumption. Includes food in the original or other container when the food portion outweighs the container. This type also includes beverages.	No	Organics
Yard Waste	Organic plant material from outdoor and indoor sources. Woody material must be uncoated/unpainted, less than 4" in diameter, and less than 4' long. Examples include grass, leaves, tree branches, flowers, fruits and vegetables from home gardens, and floral bouquets.	No	Organics
Food Soiled Paper	Any wholly paper item (free of plastic, metal, or other materials) that is food soiled and acceptable in local organics collections programs. This includes paper plates with food attached, kitchen paper towels, paper food service trays, paper cups, pizza boxes, and waxed cardboard boxes. Material is free of shiny coatings. Does not include bathroom paper towels or tissues.	No	Organics
Shredded Paper	Clean, uncoated that has been shredded. Includes bagged and unbagged shredded paper. Shredded plastic or coated paper is not included.	No	Organics
Acceptable Bio-plastics	Rigid bio-plastic items marked as Cedar Grove approved and bio-plastic film marked as compostable.	No	Organics
Electronic Waste	Electronic devices, components, and equipment. Examples include audio/visual equipment, televisions and computer monitors, computer processors, appliances, office electronic equipment, mobile phones, and computer peripherals, such as mice and mouse pads, keyboards, and disk drives.	No	E-Waste collection center

Material Type	Definition/Example of Materials Included	Belongs in Garbage Can?	Where Does it Go?
Other Household Hazardous Waste	Potentially harmful wastes such as oil-based paint, solvents, pesticides, batteries, gasoline, motor vehicle fluids, explosives, fluorescent lighting (bulbs, tubes, and "u" tubes), caustic cleaners, and other cleaners and chemicals.	No	HHW drop-off
Latex Paint	Liquid water based paints with a latex binder. Dried latex paint is not included in this type.	No	HHW drop-off, other collection centers, or dry it out. Dried out paint can be disposed of.
Medical Waste	Materials typically discarded in a health care setting such as I.V. tubing and patient drapes, sharps, specimen containers, bandages, and Petri dishes. Bags containing medical wastes that could be considered a biohazard are weighed, but not further sorted.	No	Specialized medical waste collection centers/programs.
Pharmaceuticals	Includes unwanted, left over, or expired medicines and drugs. Examples include over the counter medicines and drugs, prescription drugs, controlled substances, medications, anesthetics, antibiotics, antiseptics, balms, pills, capsules, ointments, salves, sedatives, serums, tablets, tinctures, tonics, and vaccines. Does not include containers except when they cannot be easily separated from the product they contain.	No	Specialized pharmaceutical collection centers/ programs.
Plastic Trays, Clamshells, and Other Containers	Plastic containers of any resin type typically designed to hold solid foods. Examples include cookie trays, muffin or sandwich folded containers, deli platters, and to-go salad bowls.	Yes	
Plastic Lids	Plastic caps and lids of any size or resin type. Can be screw on or snap on. Examples include soda bottle caps and coffee cup lids.	Yes	
Clean Recyclable Film	Clean plastic film. Examples include clean plastic retail, grocery, garbage, newspaper, and drycleaner bags; bubble wrap; clean product or packaging overwraps; and plastic pallet wrap. Excludes all food and freezer bags, bags that are soiled or contain other items (e.g. paper advertisement, cosmetic samples, computer disks), and plastic kitchen wrap. Bags with non-plastic handles (e.g. string) are also excluded.	Yes	Plastic bags to grocery store take back.

Material Type	Definition/Example of Materials Included	Belongs in Garbage Can?	Where Does it Go?
Expanded Polystyrene	Includes all items made from expanded polystyrene (Styrofoam). Examples include Styrofoam packaging, insulation, and products used to contain food such as “clamshells,” cups, plates, and bowls.	Yes	
Other Rigid Plastics	Rigid plastic consumer items and rigid packaging not included above. Examples include all-plastic furniture and toys, plastic car parts, plastic flower pots, plastic buckets, and plastic hangers.	Yes	
Clean Aluminum Foil and Containers	Clean aluminum foil and other types of aluminum containers. Examples include sheets of food preparation and storage foil as well as bar-b-que and roasting pans.	Yes	Transitioning to recycling soon.
Other Recyclable Metals	Other packaging and products made primarily from metal that do not meet the curbside recycling guidelines. Items may be oversize, overweight, greasy, or sharp. Examples include metal patio furniture, greasy metal car parts, scissors, hangers, and metal bed frames.	Yes	Metal recycling center.
Textiles	Fabric materials including natural and man-made textile materials such as cottons, wools, silks, woven nylon, rayon, polyesters and other materials. Examples include clothing, rags, curtains, carpets/upholstery, shoes, and leather products.	Yes	To reuse programs.
Other Materials	Any item not described above such as construction debris, soil, used garbage bags, pet waste, kitty litter, hardback books, drinking glasses, popsicle sticks, and items that are a combination of multiple materials.	Yes	



