

FINAL REPORT:

Districts, Lifestyles and Avoiding Food Waste

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We appreciate the households for their voluntary participation in the food and food waste diaries.

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Executive Summary

Food waste occurs at all stages of the food supply chain and in developed countries around 40% of all food intended for human consumption is estimated to end up as waste. Food waste is a significant concern for local government (Councils), as it comprises up to 50% of municipal waste bins. In Australia it is estimated that households throw out 2.7 million tonnes of food into landfill.

Food waste occurs through everyday practices of buying, cooking and storing. To reduce food waste, it has been suggested that these everyday practices may need to be shifted. Therefore understanding food waste is less about what is being put in the bin, and more about the upstream practices that are being performed that generate the waste.

The study investigated practices relating to the purchase, storage, preparation and disposal of food, over one week, in twenty-four households within three key districts in Banyule City Council (Ivanhoe, West Heidelberg and Greensborough) in order to gain insights to develop targeted programs to strategically reduce food waste across municipalities. Households were recruited through Banyule City Council via a range of mediums (i.e., newspaper, the waste education networks and social media) and participated through a mix of face to face interviews and completion of a household food and food waste diary and data collection kit over one week in 2013.

The distributed paper-based data collection kit consisted of a household food and food waste diary with 6 key exercises including: how they shop for food; auditing of food in the kitchen, pantry and fridge; what is cooked and what is not eaten through day 2-6; follow up audit of uneaten food on day 7; reflection; and changes they will make.

The project's success can be measured in a) the development of a food and food waste diary questionnaire and research kit; b) the engagement of 24 households; c) the level of detail in completed diaries; and d) the interest from other municipalities in the study's findings at a post-project workshop. Data was collected under fresh fruit and vegetables, processed fruit and vegetables, meat, fish, pre-prepared meals, take away meals and home grown food.

Similar insights and trends from this study have also been observed as per studies in other advanced economies regarding food categories wasted (vegetables, fruit, prepared meals and breads and cereals); and reasons for food waste ('forgot about item it looks or smells spoiled', 'it's now out of date', 'didn't get around to eating and its spoilt', 'didn't eat left overs').

The 'hands-on' approach (the actual observation of waste and recording) had a positive impact upon many of the households. Providing residents with the ability to observe; record and report their daily activities, practices and actions around food planning, procurement, storage, cooking and eating may be beneficial (e.g., in accessible ways such as online, web-application (app), hard copy). There appeared little to no difference between socioeconomic groups thus suggesting that there is little evidence for communicating in different ways. Planning of meals is crucial to reducing food waste. Education programs should emphasize this including not falling into the trap of purchasing store specials or buying extra when it is not needed.

1 Introduction

It has been estimated that approximately one third of an individual's global warming footprint is food related [1] - one third of which is wasted [2, 3]. Each year over 4.2 million tonnes of food waste is disposed to landfill in Australia. Around 1.5 million tonnes of this is from the commercial and industrial sector, costing around \$10.5 billion in waste disposal charges and lost product, while the remaining 2.7 million tonnes is from households [4]. It has been estimated that [5 p. 11]

“the per capita food loss for North America and Oceania combined (including Australia) is estimated to be around 280-300 kg per year, which is equivalent to around 6.5 million tonnes of food waste in Australia¹ [6]. The average household in New South Wales (NSW) throws out \$1,036 of food each year [7]. If this figure is extrapolated to all households in Australia, the total figure is close to \$8 billion²”.

The Banyule City Council consists of twenty one suburbs on 63 square kilometres between 7 and 21 kilometres north-east of central Melbourne. Banyule City Council has a diverse range of districts within the municipality that represent very different demographic and cultural profiles. Each district is also supported by substantially different access to services. Banyule's hypothesis is that universal behavioural change campaigns targeting waste avoidance may be ineffective given the significant differences between districts. To be more effective in reducing waste (particularly food waste), a sound understanding of why it is wasted in different districts would be advantageous.

This report documents the findings from a study of twenty four households, through a mix of interviews and food and waste diaries, across three suburbs of the municipality (Ivanhoe, West Heidelberg and Greensborough). Funding was made possible through the Metropolitan Waste Management's Groups (MWMG) Round 2 Metropolitan Local Government Waste and Resource Recovery Fund.

1.1 About the Centre for Design

RMIT University's Centre for Design (CfD) undertakes research, consulting, and capacity building in the field of sustainability. The Sustainable Products and Packaging and Life Cycle Assessment research teams of CfD are located within the School of Architecture and Design at RMIT University in Melbourne. RMIT University is one of Australia's largest Universities and is considered a leader in technology, design, global business, communication, global communities, health solutions and urban sustainable futures. For more information about the Centre for Design visit: www.rmit.edu.au/cfd

2 Project aim and scope

The primary objective of this study was to:

Understand household practices relating to the purchase, storage, preparation and disposal of food within key districts in Banyule's municipality in order for Banyule City Council to develop targeted programs to strategically reduce food waste across their municipality.

¹ Based on a population of 22,893,354.

² Based on ABS figure of 7,760,320 occupied dwellings from the 2011 census.
http://www.censusdata.abs.gov.au/census_services/getproduct/census/2011/quickstat/0

3 Background

The significance of the need to focus on food waste, over the past 5 years, has gained momentum globally e.g., [5, 8-17]. Its importance is recognised through government policies to reduce and recover food waste (e.g., UK Love Food Hate Waste) and also the action being taken by industry, retailers and consumers. The environmental, economic and social impacts associated with the loss and waste of food through the global food supply chain is significant. It has been estimated that in developed countries, around 40% of all food intended for human consumption in ends up as waste. Of the 4.2 million tonnes of food that is estimated to end up in landfill each year in Australia, 2.7 million tonnes (64%) comes from households and 1.5 million tonnes (36%) comes from the commercial and industrial sector [4]. The focus of this report is on household food waste only.

3.1 Quantifying the impacts of food waste in the household

In 2009, the Australia Institute published “*What a waste: An analysis of household expenditure on food*” that reported \$5.2 billion worth of food was being wasted in Australia every year. For the majority of the 1,603 main grocery buyers who were surveyed, food waste was not a significant concern [2, p.10]. The report also identified that in monetary terms high income households wasted more food; households with a higher demographic wasted less per capita; while single person and unrelated small share houses were the most wasteful:

“Across Australia, households with an income of \$40,000 or less reported wasting food worth \$518 a year. This compares with food waste of \$635 a year for households with an income between \$40,000 and \$80,000. Australian households earning more than \$80,000 a year are wasting \$803 in food annually” [2, p. 8].

A limitation of the report was that it reported wastage in monetary terms and did not capture the difference in food by weight. For instance a household with an income of \$80,000 wasting a ¼ of a \$5 loaf of bread is different to another household with an income of \$40,000 wasting a ¼ of a \$2 loaf of bread.

