

Food: Too Good To Waste

An Evaluation Report for the Consumption
Workgroup of the West Coast Climate and
Materials Management Forum



ACKNOWLEDGEMENTS

This report was prepared on behalf of the U.S. EPA Region 10 and the West Coast Climate and Materials Management Forum by the Forum's Consumption Workgroup with support from EcoPraxis and Tetra-Tech under subcontract to Toeroek Associates.

Special thanks to all of the EPA staff and Forum members from state and local governments who reviewed drafts, offered revisions, and contributed to the final product. Specifically, we acknowledge the contributions of:

- Dr. Viki Sonntag of EcoPraxis, the primary researcher for this report, and
- EPA Region 10 staff: Ashley Zanolli, the Campaign Planning Team Lead; Theresa Blaine, the Regional Contract Manager and Peer Learning Group Lead; and EPA NNEMS Fellows Megan Curtis-Murphy and Sanne Stienstra. Questions about the report may be directed to Ashley Zanolli, Environmental Engineer, U.S. EPA Region 10. To learn more about the West Coast Climate and Materials Management Forum, visit www.westcoastclimateforum.com.

A hearty thanks also goes out to the community partners and EPA regional representatives, listed below, upon whose work this evaluation is based. The report would be far from complete without their vital participation.

Community Partners:

- Addison County Solid Waste Management District, Addison County, Vermont: Teresa Kuczynski and Donald Maglienti
- City of Aurora, Aurora, Colorado: Nathan Owens
- City of Gresham Recycling and Solid Waste, Gresham, Oregon: Karen Guillen-Chapman and Nick Isbister
- City and County of Honolulu, Hawaii: Alexandra Lavers
- City of Iowa City Land and Recycling Center, Iowa City, Iowa: Jennifer Jordan
- City of Palo Alto Public Works Department, Palo Alto, California: Wendy Hediger
- Kanu Hawaii and Kupu, Hawaii: Cyrus Howe, Nicole Chatterson and Kaleo Ten
- King County Solid Waste Division, King County, Washington: Karen May and Josh Marx
- Sustainable Jersey City, Jersey City, New Jersey: Debra Italiano
- Naropa University, Boulder, Colorado: Santiago Giraldo-Anduaga
- Village of Oak Park Environmental Services and Seven Generations Ahead, Oak Park, Illinois: Karen Rozmus and Jen Nelson
- Rhode Island Food Policy Council, Rhode Island: Krystal Noiseux, Dave Rocheleau, and Leo Pollock
- San Benito County, California: Lisa Jensema
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Community-Based Food Waste Prevention - *Food: Too Good to Waste* Evaluation Report

EXECUTIVE SUMMARY

This report presents the findings from *Food: Too Good to Waste* (FTGTW), a partnership of Community-based Social Marketing (CBSM) campaigns aimed at reducing wasted food from households.

Preventing wasted food represents a significant opportunity to keep the valuable resources used to produce and distribute food from going to waste. Over 40 percent of the food produced or imported for domestic consumption in the United States is lost, with over one-fourth of household food purchases by weight going to waste.¹

The report includes an analysis of seventeen FTGTW campaigns conducted in ten states from October 2012 through December 2014. The campaigns focused on assisting households to make small shifts in how they shop, prepare and store food to prevent it from being wasted.

The evaluation addresses both the effectiveness and the impact of the FTGTW campaigns. It confirms that CBSM campaigns can bring about a notable reduction in preventable food waste at the household level.

CAMPAIGN EFFECTIVENESS FINDINGS

A principle objective for this report is to determine the extent to which FTGTW campaigns result in the desired behavior changes. This includes assessing how effective campaigns are in generating and sustaining the desired behaviors leading to reductions in wasted food.

FTGTW uses CBSM messaging and tools to engage households in wasted food reduction strategies. The messaging and tools are designed to address barriers and emphasize benefits to changing behaviors, in this case, behaviors associated with wasting food intended for human consumption, that is, the edible portions of food.

The tools include both tools that support specific behaviors, such as a Fruit and Vegetable Storage Guide, and those that support a broader shift in awareness of wasted food as both an environmental and economic issue, for example, a community workshop presentation. We refer to these as behavior change and outreach tools respectively.

The findings on the effectiveness of the three CBSM components – behavior change strategies and tools, messaging and outreach tools – are summarized next.

¹ Economic Research Service, United States Department of Agriculture. 2012. Loss Adjusted Food Availability Data Series. Available at [http://www.ers.usda.gov/data-products/food-availability-\(per-capita\)-data-system/.aspx](http://www.ers.usda.gov/data-products/food-availability-(per-capita)-data-system/.aspx).

Behavior Change Strategies and Tools: Households found the FTGTW strategies and tools both useful and easy to use. Of particular significance is the finding that households who measured their food waste are highly motivated to reduce wasted food. In effect, household food waste audits increase awareness by countering habitual behaviors and activating waste aversion – a dislike of wasting resources in one’s possession.

Messaging: Feeling bad about throwing away food (waste aversion) and wasting money appear to be equally strong motivators to reducing wasted food. The evaluation also found that increasing awareness of the indirect environmental effects of wasted food through messaging is challenging with mixed results. While the campaigns generated an expressed and often enthusiastic interest in reducing wasted food, there is the need to particularize environmental messaging to the household level for greatest effect. An example of such is: throwing away an apple is equivalent to flushing the toilet seven times.

Outreach and Engagement: The general rule for successful campaigns was to engage participants early and often. Additionally, campaigns designed to leverage social networks and create social norms were among the most effective in terms of outreach and engagement, while community-scale direct outreach was more effective than recruitment through indirect means such as social media outreach. It was also found that without a focused effort campaigns can fail – competing priorities in two campaigns presented significant hurdles to success.

CAMPAIGN IMPACT FINDINGS

A second major evaluation objective is to determine if a shift in household food waste behaviors has the potential to result in waste tonnage reduction. To achieve quantifiable reductions in wasted food at the community level, it is necessary to engage a significant percentage of the general population in adopting the behaviors as well as engaging and sustaining behaviors that have a significant impact at the household level.

Given the small sample size of the majority of the campaigns, the focus was on measuring the amount of food going to waste in individual households both before and after adopting strategies to reduce wasted food, that is, impact at the household level. However, requesting households weigh their waste appears to be an effective means of determining the potential for reduction in small to medium-sized sample populations.

The total baseline amount of wasted food per person per week ranged from 2.2 pounds to 3.5 pounds. This is comparable to the EPA estimate of 2.5 pounds of landfilled residential waste per person per week.

Campaigns that are successfully implemented can result in a significant reduction in preventable (edible) food waste at the household level. The magnitude of the potential reduction in preventable waste is 50% or more or approximately a half pound per person per week. This is roughly equivalent to a 20% reduction in total food waste.

CONCLUSIONS AND NEXT STEPS

The FTGTW campaign results establish that behaviors to reduce wasted food are complex with many complicating factors influencing these behaviors and food management practices in general. At the same time, this evaluation shows that even small budget CBSM campaigns can generate notable reductions in preventable food waste at the household level.

Based on the evaluation findings, it is strongly recommended that future campaigns consider incorporating a household measurement tool or strategy into their campaigns.

The next steps in advancing household prevention of wasted food as a priority are to measure the impact of FTGTW campaigns at the community-level and to identify supportive policies for scaling-up FTGTW campaigns.

1.0 INTRODUCTION

This report presents the findings from *Food: Too Good to Waste*, a Community-based Social Marketing campaign aimed at reducing wasted food.

Food: Too Good to Waste (FTGTW) is a project of the West Coast Climate and Materials Management Forum (the Forum), an EPA-led partnership of western cities and states that are developing and sharing ways to integrate sustainable materials management policies and practices into climate actions. In 2014, the project was expanded to include participation of communities in EPA Regions 1, 2, 5, 7 and 8, in addition to Regions 9 and 10. EcoPraxis and Toeroek Associates were contracted to perform the analysis contained in this report with guidance from the EPA and their partners.

For both environmental and economic reasons, wasted food is emerging as an issue of significant consequence. Over 40 percent of the food produced or imported for domestic consumption in the United States is lost to the landfill and over a quarter of household food purchases by weight go to waste.² Food waste has been identified as a major source of greenhouse gas emissions and other negative environmental impacts. By one estimate, food waste accounts for more than one quarter of total freshwater use in the U.S.³

The purpose of FTGTW is to develop and test a Community-based Social Marketing (CBSM) approach to changing food consumption behaviors with the intent of reducing wasted food from households and its associated environmental impacts.⁴

Understanding the patterns of household food consumption and waste behaviors can increase our chances of developing successful strategies to reduce wasted food and its environmental impacts. To this end, the Forum researched food waste behaviors and potential behavior change strategies in developing the campaign's messaging and tools.⁵ A branded toolkit containing a variety of tools to support campaign implementation was made available to Forum participants in the fall of 2012.⁶

This report presents the results of seventeen FTGTW campaigns conducted from October 2012 through December 2014. Data for the analysis came from household food waste measurements, household participant questionnaires, and interviews with the organizations implementing the campaigns. While the data from these early implementations are limited, the analysis provides useful insights for conducting future FTGTW campaigns.

Sections 1 and 2 of the report set the evaluative context for the results reported in Section 3. Section 1 gives an overview of the campaign and the research objectives, while Section 2

² Economic Research Service, United States Department of Agriculture. 2012. Loss Adjusted Food Availability Data Series. Available at [http://www.ers.usda.gov/data-products/food-availability-\(per-capita\)-data-system/.aspx](http://www.ers.usda.gov/data-products/food-availability-(per-capita)-data-system/.aspx)

³ Hall, Kevin D. et al. 2009. The Progressive Increase of Food Waste in America and Its Environmental Impact. *PLoS ONE* 4, no. 11.

⁴ The USDA defines food waste as food and beverages that were once available for human consumption but are discarded without being eaten. Food waste is a sub-component of food loss. (See Muth, Mary et al. 2007. *Exploratory Research on Estimation of Consumer-Level Food Loss Conversion Factors*. USDA ERS Report.) Alternatively, **food loss and waste** (FLW) is defined in the Food Loss and Waste Protocol developed by the World Resource Institute (2015) as food and associated inedible parts removed from the food supply chain, where food is any substance intended for human consumption.

⁵ Environmental Protection Agency (EPA). 2012. *Food: Too Good to Waste Pilot: A Background Research Report for the West Coast Climate and Materials Management Forum*. EPA 910-R-12-006.

⁶ West Coast Climate and Materials Management Forum. July 2013. *Toolkit Implementation Guide for the Food: Too Good to Waste Pilot*.

provides a description of the CBSM messaging and tools used in the pilot. Section 3 relates the campaign findings. The report concludes with recommendations on how best to conduct and scale-up future campaigns.

1.1 FTGTW OBJECTIVES AND DEVELOPMENT

FTGTW aims to engage households in efforts to reduce wasted food and its impacts through a CBSM campaign. A second purpose is to analyze results that will help in the design of future CBSM programs to reduce wasted food.

CBSM is an approach to driving behavioral change through community initiatives that remove barriers to desired behaviors, while simultaneously enhancing those behaviors' advantages.⁷ It relies on a series of key steps as an approach to designing programs (see sidebar).

The first step in developing a CBSM campaign is to select which behaviors to promote, beginning with a determination of how the issue under study is affected by a particular sector. In this case, the issue was food waste and the sector was households. Information was gathered to identify and compare behaviors of interest in terms of their impact, penetration and probability.

The assessment provided guidance in identifying which behaviors are potential candidates for large-scale change.

The second step in campaign development is to identify barriers and benefits associated with the behaviors selected for change. This step involved both a literature review and focus groups. A report providing a review of the research detailing food waste estimates was issued in September 2012.⁸

In step three, the information gathered through the background research and focus groups was then used to design behavioral change strategies and associated messages and tools. In the fall of 2012, five pilots were conducted and subsequently evaluated in step four. This analysis helped to further refine the FTGTW strategies, messaging and tools.

The final step in instituting a CBSM program is to roll out the pilot's successful strategies across the sector of interest.

In all, seventeen campaigns were conducted from the fall of 2012 through the end of 2014. Interested community partners, primarily local government agencies with a responsibility for solid waste management, took the lead in implementing the campaigns in their communities.

This report documents the evaluation findings and emergent best practices.

Steps in a CBSM Approach

1. Identify desired behaviors
2. Identify barriers and benefits of desired behaviors
3. Design pilot program with behavior change strategies and messaging
4. Implement pilot program
5. Evaluate pilot program
6. Replicate and scale-up successful pilot strategies

⁷ McKenzie-Mohr, Doug. 2011. *Social Marketing to Protect the Environment: What Works*. Sage Publications Inc.

⁸ Environmental Protection Agency, *ibid*.

1.1.1 Campaign Design Principles

In addition to embodying CBSM principles in the FTGTW strategies and tools, the campaign aims to address the needs of implementing communities. To facilitate implementation and ensure robustness, the campaign was designed with the following principles in mind:

- Remove/minimize barriers to preferred behaviors and emphasize benefits: This is a key principle of the CBSM approach to behavior change.
- Contextualize preferred behaviors: To motivate and sustain behavioral changes, the campaign aims to draw the linkages between household practices and environmental and social issues at a broader scale.
- Engage at the community level and speak to community values: The ability to adapt the campaign messages and tools to the needs of the community begins with engaging the community in its implementation.
- Leverage existing resources: Communities are called on to be resourceful in implementing new programs. This encourages the engagement of community-based partners in program implementation as well as a networked approach to program development.
- Design for breadth and depth: To achieve quantifiable reductions in wasted food at the community level, it will be necessary to engage and sustain behaviors that have a significant impact at the household level (depth) as well as engage a significant percentage of the general population in adopting the behaviors (breadth).
- Collect evidence for policy-making and program design: A solid evidence base that supports the effectiveness of the strategies and tools is needed to justify scaling up the campaign to long term, broad scale programs.

1.2 RESEARCH OBJECTIVES

In the design phase, the Forum established several research objectives. In addition to validating a CBSM approach to wasted food prevention, a major goal for the evaluation is to gather implementation data to support a full scale prevention campaign.

The objectives include determining:

- Campaign Reach and Effectiveness: Did the campaign result in the desired behavior changes? This includes assessments of participation rates and strategy and tool effectiveness.
- Campaign Impact: Did the campaign result in quantifiable reductions in wasted food?
- Campaign Implementation Costs: What is the cost to implement pilots and, by extension, full scale campaigns?
- Environmental Impact: What are the estimated environmental benefits for a campaign to reduce wasted food?
- Program Fit: What is the fit of a wasted food prevention campaign with existing strategic plans and programs such as climate protection and healthy food programs.

In addition to collecting measurement data from participating households, several of the community partners chose to do surveys of the Challenge participants before and after the Challenge. The data from these questionnaires provide information on demographic patterns of household waste and also on the effectiveness of the Challenge itself. The survey instrument can be found in Appendix A.

Data collected during the implementations for the purpose of this evaluation included:

- Household measurements of wasted food amounts.
- Survey data from household participants collected by community partners.
- Quantitative data on recruitment and retention.
- Observations of community partners regarding what worked.

The evaluation also includes an assessment of the value of these data for determining the effectiveness and impact of the campaigns. One question that has been raised repeatedly in past studies of household food waste is the bias in the results that arises from households documenting their own waste.⁹

1.3 ENVIRONMENTAL GOALS

As noted above, wasted food is emerging as an issue of significant consequence for both economic and environmental reasons. Consumption-based greenhouse gas (GHG) inventories point to food production as a large generator of GHG.¹⁰ And, according to the UN's Food and Agriculture Organization (FAO), wasted food contributes a total of 3.3 billion tons of GHGs a year to the planet's atmosphere, making wasted food the third largest emitter if it were a country.¹¹ The same FAO report estimates that the volume of water used in producing wasted food is equivalent to the flow of Russia's Volga River.

Ultimately, FTGTW aims to reduce the environmental impacts of wasted food. At the same time, making an evidence-based connection between household food waste prevention and environmental benefits is a complex undertaking. Proving that a CBSM approach to reducing wasted food works is an important first step in establishing this connection.

Beyond this, it will be important to understand the institutional incentives and barriers to developing programs to prevent wasted food. The need for such programs is apparent, especially as the benefits of such programs could make a significant difference with the outcomes of some of our greatest environmental challenges.

⁹ See, for example, FUSIONS, 2014, Report on Review of (Food) Waste Reporting Methodology and Practice.

¹⁰ See, for example, Stockholm Environment Institute, US Center, 2011, Consumption-Based Greenhouse Gas Inventory for Oregon – 2005.

¹¹ UN Food and Agriculture Organization. 2013. *Food Wastage Footprint: Impacts on Natural Resources Summary Report*. <http://www.fao.org/docrep/018/i3347e/i3347e.pdf>

2.0 CAMPAIGN DESCRIPTION

The FTGTW Campaign aims to engage households in efforts to reduce wasted food and its impacts through a CBSM campaign. This section of the report describes the key waste prevention behaviors selected as the focus for the campaign, as well as the CBSM messaging, tools and the toolkit implementation guide.

2.1 KEY WASTE PREVENTION BEHAVIORS

Food waste in households is the result of “a complex interrelationship between multiple activities and the context in which they are performed.”¹² In addition, these activities are influenced by other competing concerns, such as work, family, and other social relationships, often leading to a disassociation between values and behaviors. As such, there are numerous opportunities to reduce wasted food though not all are equally consequential.

In FTGTW’s development stage, five behaviors were selected on the basis of their potential impact for reducing wasted food from households. The background research informing behavior selection was published in a report, *Food: Too Good to Waste Pilot, a Background Research Report for the West Coast Climate and Materials Management Forum*.¹³ The five behaviors were later modified to incorporate findings from the first five pilots. The five final selected behaviors and the associated benefits and barriers are listed in Table 1.

Table 1: Selected Strategies and Associated Benefits and Barriers

| Behavior | Benefit | Barrier |
|-----------------------------------------------------------------------|------------------------------------------|--------------------------------------------------|
| Get Smart: See How Much Food (and Money) You Are Throwing Away | Waste aversion* | Dynamic lifestyle** Time Habitual behavior |
| Smart Shopping: Buy What You Need | Waste aversion Saving money | Dynamic lifestyle Time Habitual behavior |
| Smart Storage: Keep Fruits and Vegetables Fresh | Waste aversion Health Saving money | Knowledge Time Not enough room in fridge |
| Smart Saving: Eat What You Buy | Waste aversion | Gratification Convenience |
| Smart Prep: Prep Now, Eat Later | Convenience Saving money Health | Skills Knowledge |

* Waste aversion is a dislike of wasting resources in one’s possession. It is considered a benefit as preventing waste leads to fewer feelings of guilt. ** Dynamic lifestyle refers to a high degree of unpredictability in everyday activities, such as which meals are consumed at home.