## APPENDIX B

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KING COUNTY: IN-PERSON SURVEY PRE-NOTIFICATION STUDY LETTER:

ENGLISH VERSION - TRANSLATED INTO CHINESE, KOREAN, SPANISH, AND VIETNAMESE



[DATE]

Dear [RESIDENT],

As part of Waste Management and King County's ongoing commitment to sustainability and resource conservation, we are inviting you to participate in a study being conducted by Waste Management, your recycling and garbage service provider. This study is funded by Waste Management, and the goal is to learn more about the household recycling and garbage practices of King County residents.

You are one of only 400 residents being asked to take part in this important study. The study is being conducted in person and the conversation will take no more than 10 minutes. In addition, we will give you a \$10 gift card for your time. We will be conducting these conversations in your area this Saturday and Sunday between the hours of 10am and 4pm. Your participation is voluntary and your answers will be kept confidential. Your answers will be combined with all others, and will help Waste Management and King County promote sustainability and better plan for future education and outreach services for residents.

If you have any questions or if you wish not to take part we can remove you from the contact list. Please contact our study partner, Colehour + Cohen, at (206) 696-4084 with questions or comments.

Thank you in advance for your help and participation.

Waste Management

SNOHOMISH COUNTY: IN-PERSON SURVEY PRE-NOTIFICATION STUDY LETTER:  
ENGLISH VERSION - TRANSLATED INTO CHINESE, KOREAN, SPANISH, AND VIETNAMESE



[DATE]

Dear [RESIDENT],

As part of Waste Management's ongoing commitment to sustainability and resource conservation, we are inviting you to participate in a study being conducted by Waste Management, your recycling and garbage service provider. This study is funded by Waste Management and the goal is to learn more about the household recycling and garbage practices of Snohomish County residents.

You are one of only 400 residents being asked to take part in this important study. The study is being conducted in person and the conversation will take no more than 10 minutes. In addition, we will give you a \$10 gift card for your time. We will be conducting these conversations in your area this Saturday and Sunday between the hours of 10am and 4pm. Your participation is voluntary and your answers will be kept confidential. Your answers will be combined with all others, and will help Waste Management promote sustainability and better plan for future education and outreach services for Snohomish County residents.

If you have any questions or if you do not wish to take part in this study we can remove you from the contact list. Please contact our study partner, Colehour + Cohen, at (206) 696-4084 with questions or comments.

Thank you in advance for your help and participation.

Waste Management



IN-PERSON SURVEY DOOR HANGER



**While you were out...**

Representatives of Waste Management stopped by in the hope of conducting a ten-minute conversation with you regarding household recycling and garbage practices. Earlier this week we sent you a letter to tell you about this study. Your participation is very important. You will receive a \$10 gift card as a thank you.

We will stop by again \_\_\_\_\_.

Questions? Please call:  
Action Research at 760/613-4476

Thank you.



IN-PERSON SURVEY FORM  
 ENGLISH VERSION – TRANSLATED INTO CHINESE, KOREAN, SPANISH, AND VIETNAMESE

«ServiceHouse» «ServiceStreet» C+C Waste Management Behavior Study  
 «Yard» yard waste service «UniqueID», Page 1

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I would like to start by asking you a few questions about how your household thinks about recycling. By recycling, I mean placing items in your recycling cart for curbside pick-up by Waste Management.