One of the recommendations from the Australian Institute’s report was that:

“simply informing people about the nature and extent of the problem and providing simple strategies to reduce waste is unlikely to be successful. Most people are aware that they waste a significant amount of food and know what kinds of behaviour are likely to help them reduce their waste. The problem is not a lack of awareness but of translating this into behaviour change” [2, p. 8].

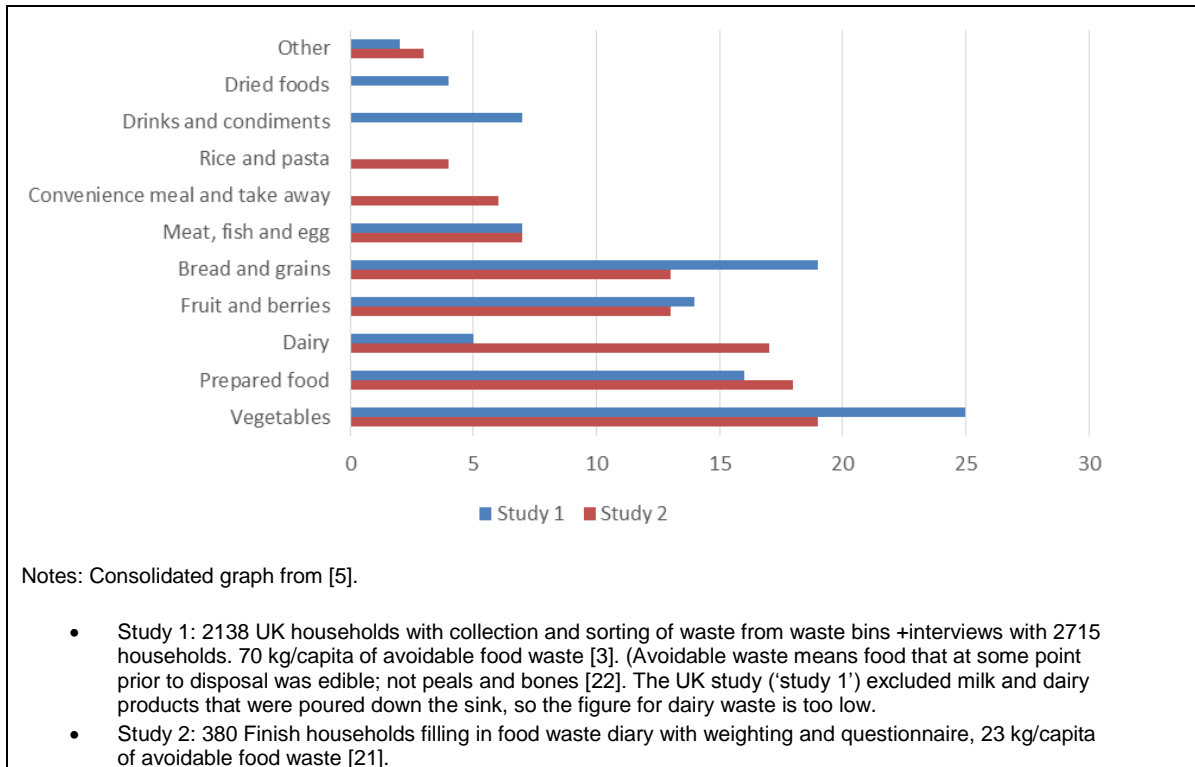
The Waste and Resource Action Programme (WRAP) in the UK has been the leader in education and promotion of the issues of food waste. WRAP has been very active since the year 2000 focusing on the “why and how” of food waste, promoting the impacts of food waste and communicating strategies and solutions to help consumers, retailers, and other business across the food supply chain to reduce food waste [3, 18-20].

In order to determine food waste avoidance potential, foods were classified as one of the following [3 p. 138]:

- the category ‘avoidable waste’ was assigned to food items that could have been eaten if they had not been allowed to go off, had not been past their food date or had been wanted (e.g. food left on the plate);
- the category ‘possibly avoidable waste’ was assigned to food that could be eaten but which some individuals choose not to eat, e.g. bread crusts, meat rinds and soft vegetable and fruit skins; and
- the category ‘unavoidable waste’ (sometimes referred to as ‘inedible waste’) was applied to food that could not have been eaten and includes items such as teabags, bones and hard fruit and vegetable peel.

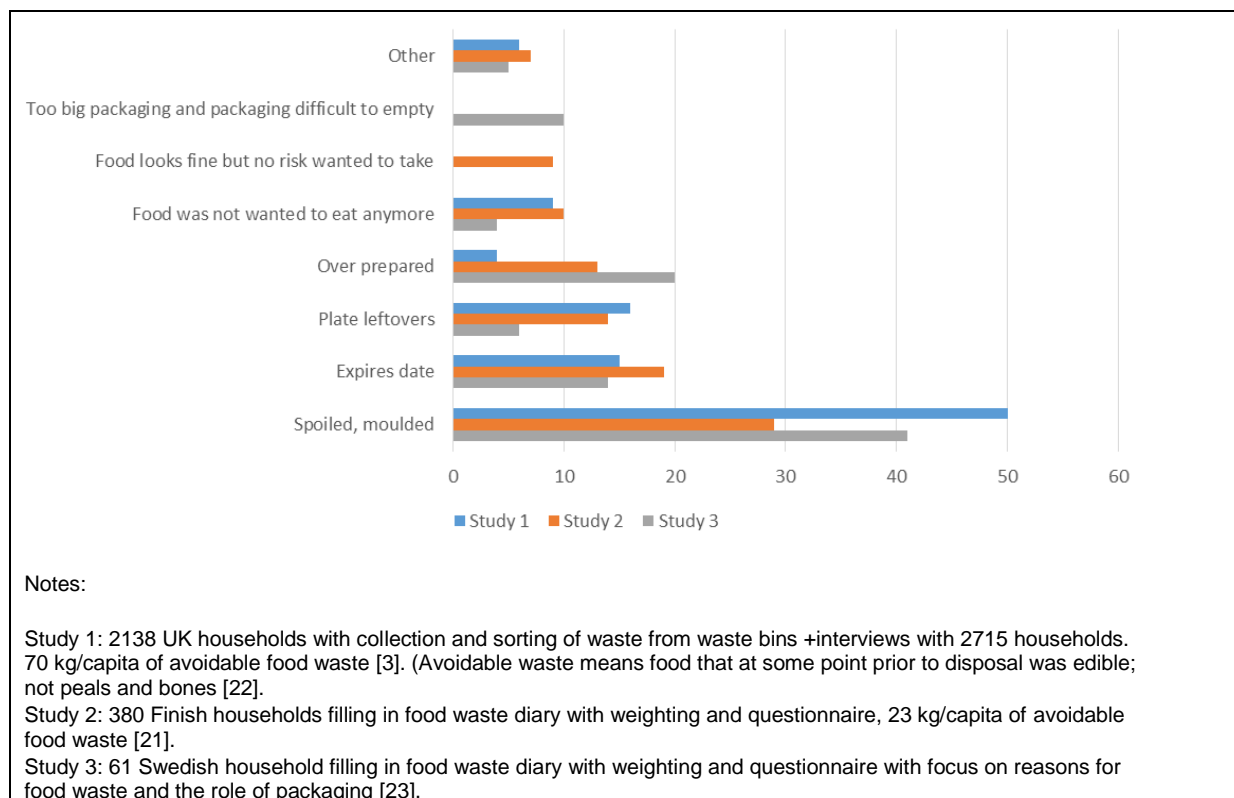
Research into household food waste, in the UK, Finland and Sweden, using interviews, food diaries and bin audits, has revealed some interesting insights [3, 21-23]. As Figure 1 illustrates perishable foods such as fruit, vegetables, dairy products and pre-prepared meals are the largest contributors to food waste [5].