¹² Quested, Tom, et al. 2013. Spaghetti Soup: The Complex World of Food Waste Behaviors, *Resources, Conservation and Recycling* 70 43-51.

¹³ Environmental Protection Agency, *ibid*.

These behaviors cover a range of household food management strategies – from food purchasing, storage and preparation to choices about what to eat when. The associated behavior change tools for these are described in the next section of this report.

It should be noted that, in addition to the barriers cited in Table 1, by the time a food item is thrown out, the opportunity to prevent this has already passed, in some cases, many days beforehand. This lag contributes to a disconnection between the activity that led to wasted food and the actual occurrence of the waste.

2.2 CBSM TOOLS

FTGTW uses CBSM messaging and tools to engage households in strategies to reduce wasted food. CBSM messaging and tools are designed to address barriers and emphasize benefits to changing behaviors, in this case, behaviors associated with wasted food.

The knowledge and experience of Forum participants informed the design of the tools and messaging, as did the literature on CBSM tool types. In particular, the McKenzie-Mohr study of CBSM campaigns focused on changing household environmental behaviors was useful in providing tool design principles and examples.¹⁴ CBSM experts also contributed to the design of the campaign and the recent literature on behavioral economics was also consulted, particularly with regard to the importance of loss aversion in averting wasteful behaviors.¹⁵ In addition, the Forum interviewed and consulted with several food waste reduction experts and programs, both here in the United States and abroad. Lastly, the strategies, tools, and messaging were tested in five pilot campaigns in late 2012 - early 2013 and subsequently modified to improve their effectiveness.

Two principal target populations were selected in crafting the campaign messaging and strategies: (1) families with young children and (2) young adults (of ages approximately from 18 to 30). The two principal target populations were chosen on the basis of previous research that indicated these two demographics generate the largest amounts of wasted food in households.

The specific campaign tools are described next. The complete set of tools can be viewed at www.westcoastclimateforum.com/food. The tools include both tools that support specific behaviors, such as the Fruit and Vegetable Storage Guide and the Shopping List Template, and those that support a broader shift in awareness of wasted food as both an environmental and economic issue, for example, the infographic/poster and the community workshop presentation. We refer to these as behavior change and outreach tools respectively.

Behavior Change Tools

Fruit and Vegetable Storage Guide (Smart Storage Tool): The fruit and vegetable storage guide is designed as a prompt tool for household use. A prompt is a visual aid to remind households of a desired behavior. The guide provides useful information for keeping produce fresh and is available in both English and Spanish. Prompts are particularly useful when designed to engage people in positive behaviors and are presented in close proximity to where the action takes place. The guide was printed in bright colors on a half sheet suitable for posting on the refrigerator.

¹⁴ McKenzie-Mohr, Doug. 2011. *Social Marketing to Protect the Environment: What Works*. Sage Publications Inc.

¹⁵ See Thaler, Richard H. and Cass R. Sunstein. 2008. *Nudge: Improving Decisions about Health, Wealth, and Happiness*. Penguin Books.

Meals-in-Mind Shopping List Template (Smart Shopping Tool): The shopping list template provides an easy-to-use tool for making a shopping list with meals in mind. It was designed to create awareness around how much food will be needed for upcoming meals and, as such, is intended to be a step towards meal planning. It was hypothesized that the tool would be effective with young adults for whom meal planning is considered a loss of time since the decision on whether to eat at home or eat out is driven by their “dynamic lifestyle”. The tool also focuses on the cost saving strategy of using up food that has already been purchased. The template is available in both English and Spanish.

Eat First Prompt (Smart Saving Tool): The Eat First prompt can be placed on a designated shelf in the refrigerator to corral items with limited shelf life. The prompt is pictured to the right.



Food: Too Good to Waste Challenge (Get Smart Tool): In practice, the Food: Too Good to Waste Challenge incorporates implementation of the four other strategies but its focus is on measuring the amount of food going to waste in households.¹⁶ Challenge participants are provided instructions and instruments to measure the amount of food going to waste in their households.

Challenges support behavioral change as a form of commitment in a group context while also drawing attention to the need for new behaviors. In addition, several implementing organizations offered incentives to participating households for completing the challenge.

The FTGTW Challenge serves a dual purpose as both a measurement and a behavior change tool. The Challenge presents an opportunity to collect data from household participants by which to evaluate the pilot’s effectiveness and impact in addition to raising awareness of food waste behaviors in participating households through feedback (measurement of amount of food going to waste).

The period of time households measured waste before adopting waste reduction strategies is referred to as the “baseline period” and the amount of food wasted during that time as the “baseline amount”.

Three variants of the Challenge were tested as described next:

Volume Measurement: The measurement tool challenges households to become aware of how much food goes to waste in their homes by measuring the amounts of food thrown out before and after adopting strategies to reduce waste. A measurement bag or bucket is used to collect and measure preventable and inedible food waste.¹⁷ (In some implementations, only preventable waste was collected). The tool consists of printed bags or buckets in which to collect waste, instructions and worksheets. The instructions provide guidance on how to participate in a month-long challenge. The worksheets are to be used to collect data on preventable and non-edible food waste from household participants during the challenge.

¹⁶ Not all campaigns implemented Challenges. Of those that did, some solely engaged Challenge participants while others conducted broader scale campaigns where only some participants took the Challenge. However, the Challenge was the sole means of collecting data on the amount of food going to waste.

¹⁷ Preventable food waste is food that is intended for human consumption but is not eaten for any reason (e.g. mold, plate waste).

Weight Measurement: In the weight measurement variant of the Challenge, weight measurements are substituted for the volume measurements.

Photo Diary: The photo diary can be used to document changes in food waste behaviors in households participating in the challenge. This tool provides guidance on how to participate in a two-week photo diary version of the challenge and worksheets to capture collected data.

Outreach and Engagement Tools

Message Map: The message map includes messaging for all 5 key waste prevention behaviors selected during the campaign design (see Table 1). It can be used to tailor outreach materials to individual campaign objectives.

Infographic/Poster: The purpose of the infographic is to tell a story about why wasted food matters. The infographic provides a means of contextualizing wasted food as an issue in relation to its environmental and economic impacts. This infographic can be used online, or as a poster or handout at community events and venues, such as sustainability fairs, farmers markets, and local grocery stores.

Workshop Presentation for Community Participants: The workshop presentation tool is a slide show with accompanying narrative to be used at community workshops. This presentation is intended to provide a space to engage households in thinking through strategies and provide potential actions to reduce wasted food. The workshop presentation helps to establish food waste aversion as a social norm. Workshop participants are also asked to make a commitment to reduce wasted food. Research shows that public commitments are strong motivators in making behavioral shifts.¹⁸

Incentives: Incentives were used to engage households in taking the Challenge. Some incentives, such as scales and compost buckets, also reduced barriers to participation. Other incentives included grocery certificates and culinary tools for participating and/or completing the challenge.

2.3 IMPLEMENTATION

The tools in the FTGTW Toolkit are designed to be adaptable to the needs of the implementing communities based on their objectives and resources.

The Implementation Guide provides local governments or other implementing organizations a description of the Campaign and tool kit, and information on how the organizations might launch a new wasted food prevention challenge or incorporate this campaign into existing programs.¹⁹ The guide is intended to support the implementing organizations, also referred to as community partners in this report, in making a number of implementation choices by explaining the trade-offs associated with the various choices.

Peer group learning calls were conducted monthly for community partners. These calls were an important opportunity for communities to learn from each other by sharing successes, newly developed resources, and lessons learned in real time.

¹⁸ McKenzie-Mohr, *ibid.*

¹⁹ West Coast Climate and Materials Management Forum, *ibid.*

3.0 ANALYSIS OF CAMPAIGN RESULTS

As of the end of 2014, seventeen FTGTW campaigns have been conducted. This section of the report presents the findings from these initial implementations. Section 3.1 describes the campaigns and the following sections relate the findings in terms of the research objectives. Section 3.5 provides a summary of the key findings and their implications for running a successful campaign.

3.1 CAMPAIGN DESCRIPTIONS

The campaign descriptions establish the reference conditions for the subsequent analyses. Table 2 provides a summary description of each of the seventeen campaigns. More extensive descriptions of select individual campaigns can be found in Appendix B.

Below is a synopsis of the descriptions in the two tables. The campaign descriptions are arrayed in the table roughly in order of their implementation dates.

FTGTW Partner: While the majority of FTGTW partners were local government agencies with a responsibility for solid waste management, non-profits were also represented. Typically, the non-profits had broader organizational objectives, such as food policy (Rhode Island Food Policy Council, Campaign 9) or environmental stewardship (Kanu Hawaii, Campaign 16).

Community Location and Urban/Rural Classification: The seventeen campaigns represented a diversity of locations and urban/rural classifications. The community locations included states from across the U.S. and spanned a range of classifications from small rural towns to large cities.

Time of Year: Campaigns were held in various months and all seasons. A few campaigns were held over the holidays leading up to mid-December.

Campaign Objectives: All of the campaigns had food waste reduction as their primary objective. In the first five pilots, the focus was assessing tool effectiveness and gauging the potential impact of waste reduction strategies on the amount of household food waste (King County, San Benito, and Honolulu). In addition, the Seattle Public Utilities campaign provided useful baseline information on the amount of household food wasted. In the late 2013 and the 2014 campaigns, partners sought to familiarize themselves with implementing a campaign and the wasted food issue. Two organizations, King County (Campaigns 8 and 15) and Kanu Hawaii (Campaign 16), scaled-up earlier pilots.

Campaign Focus: The campaign focus describes in general terms the implementing organization's approach to achieving their objectives. Each campaign had a unique focus according to their individual community's needs and resources. At the same time, for most of the partners, limited resources meant a campaign targeting a small sub-set of the population. These organizations tended to focus on Challenges. Broader scale media campaigns were conducted in King and Thurston Counties in Washington, in Palo Alto, CA and in Hawaii. Finally, King and Thurston Counties and Gresham, Oregon also did direct community-scale outreach, such as tabling at farmers markets and community events or giving presentations to faith groups.

Table 2: Campaign Descriptions (Page 1 of 3)

| | FTGTW Partner | Community Location | Urban-Rural Classification | Time of Year | Campaign Objectives | Campaign Focus | Community Partners | Target Audience |
|----------|-------------------------------------------|---------------------------|------------------------------------|---------------------|-------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|
| 1 | King County Solid Waste Division | Fall City, WA | Peri-Urban Town; population 2,000 | Fall 2012 | Test effectiveness of FTGTW messaging and tools. | King County developed and tested an elementary school curriculum on food waste that invited active participation of both the students and their families. | Local elementary school through Green Schools Program. | The target audience was families with a child in the 4th grade at the town's public school. |
| 2 | San Benito County | San Benito County, CA | Rural County; population 57,600 | Fall 2012 | Test food waste reduction strategies to inform the county's future food waste collection plans. | Households were asked to photo document instances of their preventable food waste for four weeks. | Local food bank in Hollister, California. | Lower income Hispanic families. |
| 3 | Naropa University | Boulder, CO | Mid-Sized City; population 103,000 | Oct - Nov 2012 | Bring awareness of food waste and composting to students. | The campaign had an educational focus. | Naropa University Sustainability Council | Student body and faculty of university with enrollment of approximately 400. |
| 4 | City and County of Honolulu (CCH) | Honolulu, HI | Urban; population 375,000 | Feb-Mar 2013 | Test CBSM strategies and tools including a cookbook with recipes and food waste prevention tips. | CCH was interested in food waste management solutions that would both lower the costs of landfilling as well as offset the cost of importing food to the island. | Master degree student in Environmental Sciences from the Univ. of Gothenburg, Sweden. | The principal audience was young adults. The average age of participants was 34. |
| 5 | Seattle Utilities | Seattle, WA | Urban; population 650,000 | Jan-Apr 2013 | Gather baseline data on food waste, specifically, how much of the food waste in Seattle's residential waste stream is edible. | This campaign focused on obtaining data on current food waste management practices. | None | Seattle's residential population. |
| 6 | City of Palo Alto Public Works Department | Palo Alto, CA | Suburban; population 66,000 | Jun 2013 - Present | Quantify and reduce the amount of edible food waste. | Broad media campaign that included FTGTW info in outreach for curbside compost collection services. | None | General population. |

Table 2 Continued (Page 2 of 3)

| | FTGTW Partner | Community Location | Urban-Rural Classification | Time of Year | Campaign Objectives | Campaign Focus | Community Partners | Target Audience |
|-----------|-------------------------------------------------|---------------------------|--------------------------------------|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| 7 | City of Gresham Recycling and Solid Waste | Gresham, OR | Suburban; population 109,000 | Summer 2013 - Summer 2014 | Raise awareness and change attitudes and behaviors. | Built partnerships with food related organizations (e.g. grocers) to spread FTGTW messaging. | Local grocers | General population |
| 8 | King County Solid Waste Division | King County, WA | Rural to Urban; population 2,000,000 | Fall 2013 | Raise awareness of the benefits of reducing food waste and encourage residents to try behaviors that help reduce wasted food. | Broad county-wide media campaign; Produced short videos on FTGTW strategies in partnership with food co-op grocer. | Puget Sound Consumer (Food) Coop | Families with young children with a strong focus on the adult female in the household |
| 9 | Rhode Island Food Policy Council | Rhode Island, RI | Mostly Urban; population 1,000,000 | Feb - Oct 2014 | Test campaign effectiveness with different demographics, in particular, to understand how low income households respond to waste reduction as a food security strategy. | Testing by four cohorts provides opportunity to refine outreach and messaging to social group. | Providence Housing Authority | Recruited 4 cohorts of ten each: friendlies, RIFPC list-serve subscribers, high-income apartment residents; low-income PHA residents. |
| 10 | City of Iowa City Landfill and Recycling Center | Iowa City, IA | Mid-sized City; population 71,600 | Mar - Jul 2014 | Gain experience in helping residents reduce food waste. | Educational effort to teach residents benefits of reducing waste and support for curbside collection of food waste with yard waste. | Refuse Division, City of Iowa City | Select neighborhoods chosen to represent a variety of incomes and ages. |
| 11 | Thurston County Solid Waste | Thurston County, WA | Small Town/Rural; population 262,000 | Feb - Dec 2014 | Engage Thurston County in reducing household food waste. | Test impact of combined broad-scale media awareness campaign with on-the-ground household engagement. | None | General population including outreach through schools. |

Table 2 Continued (Page 3 of 3)

| | FTGTW Partner | Community Location | Urban-Rural Classification | Time of Year | Campaign Objectives | Campaign Focus | Community Partners | Target Audience |
|-----------|------------------------------------------------|---------------------------|--------------------------------------|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|----------------------------------------------------------------|
| 12 | Village of Oak Park Environmental Services | Oak Park, IL | Suburban; population 52,000 | April-May 2014 | Promote waste reduction by linking it to cost savings. | Test cost savings message that participating in FTGTW will offset the monthly cost of participating in the compost program. | Seven Generations | Village residents who did not participate in the compost pilot |
| 13 | Addison County Solid Waste Management District | Addison County, VT | Small Town/Rural; population 37,000 | May-Jun 2014 (before garden season) | To facilitate the district's source reduction efforts. | Vermont has enacted law that will ban all food from landfills by 2015; no compost curbside collection for most towns | Middlebury Natural Foods Coop; Addison County Re-Localization Network | Families with children |
| 14 | Sustainable Jersey City | Jersey City, NJ | Urban | Jun-Aug 2014 | Test integration of waste prevention and Bokashi composting strategies. | Educational effort with Bokashi composting program participants. | Jersey City Environmental Commission; community gardens | Sustainability focused adults and community gardeners |
| 15 | King County Solid Waste Division | King County, WA | Rural to Urban; population 2,000,000 | Fall 2014 | Raise awareness of the benefits of reducing food waste, both financial and environmental and encourage residents to try strategies. | Test effectiveness of different CBSM outreach methods and messengers. | Master Composters | Farmers market customers |
| 16 | Kanu Hawaii | Hawaii, HI | Urban | Sept - Oct 2014 | Test how to leverage social networks to accelerate community-wide awareness and adoption of FTGTW strategies. | Empowering people to build more sustainable, and resilient communities rooted in personal commitments to change. | The RISE program, Kupu. | Social network of 20,000+ members |
| 17 | City of Aurora | Aurora, CO | Urban; population 346,000 | Nov-Dec 2014 | Create awareness around greenhouse emissions from wasted food. | Determine best practices in encouraging citizens to contribute to reducing the City's environmental footprint. | Kaiser Permanente; Denver Urban Gardens | City employees |

Community Partners: A few of the implementing organizations used CBSM consultants. Others partnered with local non-profits with whom they had existing relations. Food coops were another choice of partner for several campaigns (Campaigns 8, 13). In 2014, King County also partnered with Master Composters for outreach.

Target Audience: “Target audience” or “target population” refers to the demographic the implementing organization hopes to engage in the pilot. The most common target audience was a small sample of the general population. In some cases, there was additional effort to reach young adults (for example, the Naropa University campaign) or families with children (King County). The Rhode Island Policy Food Council targeted four different demographics including high- and low-income cohorts.

While the goal of food waste reduction was common to all campaigns, the communities’ needs and resources determined the implementation means. Differing levels of resources included familiarity with the CBSM approach, community size and demographics, and partner relationships, as well as varying levels of available staff and funding. Community partners made implementation choices based on a variety of such factors. These factors are cited below in the assessment when relevant to the campaigns’ outcomes. Table 3 provides an overview of the implementation details by campaign.

Outreach and Engagement Methods: Campaigns used those outreach and engagement means adapted to the needs of their communities and available resources. Many of the campaigns that conducted challenges held workshops while those engaged in broader scale outreach relied on social media. The recruitment methods were especially varied, ranging from tabling at farmers markets to invitation letters.

Conducted Challenge: All of the campaigns used the full complement of FTGTW strategies with the exception of the second year campaigns in King County and Hawaii (Campaigns 8 and 16) which did not conduct Challenges. In many campaigns, outreach was limited to recruiting for the Challenge. In effect, the Challenge was synonymous with the campaign. Broader-scale campaigns, however, engaged a wider sweep of participants in using strategies and tools independent of the Challenge.