Using a scale from 0 to 10, where 0 equals not at all important and 10 equals extremely important,

QR1. How important do you think it is for your household to participate in recycling? [ENTER ANSWER] \_\_\_\_\_ DK REF

QR2. How important do you think it is for your neighbors to participate in recycling? [ENTER ANSWER] \_\_\_\_\_ DK REF

Okay, now using a scale from 0 to 10, where 0 equals not at all difficult and 10 equals very difficult,

QR3. How difficult is it for your household to participate in recycling? [ENTER ANSWER] \_\_\_\_\_ DK REF

QR5. Do you place your recyclable items in a plastic bag before putting them in your recycle cart?  
 0 NO (SKIP TO T1)     1 YES     8 DK (SKIP TO T1)     9 REF (SKIP TO T1)

QR6. Why do you bag your recyclable items before putting them in the recycle cart? \_\_\_\_\_

---

**T1. Now I would like to ask you about some recyclable items that are sometimes thrown away in the garbage. Your answers will be used to create new educational materials. Please tell us about any difficulties or things you are not sure about related to the recycling of these materials.**

Using a scale from 0 to 10, where 0 equals not at all difficult and 10 equals very difficult,

How difficult is it to recycle...	[INTERVIEWER: Use 2 <sup>nd</sup> sheet if necessary. Be sure to record ID# and attach here.]
QBD1. «BinSort1»?	[ENTER ANSWER] _____ DK REF
①QBD1A. Can you tell me about [CHALLENGES, CONFUSION, FRUSTRATIONS, THINGS YOU ARE NOT SURE ABOUT, PROCESSES YOU TAKE] when recycling «BinSort1»?	
QBD1B. If there are times that this item is not recycled, who would you say typically throws it in the garbage?	
QBD2. «BinSort2»?	[ENTER ANSWER] _____ DK REF
①QBD2A. Can you tell me about [CHALLENGES, CONFUSION, FRUSTRATIONS, THINGS YOU ARE NOT SURE ABOUT, PROCESSES YOU TAKE] when recycling «BinSort2»?	
QBD2B. If there are times that this item is not recycled, who would you say typically throws it away?	
QBD3. «BinSort3»?	[ENTER ANSWER] _____ DK REF
①QBD3A. Can you tell me about [CHALLENGES, CONFUSION, FRUSTRATIONS, THINGS YOU ARE NOT SURE ABOUT, PROCESSES YOU TAKE] when recycling «BinSort3»?	
QBD3B. If there are times that this item is not recycled, who would you say typically throws it away?	
QBD4. «BinSort4»?	[ENTER ANSWER] _____ DK REF
①QBD4A. Can you tell me about [CHALLENGES, CONFUSION, FRUSTRATIONS, THINGS YOU ARE NOT SURE ABOUT, PROCESSES YOU TAKE] when recycling «BinSort4»?	
QBD4B. If there are times that this item is not recycled, who would you say typically throws it away?	

Using a scale from 0 to 10, where 0 equals not at all important and 10 equals extremely important,

How important is it that your household recycles...	
QB11. «BinSort1»?	[ENTER ANSWER] _____ DK REF
QB12. «BinSort2»?	[ENTER ANSWER] _____ DK REF
QB13. «BinSort3»?	[ENTER ANSWER] _____ DK REF
QB14. «BinSort4»?	[ENTER ANSWER] _____ DK REF

QB1. If there was a time when you did not recycle an item that you knew was recyclable, what would you say was the reason?  
 \_\_\_\_\_

QB2. Can you tell me, why does your household recycle? \_\_\_\_\_

---

Sometimes a household has a family gathering or does a big cleaning project which means more things to get rid of than usual.

QB3. What do you do with your garbage when your garbage cart is full?  
 1 I HAVE NEVER EXPERIENCED THIS SITUATION     2 OTHER [SPECIFY: \_\_\_\_\_]

QB4. What do you do with your recycling when your recycling cart is full?  
 1 I HAVE NEVER EXPERIENCED THIS SITUATION     2 OTHER [SPECIFY: \_\_\_\_\_]

QB5. While at home, if you are holding an item in your hand that you need to dispose of and you're not sure if it's recyclable, what do you do?  
 1 RECYCLE CART     2 GARBAGE CART     3 OTHER [SPECIFY: \_\_\_\_\_]

**Now I would like to ask you a few questions about food scraps and food-soiled paper.**

**QK1.** Where do you place your household food scraps? [IF: "In a kitchen collection container", ASK "Where does it go from there?" IF: "Compost", ASK "Do you mean your yard waste cart?"]