Figure 1 Percentage (weight) of avoidable food waste by food category



The reasons why food is waste in the household have also been explored in these overseas studies [3, 22, 23], that include food being spoiled/mouldy or past its expiry date; preparing too much food; and plate waste [5] (Figure 2). In the Swedish study, 10% of the household's food waste were caused by packaging, serving sizes that were too big or packaging difficult to empty [23]. Three reasons can be identified to the problem of serving sizes: limited options to buy an appropriate serving size, purchasing errors by the household or buying packaging that is too large because of its perceived value [24]. Mena et al [25, p 656] found that:

"Promotions [at retail] can also increase household waste as customers might buy unusually large quantities of product. This 'forward buying' can lead to waste, particularly when product shelf-life is short".

Figure 2 Reasons why food is wasted (based on percentage weight of food waste)

Jean-Baptise et al's [26] analysis of kitchen food waste diaries suggested 51% of food was wasted through spoiled or excess cooked food. Reasons for food waste generation included hectic lifestyles, small children, poor knowledge of storage, social events and forgotten food in the fridge.

With respect to left-over food, an Australian study³ of 1,000 participants reported:

'Close to 1 in 6 Australians (16%) report that they mostly put leftovers straight in the bin. The other 84% of those surveyed manage leftovers in the following ways: freeze or refrigerate (60%); compost (7%); feed to pets (13%); other, primarily eating them the next day (close to 5%).

The New South Wales department of environment [27, p.2] found the following reasons for food waste at the household level:

- **Buying:** *I think I need more than I do (61%) and I'm tempted by special offers (44%)*
- **Cooking:** *I prefer to serve too much rather than too little 48% I find it hard to estimate how much to cook per person (32%)*
- **Storing:** *I'm unsure about the best way to store different types of food (60%) I forget about leftovers (63%).*

Addressing food waste at a household level is a complex issue considering the myriad of reasons why it is generated. The following sub-section looks at food waste through the lens of "everyday practices".

³ (<http://foodwise.com.au/did-you-know/foodwise-national-poll.aspx>)

3.2 Food waste occurs through everyday practices

What the studies examined in Section 3.1 identify is that food waste occurs through everyday practices of buying, cooking and storing. To reduce food waste, it has been suggested that these everyday practices may need to be shifted. Therefore understanding food waste is less about what is being put in the bin, and more about the upstream practices that are being performed that generate the waste. This concept that ‘consumption (or un-consumption with respect to food waste) occurs through everyday practice [28] is based heavily in what is termed ‘social practice theory’ and is an approach that this project is grounded in:

“A practice . . . is a routinized type of behaviour which consists of several elements, interconnected to one other: forms of bodily activities, forms of mental activities, things and their use, a background knowledge in the form of understanding, know-how, states of emotion and motivational knowledge. A practice – a way of cooking, of consuming, of working, of investigating, of taking care of oneself or of other etc. – forms so to speak a ‘block’ whose existence necessarily depends on the existence and specific interconnectedness of these elements, and which cannot be reduced to any one of these single elements” [29] p 249-250.

Evans [30, p.429] used a mixed methods approach of photographing participants fridges, repeatedly interviewed households over time, and followed participants while shopping or cooking to make observations. One of his suggestions to reduce food waste was:

“..if food was to be made readily available in different quantities (material infrastructures of provision), then the respondents encountered here may well end wasting less. Similarly, there may be some mileage in targeting the material properties of food itself by, for example, finding ways to normalise the provisioning of foodstuffs that are not susceptible to rapid decay.

The emphasis was on the logic of stuff itself (the passage of ‘food’ into ‘waste’) and not the reasons why particular ‘types’ of households waste food. What we know about practices is that they are supported by a wide range of structures that hold them in place.

In this example, food gets displaced and wasted as a result of a mismatch between the food that is provisioned and the food that is eaten within a given period of 7–10 days. Again, the lovefoodhatewaste campaign is attuned to this situation and gives advice on planning meals such that they mirror more closely the food that is provisioned when going shopping. However, this advice is not sensitive to the temporal dynamics of everyday life nor does it appear to recognise that the materiality of food (and the temporalities of its decay) render [30, p.429].

Traditional behavioural change campaigns see the consumer as a person that is doing wrong, or does not have appropriate knowledge, Halkier and Jensen [31] flip this on the head within their study on healthy eating.

First, users (food practitioners) are to be seen as knowing and resourceful – which is in contrast to the implicit deficit model assumption. Second, communication strategies towards ideal types II (fitting in healthier food) and III (Doing healthier food ambivalently) need to be focusing upon practices that are easy to fit into a modern, busy, everyday life. Third, it might be possible to suggest new, time-consuming and at the same time healthier food practices – like making less unhealthy snacks from scratch – as use of time indicates caring in this ideal-type.

To move beyond behaviour change therefore it is necessary to investigate further than the individual, to causal issues such as social norms, technology, culture, economy and infrastructure in order to determine why particular food waste practises are being enacted, and how these may be shifted. Aspects of these causal issues are explored within the primary research in this study.

4 Method

The data collection design for this study was viewed as critical to ensure appropriate data was collected to enable the development of an effective future food waste program by Banyule Council.

Households were issued with data collection kits to obtain relevant primary information from households regarding food and waste practises over the course of a week.

Follow up interviews were then prepared and organised to further probe selected households on the data that they provided through the data collection kits (See Appendix 1 for the rationale and questions for these interviews).

The research was conducted as follows:

- Compilation of a household food and food waste diary and data collection kit (Section 4.1)
- Recruitment of households (Section 4.2)
- Analysis of household food and food waste dairies (Section 5)
- Face to face interviews with selected households (Section 4.3).