Length of Challenge: Most Challenges ran from 4 to 6 weeks. Participants in Seattle’s baseline waste audits weighed their preventable and inedible waste fractions for 13 weeks.

Fraction Measured and Method Used: Campaigns made the choice of which waste fraction to measure and whether to use weight or volume measurement in relation to their objectives and resources. In general, there was a balance between these two choices.

Target Population Size: The majority of campaigns targeted a demographic or demographics within their population but also chose to do blanket outreach to their communities at large. The Rhode Island and Iowa City campaigns (Campaigns 9 and 10) are examples of more targeted outreach.

Implementation Outcomes: The last three columns in Table 3 convey implementation outcomes, including the number of households recruited for Challenges and a given Challenge’s sample size and retention rate. These are referred to in the assessment of Outreach and Engagement effectiveness.

Table 3: Outreach and Engagement Descriptions and Results (Page 1 of 3)

| | Community Location | Outreach and Engagement Methods | Conducted Challenge | Length of Challenge | Fraction Measured | Measurement Method | Target Population Size | Number of Households Recruited | Final Sample Size | Retention Rate |
|---|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|---------------------|------------------------------------------------------|--------------------|------------------------|----------------------------------------------|--------------------------------------------------------|----------------|
| 1 | Fall City, King County 2012 | The invitation to participate was emailed to families, followed by a visit to the classroom. The curriculum was ongoing throughout the five weeks. All families who completed the challenge were given a grocery store certificate. | Yes | 5 weeks | All solid waste | Volume | 110 families | 47 families submitted Week 1 data | 13 families (another 11 families completed five weeks) | 28% |
| 2 | San Benito County | Fliers were placed in food bank bags to invite participation, followed by phone calls and email (when available), while the workshop presentation was used to recruit participants from the seniors and the moms' group. | Yes | 4 weeks | All solid waste | Photo diary | 560 | 20 | 10 | 50% |
| 3 | Boulder | Initial outreach was through an email announcement. Participants were also recruited through tabling at the University's Sustainability Fair at the end of which the workshop presentation was made. All subsequent contact was through email. | Yes | 4 weeks | All solid waste | Weight | 500 | 65 individuals picked up Challenge materials | 1 | 2% |
| 4 | Honolulu | Recruitment was made by email using personal contacts in two social networks. Two workshops were held, the second came after the baseline weeks to introduce strategies. | Yes | 4 weeks | All solid waste | Weight | 210 | 17 | 14 | 82% |
| 5 | Seattle | Study participants were recruited through a short article in the utility's newsletter that is mailed to residential customers with their bi-monthly bill. Participants weighed daily and submitted results weekly on-line. | Yes | 13 weeks | Preventable and non-edible fractions - baseline only | Weight | All utility customers | 125 | 119 | 95% |

Table 3 Continued (Page 2 of 3)

| | Community Location | Outreach and Engagement Methods | Conducted Challenge | Length of Challenge | Fraction Measured | Measurement Method | Target Population Size | Number of Households Recruited | Final Sample Size | Retention Rate |
|-----------|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|----------------------------|--------------------------------------|---------------------------|-------------------------------|---------------------------------------|--------------------------|-----------------------|
| 6 | Palo Alto | Campaign outreach means included traditional media (newspaper and publication print ads), a bill insert, and social media (online, Facebook and Pandora ads). Transitioning to greater emphasis on peer-to-peer and direct-personal-contact outreach in 2014. | Yes (limited) | 6 weeks | Preventable fraction only | Volume | City population | Not available | Not available | Not available |
| 7 | Gresham | Tabling at farmers markets, art walk, car show and at grocery stores. | Yes | 6 Weeks | Preventable fraction only | Weight | City population | 31 | 14 | 45% |
| 8 | King County 2013 | Strategy was to drive awareness and engage with the community through broad-based communication such as advertising, social media and media relations. | No | Not applicable | Not applicable | Not applicable | Not applicable | Not applicable | Not applicable | Not applicable |
| 9 | Rhode Island | Engagement workshops focused on hands-on demonstrations of waste prevention strategies. Campaign arrange for low-income participants to receive community credits as incentive to participate. | Yes | 6 weeks | Preventable fraction only | Both weight and volume | Not available | 39 | 22 | 56% |
| 10 | Iowa City, IA | Intense personalized recruitment: an invitation to participate was sent to select neighborhoods followed by door hangers and neighborhood open houses. | Yes | 6 weeks | Preventable and non-edible fractions | Weight | 300 households | 52 | 29 | 56% |
| 11 | Thurston County, WA | Extensive social media presence was combined with in-person educational presentations made to a variety of community groups and schools. | Yes | 4 weeks | Preventable fraction only | Volume | County population | 80 | 42 | 53% |

Table 3 Continued (Page 3 of 3)

| | Community Location | Outreach and Engagement Methods | Conducted Challenge | Length of Challenge | Fraction Measured | Measurement Method | Target Population Size | Number of Households Recruited | Final Sample Size | Retention Rate |
|-----------|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|----------------------------|--------------------------------------|---------------------------|-------------------------------|---------------------------------------|--------------------------|-----------------------|
| 12 | Oak Park, IL | Blanket recruitment through notice in Village of Oak Park's newsletter. | Yes | 6 Weeks | All solid waste | Volume | City population | 25 | 12 | 48% |
| 13 | Addison County, VT | Outreach occurred through partners and educational workshops. Also, a recruitment ad was placed in local newspaper offering grocery coupon incentive for participation. | Yes | 6 weeks | Preventable and non-edible fractions | Volume | District population | Not available | 31 | Not available |
| 14 | Jersey City, NJ | Recruitment to Bokashi composting program with community gardens with FTGTW presented as first step in Bokashi process. | Yes | 6 weeks | All solid waste | Volume | 1200 network members | 25 | Not available | Not available |
| 15 | King County 2014 | Trained master composters to disseminate FTGTW materials and recruit Challenge participants at farmers markets. | Yes | 4 weeks | Preventable fraction only | Volume | Farmers Market customers | 71 | 53 | 75% |
| 16 | Hawaii, HI | Messages focusing on reducing residential food waste were shared through Kanu Hawaii's 20,000+ member network on an almost daily basis. These messages included images, text, and some videos. | No | Not applicable | Not applicable | Not applicable | Not applicable | Not applicable | Not applicable | Not applicable |
| 17 | Aurora, CO | Promoted through city's intranet website that most employees visit at least once per workday. | Yes | 6 weeks | All solid waste | Volume | 2650 city employees | 72 | 24 | 33% |

3.2 CAMPAIGN EFFECTIVENESS

A principle evaluation objective is to determine the extent to which FTGTW campaigns result in the desired behavior changes. This includes assessing how effective campaigns are in both generating and sustaining the desired behaviors. The result of these changes, that is, the impact on the amount of food going to waste, is covered in Section 3.3.

A CBSM campaign typically consists of behavior change strategies and tools, messaging, and outreach and engagement. The effectiveness of these three components are evaluated in turn: Section 3.2.1 evaluates how effective the behavior change strategies and tools are at engaging households in the desired behaviors, while Section 3.2.2 and 3.2.3 look at messaging and outreach effectiveness respectively. Key findings in each section are bolded.

Household factors affecting reach and effectiveness are discussed in Section 3.2.4.

Lastly, in addition to what the community partners did individually to implement campaigns, another critical factor in their success was the support provided by the EPA and to each other. This support is addressed in Section 3.2.5.

3.2.1 Effectiveness of Behavior Change Strategies and Tools

This section of the report focuses on assessing how useful households found the FTGTW strategies and tools in changing their behaviors. It answers such questions as: Are the strategies and tools useful and easy to implement? How likely are households likely to continue to use the strategies and tools? And do the strategies and tools increase awareness of wasted food in the household? The assessment includes an analysis of the campaign participants' experience and quantitative measures of their engagement. Post-challenge participant questionnaires provided the main source of quantitative data.²⁰

In general, **households gave high marks, both qualitatively and quantitatively, to the FTGTW strategies and tools.** Numerous comments from campaign participants indicated they greatly valued their experience.²¹ Three such comments are:

- "This was a wonderful learning experience and taught us all how to be more mindful of the food we consume and the food we bought but didn't consume." (King County)
- "I think this was a really good idea. I hope more people decide to do this." (Rhode Island)
- "This was a very wonderful learning experience and I have already noticed a change in my house in regards to the amount of money we are saving because we plan ahead." (Aurora)

Post-challenge survey responses support these observations. Figure 1 shows that 86% of the respondents found the strategies and tools useful (n=70).²² Participants who already considered themselves knowledgeable in preventing wasted food tended to be more neutral in their evaluation of the strategies and tools' usefulness.

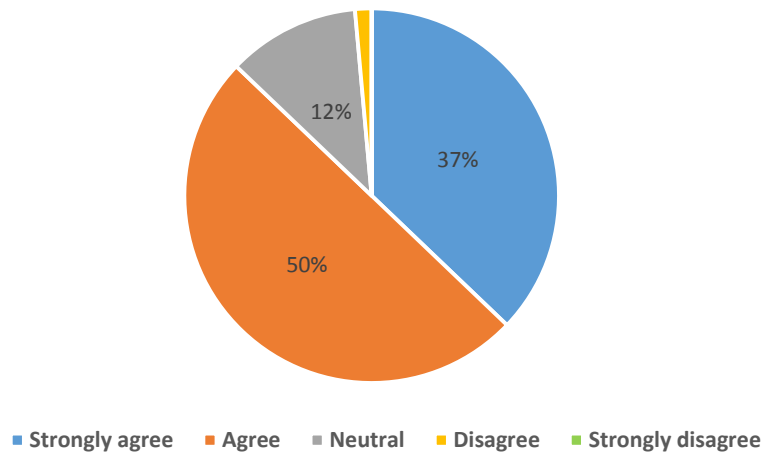
²⁰ In addition to collecting measurement data from participating households, the Rhode Island, Iowa City and Aurora campaigns chose to do surveys of Challenge participants before and after the Challenge.

²¹ Comments were solicited along with measurement data by the majority of campaigns conducting Challenges.

²² The combined number of post-survey responses for the Rhode Island, Iowa City and Aurora campaigns was 70 (or n=70).

Figure 1: Usefulness of Strategies and Tools

Survey Response to the Statement:
"In general, I found the strategies and tools useful."

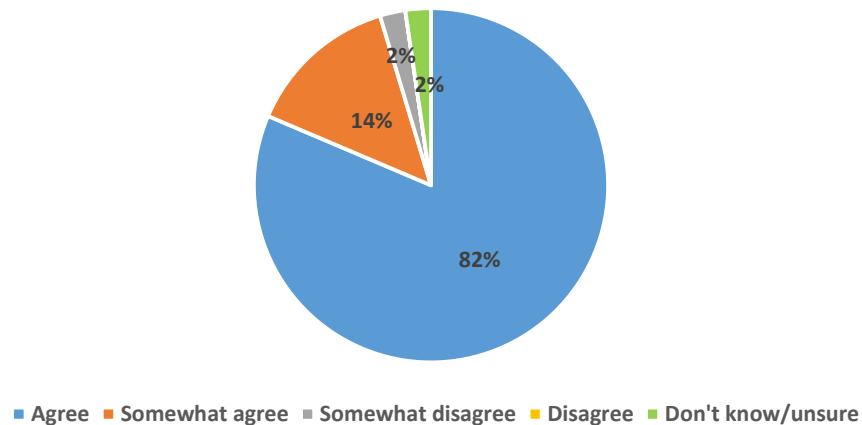


Iowa City Challenge participants (n=26) were also asked whether they found the strategies and tools easy or hard to use. **95% responded that they found them easy or somewhat easy to use.**

96% of the households also indicated that they are likely to continue to use the tools and strategies as shown in Figure 2, indicating there are no on-going significant barriers to use of the strategies and tools.

Figure 2: Likelihood of Continuing to Use Tools and Strategies

Survey Response to the Statement: "I am likely to
continue to use the tools and strategies."



The evidence on the effectiveness of specific strategies and tools indicates that **strategies associated with a tool are considered more useful than those without a tool.** This is consistent with CBSM research. As an example, the Eat First Prompt was developed in 2013 after other tools. In later campaigns after the introduction of the prompt, the associated strategy, Smart Saving, was seen as equally or more useful to the Smart Storage and Smart Shopping strategies, where before it was not. Also, the Smart Prep strategy which has no associated tool

was rated as least useful of the five strategies. It is also likely that there are time barriers to the Smart Prep strategy.

Although the CBSM literature advises campaigns to concentrate on one behavior at a time, new research suggests a focus on practices has a greater impact, especially when there is a cascade of behaviors with a compounded impact as is the case with food waste behaviors.²³ It is difficult to interpret from the available data whether targeting one or two strategies versus a suite or mix of strategies would be more effective. So while there may be some expressed preferences for certain strategies, it may be premature to limit the suggested strategies to only those perceived as the most useful.

To test whether targeting two strategies was more effective than targeting the suite of FTGTW strategies, Gresham conducted two rounds of the Challenge. In the first round, participants were given information on the Smart Saving: Eat What You Buy Strategy as well as measuring their waste (the Get Smart strategy). In the second round, all five strategies were introduced to the participants. The group that used all five strategies reduced their waste by a greater amount than did the one focusing on the Eat What You Buy strategy. As the samples in the Gresham challenges were extremely small, caution should be used in interpreting the results but they do support the idea of introducing a greater number of strategies.

In addition, there is a great deal of variability on household food management practices related to a number of demographic and lifestyle factors. Even within a target demographic there is considerable variability in practices. It is therefore difficult to design a campaign that singles out the strategy that is most relevant for each demographic or lifestyle. On the other hand, **campaigns featuring a range of strategies allow each household to focus on the strategy or strategies that work best for them** but still targeted toward the ultimate behavior of reducing wasted food at home.

A key measure of strategy and tool effectiveness is the degree to which they shifted awareness of the households' tendency to waste food. The most effective strategy in this regard was the Get Smart Strategy wherein households measured the amount of food going to waste in their households as part of a challenge. (As noted previously, the FTGTW Challenge incorporates all five strategies but its primary focus is having households measure the amount of food going to waste in their households.)

Previous research indicates that most people underestimate the amount of food going to waste in their households.²⁴ For example, in a recent national survey, Dr. Roni Neff at John Hopkins found that 73% of Americans thought they wasted less food than average.²⁵

An unexpected finding from the early pilots was that having households measure their waste strongly motivates their desire to reduce waste. Initially, the Challenge measurement tools were intended as a means of collecting data to evaluate the impact of waste reduction strategies but the measurement tools' value in raising awareness quickly became evident.

One possible intervention to a lack of reflectivity around household waste practices, that is, automatic or habitual behavior, is to create a feedback mechanism to stimulate awareness. The

²³ Quested, T.E., *ibid.*

²⁴ Cox, Jayne, and Phil Downing. 2007. *Food Behaviour Consumer Research: Quantitative Phase*. WRAP Report; Glanz, Robert. 2008. Causes of Food Waste Generation in Households – An Empirical Analysis. *Applied Sciences*.

²⁵ Neff RA, et al. 2015. Wasted Food: U.S. Consumers' Reported Awareness, Attitudes, and Behaviors. *PLOS ONE*.

measurement tools used in the Challenge served this purpose. In addition, it appears that measuring waste taps into our neuro-psychological tendency to dislike waste which, in turn, is a strong motivator to try strategies to reduce waste.

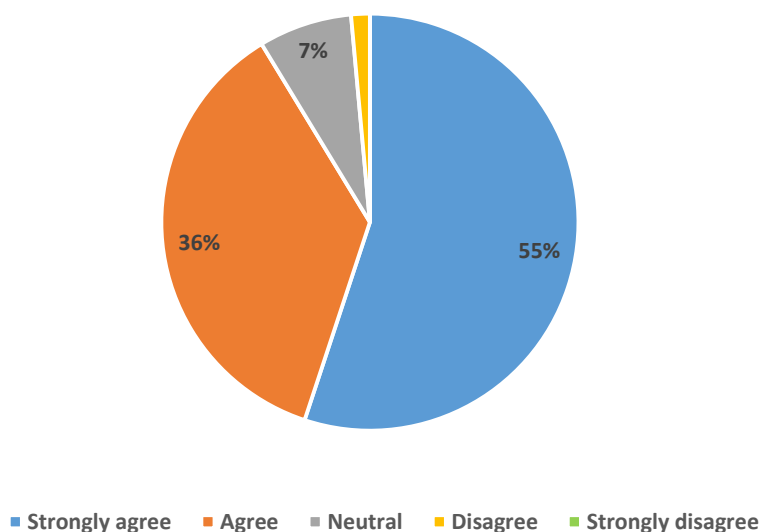
A number of participant observations were made indicating the effectiveness of the Challenge in raising awareness and thus motivating people to reduce waste, among them:

- “[I was] shocked at how much we’ve actually been wasting.” (Honolulu)
- “This was a great way to teach/show our kids how much food gets wasted and how to change our habits to be more efficient.” (King County)
- “Participating definitely made me more conscious about my patterns, including buying too much food and not eating it before it went bad.” (Thurston County)

Challenge participants were also asked in the post-Challenge survey whether the Challenge raised their awareness of how much food was going to waste in their households. Their combined responses (n=69) are shown in Figure 3. **91% of the respondents agreed that participating in the Challenge raised their awareness of food going to waste in their households and over half strongly agreed.**

Figure 3: Challenge’s Effect on Increasing Awareness of Wasted Food in Household

Survey Response to the Statement:
"I am now more aware of food going to waste in my household"



In addition, 42 Challenge participants in Thurston County, WA rated the Challenge as the most effective of eight different tools. While, in Seattle, the amount of wasted food trended down even though no food reduction messaging or strategies were introduced as part of their home waste audits.

The take-away in these observations and data is that **tracking the amount of wasted food motivates action to reduce wasted food. In effect, feedback increases awareness by countering habitual behavior and activating waste aversion.** While there are barriers to engaging people in measuring food waste over an extended period of weeks, tools designed to provide feedback and raise awareness, such as the FTGTW Challenge, highly motivate households to reduce wasted food.

As described in Section 2.2, campaigns used different Challenge procedures according to their objectives and available resources. While all the methods were effective in raising awareness, they were not equally effective in measuring the amount of food going to waste. For example, the San Benito pilot used a photo diary to document food waste. The method was too complex to obtain an accurate measure of the amount of food going to waste as evidenced by inconsistencies in the data. This method was not offered in the 2013 and 2014 campaigns.