1 YARD CART  2 GARBAGE CART  3 GARBAGE DISPOSAL  4 OTHER [SPECIFY: \_\_\_\_\_]

**QK2.** In a given week, how much of your food scraps would you estimate you put in your yard waste cart? Please use a scale from 0 to 10, where 0 equals none of your food scraps and 10 equals all of your food scraps. [ENTER ANSWER] \_\_\_\_\_  10 DK REF

**QK3.** Where do you place your food-soiled paper, such as uncoated paper plates and pizza boxes?

1 YARD CART  2 GARBAGE CART  3 OTHER [SPECIFY: \_\_\_\_\_]

**Waste Management encourages customers to recycle their food scraps and food-soiled paper by placing them in their yard waste carts.**

**QK4.** Before today, were you aware of that?

1 YES [AWARE OF BOTH]  2 AWARE OF FOOD SCRAPS ONLY  3 AWARE OF FOOD-SOILED PAPER ONLY  4 NO

**QK5.** Why do you not recycle all of your food scraps and food-soiled paper in your yard waste cart? \_\_\_\_\_

**QK6.** Now that you know food scraps and food-soiled paper can be recycled in yard waste carts, how likely are you to start recycling these items in your yard waste cart? Please use a scale from 0 to 10, where 0 equals not at all likely and 10 equals very likely. [ENTER ANSWER] \_\_\_\_\_  DK REF

**QK7.** What would make you more likely to start recycling all of your food scraps and food-soiled paper in your yard waste cart? \_\_\_\_\_

**QK8.** Why do you not have yard waste service? \_\_\_\_\_

**QK9.** Now that you know food scraps and food-soiled paper can be recycled in yard waste carts, how likely are you to start yard waste service? Please use a scale from 0 to 10, where 0 equals not at all likely and 10 equals very likely. [ANSWER] \_\_\_\_\_  10-6 DK REF

**QK10.** What would make you more likely to start yard waste service? [INTERVIEWER: IF PARTICIPANT STATES SEASONAL SERVICE, RECORD COMMENT AND ASK, "What would make you more likely to keep the service year round?"] \_\_\_\_\_

**TC. Now I have a few questions about how your household handles recycling.**

**QC1.** If you have a question about recycling, where do you go to find information?

1 WM WEBSITE  2 LABEL ON CART  3 FLYER WM  4 OTHER [SPECIFY: \_\_\_\_\_]

**In some households there is a family member who takes a lot of the responsibility for the recycling. By taking responsibility I mean telling others which items can and cannot be recycled, correcting mistakes, and reminding everyone to recycle.**

**QC2.** Who in your household takes most of the responsibility for recycling?

1 ME  2 OTHER [SPECIFY: \_\_\_\_\_]  8 DK  9 REF

**QC3.** Who in your household is the least cooperative when it comes to recycling?

1 ME  2 OTHER [SPECIFY: \_\_\_\_\_]  8 DK  9 REF

**QC4.** What language is spoken most often in your home?

1 ENGLISH [IF LANGUAGE OF INTERVIEW IS ENGLISH, SKIP TO TD, ELSE CONTINUE]  2 OTHER [SPECIFY: \_\_\_\_\_]

8 DK  9 REF

**QC5.** Is English spoken in your home...  1 Often,  2 Sometimes,  3 Rarely, or  4 Never?  8 DK  9 REF

Does the person most responsible for recycling...

**QC6.** Speak English  1 Very well,  2 Well,  3 Not very well, or  4 Not at all well?  8 DK  9 REF

**QC7.** Read in English  1 Very well,  2 Well,  3 Not very well, or  4 Not at all well?  8 DK  9 REF

**QC8.** Write in English  1 Very well,  2 Well,  3 Not very well, or  4 Not at all well?  8 DK  9 REF

**QC9.** Is there a language other than English that would help your household better understand how to recycle?

0 NO  1 YES [SPECIFY: \_\_\_\_\_]  8 DK  9 REF

**TD. We are almost done. I have just a few more questions.**

**QD1.** In what year were you born? \_\_\_\_\_ **QD2.** What is the highest grade or year of school you have completed? \_\_\_\_\_

**QD3.** Including yourself, how many people live in your household? # \_\_\_\_\_ **QD4.** Children under 18? # \_\_\_\_\_ **QD5.** Under 5? # \_\_\_\_\_

**QD6.** Are you of Hispanic or Latino origin?  0 NO  1 YES  8 DK  9 REF

**QD7.** What race do you consider yourself to be?

1 White  5 Asian  
 2 Black or African-American  6 Pacific Islander  
 3 Hispanic or Latino  7 OTHER [SPECIFY: \_\_\_\_\_]  
 4 American Indian or Alaskan Native  8 DK  9 REF

CLOSE. Thank you very much for your time and participation.