4.1 Household food and food waste diaries and data collection kit

A data collection kit providing a household food and food waste diary consisting of 6 key exercises was developed and distributed to 24 recruited households (Section 4.2) to help understand household practices relating to the purchase, storage, preparation and disposal of food within key districts in Banyule's municipality. The data collection kit (cultural probes⁴) consisted of:

- a printed version of the food and food waste diary (across 7 days)
- printed maps of the local communities so households could draw on and explain how they shop for exercise 1 (e.g., Shop A to Shop D),
- digital photographs of examples of "out of date" / "off foods",
- a printed survey including a printed food and food waste diary for 5 days.

The food and food waste diary consisted of 6 exercises across 7 days (Table 1).

⁴ Cultural probes are a design-led approach to understanding users that stressed empathy and engagement. Cultural probes aim to gather data through an 'empathic and respectful dialogue'. Cultural Probes (Gaver et al., 2004) are collections of provocative tasks designed to elicit inspirational responses from volunteers. Materials in this instance varied from maps to be annotated with labels or pictorial stickers.



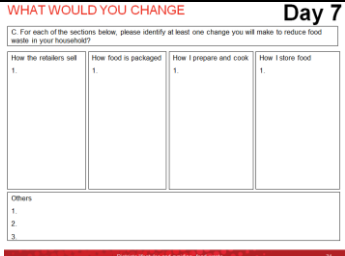
Table 1 Food and food waste diary exercises	Data collection sheet (example)	Notes																																																								
<p>Exercise 1 (day 1): How you shop</p> <ul style="list-style-type: none"> General questions about the household (e.g., demographics including gender, ages of people); who does the majority of the food shopping and food preparation; inclusion of food from the backyard; and frequency of consumption of different food categories. Where the household shops; frequency of shopping at different shops; planning method for purchases at shops; what food items/products are commonly purchased at each shop; and reasons why the household shops at a particular shop 	<p>ABOUT YOUR HOUSEHOLD Day 1</p> <p>Please tick to indicate the frequency with which your household usually consumes the following food types.</p> <table border="1"> <thead> <tr> <th></th> <th>More than once per day</th> <th>Once per day</th> <th>2-6 days per week</th> <th>Once per week</th> <th>Once per fortnight</th> <th>Once per month</th> <th>Less than once per month</th> </tr> </thead> <tbody> <tr><td>Meat and meat, chicken and parts</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>Fish or seafood</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>Fresh fruit and vegetables</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>Pre-prepared meats (ready meals, frozen meats)</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>Pre-prepared fruit and vegetables (smoothies, etc.)</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>Take away</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </tbody> </table>		More than once per day	Once per day	2-6 days per week	Once per week	Once per fortnight	Once per month	Less than once per month	Meat and meat, chicken and parts								Fish or seafood								Fresh fruit and vegetables								Pre-prepared meats (ready meals, frozen meats)								Pre-prepared fruit and vegetables (smoothies, etc.)								Take away								<p>Households drew and explained how they shopped on submitted maps.</p> <p>1 household failed to submit this data.</p> <p>Refer to Section 5.1 (page 15) for presentation of results.</p>
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<p>Exercise 2 (day 1): Audit of food in the kitchen</p> <ul style="list-style-type: none"> Household identified and documented the food in kitchen, pantry and fridge that may be out of date, about to spoil, seen better days, a little disgusting, mouldy, furry, smelly or bad. Attach label writing where food waste stored and why it was wasted. Photos of identified food were recorded. 	<p>FOOD AUDIT Day 1</p> <ol style="list-style-type: none"> Who would like you to identify food in your kitchen, pantry or fridge that may be → out of date, about to spoil, seen better days, a little disgusting, mouldy, furry, smelly or bad? Attach an appropriate label (E.g. A-Z) to the identified food and if possible write on the back of the label where the food was stored and why it was or still to be wasted. Photograph the identified food next to the attached label (see photos below and on the next page and a guide). Upload the photos to the USB stick included. Remember to include the cards when you return this diary once you have finished it. <p>Examples</p> 	<p>Households wrote on card labels and took photos. 7 households failed to submit this data.</p> <p>Refer to Section 5.2 (page 22) for presentation of results.</p>																																																								
<p>Exercise 3 (day 2-6): What is cooked and what is not eaten</p> <p>Household recorded what was cooked and what was eaten and what happens with left overs each day for 5 days.</p>	<p>WHAT YOU COOK Example</p> <p>This is an EXAMPLE of one day of food preparation and consumption</p> <p>A. What types of meals does your household have at home or pack for work/school etc?</p> <p>Breakfast <input checked="" type="checkbox"/> Lunch <input checked="" type="checkbox"/> Dinner <input checked="" type="checkbox"/> Other <input checked="" type="checkbox"/></p> <table border="1"> <thead> <tr> <th>Meal</th> <th>Detailed description of what is cooked and how</th> <th>No. people eating</th> <th>Preparation time</th> </tr> </thead> <tbody> <tr> <td>Breakfast</td> <td>Boat of cereal with milk, one piece of bread with jam, cup of tea</td> <td>2</td> <td>5 minutes</td> </tr> <tr> <td>Lunch</td> <td>Leftover salad with cheese, dressed ham, sandwich</td> <td>2</td> <td>5 minutes</td> </tr> <tr> <td>Dinner</td> <td>E.g. Chicken breast cooked on a fry pan, fresh carrots and pine nuts, cooked in the microwave, steamed rice. Salty sauce from a bottle.</td> <td>3</td> <td>20 minutes</td> </tr> <tr> <td>Other</td> <td>A couple of hand-fuls of mixed nuts, one apple</td> <td>2</td> <td>2 minutes</td> </tr> </tbody> </table> <p>B. Did you shop today? If so what did you buy and where? I shopped at my local Coles for chicken and some fruit and vegetables for lunch in the week.</p>	Meal	Detailed description of what is cooked and how	No. people eating	Preparation time	Breakfast	Boat of cereal with milk, one piece of bread with jam, cup of tea	2	5 minutes	Lunch	Leftover salad with cheese, dressed ham, sandwich	2	5 minutes	Dinner	E.g. Chicken breast cooked on a fry pan, fresh carrots and pine nuts, cooked in the microwave, steamed rice. Salty sauce from a bottle.	3	20 minutes	Other	A couple of hand-fuls of mixed nuts, one apple	2	2 minutes	<p>1 household failed to submit this data.</p> <p>Refer to Section 5.3 (page 28) for presentation of results.</p>																																				
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Table 1 Food and food waste diary exercises Exercise	Data collection sheet (example)	Notes																								
	<p>WHAT'S NOT EATEN Example</p> <p><i>This is an EXAMPLE of one day of food preparation and consumption</i></p> <p>A. Of the total amount of each meal prepared estimate the percentage that was eaten on this day</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <td>Breakfast</td> <td>Lunch</td> <td>Dinner</td> <td>Other</td> </tr> <tr> <td>95%</td> <td>90%</td> <td>50%</td> <td>100%</td> </tr> </table> <p>B. What did you do with the leftovers?</p> <p><i>Breakfast: left a bit of cereal and milk, washed down the sink Lunch: left over lettuce leaf and bit of tomato from salad, put into the compost Dinner: left over chicken, rice and vegetables, put in Tupperware for 2 lunches Dinnerware:</i></p> <p>C. Did you plan for this amount of leftovers? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/></p> <p>D. If no, please explain why you ended up with leftovers?</p> <p><i>We were expecting two extra people for dinner but they cancelled at the last minute.</i></p> <p style="text-align: center; font-size: small;">Districts, lifestyles and avoiding food waste 18</p>	Breakfast	Lunch	Dinner	Other	95%	90%	50%	100%																	
Breakfast	Lunch	Dinner	Other																							
95%	90%	50%	100%																							
<p>Exercise 4 (day 7): What is not eaten?</p> <p>Households updated <i>Exercise 2</i> by identifying and making photos of some new 'off' food in their kitchen, pantry or fridge.</p>	<p>WHAT IS NOT EATEN Day 7</p> <p><i>This is an example</i></p> <p>A. 1. Update Exercise 2 by identifying food in your kitchen, pantry or fridge that may be out of date, about to spoil, seem better days, a little disgusting, mouldy, funny smelling or bad. 2. Attach an appropriate label (e.g. with numbers this time) to the identified food 3. Photograph the identified food alongside its label 4. Upload the photos to the USB stick included in this kit.</p>  <p>B. Were the left-overs eaten as intended? Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>C. Are they going to be eaten? Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>D. If you answered no to B or C, please explain why the leftovers may not have been eaten?</p> <p style="text-align: center; font-size: small;">Districts, lifestyles and avoiding food waste 21</p>	<p>7 households failed to submit this data.</p> <p>Refer to Section 5.4 (page 31) for presentation of results.</p>																								
<p>Exercise 5 (day 7): How do you feel?</p> <p>Households provided reflections and feelings about what they had experienced during <i>Exercises 1 to 4</i> by filling in a questionnaire about different statements regarding attitudes to food waste as well as purchase habits. They were asked to grade them from 1 (do not agree at all), to 5 (do fully agree), a Likert scale⁵.</p>	<p>HOW DO YOU FEEL Day 7</p> <p>A. Do you see your answer as being representative of a normal week? Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>B. If no please explain how it was different.</p> <p>C. What surprised you about your results? Is there more or less waste than you thought?</p> <p>D. For the below statements mark your response?</p> <table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th></th> <th>Never</th> <th>Sometimes</th> <th>Always</th> </tr> </thead> <tbody> <tr> <td>I think of food waste as wasted money</td> <td><input type="radio"/></td> <td><input type="radio"/></td> <td><input type="radio"/></td> </tr> <tr> <td>I think of food waste as a wasted resource</td> <td><input type="radio"/></td> <td><input type="radio"/></td> <td><input type="radio"/></td> </tr> <tr> <td>I think of food waste as pet food</td> <td><input type="radio"/></td> <td><input type="radio"/></td> <td><input type="radio"/></td> </tr> <tr> <td>I think of food waste as compost</td> <td><input type="radio"/></td> <td><input type="radio"/></td> <td><input type="radio"/></td> </tr> <tr> <td>I think of food waste as no concern</td> <td><input type="radio"/></td> <td><input type="radio"/></td> <td><input type="radio"/></td> </tr> </tbody> </table> <p style="text-align: center; font-size: small;">Districts, lifestyles and avoiding food waste 25</p>		Never	Sometimes	Always	I think of food waste as wasted money	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	I think of food waste as a wasted resource	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	I think of food waste as pet food	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	I think of food waste as compost	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	I think of food waste as no concern	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<p>1 household failed to submit this data.</p> <p>Refer to Section 5.5 (page 35) for presentation of results.</p>
	Never	Sometimes	Always																							
I think of food waste as wasted money	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>																							
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I think of food waste as no concern	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>																							