Three implementation choices appear to influence the impact results: whether to use volumetric or weight measurement; what portions of the waste stream to measure; and the length of the Challenge.

The trade-offs between volume and weight measurement methods are summarized in Table 4, followed by a discussion of the trade-offs.

Table 4: Volume versus Weight Measurement Trade-offs

| Trade-off | Volume Measurement | Weight Measurement |
|----------------------------------------|-------------------------------------|-------------------------------------|
| Accuracy of Measurement | Less accurate | More accurate |
| Ease of Use in Households | Less time consuming/more convenient | More time consuming/less convenient |
| Clarity of Method to Households | More complex | Less complex |
| Costs | Lower costs | Higher costs |

While volumetric measurement is very effective in creating a visual sense of how much goes to waste that households can refer to on an on-going basis, it is less exact than weight measurements given the considerable variability in what goes to waste in different households and at different times in the same household. This has to do with some foods being denser than others. Volume measurements are less accurate than weight measurements for additional reasons: some participants might tamp down the volume, while others do not; people may have difficulty accurately reading the volume if measurement indicators are on the outside of non-transparent containers; and volume measurements are less precise than weight as participants were instructed to round off to a fraction of the volume. Also, when different size containers are used, it makes it more difficult to compare measurements. In sum, **volumetric measurement is more geared to providing households a convenient waste yardstick but weight measurements provide for more accurate accounts of food waste**, both for the household and as a data source for implementing organizations.

Another measurement variable in the different Challenges was the portion of waste recorded. It seems important to have households focus on that portion of food waste they might prevent. While data on the total amount of waste is useful for solid waste agencies, there is a great deal of seasonal variability in the amount of inedible waste which may obscure a reduction in preventable waste. In the Seattle and Honolulu campaigns, participants recorded both the preventable and non-edible portions of waste but separately. From a research perspective, this data is important to determining what the limits might be on waste reduction at the community level.

It should also be noted that the instructions on separating preventable waste, that is, edibles, from inedible waste were not always provided and this was largely left to households to determine. In particular, discarding food waste that is not already separated during food preparation, for example, a discard chicken carcass with meat still on it, introduces a level of

uncertainty into the accuracy of the measurements. It is recommended that Campaign instructions be amended to address how to separate from inedible from preventable waste when discarding.

Collecting data on both the edible and inedible fractions of household food waste allows for a comparison to municipal waste stream data. By contrast, collecting data on the preventable fraction alone focuses household attention on the potential impact from adopting waste prevention strategies. Seasonal variability of the total waste stream may mask reductions in the preventable fraction.

Measurement periods varied from four to six weeks for the different pilots. In the Honolulu pilot, several Challenge participants felt that four weeks was too short a time period either to collect data or to establish waste reduction habits. In the 2014 campaigns, it was strongly recommended that households measure for two weeks to establish a baseline amount and then four weeks to determine the impact of the waste reduction strategies. Campaigns that opted to do fewer than these recommended time frames reported poor results. Also, the length of the Challenge did not seem to correlate to the retention rates (see Table 3). Routinized data collection seemed to make participation less problematic as evidenced by the high retention rate in Seattle where they measured wasted food for 13 weeks.

In sum, **less than six weeks is too short a time to provide an accurate idea of the reduction potential** but longer Challenges may affect participation rates, although the evidence from different pilots seems to suggest that the means of outreach are a more important factor in determining participation.

A final question with regard to the efficacy of the Challenge as a measurement tool is the accuracy of having households perform their own waste audits. The most commonly recommended method of quantifying household food waste is to conduct waste characterization studies which involves the use of trained waste handlers to measure the waste.²⁶ FTGTW has pioneered self-audits as a cost-effective means of collecting data on household waste patterns.

To determine whether waste audits are sufficiently accurate compared to a waste characterization study is beyond the scope of the FTGTW mandate. However, the trade-offs between the two methods merit comment. Self-auditing provides for more granular data than do waste characterization studies and, significantly, are instrumental in raising household awareness. Attributing changes in the amounts wasted to behavior changes is more difficult with waste characterization studies than with self-audits. The major drawback of self-audits is the resources needed to obtain a statistically robust sampling are cost prohibitive.

More research is indicated to verify whether audits introduce bias in the results towards under-reporting the amounts wasted. In the FTGTW campaigns, it was found that clear and simple Challenge instructions to households increase the accuracy of data collection and reporting.

Based on the measurement results, **requesting households weigh their waste appears to be an effective means of determining the potential for reduction in small to medium-sized sample populations**, especially when there are limited resources to conduct waste

²⁶ World Resources Institute. 2015. Draft FLW Protocol Accounting and Reporting Standard (FLW Standard). <http://www.wri.org/our-work/project/global-food-loss-and-waste-measurement-protocol/documents-and-updates#project-tabs>

characterization studies. Appendix C describes a community-scale measurement protocol that combines waste characterization approach with self-audits.

3.2.2 Effectiveness of Messaging

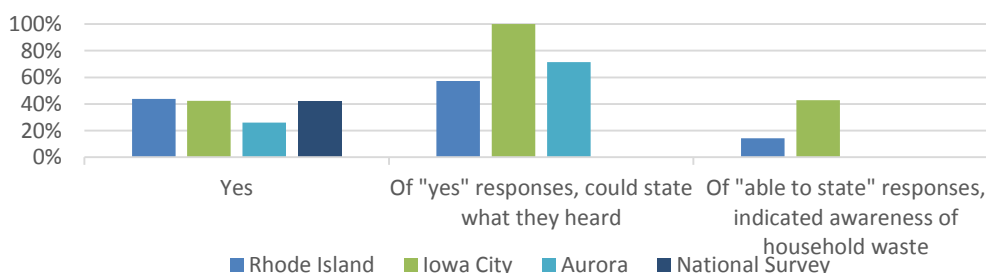
Data on the effectiveness of the messaging content came from three sources: the pre- and post-Challenge surveys; observations from campaign staff; and social media statistics.²⁷ In addition, the results from a recent nationally representative survey on U.S. consumers awareness, attitudes and behaviors related to food waste are presented.²⁸ This survey was conducted by Dr. Roni Neff of the John Hopkins Center for a Livable Future.

One concern during the design phase of the campaign was that the campaign messaging not be perceived as “preachy” or condescending. There were no reported incidents of complaints about the tone of the messaging. Instead, **campaign volunteers and staff reported significant expression of interest at tabling events and lively and spirited conversations at workshops.**²⁹ These results are likely an effect of CBSM principles – rather than instruct participants not to waste food as might be typical of a more traditional education campaign, CBSM offers interested participants tools and strategies for achieving the desired behavior changes.

The positive interest probably also reflects the issue’s relevance to households. In the John Hopkins national survey, 88% of the respondents indicated interest in reducing food waste, while only 12% of the respondents said that they were not at all interested. Likewise, in Gresham, 78% of participants in an event tabling survey (n=94) answered that they would like to reduce wasted food in their households.

One measure of messaging effectiveness is the increase in the percentage of the target population that expresses awareness of wasted food as an issue which requires action. Responses to pre-Challenge surveys serve to provide a baseline for establishing how much of the population is aware of wasted food as an issue. The questionnaires asked respondents whether they had seen or heard anything about the problem of wasted food in the last year. Their responses are shown in Figure 4. 42% and 44% responded yes in Iowa and Rhode Island respectively, which compared to 42% in the national survey.

Figure 4: Baseline Awareness (In the past year, have you seen or heard anything about the problem of wasted food?)



²⁷ This section looks at messaging content. Message delivery is considered in the context of outreach in the next section.

²⁸ Neff RA, et al. 2015. Wasted Food: U.S. Consumers' Reported Awareness, Attitudes, and Behaviors. *PLOS ONE*.

²⁹ Event tabling is the presentation of relevant materials, usually laid out on a table, at public events.

Respondents were also asked to state what they had heard. If we consider the “yes” and “able to state” responses, the data indicate that awareness of wasted food as a problem is not necessarily linked to taking action to reduce waste at home. While 42 to 44% might be considered relatively high percentages, only half of the “yes” respondents in Rhode Island could say what they had seen or heard and only 10% of these responses, in turn, indicated an awareness of household waste. Other responses had to do with such things as composting and landfilling waste or food recovery efforts. In Iowa City, 100% of the “yes” respondents could state what they had seen or heard and over 40% of the “able to state” responses indicated an awareness of wasted food as a household issue. These results suggest that the Iowa City sample showed a higher awareness of wasted food as a consumer problem, prior to the Challenge, than did the Rhode Island and Aurora samples.³⁰

To understand the impact of campaign messaging on awareness, the Iowa City and Rhode Island pre- and post-Challenge questionnaires asked to what extent different rationales motivated the respondents to minimize the amount of food being thrown out by them. The rating system was as follows: (1) Not at all (2) A little (3) A fair amount (4) A great deal. Their averaged responses are shown in Figure 5.

It can be seen from the figure that over half of the rationales concerned respondents “a fair amount” to “a great deal”, (between 3 and 4 on the scale). The rankings indicate that **feeling bad about throwing away food and wasting money appear to be equally strong motivators to reduce wasted food**. In a similar question, the national survey included a slightly different selection of motivations. It was found that saving money was the most important motivation with setting an example for children ranking second with parents. They found no geographical differences in the rankings.

Figure 5: Ranked Motivations to Reduce Wasted Food



³⁰ One possible explanation for Iowa’s higher awareness is their proximity to food production.

Comparing the rankings before and after the Challenge reveals some tentative conclusions about FTGTW messaging. Messaging intending to raise awareness of wasting energy and water resources by throwing out food was a key component of the FTGTW campaigns. Concern for wasted resources rose in both Rhode Island and Iowa City, in Iowa City it ranked third following the Challenge. However, In Rhode Island it was second to last of the seven motivations after the Challenge. Both in Rhode Island and Iowa City, the lowest ranked motivation prior to the Challenge was the contribution of wasted food to global warming. In Iowa, the degree of concern fell from before to after the Challenge, where in Rhode Island it increased by half of a scale point. Overall, these responses suggest that **increasing awareness of the indirect environmental effects of wasted food through messaging is challenging with mixed results.**

Campaigns also found that **there is the need to particularize environmental messaging to the household level for greatest effect.** An example of this is equating throwing away an apple to flushing the toilet seven times. During the Thurston County outreach presentations to community groups, the outreach staff observed that talking about the amount of resources embodied in a single food item made a greater impression on the audience than talking about wasted resources in the abstract. Also, pointing to the socio-economic consequences of wasting embodied resources, such as linking rising food prices to wasting the scarce resources used to produce and distribute food, make the significance of the environmental impacts easier to understand.

Additional information on messaging effectiveness comes from two of the community partners who collected data on their social media campaigns – Thurston County Solid Waste and Kanu Hawaii. Three measures were used to evaluate the effectiveness of individual messages: reach (the number of unique users who received at least one impression of the post), engagement (the sum of clicks, likes, engagements and shares) and stickiness (engagement divided by reach). The Kanu Hawaii Facebook campaign was conducted in August 2014. The content of their Facebook posts relate to a variety of environmental and socio-economic issues. By contrast, the Thurston County Facebook campaign began in March 2014 and continues but their Facebook community was built from scratch and their page is dedicated to raising awareness around wasted food.³¹ At the end of 2014, they reached over 2,500 page likes. A summary of the media statistics on the top individual messages follows.

In the 20,000+ Kanu Hawaii network, a posting on the shelf life of different foods had the greatest reach at 38 thousand impressions, exceeding the number in their network. The message with the greatest amount of stickiness was a posting on how to reduce browning of avocados at 12.4%. In Thurston County, the post with the greatest reach at 2900 was one asking if people had taken the Challenge, while the message with the greatest stickiness at 25% was one asking opinions on whether supermarkets should sell fruits and vegetables that do not meet their “normal” standards.

It should be noted that both campaigns’ choices about what to post reflected their perception of their communities’ needs, so the content was not necessarily equivalent. In Hawaii, there was a conscious decision to “emphasize the importance of local perspective in the campaign’s content”. Messages harvested from FTGTW materials were discarded as being too “mainland” and global. In Thurston County, only a handful of posts included content pointing to the consequent environmental problems of climate change or wasted resources, so determining

³¹ Behavior change tools were distributed as part of the Thurston County campaign but not in Kanu Hawaii’s campaign.

how effective this messaging was compared to other messaging types (e.g. tips and hints) is problematic. However, one post asking people to share the post if they agreed with the statement that “All food production uses resources that we rarely see or think of” did garner a stickiness rate of 17% and a reach of 1300.

A more systematic examination of messaging content would need to be undertaken to draw definitive answers on what type of social media messaging is most effective. One tentative conclusion is that posts asking the audience to respond through a question or to demonstrate their knowledge have higher levels of engagement and stickiness. Also, more content with localized environmental messaging is needed.

Both building a new network to focus on wasted food (Thurston County) and utilizing an existing network to achieve reach (Kanu Hawaii) appear to have advantages. The results suggest that it might be interesting to combine these two approaches in future campaigns.

3.2.3 Effectiveness of Outreach and Engagement

In addition to customizing outreach and engagement methods to the needs of their communities, the amount and type of available resources for a given campaign also had bearing on the methods used. These differences can lead to qualitatively different results. In consequence, it is possible to make only general statements about the effectiveness of particular outreach and engagement methods given the limited number of campaigns conducted. It is also too early to tell whether the pilots will result in sustained behavior changes.

Both qualitative and quantitative data were collected to evaluate the effectiveness of the campaigns’ outreach and engagement. In addition to tracking outreach efforts such as Challenge recruitment and retention rates, campaign staff also reported their observations on their interactions with target audiences.

Generally, it was found that **campaigns designed to leverage social networks and create social norms were among the most effective in terms of outreach and engagement.** Clear campaign objectives along with an understanding of how these related to the implementation means also led to more successful campaign outcomes as defined by the community partners. Finally, campaigns that had staff who were experienced in community outreach were able to benefit from this experience.

To track outreach efforts, campaigns collected data on Challenge recruitment. However, caution should be used in interpreting Challenge recruitment numbers as a measure of a campaign’s reach, that is, the percentage of the population that changed behavior from exposure to the campaign. The number of people influenced to change their behavior will be greater than the number of people recruited to take a Challenge.

While the majority of the campaigns focused on implementing small-scale Challenges, several of the 2013 and 2014 campaigns had broad-scale media components. These included the King County campaigns in 2013 and 2014, and the Palo Alto, Thurston and Kanu Hawaii campaigns. In the small-scale pilots, outreach was directed primarily to potential Challenge participants. By contrast, the broad-scale campaigns focused on building awareness of the targeted population using a variety of engagement techniques such as social media, traditional media, and videos. In between small-scale Challenges and broad-scale Campaigns are community-scale outreach initiatives such as tabling and presentations to community groups and networks. These sustain one-to-one and peer-to-peer connections while increasing the numbers reached.

Table 3 shows the recruitment outcomes. The results indicate there was varying success in recruiting households to take the Challenge. CBSM research has established that direct personal outreach is more effective than broad scale media campaigns. The recruitment data support this conclusion. In particular, **community-scale direct outreach, such as used in the Thurston and King County 2014 campaigns, was more effective than recruitment through indirect means such as social media outreach.**



Campaign staff reported that the **response to FTGTW community-scale direct outreach efforts was enthusiastic.** A ten year veteran of community outreach campaigns in Thurston County observed that she had never seen as high a level of interest and gratitude for bringing an issue forward. Other campaign volunteers reported that, during tabling, people commented that they thought FTGTW was a good use of public dollars.

In terms of venues, tabling at farmers markets (King and Thurston Counties) led to greater engagement than did tabling at grocery stores (Gresham) as reported by campaign staff and volunteers.

The U.K.'s Waste and Resources Action Programme (WRAP) hypothesizes that direct or one-to-one outreach allows campaigns to tailor wasted food reduction strategies to the individuals.³² Another explanation is that one-to-one and peer-to-peer outreach engages social learning and the creation of

new social norms, as well as the opportunity to leverage networks.

Leveraging existing networks through cascade training, e.g. “train the trainer”, approaches is one possibility for cost effective community-scale campaigns. King County, in its 2014 campaign, partnered with Master Composters to do tabling at farmers markets and report that their engagement in outreach elevated the network’s knowledge about the benefits of waste prevention. A variant of this approach is to organize a campaign around “food waste champions” who, equipped with campaign materials, perform outreach to their personal networks.

In addition to direct personal contact, more personalized appeals to participate also appear to be more effective. For example, in Iowa City, an outreach letter to potential Challenge participants began with their having been “chosen” to participate. Over 50 people out of the 300 receiving the letter responded. (See Section 4.1 for further discussion of Iowa City’s outreach.) In this regard, campaigns that focused their outreach were more successful in recruiting participants as measured by the percentage recruited of the target population size than those who chose blanket approaches. The recruitment rate for those using non-targeted outreach did not exceed 2%. Iowa City achieved the highest recruitment rate at 17%. In addition, by identifying target neighborhoods, their sample was more representative of the target population as a whole.

³² Quested et al. 2013. Spaghetti Soup: The Complex World of Food Waste Behaviors. WRAP is the U.K.'s premiere food waste reduction organization. They have conducted extensive research on the causes of wasted food and behavioral interventions.

To date, creating a new social norm around wasting less food has not been a primary focus of campaigns. One outreach tool used by Thurston County and King County in its 2014 campaign that serves this purpose was the public commitment, an example of which can be seen in the accompanying photograph. People visiting the FTGTW table at farmers markets were invited to have their photograph taken with a chalkboard on which they had written their “commitment” to trying a reduction strategy. In turn, these photographs can be shared through social media sites like Facebook and Instagram. This is a fun way of making the new behaviors visible.



As noted above, the Challenge recruitment rates should not be read as a measure of a campaign’s overall reach, especially in broad scale campaigns. There are many barriers to households measuring their wasted food over several weeks, from the practical, such as being away from home during part of the Challenge period, to more aesthetic reasons, such as a concern about odors. In Thurston County, there was also feedback that many households already knew they wasted more food than they wanted to and wished to start trying the strategies immediately instead of measuring their baseline amounts. To determine the full impact of a broad-scale campaign, and thereby its effectiveness, it will be necessary to conduct a community-wide measurement program that combines surveying and some method of waste characterization.

Recruitment rates reflect outreach effectiveness, while retention rates are more an indication of successful engagement techniques. Almost all of the campaigns achieved a fifty percent or greater retention rate.