Please initial to receive your gift card.

**INTERVIEWERS: FILL OUT AT CONCLUSION OF INTERVIEW**

**IC1.** Is this home multi-level?  0 NO  1 YES

**IC3.** Gender?  1 MALE  2 FEMALE

**IC2.** Does this home have a garage?  0 NO  1 YES

**IC4.** Language of interview? \_\_\_\_\_

EXAMPLE OF AN INTERVIEWER TEAM ITINERARY

The address numbers and street names on the itinerary and the detailed map that follow are fictitious.

Sched ID: 35 [Saturday, June 15] WM Behavior Study Interviewers: \_\_\_\_\_  
 Driving distance: 15 miles  
 Driving time: 51 minutes

Time Estimate	Miles	Directions	Proximity	Time 1	Time 2	Zone	UniqueID	Dispo 1	Dispo 2	Dispo 3	Notes
9:00 AM	1	Depart 111 CRITERION RD #1 [111 CRITERION RD UNIT K30, LYNNWOOD 98087]				3E	stu43	2	2		
9:00 AM	2	At 222 CRITERION RD #2 [222 CRITERION RD UNIT E19, LYNNWOOD 98087], turn RIGHT (West) onto Criterion Rd	0.1 mi			3E	stu47	2	2		
9:00 AM		0.1 Turn LEFT (South) onto Lincoln Way	0.4 mi								
9:02 AM		0.6 Turn RIGHT (North) onto Jefferson Pl	0.1 mi								
9:02 AM		0.7 Turn RIGHT (North) onto Washington Rd	0.3 mi								
9:03 AM	3	At 333 JONAGOLD PL [333 JONAGOLD PL, LYNNWOOD 98087], stay on Washington Rd (North)	0.3 mi			3E	stu52	2	2		
9:04 AM		1.3 Turn LEFT (West) onto Newton Pippin Rd	131 yds								
9:05 AM	4	At 444 NEWTON PIPPIN RD [444 NEWTON PIPPIN RD, LYNNWOOD 98087], return East on Newton Pippin Rd	131 yds			3E	stu53	2	2		
9:05 AM		1.4 Turn LEFT (North) onto Jackson Rd	1.0 mi								
9:07 AM		2.4 Road name changes to Jackson Pl	0.2 mi								
9:08 AM		2.5 Turn LEFT (North) onto Harrison Ave S	0.2 mi								
9:09 AM		2.7 Turn RIGHT (East) onto Madison St	0.2 mi								
9:10 AM		3 Keep STRAIGHT onto Monroe Ave	0.1 mi								
9:10 AM		3.1 Turn LEFT (West) onto WA-47 [Adams St]	0.3 mi								
9:11 AM		3.4 Road name changes to Adams St	0.2 mi								
9:12 AM		3.6 Turn RIGHT (North) onto Taylor Ave	0.6 mi								
9:13 AM		4.2 Turn LEFT (West) onto Price Rd	0.3 mi								

**DISPO CODES**

1 = Completed Interview      3 = Home - no adult available      5 = Could not approach home (explain)  
 2 = No one at home      4 = Home - other issue (explain)      6 = Refusal (explain)



# EXAMPLE OF AN ITINERARY MAP

The detailed map is fictitious. The figures below display examples of the two maps types.