⁵ A scale used for measurement of individuals' attitudes to a topic. Developed by US psychologist Rensis Likert and described in his thesis, 1932 (*Oxford English Dictionary*)

Table 1 Food and food waste diary exercises Exercise	Data collection sheet (example)	Notes
<p>Exercise 6 (day 7): <i>What would you change?</i></p> <p>Households wrote down ideas that may help them to reduce food waste.</p>		<p>1 household failed to submit this data.</p> <p>Refer to Section 5.6 (page 40) for presentation of results.</p>

4.2 Recruitment of households (population and sample)

Householders were recruited through Banyule City Council from key districts representing different lifestyle stages via a range of mediums (i.e. newspapers, the waste education networks and social media).

A total of 24 households from the Banyule City Council participated in the study. This consisted of 8 households each from the suburbs of Ivanhoe, Greensborough and West Heidelberg. The suburbs were classified as high (Ivanhoe), medium (Greensborough) and low (West Heidelberg) dependent upon food budget area which is further explained in Section 5.1 and Table 2 on page 15. There was a 96% response rate (23 of 24 approached households) returned completed diaries (i.e., one household did not provide any data). All households completed the diary over a “normal” week (without any special occasions) during March and April 2013.

The study period of 7 days was chosen based on experiences with consumer studies and a compromise between a high rate of participation and more accurate results from a longer test period [23]. Of the completed diaries, 70% finalized all of the work adequately (i.e. majority of data for all six exercises was completed).

Some statistics on the households are as follows:

- Sixty-five percent of the households (15) had children below the age of 25. The remainder were two-person households, of which one is a one adult with child household.
- The average size of the households was 3.4 persons. For each of the three areas represented the household size was 3.1 persons (high-Ivanhoe), 4.6 persons (medium-Greensborough) and 2.8 persons (low-West Heidelberg). The average Australian household is 2.6 persons⁶.
- All households in Greensborough had children, whereas the households in Ivanhoe and West Heidelberg each had four households with children and four households without children.

4.3 Face to face interviews

Household interviews were conducted by Banyule City Council staff following the completion of gathering the household data collection kits. The aim of the interviews was to gain more in-depth understanding of householders’ practices associated with participating and completing the food and food waste diaries. It was envisaged that this would assist in identifying potential strategies and programs designed to reorient selected practices. The interview questions are provided in Appendix 1: Interview questions and rationale.

⁶ (www.censusdata.abs.gov.au/census_services/getproduct/census/2011/quickstat/0)

5 Results and analysis

This section presents the household data and analysis of the food waste diaries. The sections are divided around the six exercises that the households undertook in this first analysis of the data.