With respect to engagement, **the general rule for successful campaigns was to engage participants early and often.** For example, the 2014 King County campaign emailed participants weekly with encouragement, tips, reminders and incentives in the form of an opportunity to “win” waste reduction-related products through participation. Frequent engagement also likely reinforces the sense of belonging to a group or network, thus enhancing pro-social motivations.

Another successful engagement technique was to engage challenge participants through a variety of learning techniques. For example, Rhode Island conducted hands-on workshops in which the workshop presenter, a chef, demonstrated measurement techniques and strategies. This type of social learning and learning by doing reduces the knowledge barrier to wasting less food. The efficacy of this approach is likely reflected in the higher percentage waste reductions achieved in Rhode Island.

Finally, it is clear that **without a focused effort a campaign can fail.** Two campaigns that encountered significant hurdles to implementation were the Naropa University and Sustainable Jersey City campaigns. In both campaigns, there were competing priorities for the organizations carrying out the campaigns and hence for the Challenge participants.

By contrast, campaigns that expressed learning objectives achieved success by familiarizing themselves with CBSM principles and techniques which, in turn, resulted in a higher quality

engagement. The majority of these organizations plan to build on this early success and continue to scale up their programs.

As noted above, it is too early to assess whether FTGTW campaigns result in sustained behavior changes. However, there are a few indicators of the potential to effect lasting behavior change. One is the high percentage of post-Challenge participants reporting that they are likely to continue to use the tools and strategies (see Figure 2 above). The other is the campaign's confidence in their success and their plans to scale-up their programs. Ultimately, the question of how to sustain waste reduction behaviors comes back to creating new social norms which suggests sustained campaigns and an increase in scale.

3.2.4 Household Factors Affecting Reach and Effectiveness

Given the small sample size of the campaigns and self-selection by Challenge participants, it is difficult to draw conclusions from the quantitative data with respect to factors influencing household participation and the reported effectiveness of strategies and tools.

The two major target audiences for the early pilots were households with young children and young adults. However, in practice, a majority of the 2013 and 2014 campaigns did not target their outreach or messaging. Of those who did, more targeted families with children. One challenge cited by a number of campaigns in targeting young adults was identifying networks or venues through which to reach them. Farmers markets appear to offer access to more diverse demographics than do presentations at civic or neighborhood groups.

Some hints as to differences in the two target populations' responses to the campaign materials emerge from comparing the Honolulu and King County 2012 results. Meal planning was judged to be more of a task by young adults than families with children, although (as noted above) these results should take into consideration that the Honolulu campaign which targeted young adults used a more complex meal planning tool requiring more effort.

In Seattle, the baseline audit participants, who were self-selected through responding to a request for participants placed in the newsletter that accompanies utility bills, skewed heavily towards the well-educated and those with higher level incomes. While this bias does not predict who might respond to a FTGTW campaign, it does indicate that **outreach needs to be targeted with the desired demographics in mind.**

In the San Benito pilot, most of the participants were Spanish-speaking. Language appeared to be a barrier to participation as reported by the implementing partner, even with the FTGTW tools being available in Spanish.

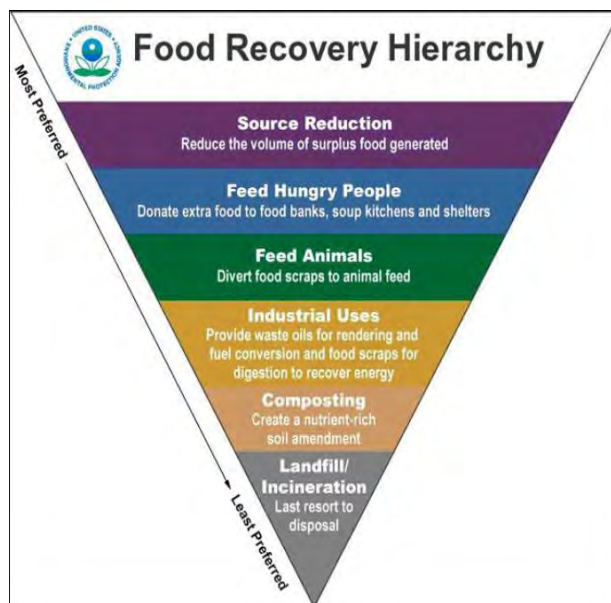
Rhode Island reported a very positive experience in engaging low-income households but also noted the need for sensitivity around whether some of these households would have food at all. Many of the participants wanted to know what more they could do around the issue of wasted food and also offered to be ambassadors to their communities. The incentives they offered for participation included community hours credits which housing authority residents are required to fill in exchange for subsidized housing.

In Thurston County, a late 2014 survey of people who chose not to participate in the Challenge identified two main reasons for their choice. One was the previously mentioned time barrier but also many of the survey respondents stated that they didn't need to see how much they wasted since they were already aware they wasted a lot and wanted to move forward with testing the strategies without taking time for baseline measurements.

As campaigns scale-up, they are more likely to target the general population. Whether one should focus on identifying innovators and early adopters over representative samples of the whole population depends on a campaign's objectives. This also holds true for whether one should try targeting different demographic segments over outreach to the general community.

3.2.5 Effectiveness of Implementation Support and Learning Community

FTGTW was developed as a partnership that includes the EPA, city, county and state agencies, and non-profits, each contributing unique perspectives, skills and experiences. This collaboration provides a valuable opportunity to both leverage resources and accelerate learning.



One of the most successful elements of the partnership are the monthly peer learning group calls convened by the EPA. Community partners share their experiences and offer peer advice in tackling various implementation issues, while the EPA uses the calls to seek feedback on FTGTW campaign development and to efficiently support the network.

In effect, the calls are facilitating the emergence of a network of waste prevention practitioners focused on source reduction (see hierarchy at right). Through these calls, participants gained valuable experience in CBSM as a means of community engagement.

This collaboration allows communities to leverage their limited resources by sharing the costs of campaign development and

implementation. This network model of information sharing, replicating and implementing has the potential to generate novel solutions and whole system innovations that no one could achieve on their own.

Additionally, the importance of participating in the peer group learning calls to learning CBSM as the foundation of successful campaigns cannot be overstressed. CBSM provides a way to creatively engage communities in wide-scale behavior changes but it takes both understanding and experience to successfully execute. **The peer learning group calls provide a way for the implementing organizations to share lessons learned and accelerate their own learning.**

3.3 CAMPAIGN IMPACT

A second major FTGTW program objective is to determine if a shift in household food waste behaviors has the potential to result in waste tonnage reduction. To achieve quantifiable reductions in wasted food at the community level, it is necessary to engage and sustain behaviors that have a significant impact at the household level (depth) as well as engage a significant percentage of the general population in adopting the behaviors (breadth).

Given the small sample size of the majority of the campaigns, the focus was on measuring the amount of food going to waste in individual households both before and after adopting the strategies to reduce wasted food, that is, on measuring impact at the household level or the “depth” potential. The period of time households measured waste before adopting waste reduction strategies is referred to as the “baseline period” and the amount of food wasted during that time as the “baseline amount”.

Figure 6, the Food Loss and Waste Data Map, locates the impact results from the FTGTW campaigns relative to other food loss and waste (FLW) data. The map shows key FLW data in relation to the material flows the data represent and the data types and sources. It is intended for use as a tool to assist understanding of the more commonly used data points referencing the extent of food waste.

Interpreting impact results requires understanding which fraction of waste flows is being measured which, in turn, depends on clear definitions of what is being measured. Food loss and waste (FLW) is defined as food and associated inedible parts removed from the food supply chain, where food is any substance intended for human consumption.³³ The USDA defines food loss as the edible amount of food, postharvest, that is available for human consumption but is not consumed for any reason, while food waste is defined as a component of food loss and occurs when an edible item goes unconsumed.³⁴ Food waste as referred to in waste characterization studies typically includes both the edible and non-edible portions of food.

It is worth noting with regard to calculating impact that there is no data source that provides the amount of household food purchases by weight. The USDA Loss-Adjusted Food Availability (LAFA) Data Series estimates for consumer level loss aggregate consumer purchases (by weight) of food for preparation or consumption at home with purchases made at restaurants and food service (as seen in Figure 6).³⁵

Figure 6 indicates that the fraction of waste measured in the FTGTW challenges is a portion of the waste that goes to solid waste destinations and does not include wasted food that was fed to animals, was backyard composted or went down the drain.

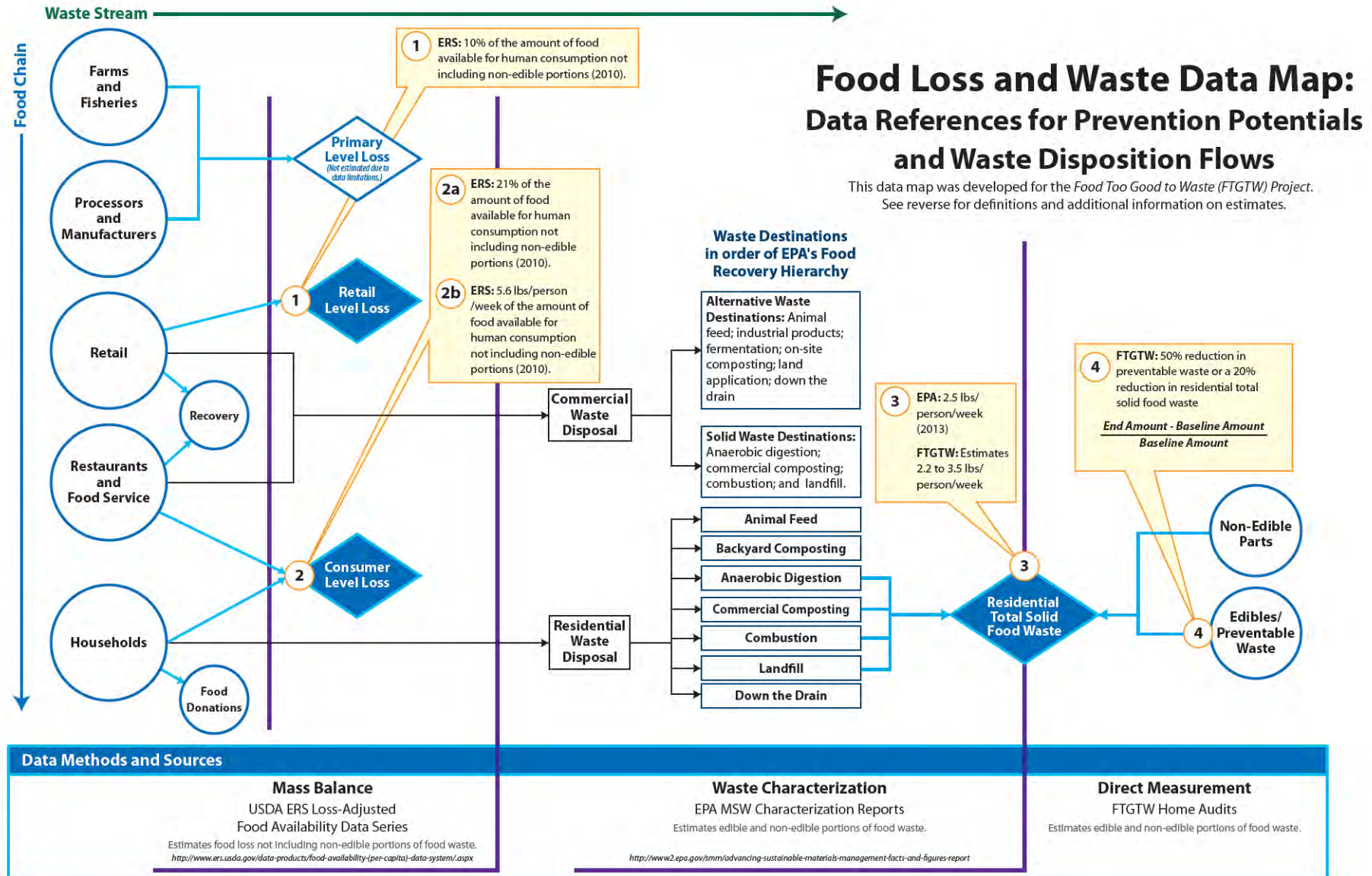
Depending on what data was collected by a campaign, the percentage reductions reflect either the households’ total solid food waste (hereafter referred to as “total waste”) or preventable waste fractions.

³³ World Resources Institute. 2015. *Draft FLW Protocol Accounting and Reporting Standard*.

³⁴ Buzby, Jean C., Hodan Farah Wells, and Jeffry Hyman. 2014. *The Estimated Amount, Value, and Calories of Postharvest Food Losses at the Retail and Consumer Levels in the United States*.

³⁵ Available at <http://www.ers.usda.gov/data-products/food-availability-per-capita-data-system/.aspx>.

Figure 6: Food Loss and Waste Data Map



Food Waste Data Map: Definitions and Notes

The Food Waste Data Map (the schematic on the reverse side of this sheet) shows key data in relation to the material waste flows the data represent and the data types and sources. The map was produced as part of the EPA-supported Food: Too Good to Waste (FTGTW) Project. It is intended for use as a tool to assist understanding of the more commonly used data points referencing the extent of food waste.

Primary Definitions

In this schematic, food loss and waste (FLW) is defined as food and associated inedible parts removed from the food supply chain, where food is any substance intended for human consumption (see <http://www.wri.org/our-work/project/food-loss-waste-protocol>).

The USDA defines food loss as the edible amount of food, postharvest, that is intended for human consumption but is not consumed for any reason, such as spoilage, moisture loss, and food waste. (<http://www.ers.usda.gov/publications/eib-economic-information-bulletin/eib121.aspx>). Food waste as referred to in waste characterization studies typically includes both the edible and non-edible portions of food.

Recovery is the collection of wholesome food from wholesale and retail sources for distribution to people in need. Food donations are the contribution of wholesome food by households to programs distributing food to people in need.

Data Type Definitions

Mass Balance: Estimates based on data for raw material input and produced amounts.

Waste Characterization: Data from waste stream samples where the different fractions of waste are weighed.

Direct Measurement (e.g. home audits): Volume or weight measurements conducted at unit of analysis (e.g., household, business).

Data Source Acronyms

USDA ERS: US Department of Agriculture, Economic Research Service

US EPA: US Environmental Protection Agency

FTGTW: Food Too Good to Waste

Mass Balance Fraction Definitions

All ERS estimates are for food loss. ERS Loss-Adjusted Food Availability (LAFA) data is considered to be preliminary because data initiatives are underway to improve the underlying loss assumptions. Additional information on the ERS' mass balance loss estimates can be found at: [http://www.ers.usda.gov/data-products/food-availability-\(per-capita\)-data-system/loss-adjusted-food-availability-documentation.aspx](http://www.ers.usda.gov/data-products/food-availability-(per-capita)-data-system/loss-adjusted-food-availability-documentation.aspx)

Primary Level Loss: Losses occurring between point of production (e.g. farm or processing or manufacturing facility) and retail such as further processing, trimming, shrinkage, or loss in the marketing and distribution system. Primary level waste is limited to post-harvest waste, that is, it does not account for on-farm losses. ERS cannot estimate primary level loss because of data limitations.

Retail Level Loss: Losses at the retail level, such as in supermarkets, supercenters, convenience stores, mom-and-pop grocery stores, and other retail outlets (but not including restaurants and other foodservice outlets). For fresh fruits, vegetables, meat, poultry, and seafood, loss estimates are based on supplier shipment data with point-of-sale data from stores in large, national supermarket retail chains.

Consumer Level Loss: Losses at the consumer level including losses for food consumed at home and away from home (for example, restaurants and fast food outlets) by consumers and food services. For most commodities, loss estimates are based on Nielsen Homescan data (food purchase data) and the dietary intake component of the National Health and Nutrition Examination Survey (NHANES) (food consumption data).

Available Food Supply: The amount of food available for consumption not including non-edible portions. The estimates of food loss as a percentage of the available food supply cited on the data map have had the non-edible portions removed (Buzby et al. February 2014, The Estimated Amount, Value and Calories of Post-Harvest Food Losses at the Retail and Consumer Levels in the United States. USDA ERS Economic Information Bulletin No.121.)

Direct Measurement Definitions

Inedible Parts: Components of a food that the user does not intend to consume. Examples could include bones, rinds, or pits/stones.

Edibles/Preventable Waste: Food that is intended for human consumption but is not consumed for any reason (e.g. loss from mold, plate waste).

Baseline Amount: Amount of food wasted before FTGTW intervention.

End Amount: Amount of food wasted after FTGTW intervention.

Table 5 (on the following page) summarizes the results on how much food was wasted during the baseline period (prior to the households adopting strategies) and during the final week and computes the percentage reduction. The per capita averages for both total and preventable waste fractions by weight and volume are shown in Figures 7 and 8 respectively.

The methodology for calculating the percentage reduction was to average the amounts of waste for the baseline weeks and to compare that to the average of the final week. The reason for selecting the final week average as the basis for comparison is because the change in behavior has a cumulative effect as new habits become established. Thus, the predominant pattern is a downward trend in the amount of food wasted over the period of the Challenge, (as noted above in Section 3.2.1 in the discussion of the Seattle baseline waste audits). As the samples are small, the most that can be determined by this method is the potential for wasted food reduction at the household level. The final week average represents a more accurate estimate of this potential than does an average of the strategy implementation weeks. In fact, in more than one campaign a jump was seen in the amount of waste collected during the first week of implementation.

The following sections of the report discuss first the findings on the baseline amounts of wasted food, then the percentage reductions, followed by a discussion of the household factors affecting impact.

3.3.1 Baseline Amount

Table 6 summarizes the findings on how much food was wasted in households in the Iowa City, Honolulu and Seattle pilots during the baseline period (prior to intervention) and compares it to figures for tipping weights in King County (where Seattle is located) in 2007, the USDA estimate for consumer food loss, and the EPA estimate of residential food waste sent to landfills. (The USDA and EPA figures cover the entire U.S.)

Table 6: Total Baseline Food Waste per Person per Week (Iowa City, Seattle, Honolulu)

| Community | Pounds/ household/ week | Number of people/ household | Pounds/person/ week |
|-----------------------------------------------------------------|-------------------------------|-----------------------------------|------------------------|
| Iowa City | 4.7 lbs | 2.5 | 2.2 lbs |
| Honolulu | 4.3 lbs | 1.7 | 3.5 lbs |
| Seattle | 6.3 lbs | 2.3 | 2.8 lbs |
| King County 2007 – Tipping weights (1) | 10.5 lbs | 2.5 | 4.2 lbs |
| EPA Landfilled Food Waste 2011 (2) | -- | -- | 2.5 lbs |
| USDA Consumer Food Loss 2010 (Includes restaurant waste) (3) | -- | -- | 5.6 lbs |

Sources: (1) Cascadia Consulting Group. *2007 Waste Characterization Study* (2) Municipal Solid Waste in the United States: 2011 Facts and Figures. May 2013, US EPA. U.S. EPA. (3) Buzby et al, 2014. The Estimated Amount, Value, and Calories of Postharvest Food Losses at the Retail and Consumer Levels in the United States.