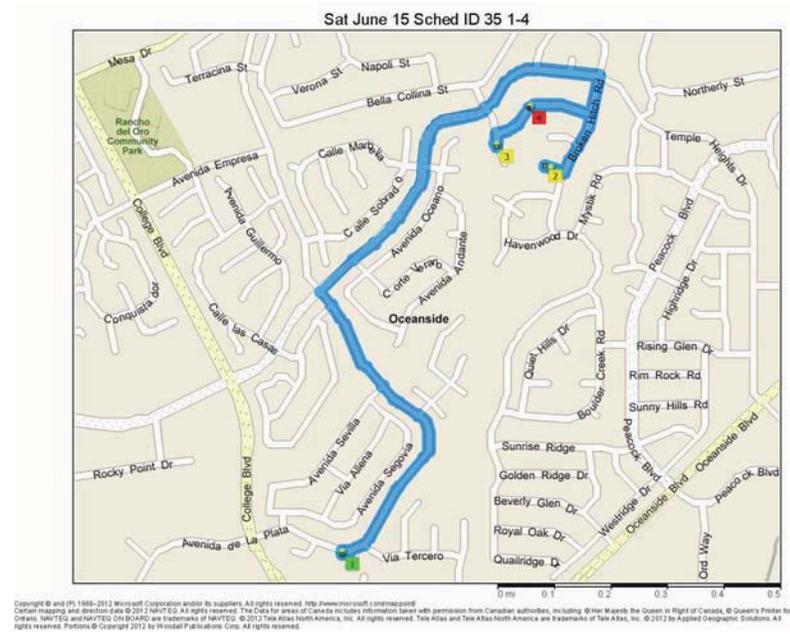
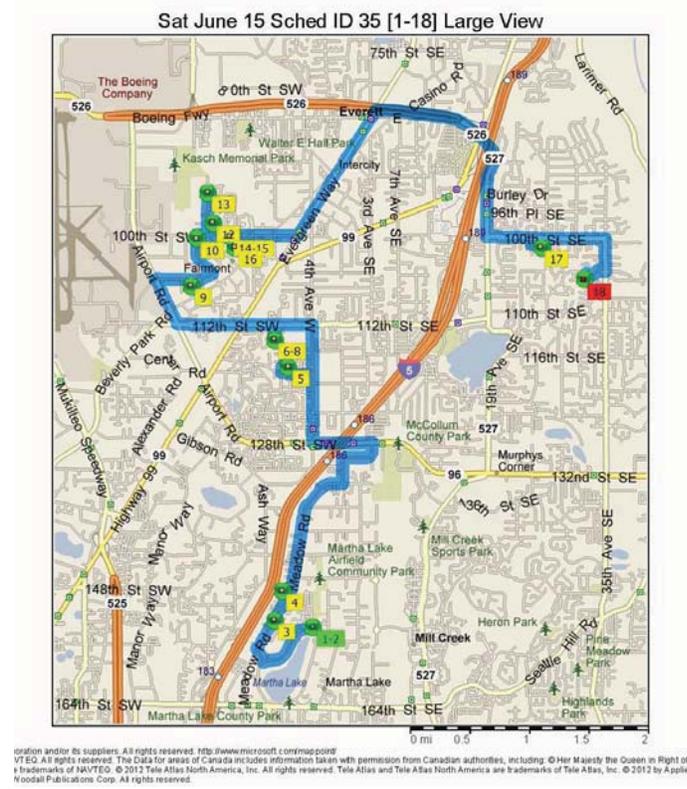


TABLE OF COMPLETED IN-PERSON SURVEY DATES

Sunday	Monday	Tuesday	Wed	Thursday	Friday	Saturday
<b>4/28</b>	4/29	4/30	5/1	5/2	5/3	<b>5/4</b> King = 22
<b>5/5</b> No Sampling	5/6	5/7	5/8	5/9	5/10	<b>5/11</b> King = 8 Snohomish = 10
<b>5/12</b> Mother's Day No Sampling	5/13	5/14	5/15	5/16	5/17	<b>5/18</b> Snohomish = 26
<b>5/19</b> Snohomish = 27	5/20	5/21	5/22	5/23	5/24	<b>5/25</b> Memorial Day No Sampling
<b>5/26</b> Memorial Day No Sampling	5/27	5/28	5/29	5/30	5/31	<b>6/1</b> King = 24 Snohomish = 14
<b>6/2</b> King = 16 Snohomish = 12	6/3	6/4	6/5	6/6	6/7	<b>6/8</b> King = 6 Snohomish = 22
<b>6/9</b> Snohomish = 19	6/10	6/11	6/12	6/13	6/14	<b>6/15</b> Snohomish = 19



## APPENDIX C

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### WASTE MANAGEMENT SERVICE AREA ZIP CODES (UTC)