5.1 Exercise 1: Details on the household

5.1.1 About the households

The weekly budget, provided by the participating households, for food varied among the three suburban areas (on a per capita basis): Ivanhoe (AU\$81), Greensborough (AU\$68) and West Heidelberg (AU\$53). For the purposes of this study, the suburbs are correlated and ranked according to economic zones “food budget areas” of high, medium and low median weekly incomes per capita although these budgets are not respectively proportional to the surveyed food budgets areas (Table 2). *The remainder of the report will present results classified per food budget area.*

Table 2 Studied suburbs classified into food budget areas by economic zones defined by median weekly income per capita

Food budget area (economic zone) (\$ weekly food budget)	Suburb in study	Median weekly income per capita
High (\$81)	Ivanhoe	AUD\$728 ^(a)
Medium (\$68)	Greensborough	AUD\$654 ^(b)
Low (\$53)	West Heidelberg	AUD\$372 ^(c)
Notes:		
(a) [32]		
(b) [33]		
(c) [34]		

Frequency in consumption of different food categories

At a macro level across the three food budget areas, the frequency of consumption of particular food categories was⁷:

- Fresh fruit and vegetables are consumed 2 days per week or more by 20 households.
- Meat is consumed 2 days per week or more by 18 households.
- Fish is consumed 2 days per week or more by 3 households. Another 11 households consume fish once a week and 4 households less than once a month.
- Pre-prepared meals are consumed by a low number of households (4) once per week or more.
- Take away meals are consumed at least once a week by 9 households.
- Home grown food from backyard gardens is consumed by 16 households on a weekly or monthly basis (dependent upon food item).

⁷ Exercise 1 did not capture the bread consumption habits of participants.

Differences were observed across households in the three food budget areas with respect to aspects of consumption within the different food categories:

- *Fresh fruit and vegetables*: Are consumed by 75% of households (6) in the high food budget area more than once a day, compared with 63% of households (5) in the lower food budget area and 57% of households (4) in the medium food budget area.
- *Processed fruit and vegetables*: Are consumed by 63% of households (5) in the high food budget area once or more per week, compared with 43% of households (3) in the lower food budget area and 38% of households (3) in the medium food budget area.
- *Meat*: 75% of households (18) eat meat at least once every week. Of these 18 households, there were 8 households that eat meat every day. These comprised one in the high food budget area, 4 in the medium and 3 in the low food budget area.
- *Fish*: Is consumed by 13% of households (1) in the high food budget area once or more per day, compared with 0 households in the lower or medium food budget areas. Of the three households that consume fish 2 or more times a week, 2 of are in the high food budget area.
- *Pre-prepared meals*: Are consumed once or more a week by 13% of households (1) in the high food budget area, compared to 14% of households (1) in the medium food budget area and 38% of households (3) in the lower food budget area.
- *Take away meals*: Are consumed at least once a week by 38% of households (3) in the high food budget area, 71% of households (5) in the medium food budget area and 13% of households (1) in the lower food budget area.
- *Home grown food*: Is consumed at least once a week by 63% of households (5) in the high food budget area, 14% of households (1) in the medium food budget area and 50% of households (4) in the lower food budget area.

The majority of shopping and preparing of food is undertaken by the female in the household. Within one household, the male and female undertake both tasks and in four other households, the male helps with either shopping or preparing. There were only two of the 15 households with children where the male does either of the tasks.

5.1.2 Shopping (type of shop, distance travelled and mode of transport taken)

The main shopping locations were identified by participating households (Shop A, B, C, D) including identifying the type of shop (e.g., supermarket, greengrocer) and the distance travelled between house and shop (Figure 3 and Table 3) one way. The mode of transport was also detailed.

The main insights for shopping were as follows:

- *Number of shops:* Shop A was identified by 21 households, Shop B by 20 households, Shop C by 16 households and Shop D by 6 households. This suggests that households visit more than one shop to purchase their weekly food items, with 6 households visiting 4 shops.
- *Type of shops:* Range from shopping malls/centres, supermarkets, speciality shops, markets, fast food and home delivery services (Figure 3).
- *Distances travelled:* The majority of shops frequented are located within 5km of households (Table 3).
- *Mode of transport:* Within the high food budget area the households have shop A and B very close to their house (average distance 1km) and 3 (38%) and 2 (25%) households respectively do their shopping by walking. The medium (average distance 2 km) and low food budget areas (average distance 3 km) complete their shopping via car, except one via by bus and one utilising home delivery.
- *Frequency of shopping trips:* Shop A is typically visited 2-6 days per week (9 households) or once per week (12 households); shop B is visited 2-6 days per week (3 households) or once per week (13 households) or more seldom (5 households); shop C is visited 2-6 days per week (1 household) or once per week (7 households) or more seldom (8 households); and shop D is used by 8 of the households.

Figure 3 Categories of shops defined and number of households that identified them as either Shop A, B, C or D