From Table 6 we see that the total amount of food wasted per person per week in the three campaigns ranged from 2.2 pounds in Iowa City to 3.5 pounds in Honolulu. **This is comparable to the EPA estimate of 2.5 pounds of landfilled residential waste per person per week.** The comparability suggests that the household measurements reasonably represent the actual amount of wasted food.

Table 5: Household and Per Capita Average Percentage Reductions by Project

| Project | Sample Size | Avg Number of People per Household | Fraction | Method | Number of Weeks | Number of Baseline Weeks | Avg Household Baseline Amount | Avg Household Final Week Amount | % Change in Household Averages | Avg per Capita Baseline Amount | Avg per Capita Final Week Amount | % Change in Per Capita Averages |
|------------------|-------------|------------------------------------|-------------|--------|-----------------|--------------------------|-------------------------------|---------------------------------|--------------------------------|--------------------------------|----------------------------------|---------------------------------|
| | | | | | | | Per Household | | | Per Capita | | |
| Gresham | 17 | 2.3 | Preventable | Weight | 6 | 2 | 2.4 | 1.9 | -19% | 1 | 0.9 | -15% |
| Honolulu | 12 | 1.7 | Preventable | Weight | 4 | 2 | 1.6 | 1.2 | -22% | 1.0 | 0.9 | -11% |
| Rhode Island | 15 | 2.2 | Preventable | Weight | 6 | 2 | 2.4 | 0.8 | -66% | 1.1 | 0.6 | -48% |
| Seattle | 107 | 2.3 | Preventable | Weight | 13 | 13 | 2.1 | n/a | n/a | 0.9 | n/a | n/a |
| Honolulu | 12 | 1.7 | Total | Weight | 4 | 2 | 4.3 | 3.8 | -12% | 3.5 | 2.7 | -31% |
| Iowa City | 29 | 2.5 | Total | Weight | 6 | 1 | 4.7 | 5.4 | 15% | 2.2 | 2.4 | 7% |
| Seattle | 107 | 2.3 | Total | Weight | 13 | 13 | 6.3 | n/a | n/a | 2.8 | n/a | n/a |
| Rhode Island | 15 | 2 | Preventable | Volume | 6 | 2 | 69 | 49 | -30% | 52 | 36 | -30% |
| Addison County | 31 | n/a | Preventable | Volume | 6 | 2 | 112 | 101 | -9% | n/a | n/a | n/a |
| Aurora | 23 | 2.1 | Preventable | Volume | 6 | 2 | 146 | 81 | -45% | 65 | 38.6 | -41% |
| King County 2014 | 53 | 2.9 | Preventable | Volume | 4 | 1 | 141 | 88 | -38% | 49 | 31 | -37% |
| Thurston County | 42 | 2.9 | Preventable | Volume | 4 | 1 | n/a | n/a | -31% | n/a | n/a | -30% |
| King County 2012 | 13 | 4.5 | Total | Volume | 5 | 1 | 190 | 137 | -28% | 41 | 30 | -27% |
| Oak Park | 12 | 3.5 | Total | Volume | 6 | 2 | 152 | 167 | 10% | 45 | 48 | 7% |

Figure 7: Per Capita Wasted Food Reduction Averages by Weight

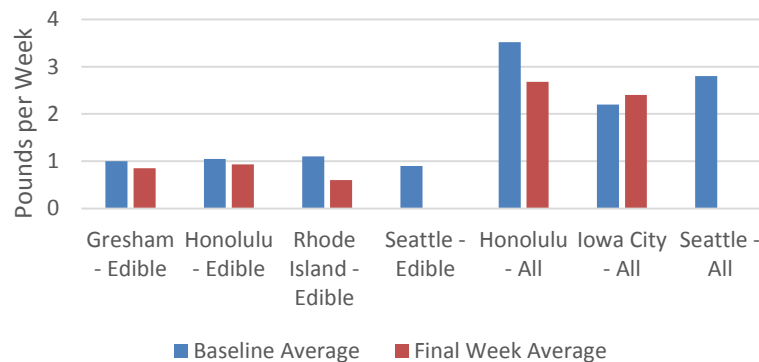
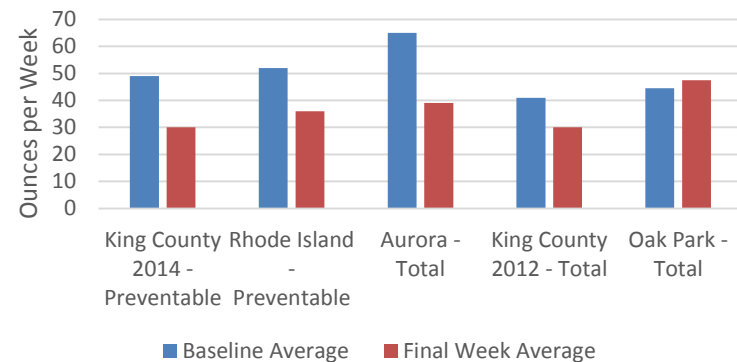


Figure 8: Per Capita Wasted Food Reduction Averages by Volume



Seattle's numbers are also similar to those found in previous studies conducted by Seattle Public Utilities as seen in Table 7 below. This indicates that the Seattle averages are a fair estimate for how much food goes to waste in Seattle. However, the Seattle Campaign was conducted from Jan 6 through April 6 of 2013, so it may be that the seasonal average for winter months is lower than the average for growing season months when more fresh produce might be purchased.

Table 7: Baseline Data Comparison with Previous Waste Studies

| Study | Year | Average Weight per Household |
|------------------------------------------|------|------------------------------|
| Food: Too Good to Waste | 2013 | 329 lbs./household/year |
| Green Cone backyard compost study | 1993 | 370 lbs./household/year |
| Curbside weighing project | 1994 | 328 lbs./household/year |
| Adjusted waste composition study | 1994 | 293 lbs./household/year |

Source: Seattle Public Utilities, Draft Report, Seattle's Food Waste Weighing Pilot

Time of year was probably not a factor in comparing the campaign results for Seattle and Honolulu with due consideration for the two different campaign locations. The Honolulu Challenge ran from February 20 to March 20 of 2013, so the two pilots were conducted at the same time of year. However, the Iowa City campaign was conducted during the early summer months. We would expect that there would be more total food waste during the summer months because of an increase of the availability of fresh produce. However, the Iowa City results indicate a lower baseline amount.

It could be that household size is the explanatory factor in the range of baseline amounts, especially the higher baseline amount in Honolulu. Previous research says that the larger the household size, the smaller amount of waste per capita, the explanation being that food tends to get eaten up at a faster rate.³⁶ The second factor that might explain the differences are existing regional differences in food waste management behaviors. Prior to the campaign Iowa City residents were already taking steps to reduce wasted food at home which is reflected in their lower baseline amounts. There is some evidence to support this supposition which is discussed in the following section.

In both the Seattle and Honolulu pilots, **baseline preventable food waste averaged about one-third of all food waste.** (Preventable waste was not measured in the Iowa City campaign.) Over the course of the Seattle pilot, weekly averages varied from 26.9% to 41.8%. While the average percentage of preventable food waste in the Honolulu campaign fell from the baseline period to the period participants tried strategies, the average was over 40% in the baseline period.

The results on the amount of preventable food waste as a percentage of total food waste merit further research. In the U.K. WRAP studies, preventable food waste accounted for 60% of household food waste compared to the one-third of overall waste in the Seattle and Honolulu campaigns.³⁷

³⁶ Quested et al. 2013. *Household Food and Drink Waste in the United Kingdom 2012*. Also, the Seattle data bears out this hypothesis as discussed in Section 3.3.3 below.

³⁷ Quested et al. 2013. *Household Food and Drink Waste in the United Kingdom 2012*.

3.3.2 Percentage Reduction in Wasted Food

Table 5 and Figures 7 and 8 summarize the FTGTW impact findings. The reduction in preventable food waste ranged from -11% to -48% by weight and from -27% to -39% by volume, while the total waste change ranged from +7% to -30% by weight and from +7% to -27% by volume.

Several conclusions can be drawn from these results. First, there is a high degree of variability in the wasted food reduction potential. It is apparent that the percentage of waste reduction is affected by campaign variables such as the time of year when the campaign was conducted and which fraction of waste was measured.

Both Iowa City and Oak Park saw increases in the total amount of wasted food rather than reductions. That both campaigns measured total waste rather than preventable waste in tandem with their timing in late spring/early summer probably account for the increases. Participants noted the individual household amounts in later weeks were due to watermelon rinds and fresh corn husks. It seems likely that there is enough of a seasonal variation in the amount of non-edible waste to obscure probable reductions in the amount of preventable waste. This is bolstered by the fact that preventable waste reductions are more significant than the total waste reductions as would be consistent with this premise.

Another campaign variable that appears to significantly affect the recorded amount of reduction was the length of the Challenge. Challenges that lasted longer saw more significant reductions. The six week Rhode Island campaign resulted in a 48% reduction while the four week Honolulu campaign resulted in an 11% reduction.

A third campaign variable that affected results is the choice of measurement method. As discussed earlier, volume measurements are less accurate than weight measurements. While volume measurement can be an effective and relatively inexpensive means of raising awareness in individual households, it is less useful than weight measurements in reliably establishing the potential for waste reduction. For example, the difference in the Rhode Island results by weight and volume were substantial. The Rhode Island campaign saw an average 48% reduction by weight and only a 30% reduction by volume. The diminished accuracy of volume measurement may also help explain why the volume of edible waste in King County in 2014 was as great as total waste in 2012 (see Figure 7).

Region may also be a factor in determining the waste reduction potential. One household factor that greatly affects the potential for reduction is the amount of baseline waste. It is clear that **households starting with a low level of waste have less waste reduction potential** (see the next section for a discussion of the Rhode Island Results). The Iowa City results are an interesting case in this respect. While Iowa City measured the total waste fraction and thus we do not know what percentage reduction was achieved in preventable waste, it is also seen from Figure 7 that Iowa City started with a lower baseline amount of waste than did the other campaigns. One contributing factor in this lower starting point may be that there is a higher level of awareness in Iowa City as discussed above in Section 3.2.2.

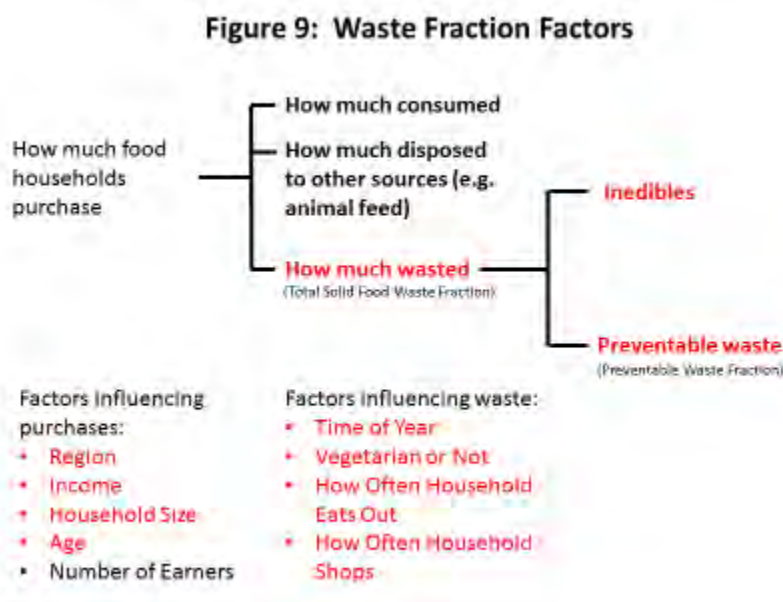
Possibly the most significant conclusion regarding the impact results is that **campaigns that are successfully implemented can result in a significant reduction in preventable food waste at the household level. The magnitude of the potential reduction in preventable waste is 50% or more or approximately a half pound per person per week.** This is roughly equivalent to a 20% reduction in total waste.

The 50% or more potential reduction estimate is based on the Rhode Island campaign results where the average reduction in preventable waste was 48% by weight and the 41% and 37% reduction by volume in the Aurora and King County 2014 campaigns respectively. One of the four Rhode Island cohorts achieved a 70% average reduction (see the next section).

Finally, it is worth repeating that given the small sample sizes and the lack of quantitative data on reach, these impact results are not scalable to the community level. A next step in determining impact will be to conduct a community-scale measurement study (see Section 4.3 for further discussion).

3.3.3 Household Factors Affecting Impact

There is a significant amount of variability in the amount of wasted food by household and therefore, the amount of waste reduction possible. These differences largely reflect household food management practices but, in turn, these practices are influenced by demographic and lifestyle factors as seen in Figure 9.



The behavior-influencing factors that affect both how much food is purchased and how much of that is wasted are also shown in Figure 9. Data was collected on the variables in red font in at least one of the pilots. Factors affecting how much food is purchased may also influence how much is wasted. These factors' influence on impact are discussed below in Section 3.3.3.

The high degree of variability introduces a large amount of noise into the data with small samples, particularly since the Challenge participants are self-selected. For that reason, caution should be used in extrapolating the data. At the same time, the data provide useful indicators of which demographics and management practices to target for the greatest impact.

A regression analysis of the Seattle baseline data where 123 households measured their waste for 13 weeks found that:

- Income and education significantly affect amount of food waste. Both low and high income wasted more, while middle income households (inflection point of \$67k) wasted the least.

- Young adults generate the most food waste.
- Immigrants waste less than average.
- Vegetarians waste more than average.
- The amount wasted per person decreases with household size.

The finding that young adults have greater baseline amounts of wasted food is consistent with earlier studies. As explained in the FTGTW background research report, a dynamic lifestyle in which plans on where and when to eat frequently change makes food management challenging.³⁸ With vegetarians, the higher waste amounts are attributable to greater amounts of inedible waste.

While the Seattle survey also contained questions regarding food management practices, the findings around these were much weaker. It is surmised that self-reporting food management practices will be biased and any correlations with amounts of wasted food weak.

Finally, the Seattle analysis confirmed the significance of the feedback effect from measuring waste: food waste decreased over the length of 13 weeks although no strategies or tools were introduced to the study participants.

Also contributing to high variance, a number of out-of-the-ordinary but not infrequent household events can alter food management practices, such as household visitors, vacations, and sickness. For example, in Honolulu, “irregular” events reported by participants included a family member placing a large quantity of food in refrigerator unbeknownst those responsible for food preparation, where after it went to waste; one household moving to a new residence; and another spending a week at a residence other than their own.

Factors such as diet and households schedules can cause variability as well. These “lifestyle” factors might also influence waste averages for different demographics. For example, in the San Benito pilot, which targeted low income-families whose primary language was Spanish, higher amounts of legumes and grains were wasted and lettuce was the main vegetable wasted.

Photo Examples of Wasted Food – San Benito Pilot



The average amount wasted per household per week for all weeks of the San Benito pilot, both baseline and post-intervention, was 2.5 pounds. A high percentage of the wasted food was food that was prepared but not eaten (see photographs above). These patterns may reflect food management practices that are typical of this demographic.

Further evidence of the effect of household factors on the amount of wasted food comes from the analysis of the Honolulu campaign results performed by A. Lavers.³⁹ Of the eight

³⁸ EPA 2012 *ibid*.

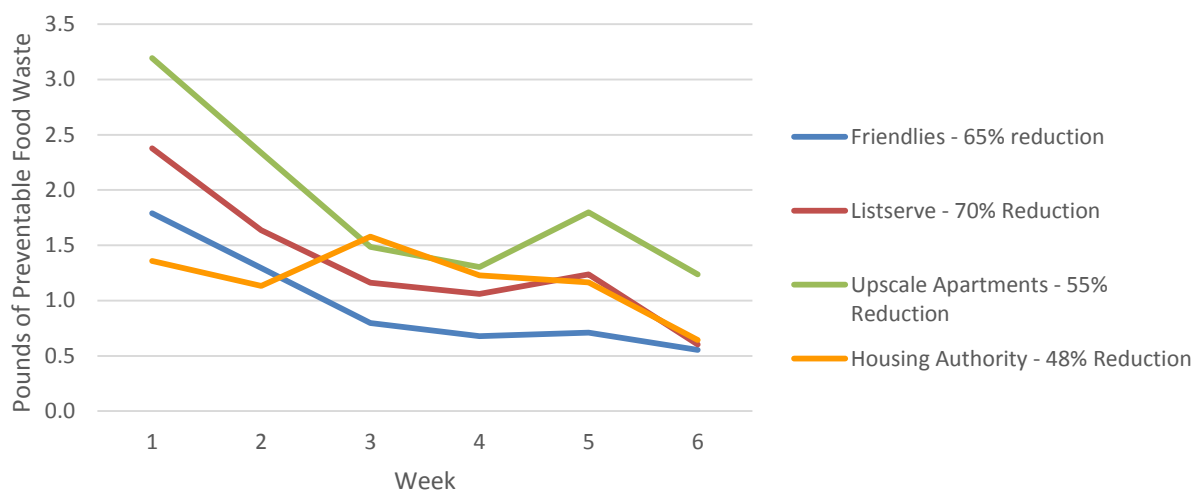
³⁹ Alexandra Lavers. 2013. *Eat Me First! Development and Evaluation of the Food: Too Good to Waste Household Food Waste Prevention Program in Honolulu, Hawaii, USA*.

households that saw waste reductions, two distinct clusters were identified: Cluster 1 consisted of younger participants and predominantly single-member households. Cluster 2 included all campaign study participants who were over the age of 45. Cluster 1 averaged a 41% reduction, while Cluster 2 averaged a 24% reduction. The report states, “[I]t is apparent that the difference in preventable food waste reduction can be attributed to the fact that Cluster 2 households started with less food waste and thus had less potential for reduction; Cluster 1 simply started with a larger amount of food waste.” An additional five households increased the amount of food wasted over the Challenge. Three of these households cited “irregular” events that affected the amount wasted.

The effect of eating out on the amount of wasted food was also analyzed in the Honolulu report. No discernible effect was seen and the report concluded, “[S]ome households are aware that they eat out frequently and adjust grocery habits accordingly while others do not.”