<b>King County</b>	<b>Snohomish County</b>
98001	98012
98002	98020
98003	98021
98011	98026
98014	98028
98019	98036
98021	98037
98022	98038
98024	98043
98028	98058
98032	98059
98033	98067
98034	98072
98051	98077
98052	98087
98053	98201
98055	98203
98056	98204
98057	98205
98058	98208
98059	98221
98063	98223
98072	98236
98074	98241
98077	98251
98092	98252
98106	98256
98108	98258
98109	98270
98126	98271
98146	98272
98166	98274
98168	98275
98178	98282
98188	98285
98274	98287
	98290
	98292
	98294
	98296

## APPENDIX D

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### CASCADIA REPORTING ON UTC AND NON-UTC STUDIES IN KING COUNTY:

#### Overview and Findings

It is of interest to the project team whether there is a statistically significant difference between the waste composition for residents in the study area and the waste composition for nearby residents outside the study area. Assuming data exists for the two populations their respective compositions can be compared using a statistical t-test.

This study focused on residents living in areas of King and Snohomish Counties where solid waste service is administered by the Washington Utilities and Transportation Commission (WUTC) so we have composition data readily available for that population. Recent composition data is also available from a different study for King County residents living in areas not administered by the WUTC (non-WUTC).<sup>23</sup> Snohomish County data for non-WUTC residents is not available so no comparisons can be made against that population. With the two available data sets a statistical t-test can be completed for the King County WUTC population included in this study and the King County non-WUTC population included the other recent study.

The non-WUTC data was collected using a slightly different material list than the WUTC data collected in the current study, but the WUTC and the non-WUTC sample data can be aggregated into four general material groups:

**Recycling** - materials that belong in the recycling cart,

**Greenery** - materials that belong in the greenery/organics cart,

**Garbage** - materials that belong in the refuse cart, and

**Special/Drop-off** - materials that are generally hazardous and should not be disposed of curbside.

Table 15 shows the composition data for 47 samples from non-WUTC King County residents and 138 samples from King County WUTC residents. Based on the available data, **Garbage** is the only material group that showed a statistically significant difference between the two study populations. **Garbage** comprises 38.4% of disposal for the non-WUTC population and 49.6% of disposal for the WUTC population. The t-test results can be interpreted as “we are 90% certain the difference between the proportion of disposal that is **Garbage** for non-WUTC residents (38.4%) and WUTC residents (49.6%) is real and is not due to random variation between sample populations.”

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<sup>23</sup> The data used in the t-test were collected as part of the 2011 King County Waste Characterization and Customer Survey (<http://your.kingcounty.gov/solidwaste/about/documents/waste-characterization-study-2011.pdf>)



**Table 15. Test for Statistically Significant Difference between Study Population Composition Data**

Where Should it Go?	Estimated Percent King County		t-Statistic	p-Value <i>(Cut-off for statistically valid difference = 0.025)</i>
	Non-WUTC	WUTC		
Recycling	16.0%	12.3%	1.6992	0.0910
Greenery	45.2%	37.1%	1.6719	0.0963
<b>Garbage</b>	<b>38.4%</b>	<b>49.6%</b>	<b>2.6009</b>	<b>0.0101 *</b>
Special/Drop-off	0.5%	0.9%	1.1713	0.2430
<b>Number of Samples</b>	<b>47</b>	<b>138</b>		

*\*Bold type indicates a statistically significant difference at the 90% confidence level*

## Background

In order to control for population changes and other factors that may influence the total amount of waste disposed from year to year, the tests used in this study measure waste proportions, not tonnage. For example, if newspaper accounts for 5% of disposed waste totaling 1,000 tons during one study period and 5% of waste totaling 1,200 tons during another—while the amount of newspaper in terms of total tons has increased, the proportion of newspaper, 5%, in the waste stream has not. The tests would indicate no change in newspaper.

The statistical tests used assume the hypothesis that there is no change. For example, “There is no statistically significant difference between the non-WUTC and WUTC areas in the proportion of recycling in the garbage cart disposed by the commercially collected single-family substream.”

Statistics are then employed to look for evidence disproving the hypothesis. A “significant” result means that there is enough evidence to disprove the hypothesis and it can be concluded that there is a true difference in composition. “Insignificant” results indicate that either 1) there is no true difference, or 2) even though there may be a difference, there is not enough evidence to prove it because the findings are limited by sample size. It is also possible that changes occurred in waste categories that were not considered in this part of the analysis.