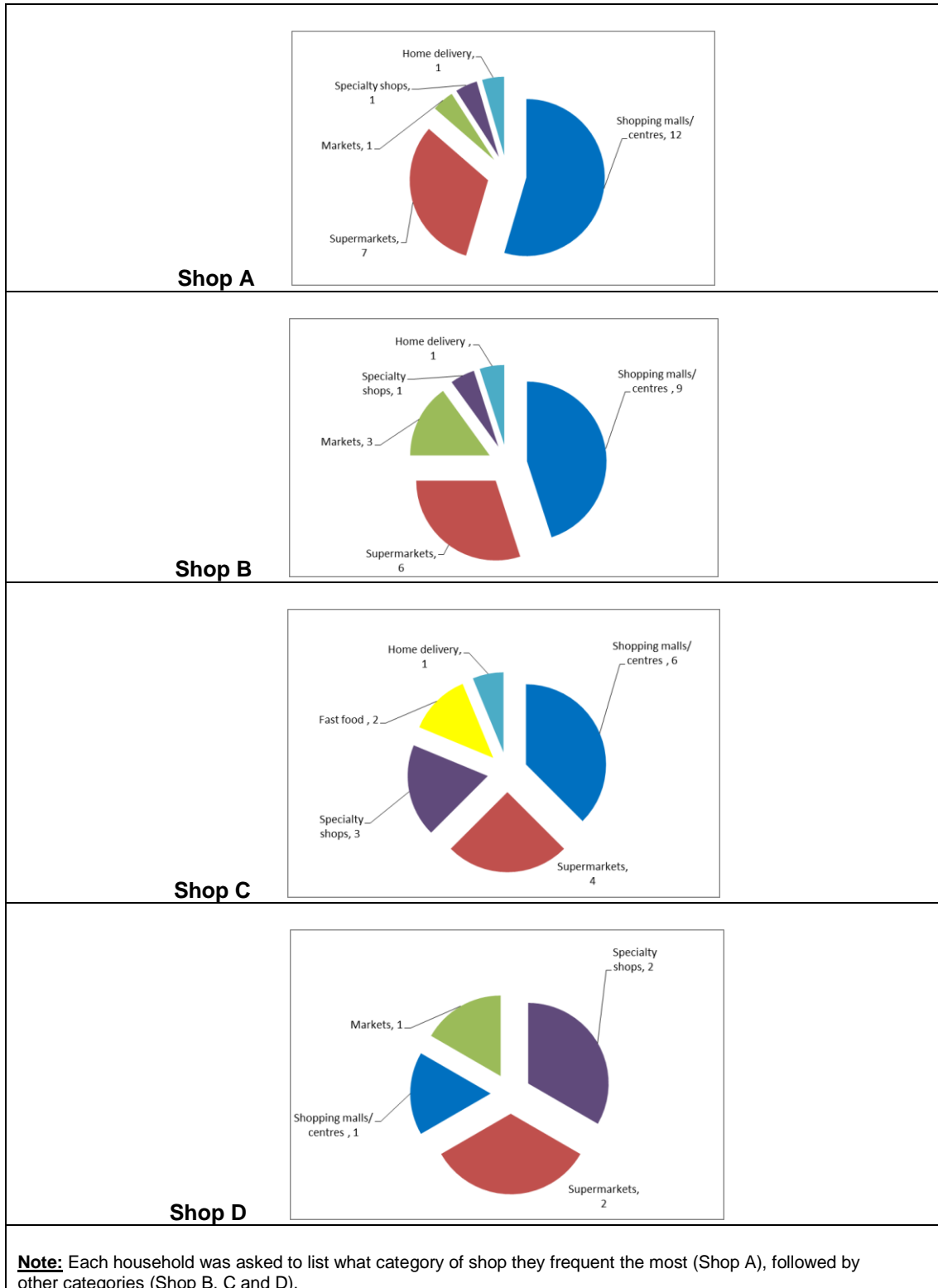


Table 3 Main shopping locations of participating households per food budget area

Shop	Food budget area	Distance (km)			
		0-1.9	2-4.9	5-9.9	>10
Shop A	High	7	1	0	0
	Medium	2	5	0	0
	Low	1	5	0	0
	Total shop A	10	11		
Shop B	High	7	0	0	1
	Medium	1	5	0	0
	Low	0	5	0	1
	Total shop B	8	10		2
Shop C	High	4	1	0	1
	Medium	2	2	0	0
	Low	2	2	0	1
	Total shop C	8	5		2
Shop D	High	1	1	1	0
	Medium	1	0	0	0
	Low	0	1	0	0
	Total shop D	2	2	1	

5.1.3 Planning

The types of plans that households employ prior to undertaking food shopping trips is presented in Table 4.

Table 4 Type of planning undertaken prior to shopping for food

Plan	Total instances	Total households with children	Food budget area (breakdown of total instances)		
			High	Medium	Low
Check food before shopping	15	9	6	4	5
Scribble a rough list	10	5	4	3	3
Plan shopping/ meals with a list	9	4	4	1	4
Check what's on special	6	4	5	0	1
Make no plans	4	3	1	2	1
Note: If the plan is repeated for more than one shop, it is only counted once per household					

For at least one of their shops, 15 households check “their food before shopping” (with shops A and/ or B being the large proportion of frequented shops). There were only a small proportion of households from all areas that “make no plans” (total of 4). Of the 10 households that reported “scribbling a rough list” for one or more of their shops, a similar proportion across all food budget areas was observed (high - 50%; medium - 38%; and low - 38%). For 9 households that “plan shopping/ meals with a list”, the same proportion of households came from the higher and lower food budget area (50% each), with the middle food budget area having a much lower proportion of reported formal list planning for their shops (13%). One trait of the higher food budget area is that more households (63%) “check for specials” before shopping than other areas (medium - 0% and low - 13%). Of the households that reported planning techniques, 50% who scribble a rough list, 44% who plan shopping/ meals with list, 67% who check what's on special, and 75% who make no plans, have children (households with children account for 65% of the total household sample).

5.1.4 Reason to shop

There were six main reasons (motivations) behind households shopping at different shops (Table 5).

Table 5 Motivations behind shopping at different shops

Motivation	Total instances	Total households with children	Food budget area (breakdown of total instances)		
			High	Medium	Low
Price	9	6	4	2	3
Convenience	9	7	3	4	2
Closeness to home	9	7	4	3	2
On the way from somewhere	6	4	4	0	2
Quality	6	4	3	1	2
Getting in and out quickly	3	2	1	1	1

Notes: If the motivation is repeated for more than one shop, it is only counted once per household.

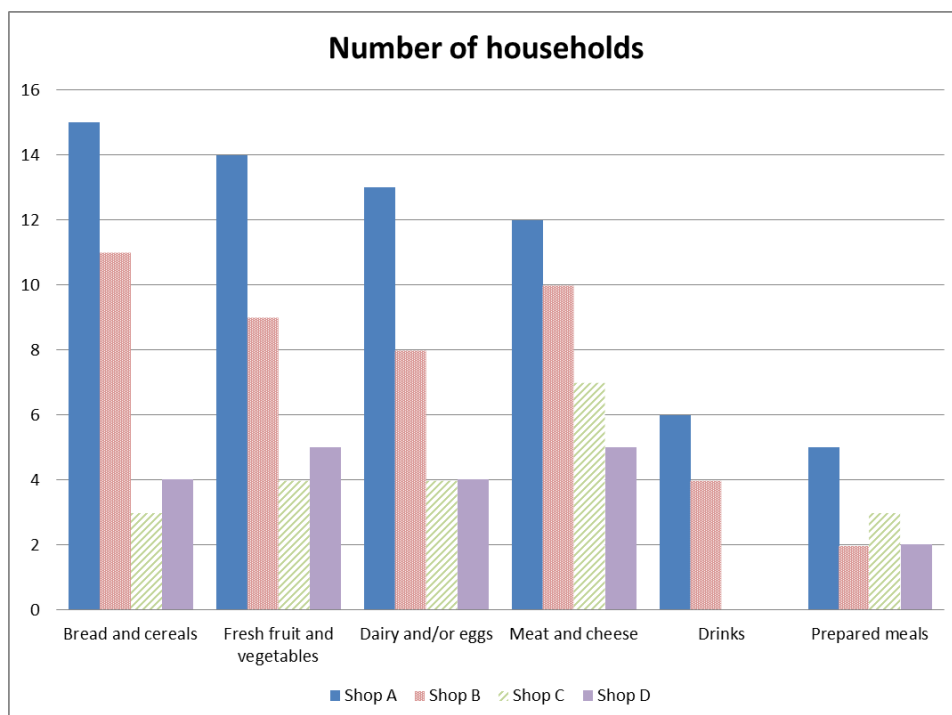
The main motivations for shopping at a particular shop are price, convenience and closeness (9 households for each (Table 5). In the case of price for instance, a similar proportion of households from the higher (50%) and lower (38%) food budget areas reported going to one or more of their shops based on price, whereas the medium budget area it was only 25% of households.