Figure 10 depicts the waste reduction by week for four cohorts in Rhode Island. The baseline amount for the high-income households is more than twice that of the low-income households. Correspondingly, the reduction for the housing authority cohort was 48%, less than the 55% reduction in the upscale apartment cohort.

Figure 10: Rhode Island Food Policy Council (RIFPC) Preventable Food Waste Household Averages by Test Group



The Iowa City results also indicate that the amount of food wasted rose with income level although there was a huge variance in the amounts. Other influences included diet, vegetarians had more waste than non-vegetarians; household gardening, gardeners had more waste than non-gardeners; and age, seniors had less waste. Interestingly, peak waste was generated by the 41-50 year old participants in the Iowa City Challenge.

In sum, almost all of the factors cited in Figure 9 has some effect in the amount of food going to waste though different factors had greater influence in some campaigns than others.

3.4 CAMPAIGN COSTS, ENVIRONMENTAL BENEFITS AND FIT WITH EXISTING PROGRAMS

At the request of the Forum partners, a key FTGTW evaluation goal was to determine the costs to implement a FTGTW project and to estimate its environmental benefits. This information is needed to help make the case for the return on larger scale campaigns. One more final objective was to review the alignment of FTGTW with existing policy and program objectives.

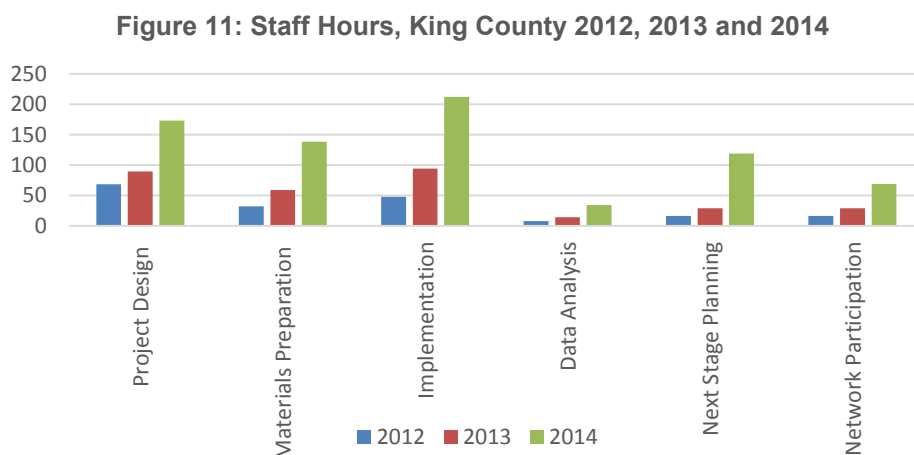
Implementation costs for campaigns ranged from a few thousand dollars for pilots to above \$100,000, not including staff time, for broad scale campaigns.

Given the small scale of the pilots and the shared responsibility for design and development between the Forum and the implementing partners, campaign costs were modest. Basic costs included costs to print the CBSM tools, cost of measurement bags or other containers used in the Challenge, and staff time. In addition, some pilots used incentives to engage individual households, the costs of which include both time to procure the items and/or the cost of the incentives themselves. In several campaigns, partnerships were made with businesses who offered the incentives in-kind.

For the 2013-2014 campaigns, the cost to use FTGTW materials was negligible to participating communities, while the opportunity to collaborate on tool and campaign design led to reduced costs for these activities.

Staff time included time spent in the following: gaining organizational approval; campaign design; materials preparation and modifying the tools for local use; outreach and collecting data; and time spent evaluating and disseminating campaign results. The allocation of staff time varied according to campaign objectives and scale; whether outside resources were used; and the implementing organization's level of CBSM experience. In Iowa City, staff time accounted for 82% of an \$11,000 budget.

The cost data for the three campaigns King County conducted each fall in 2012, 2013 and 2014 (see Campaigns 1, 8 and 15 in Table 2) indicate a progression in the cost structure as shown in Figure 11. (Volunteer hours are not included).



This progression suggests that, as experience grows, less time as a percentage of total staff hours will be spent in design and material preparation, and proportionally more in implementation but also that staff time will increase as campaigns increase in size. Specifically:

- Total staff hours grew from 190 hours in 2012 to 315 hours in 2013 and 745 hours in 2014. The 2014 community-scale direct outreach campaign involved more than double the staff hours of the 2013 broad-scale media campaign.
- In 2012, the pilot year, staff hours spent for design and materials preparation accounted for 44% and 17% of 188 hours total.
- In 2013 and 2014, the percentage of staff time shrunk to 38% and 32% respectively as the total number of hours increased to 315 hours in 2013 and again to 745 in 2014.

Material costs will also rise as activities are scaled-up. However, the type of campaign determines how much. Thus, King County spent \$42 thousand in 2013, which included the costs of video production in its broad-scale media campaign but only \$20 thousand for its 2014 community-scale direct outreach campaign which focused on tabling at farmers markets, including \$3,700 for incentives. Consultant costs for both years were \$59 thousand.

Within the scope of our present work, it is not possible to estimate the environmental benefits of a FTGTW campaign with any degree of accuracy given the current data sources and life cycle assessment assumptions. However, the macro data point to considerable benefits.

To see a return at the community level in terms of environmental benefits and reduced waste handling costs, larger scale initiatives that see significant diffusion of the program in the community are indicated. The to-date findings only provide evidence of the potential for reductions at the individual household level.

For comparison, however, WRAP documented the benefits of a targeted campaign in West London. The campaign resulted in a 15% reduction in household food waste, on average, and a 35% reduction in households who took action as a result of the campaign (14% of the sample).⁴⁰ Annually, this reduction could save West London households an estimated £14 million and prevent 20,000 tons of CO₂e. In addition, for every £1 invested in the campaign, West London boroughs saved up to £8 in avoided disposal costs. The research was funded by the London Waste and Recycling Board and performed by WRAP in 2012-2013.

With respect to fit of the campaign with existing programs, **most campaigns had waste management goals as their primary objective.** On the policy front, household food waste reduction promises to be significant both in terms of climate action and solid waste. State level mandates and legislation on climate change and solid waste are driving interest in the need to reduce waste, not just divert it. For example, both Vermont and Massachusetts have enacted bans on food waste going to landfills. Because most of Vermont's population is located in small towns and rural areas, curbside collection of composting materials is not an option. Therefore, publicly supported food waste prevention initiatives are a strategic answer to meet the state's ban cost effectively.

The Rhode Island campaign was implemented by the Rhode Island Food Policy Council. In addition to having a zero waste mission, they were also interested in how reducing wasted food contributed to food security. It was possible for them to obtain relevant data for this purpose by segmenting their participants into cohort groups. In other words, they aligned their implementation methods with their objectives.

⁴⁰ Quested, Tom and Robert Ingle. 2013. *West London Food Waste Prevention Campaign Evaluation Report*.

King County has conducted a consumption-based emissions inventory where food was shown to be a large contributor to CO2 emissions and thus an important target for emission reductions. On the solid waste side, King County has done a lot of things like composting, so they wanted to take their program to the next level and food waste reduction was a next logical step.

The question of how to integrate prevention of wasted food with existing composting initiatives is still open with respect to the evidence. However, the FTGTW campaigns that were able to successfully integrate promoting composting with waste prevention framed their objectives using the EPA's Food Recovery Hierarchy in which wasted food prevention and composting are seen as complementary strategies but source reduction is the preferred option. WRAP also had done research supporting this conclusion.⁴¹

The challenge is to develop clear messaging that distinguishes between handling preventable and inedible waste and the best solutions with respect to their environmental impact. WRAP's research has shown that composting options may provide a rationale for some households to waste, that is, legitimize waste generation.

3.5 FINDINGS SUMMARY

A summary evaluation of the FTGTW campaign results relative to the research goals discussed in Section 1.2 of this report is presented next.

Behavior Change Strategy and Tool Effectiveness:

- Households gave high marks to the FTGTW strategies and tools, finding them useful and easy to use.
- Consistent with CBSM research, strategies associated with a tool are considered more useful than those without.
- Campaigns featuring a range of strategies allow each household to focus on the strategy or strategies that work best for them. Even within a target demographic there is considerable variability in household food management practices.
- The FTGTW Challenge served a dual purpose as both a measurement and a behavior change tool. 93% of participants said that they were now more aware of food going to waste in their households with 55% strongly agreeing that this was the case. Tracking the amount of wasted food motivates action to reduce wasted food. In effect, feedback increases awareness by countering habitual behavior and activating waste aversion.
- Volumetric measurement is more geared to providing households a convenient waste yardstick but weight measurements provide for more accurate accounts of food waste.
- Measuring the preventable portion of wasted food focuses household attention on the potential impact from adopting the waste prevention strategies.
- Less than six weeks (including a two-week baseline measurement period) is too short a time to provide an accurate estimate of the waste reduction potential.
- Self-audits appears to be an effective means of determining how much food is going to waste for small to medium-sized sample populations.

⁴¹ Marsh, Emma. 2013. *Food Waste Messages for Maximum Impact: How to Engage Your Residents in Preventions and Collections*.

Messaging Effectiveness:

- Campaign volunteers and staff reported lively discussions and expression of interest at tabling events and lively and spirited conversations at workshops, reflecting the issue's relevance to households and the effectiveness of offering tools and strategies to reduce wasted food along with the messaging.
- Feeling bad about throwing away food and wasting money appear to be equally strong motivators to reduce wasted food.
- Increasing awareness of the indirect environmental effects of wasted food through messaging is challenging with mixed results. There is the need to particularize environmental messaging to the household level for greatest effect.

Outreach and Engagement Effectiveness:

- Outreach and engagement tools that are designed to leverage social networks and create social norms are among the most effective.
- Community-scale direct outreach using one-on-one and peer-to-peer recruitment techniques was more effective than recruitment through indirect means such as social media outreach, a finding consistent with previous research on CBSM methods. Response to direct outreach efforts was enthusiastic.
- The general rule for successful campaigns was to engage participants early and often.
- Outreach needs to be targeted with the desired demographics in mind.
- Campaigns can fail without a focused effort.

Effectiveness of Implementation Support and Learning Community:

- The FTGTW peer network allows communities to leverage their limited resources by sharing the costs of campaign development and implementation.
- Peer learning group calls provide a way for implementing organizations to share lessons learned and accelerate their own learning.

Impact:

- The total average amount of food wasted per person per week of 2.2 to 3.5 pounds is comparable to the EPA estimate of 2.5 pounds of landfilled residential waste per person per week.
- The baseline preventable fraction averaged about one-third of all food waste.
- Households starting with a low level of waste have less waste reduction potential.
- Campaigns that are successfully implemented can result in a significant reduction in preventable food waste at the household level. Reductions in preventable waste of 50% and greater are possible. This equates to an average reduction in preventable food waste of around a half pound per week per capita or 20% of total food waste.

Implementation Costs:

- Campaign implementation costs ranged from a few thousand dollars for pilots to above \$100,000, not including staff time, for broad scale campaigns.
- Community-scale direct outreach campaigns involve more staff time than do broad-scale media campaigns but material costs will be less.

Environmental Benefits:

- There is insufficient data to determine the environmental benefits of FTGTW projects at the community level. However, the macro data point to considerable benefits.

Fit with Existing Programs:

- Most campaigns had waste management goals as their primary objective. On the policy front, household food waste reduction promises to be significant both in terms of climate action and solid waste.
- Campaigns with a focus on food security, whether at the household (Rhode Island) or community level (Hawaii), were also successful.

4.0 RECOMMENDATIONS

The FTGTW strategies and tools have proven effective in helping households to reduce wasted food. In addition, the greater majority of the campaigns were successful in achieving their stated objectives. This section of the report discusses recommendations to newly implementing organizations based on the previous campaigns' experiences. It concludes with an applied research agenda for strengthening the evidence base.

4.1 EMERGING BEST PRACTICES

Community-based Social Marketing is a grounded approach to changing household behaviors. Implementing organizations have the ability to adapt the campaign messages and tools to the needs of their communities. The following campaign examples illustrate emerging best practices that advance the basic FTGTW model described in Section 2.

Targeting Campaign Outreach, Iowa City, Iowa

Iowa City used an intensive targeted outreach approach to achieve a very high recruitment rate of 17% compared to the average of 1 to 2% in the majority of the campaigns. In addition, they selected, in consultation with the city's solid waste manager, defined neighborhoods to represent the city's demographics (similar to cluster sampling), emphasizing a variety of ages and income levels. This provided for a high degree of confidence that their results were typical for the city's population.

Their outreach methods included:

- Initial mailing to 300 households in six neighborhoods, including a pre-pilot survey, background letter, and pre-stamped envelope to return survey.
- Door hangers to encourage people to participate in pilot.
- Neighborhood open houses to offer participants a convenient location to pick up pilot supplies and to have a face-to-face introduction with participants.
- Yard signs to remind participants of important dates in pilot such as when to start strategies.

Hands-on Community Engagement, Rhode Island

The Rhode Island Food Policy Council had as their objective to test the FTGTW tools and strategies with different backgrounds and socio-economic statuses. Their outreach workshops featured live demonstrations of the strategies and measuring techniques (see the picture of scales with container at right) which greatly assisted participant learning. (Most campaigns relied on written materials and slide shows.) The hands-on workshops likely explain why Challenge participants in Rhode Island had the greatest percentage reduction in wasted food.

They also shared food from cooking demonstrations at the workshops creating a sense of inclusion. The workshop presentation was translated into Spanish for workshops where Spanish was the dominant language.



Creating New Social Norms, King County, Washington



King County has evolved its outreach and engagement approach over three campaigns, one each fall from 2012 to 2014. In 2014, they adopted a cascade training (or train-the-trainer) approach, working with Master Composters to do tabling and outreach.

One engagement technique they developed in 2014 was taking pictures of public commitments to reduce wasted food at farmers market tabling events (see picture at left). They then shared these through social media.

Making public commitments like these reinforces the intent to follow through. As evidence, King County had the highest retention rate of all the campaigns. It can also serve to make emerging social norms visible. This is especially important with behaviors taking place in the privacy of one's own home.

Sharing these photos with the person whose picture is being taken so they in turn can share with their social networks is a powerful way of creating a new social norm around reducing wasted food.

4.2 LESSONS LEARNED

This section offers lessons learned on how to conduct a successful FTGTW campaign based on the above evaluation of seventeen campaigns. These lessons build on the implementation recommendations presented in the FTGTW Implementation Guide which captured the experience of the first five pilots in 2012.⁴² The list below both reiterates critical Implementation Guide recommendations and expands on them.

- Develop clear campaign objectives and a clear sense of how implementation choices (e.g. what activities to conduct; what data to collect; and how to collect and analyze the data) support these objectives.
- Engage target audiences early and often for higher recruitment and retention rates.
- Before modifying any campaign materials, particularly Campaign instructions, implementing organizations should review the need for these changes and vet any changes carefully. Seemingly minor changes can undermine the data collection and analysis process.
- Having households focus on the preventable waste portion of food waste may help to simplify the measurement of food waste as well as challenge the perception that it is only non-edibles that are being thrown out. By measuring the preventable food waste portion only, households will also see a more dramatic reduction in the amount being wasted, incentivizing the continued use of the strategies.
- The length of time needed for households to establish new food management practices is at least 3 to 4 weeks. Implementing partners are strongly encouraged to engage households in trying strategies for four weeks minimum in addition to the two weeks required for baseline data collection. Shortening these time periods does not appear to increase participation. Also, campaigns that opted for shorter challenges reported that this negatively impacted their results and they would not do so again.

⁴² West Coast Climate and Materials Management Forum, *ibid*.

- Households can either measure the waste reduction throughout the period of trying strategies or at the end of this period. However, the analysis should compare the baseline average to the final week average.
- There are trade-offs between volumetric and weight measurements. Volumetric is less exact than weight measurements but is simpler for participants to execute and does not require scales. Pilots should consider these trade-offs in relation to their objectives. For campaigns wishing to collect data, weight measurements are strongly recommended.
- A few comments indicated that there was some confusion about the relationship between composting and strategies to reduce wasted food. It is recommended that a future campaign along with an academic partner investigate messaging to clarify this relationship.
- The social nature of behavior change suggests that a focus on engaging households in FTGTW through existing social networks that meet regularly would be very effective.
- It is strongly recommended that pilots not schedule household engagement during the holiday seasons as participants are particularly busy which makes participation difficult.
- The importance of peer group learning cannot be overestimated in the success of the pilots. Participation in the FTGTW peer learning group is strongly recommended.

4.3 MEASUREMENT RECOMMENDATIONS

Beyond the research questions that guided this evaluation is the broader issue of how to generate large-scale social change. What policy approaches and program initiatives would support the rapid normalization of preventing wasted food in households?

FTGTW pioneered self-audits as a cost-effective means of collecting data on household waste patterns. The results suggest that measurement plays a critical role – not only in determining the impact of waste prevention campaigns but also in raising households' awareness of how much food they are wasting. As such, providing households the means to measure the amounts of food going to waste at home becomes a powerful tool to support change in household practices. For this reason, it is strongly recommended that future campaigns consider incorporating a household measurement tool or strategy into their campaigns.

At the same time, to advance our understanding of how to accelerate the development of preventing wasted food as a social norm, we need sufficient data on the community level impact of campaigns to prevent wasted food. This includes understanding the baseline awareness of wasted food, both as a cost to households and as an environmental issue. To measure the impact of a campaign at a community scale, it is also necessary to know how many people adopt waste prevention practices as well as their average waste reduction. To determine both, FTGTW has developed a draft community-scale measurement protocol (see Appendix C).

4.4 FURTHER APPLIED RESEARCH

The *Food: Too Good to Waste* campaign results substantiate the hypothesis that food waste reduction behaviors are complex with many complicating factors influencing these behaviors and food management practices in general. At the same time, this evaluation confirms that CBSM-style campaigns can bring about a notable reduction in preventable food waste at the household level.

Ultimately, wasted food is an issue of significant concern for both environmental and socio-economic reasons. Additional applied research is needed to quantify the impacts of wasted food and the benefits of food waste reduction programs. A research agenda is outlined below.

Baseline Questions

Baseline research questions concern defining the scope of the problem of wasted food at the household level and the contributing factors. These are presented next.