## Statistical Considerations

The analyses are based on the material component percentages, by weight. These percentages are calculated by dividing the sum of the selected material component weights by the sum of the corresponding sample weights. T-tests (modified for ratio estimation) were used to examine the non-WUTC area-to-WUTC area variation.

### *Normality*

The distribution of some of the material components (particularly the special/drop-off materials) are skewed and may not follow a normal distribution. Although t-tests assume a normal distribution, they are very robust to departures from this assumption, particularly with large sample sizes. In addition, most of the selected material components are sums of several individual waste components, which improves our ability to meet the assumptions of normality.

### *Dependence*

There may be dependence between material components (if a person disposes of material component A, they always dispose of material component B at the same time). There is certainly a degree of dependence between the calculated percentages (since the percentages sum to 100, if the percentage of material component A increases, the percentage of some other material component must decrease). Future studies might be merited to examine these two types of dependence explicitly.

### *Multiple T-Tests*

In all statistical tests, there is a chance of incorrectly concluding that a result is significant. The area-to-area comparison required conducting several t-tests, (one for each material component) each of which carries that risk. However, we were willing to accept only a 10% chance, overall, of making an incorrect conclusion. Therefore, each test was adjusted by setting the significance threshold to  $\frac{0.10}{w}$  ( $w$  = the number of t-tests).

*The adjustment can be explained as follows:*

For each test, we set a  $1 - \frac{0.10}{w}$  chance of not making a mistake, which results in a  $\left(1 - \frac{0.10}{w}\right)^w$  chance of not making a mistake during all  $w$  tests.

Since one minus the chance of not making a mistake equals the chance of making a mistake, by making this adjustment, we have set the overall risk of making a wrong conclusion during any one of the tests at  $\left(1 - \left(1 - \frac{0.10}{w}\right)^w\right) = 0.10$ .

The chance of a “false positive” for this study is restricted to 10% overall, or 2.5% for each test (10% divided by the four tests equals 2.5%).

For more detail regarding this issue, please refer to Section 11.2 “The Multiplicity Problem and the Bonferroni Inequality” of *An Introduction to Contemporary Statistics* by L.H. Koopmans (Duxbury Press, 1981).

### *Power Analysis*

The greater the number of samples, the greater the ability to detect differences. In the future, an *a priori* power analysis might benefit this research by determining how many samples would be required to detect a particular minimum difference of interest.

### Interpreting the Calculation Results

For the purposes of this study, only those calculation results with a p-value of less than 2.5% are considered to be statistically significant. As described above, the threshold for determining statistically significant results (the “alpha-level”) is conservative, accounting for the fact that so many individual tests were calculated.



The t-statistic is calculated from the data: according to statistical theory, the larger the absolute value of the t-statistic, the less likely that the two populations have the same mean. The p-value describes the probability of observing the calculated t-statistic if there were no true difference between the population means.

For example the proportion of garbage increased from 38.4% to 49.6% between the study areas. The t-statistic is relatively large (2.6009) and the probability (p-value) of observing that t-statistic if there had been no true difference between years is just 1.0%. This value is less than the study's pre-determined threshold for statistically significant results (alpha-level of 2.5%); thus the increase in garbage is considered to be a true difference. On the other hand, the p-value corresponding to the decrease in recycling is much larger ( $p=.0910$ ). The chance of observing the 16.0 % to 12.3% decrease when the actual proportion had not changed is 9.1%—much too high to be considered a true difference.

## APPENDIX E

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Analysis of Variance (ANOVA)	A statistical test conducted to compare means for two or more groups on continuously-scale survey items.
Cross-tabulation	A display of data that shows how many cases in each category of one variable are divided among the categories of one or more additional variables
Chi-square	A statistical analysis conducted to compare groups on survey items with categorical responses
Mean (M)	The statistical average, obtained by adding scores and dividing by the number of scores.
Median	The value at the center of a distribution of scores, such that half are above and half are below it.
N	The number of individuals in a sample, the sample size.
Standard Deviation (SD)	A statistic representing the “spread” of scores around the mean. A low SD indicates that data points tend to be close to the mean; a high SD indicates that data points are spread out over a larger range of values.
Range	The difference between the highest and lowest values.