- What are the average per capita weights of preventable (edible) and inedible fractions? Different best practice solutions are needed to address the preventable and inedible fractions.
- What is the amount of household in-home food purchases by weight (that is, excluding restaurant and food service purchases)? Establishing how much wasted food there is as a percentage of in-home purchases will help determine the return to prevention practices.
- What are the baseline amounts of food waste by food type (e.g. vegetables, meat and poultry, dairy)?

Campaign Effectiveness Questions

- How do we cost effectively include direct contact in community-wide campaigns?
- What is the necessary level of engagement to sustain behavioral change?
- What tools are best for spurring the development of new social norms around wasted food?
- What policies are needed to support the development of successful campaigns?

Campaign Impact Questions

The intent of the intervention questions is to determine the environmental and socio-economic impacts of waste reduction campaigns.

- What is the impact of a FTGTW campaign on reducing the amount of wasted food in a community's residential solid waste (i.e. residual waste) and/or mixed compost streams?
- What are the reach and engagement rates of campaigns by input? This data is needed to establish impact at the community level and will help determine the most effective means.
- What is the typical composition of food waste before and after intervention? This data is needed to determine the environmental and socio-economic impacts.
- What are the life cycle impacts by ton of reducing wasted food?
- How does the shift to healthier eating, particularly more fruit and vegetables, affect waste prevention behaviors and the amount of non-edibles?

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APPENDIX A: PRE- AND POST-CHALLENGE SURVEY INSTRUMENT

In addition to demographic questions, the following questions were asked in pre- and post-Challenge surveys conducted by the FTGTW partners.

Pre-Campaign Questions

How strongly do you agree or disagree with the statement: I take steps at home to not waste food that could have been eaten.

- Agree
- Somewhat agree
- Somewhat disagree
- Disagree
- Don't know/unsure

In the past year, have you seen or heard anything about the problem of wasted food?

- Yes
- No
- I don't know

If yes, what? [Textbox]

Did this make you more concerned about wasted food?

- Yes
- No
- I feel the same amount of concern as before

To what extent, do any of the following motivate you to minimize the amount of food your household throws out? Please rate as follows: (1) Not at all (2) A little (3) A fair amount (4) A great deal

- Wasted money I spent buying the food
- Wasted time I spent shopping, storing, and/or preparing food
- That there are people without enough to eat
- The wasted energy and water resources it took to get the food to my plate
- Feeling bad about throwing away food that could have been eaten
- The contribution of wasted food to global warming
- The amount of food that ends up in landfills

Post-Campaign Questions

How strongly do you agree with this statement: I am now more aware of food going to waste in my household?

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

How strongly do you agree with this state: In general, I found the strategies and tool useful.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

How strongly do you agree with this statement: I am likely to continue to use the tools and strategies.

- Agree
- Somewhat agree
- Somewhat disagree
- Disagree
- Don't know/unsure

To what extent, do any of the following motivate you to minimize the amount of food your household throws out? Please rate as follows: (1) Not at all (2) A little (3) A fair amount (4) A great deal

- Wasted money I spent buying the food
- Wasted time I spent shopping, storing, and/or preparing food
- That there are people without enough to eat
- The wasted energy and water resources it took to get the food to my plate
- Feeling bad about throwing away food that could have been eaten
- The contribution of wasted food to global warming
- The amount of food that ends up in landfills

APPENDIX B: CAMPAIGN DESCRIPTIONS

King County, Washington, 2012

FTGTW Partner: King County Solid Waste Division

Community Location: Fall City, WA

Urban-Rural Classification: Peri-urban town with a population of approximately 2000.

Campaign Objectives: Reducing wasted food is a priority for King County in its effort to achieve Zero Waste. The specific aim of the King County campaign was to test the effectiveness of the campaign messaging and tools in reducing food waste and to gauge the impact of a CBSM campaign based on these results.

Community Partners: King County partnered with a local elementary school through their Green Schools Program. They were assisted by the marketing firm of Colehour + Cohen who have special expertise in CBSM campaigns.

Target Audience: The target audience for the King County implementation was families with small children. The campaign was introduced to 110 families with a child enrolled in the 4th grade at the Fall City public elementary school.

Targeted Behaviors: During the pilot, all five waste prevention behaviors were introduced to the families.

Behavior Change Tools Used in Pilot: This campaign used both the Meals-in-Mind Shopping List Template and the Fruit and Storage Guide tools. They also structured the campaign around a modified Challenge as described below under the subheading “Implementation Choices”. In addition, King County developed several other tools including: a Top Five Ways to Waste Less Food information sheet; Packing a Waste Free Lunch tip sheet; a blog to keep families informed and motivated; a Food: Too Good to Waste daily tip PowerPoint presentation; and a Learn More resource list.

Length of Pilot: As one of the first pilots, the King County campaign included time to develop materials in parallel with the Forum’s efforts of nearly a year. The participant engagement period lasted approximately two months, including time to recruit and assess and acknowledge the families’ participation. The length of the Challenge was five weeks.

Implementation Choices: The invitation to participate in the Food: Too Good to Waste Challenge was sent via email to the families of the 4th grade children. A King County representative then visited the classroom to explain to the students why wasted food is bad for the environment and household economics and distributed the measurement tools (bag and weekly worksheets). The first week waste collection served to establish a baseline for the volume of food going to waste. Both preventable and non-edible food waste items were collected in the same measurement bag to simplify the process. At the start of the second week of the pilot, all five campaign strategies were introduced. Thereafter, tools were introduced one at a time at one week intervals. Students were also presented a daily food waste reduction tip. All families who completed the challenge were given a grocery store certificate.

San Benito County, California

Objectives: San Benito County's objective was to test food waste reduction strategies to inform the county's future food waste collection plans.

Target Population and Sample Size: In San Benito County, lower income Hispanic families were recruited through a food bank to participate in the pilot. Additional audiences included a senior citizen center's service clientele and a mom's group.

Targeted Behaviors: San Benito County targeted keeping fruits and vegetables fresh and using a shopping list with meals-in-mind.

Tools Used in Pilot: This campaign used both the Shopping List Template and the Fruit and Storage Guide tools as well as the Photo Diary version of the Challenge. In addition, they used the Workshop Presentation to introduce the challenge to the seniors and mom's group.

Community Partners: San Benito County partnered with the local food bank in Hollister, California.

Length of Pilot: Households were asked to complete worksheets recording instances of their preventable food waste by weight for four weeks.

Implementation Choices: Fliers were placed in food bank bags to invite participation in the Challenge, followed by phone calls and email (when available), while the workshop presentation was used to recruit participants from the seniors and the moms' group.

Boulder, Colorado

Objectives: The campaign presented an opportunity for Naropa University to bring awareness around food waste and the importance of composting to its students.

Target Population and Sample Size: In Boulder, the campaign was introduced to the student body and faculty of a local university.

Targeted Behaviors: All five behaviors were introduced to participants.

Tools Used in Pilot: The Workshop Presentation was used to introduce the study participants to the issue and recruit pilot participants.

Community Partners: Naropa University, Naropa Sustainability Council

Length of Pilot: The campaign took approximately three months to complete. Time was needed to secure permission from the university to conduct the pilot. The four week Challenge took place in the period leading up to Thanksgiving, beginning in late October.

Implementation Choices: Initial outreach to the community was through an email announcement that contained basic information about the campaign along with an invitation to attend a workshop presentation. Participants were also recruited through tabling at the university's Sustainability Fair at the end of which the workshop presentation was made. The workshop was followed by a local food panel and dinner in which local foods were served. Participants were offered both the photo diary and measurement bag options of the

Challenge with instructions to measure food waste in weeks 1 and 4. Three raffle prizes were offered as incentives to participate. Weekly email reminders were sent to participants.

Honolulu, Hawaii

Objectives: The City and County of Honolulu (CCH) are interested in food waste management solutions that would both lower the costs of landfilling as well as offset the cost of importing food to the island.⁴³ The Honolulu campaign sought to test CBSM food waste reduction strategies and tools including a cookbook with local chef-contributed recipes and food waste prevention tips. It also aimed to see if there was a connection between preventable food waste and the number of meals outside the home.

Target Population and Sample Size: Out of approximately 210 emails sent, 17 households were recruited to participate in a four week challenge. The principal audience was young adults although two households were in their fifties and two had children. The average age of participants was 34.

Targeted Behaviors: All five behaviors were tested but the “Buy What You Need” strategy was combined with the “Make a Shopping List with Meals in Mind” strategy and relabeled “Smart Shopping”. In addition, households were encouraged to test recipes for using leftover ingredients.

Tools Used in Pilot: The Workshop Presentation was used to introduce the Food: Too Good to Waste Challenge to the household participants. Behavior change tools included: a food storage guide developed by Eureka Recycling; a menu planner used in the Australian campaign; an “Eat Me First” prompt; and a cookbook developed by local chefs containing recipes for using leftover ingredients.

Community Partners: Alexander Lavers researched, directed and managed the campaign in fulfillment of a Master degree in Environmental Sciences from the University of Gothenburg, Sweden.

Length of Pilot: The total elapsed time of the campaign was four months. Recruitment took approximately three weeks, while the length of the Challenge was four weeks. Adapting, preparing and purchasing materials for the challenge took three weeks as did the data analysis. In addition, the project organizer spent several months coordinating the cookbook’s development with the contributing restaurants, the graphic designer, and the county.

Implementation Choices: Recruitment was made by email using personal contacts in two social networks, the Recycling Branch of the Refuse Division of CCH and a Honolulu running club. Challenge participants were asked to measure preventable and non-edible food waste for two weeks after which they measured both types of waste for an additional two weeks while trying food waste reduction strategies. Non-campaign study cookbook recipients will receive an option to fill out a survey on their experience with the

⁴³ Alexandra Lavers. 2013. Eat me First! Development and Evaluation of the Food: Too Good to Waste Household Food Waste Prevention Program in Honolulu, Hawaii, USA.

cookbook/toolkit; in return for their responses they will receive a coupon to a restaurant featured in the cookbook.

Seattle, Washington

Objectives: Seattle Public Utilities sought to gather baseline data on food waste, specifically, how much of the food waste in Seattle's residential waste stream is edible food.

Target Population and Sample Size: The target population was Seattle's residential population. Study participants were recruited through a short article in the utility's newsletter that is mailed to residential customers with their bi-monthly bill. This initial article resulted in over 500 responses. Approximately 170 customers still expressed interest in participating in the campaign after receiving a follow-up letter that described what was expected in terms their participation. 119 households sent data routinely.

Targeted Behaviors: The objective of this study was to collect baseline data on the composition of household food waste so no behavior change strategies were suggested to participants.

Tools Used in Pilot: This campaign focused on obtaining data on current food waste management practices for a representative sample of Seattle Public Utilities customers. None of the strategies were introduced in this phase of the work.

Community Partners: None

Length of Pilot: The length of campaign implementation was approximately 8 months from initial outreach to families, through data collection and preliminary analysis of results.

Implementation Choices: A subsequent letter to respondents detailed what was expected of participants in the pilot: separation of edible and non-edible food waste for 13 weeks, daily weighing and recording of the food waste weights, and weekly transcribing of this information to a Survey Monkey questionnaire.

Iowa City, Iowa

FTGTW Partner: City of Iowa City Landfill and Recycling Center

Community Location: Iowa City, IA

Urban-Rural Classification: Mid-sized city with population of 71,600

Campaign Objectives: Gain experience in helping residents reduce wasted food.

Campaign Focus: Educate residents on benefits of reducing waste and support for curbside collection of food waste with yard waste.

Community Partners: Iowa City Solid Waste Division.

Target Audience: Representative sample of city's population reflecting its age and income diversity.

Outreach and Engagement Methods: Five neighborhoods with a combined population of about three hundred households were selected in consultation with the city's solid waste

manager to represent a variety of ages and income levels. A letter invitation highlighting their selection was sent to the households along with a survey and a pre-stamped envelope. The households were asked to return the survey if they chose to participate. Participants were also offered food scrap curbside collection services for the duration of the study. A door hanger encouraging participation was later placed at each of the targeted homes.

The pilot organizers held “neighborhood open houses” where they could answer participant questions and address concerns as well as deliver the materials needed to participate. These events also presented an opportunity to connect with others in the neighborhood who had not initially chosen to participate. This was the most personal method of outreach.

Initially about 50 households indicated they would participate. While participants were self-selected they were also pre-chosen for their representativeness of the general population.

Length of Pilot: Iowa City conducted a five week Challenge with a baseline period of one week.

APPENDIX C: FTGTW COMMUNITY-SCALE MEASUREMENT METHODOLOGY DRAFT PROTOCOL

Date: August 4, 2014

Updated: October 8, 2014

Intended Audience: This protocol has been developed to assist organizations responsible for food waste disposal, such as states, counties and municipalities, in evaluating the impact of a FTGTW campaign on the amount of wasted food entering a community's solid waste and or/compost streams.

Research Objective: Determine the impact of a *Food: Too Good to Waste* (FTGTW) campaign on reducing the amount of wasted food in a community's residential solid waste (i.e. residual waste) and/or mixed compost streams using a robust sampling strategy.

Scope: The protocol addresses food waste from food consumed at home, that is, food entering the home. This would include restaurant food brought home but not restaurant food left on the plate at the restaurant or discarded at the restaurant. Additionally, the protocol does not account for food being disposed through other means than in the solid waste or compost streams, such as backyard composting or flushing liquid wasted foods down the drain.

Research Questions:

- What percentage of the target population took steps to reduce food waste during the campaign?
- What was the extent of food reduction in households that acted to reduce wasted food using campaign strategies?
- What is the impact of a FTGTW campaign on reducing the amount of wasted food in the residential solid waste stream and/or mixed compost stream?
- How did campaign (awareness, self-reported new knowledge, self-reported impact) affect observed change in level of waste?

Community Selection Criteria:

- Resources sufficient to mount and evaluate community/neighborhood FTGTW campaign over six month period
- Support from decision-makers
- Expertise in statistical analysis or access to such expertise
 - Note: This protocol's intent is to obtain statistically robust results that can be scaled to a community's population. This requires randomized sampling (i.e. participants are not self-selected) and a fairly large sample. Information on how to perform a randomized sample study can be found at [SOURCE TO BE DETERMINED].
- Commitment to long-term tracking of wasted food in residential stream

Data Collection Method: Waste composition analysis linked to household survey

Overview of Waste Composition Analysis Method: A statistically robust sample of households is recruited to participate in the study. Authorized collectors retrieve the contents of residual waste and/or compost bins by individual household prior to the introduction of the FTGTW campaign. The food waste is then sorted and separated from other waste components by trained sorters and weighed. At the end of the campaign, waste is again collected, sorted and weighed to determine impact of campaign. A follow-up survey is conducted to determine which households were reached by the campaign and then acted to reduce food waste.

Pros: Minimum intrusion into household routine.

Cons: Costly, especially if there are two streams to sample. Sorting after mixing may introduce uncertainties compared to food waste being collected separately at source.

Note: This protocol was designed to be consistent with the Global Food Loss and Waste (FLW) Measurement Protocol. Development of the FLW Protocol is being coordinated by the World Resources Institute (WRI) in conjunction with the Consumer Goods Forum (CGF), FAO, FUSIONS, UNEP, World Business Council for Sustainable Development (WBCSD), and WRAP. Interested communities will be invited to test the FLW protocol in 2015.

Impact Measurement Protocol

Pre-Planning

- Scope out potential partnerships for both campaign and data collection/measurement tasks.
- Investigate potential funding sources.
- Secure support of decision-makers.

Planning

- Assess fit with community selection criteria (see above).
- Determine community objectives and additional research questions, if possible, using a community engagement process.
- Define geographical scope and campaign's target audience (e.g. general population, families with children, young adults).
- Describe and quantify planned FTGTW campaign activities.
- Schedule campaign and data collection activities.

Survey and Sampling Design

- Define waste producing unit (e.g. household characteristics).
- Determine if cluster analysis is desirable and feasible based on available resources. Information on how to perform a cluster analysis can be found at [SOURCE TO BE DETERMINED].
- Draw up population of potential analysis/survey participants. Potential sources include waste collection service customer rolls.

- Determine sample size(s) based on level of confidence required and variability in wasted food levels among units in the population (if there is available data) and draw random sample.
- Determine whether residual waste, compost or both streams are to be sampled
 - Note: If the compost stream is the designated stream for wasted food, it may be possible to sample just the compost stream provided there is available historical data to support that the majority of food waste is being disposed in this stream.
- Determine temporal scope, adjusting for seasonality in wasted food
- Determine waste categories (if other than all food waste)
 - Note: This protocol is designed to measure all food waste. All food waste consists of both edible food and food's associated inedible parts (e.g. egg shells, bones, hard melon rinds). If the research objectives include the quantification of edible versus non-edible food fractions or the amount of food waste by food categories, it will be necessary to construct definitions for these sub-categories and design appropriate sampling and sorting procedures.
- Prepare pre- and post-campaign survey instruments. (See FTGTW Standardized Questions for candidate questions.)
- Recruit and train surveyors (possibly community volunteers)

Secure permission from households to sample waste

- Survey households to assess their level of awareness around food waste.
- Acquire permission to sort their household's waste (opt in). By requesting permission to access waste bins and sort waste at the end of the survey, the likelihood of household's agreement will be greater.

Waste and Data Collection

- Determine who will perform waste collection and schedule, pre- and post-campaign. The pre-campaign waste collection should be scheduled to follow the initial survey after some time (three weeks to a month) to allow for a reversion to normal behaviors that may have been affected by the survey interviewing.
- Determine how waste will be handled (e.g., no compaction to allow for sorting) and necessary equipment.
- Determine sorting procedure, training and personal protective equipment. This should be consistent with additional research objectives such as determining extent of reduction in preventable and non-edible waste fractions.
- Develop data transmission requirements and form for recording data.
- Coordinate with waste handlers.
- Track campaign inputs, e.g. number of farmer's market tabling events, number of media articles, etc.

Post-campaign survey

- Perform follow-up survey to identify households who took steps as a result of the campaign. The survey should assess their awareness of the campaign, what they say they learned from it, how they describe its influence on their behaviors, and what aspects of the campaign they saw as being particularly influential.

- Ask about anything specific to their household that may not be learned based on waste collection, anything that changed since initial collection.

Data Analysis and Reporting

- Link weight measurements and survey data.
- Provide information on the representativeness of sample for whole population.
- Scale-up results to general population using appropriate weighting factors. Information on how to scale-up results can be found at [SOURCE TO BE DETERMINED].

Resources

Quested, Tom, and Robert Ingle. 2013. "West London Food Waste Prevention Campaign Evaluation Report."

Describes a similar study conducted in West London and study results.



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