Similar observations can be made across the three food budget areas for “convenience” and “closeness to home”, with more of the medium food budget area households motivated by “convenience” and “closeness to home” than were for “price”. One trait of the higher food budget area is that more households (50%) look to shop “on the way from somewhere else” than other areas (medium - 0% and low - 25%). Only one household in each of the three areas (13% each), shop at a particular shop due to the ability of being able to “get in and out quickly”. On the question of “quality” motivating purchases from particular shops, the higher food budget area households led with 38%, while it is only 13% for medium and 25% for low food budget areas.

5.1.5 What is purchased from shops?

The highest frequency of food items within each food category was purchased from shop A (Figure 4). The frequency dropped at a similar quantum at shop B, except meat and cheese, potentially from more of a diversity of shops classified as shop B. Shop C and D are less frequented; though in some food categories (e.g., bread and cereals and fresh fruit and vegetables) one additional household purchases these items (as shop D), whereas for meat and cheese and prepared meals it is at shop C. Meat and cheese purchases stayed relatively high, potentially from more of a mixture of shops including more specialty stores for shop C proportionally to shops A and B.

Figure 4 Items purchased from shops (by number of households)



The phenomenon of less drop off in purchasing meat and cheese for Shop B, C, and D compared to Shop A in relation to the other food categories relates to the types of shops defined by participants for these items. Responses that were related included a mixture of shopping strips, markets, supermarkets and butchers, seemingly allowing access to specialty cheese shops, butchers, cheese/ meat counters at these locations. In regards to prepared meals, the majority of purchases for Shops A and B were at supermarkets, with Shop C and D purchases predominantly at take away shops.

5.2 Exercise 2: Audit of food in kitchen (items to dispose of)

The first day of the audit required households to undertake an audit of the food in their kitchen, fridge, and pantry and to identify any food items that should be thrown out. This activity was completed by 17 households, while 7 households did not submit any data (i.e., 2 from Ivanhoe, 2 from Greensborough, and 3 from West Heidelberg). Table 6 documents the food items identified to be thrown out by households on day 1 of the audit.

Table 6 Number of food items (in kitchen*) identified on day 1 of audit to be thrown out

Type of food waste	Total waste instances	Food budget area		
		High	Medium	Low
Prepared meals	15	4	8	3
Fruit	19	8	7	4
Vegetables	19	5	10	4
Bread and cereal	16	2	8	6
Sauce	13	3	7	3
Meat and cheese	7	1	4	2
Drinks	3	1	1	1
Other	3	0	2	1
Milk products, eggs	4	0	3	1
Total	99	24	50	25

Notes: Seven households did not complete this activity (two from high food budget area, two from medium area and three from low food budget area). (*) Kitchen defined as pantry and fridge.

More food items were identified as needing to be thrown out in the medium food budget area (50 items), compared with the low area (25 items) and the high food budget area (24 items).

Fresh fruit and vegetables (Photo 1) accounted for the most instances (19% respectively), followed by bread and cereals (16%), prepared meals (15%), and meat and cheese (7 %) (see Photo 1).

Photo 1 Examples of wasted food across the categories



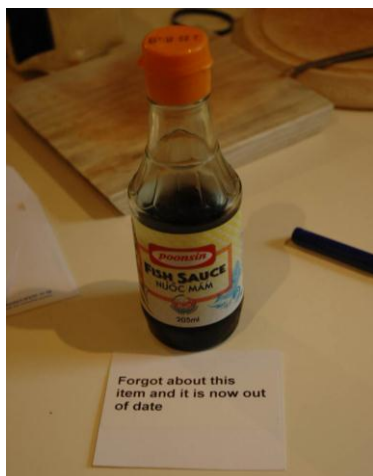
Of the top six food categories wasted the food budget area that had the most instances within each food category were:

- the high food budget area - fresh fruit category (8 items);
- the medium food budget area - vegetables (10 items), prepared meals (8), bread and cereals (8), sauce (7) and meat and cheese (4); and
- the low food budget area had the least number of items across the top six categories.

There were nine “causes” provided why households had identified food items in the day one audit as needing to be thrown out. These are listed per food category in Table 7 and described below:

- The main cause of food waste was “forgot about this item and it’s now out of date” (with 21 instances). The main food category was sauce (7 instances e.g., Photo 2), followed by bread and cereal (4), and fruit (3);
- The second cause was “left overs not being eaten” (17 instances). The main offending food item was prepared meals (6 instances, including 2 serves of pasta and 2 serves of breakfast);
- “Not getting around to eating to the point of spoilage” (16 instances) with the main offending food item being vegetables (e.g., Photo 1);
- “Forgetting about an item to the point of looking or smelling spoiled” (11 instances) with the main offending item being vegetables;
- “Uncertainty of an item being healthy to eat being in an opened package” (11 instances) with the main offending items being vegetables and bread and cereals; and
- “Buying too much so as not to get through an item” (11 instances) with the main items being fresh fruits and vegetables.

Photo 2 Examples of food items and causes of waste



Forgetting about sauce to the point of being out of date



Not getting around to eating fruit to the point of spoilage

Table 7 Reasons for food waste

Type of food waste	Total causal instances	Forgot about this item and it now looks or smells spoiled	Forgot about this item and it's now out of date	Didn't get around to eating this and now it is spoiled	Didn't get around to eating this and now it is out of date	Uncertain if this is still healthy to eat, been in an opened package	Don't like this item	Bought too much and can't get through it all	The packaging too large for my normal consumption of this item	Left overs that didn't get eaten	Other reason
Prepared meals	15	2	2	0	2	0	2	0	1	6	0
Fruit*	21	2	3	6	3	1	0	3	1	2	0
Vegetables*	20	5	1	3	1	3	0	3	0	4	0
Bread and cereal	16	1	4	2	1	3	0	2	1	2	0
Sauce*	15	0	7	2	1	2	1	1	0	1	0
Meat and cheese*	9	2	1	2	0	2	0	1	0	1	0
Drinks	3	0	1	0	0	0	1	1	0	0	0
Other**	2	0	0	0	1	0	0	0	0	1	0
Milk products, eggs	4	0	2	1	0	0	1	0	0	0	0
Total* (instances)	105	12	21	16	9	11	5	11	3	17	0

Notes: *More than one cause given or no cause reported for some food waste instance/s (explaining difference between causes in this table than instances from previous table).

Table 8 provides a breakdown of the reasons for food waste per food budget area.

Table 8 Reasons for food waste per food budget area

Cause of food waste	Total instances	Food budget area		
		High	Medium	Low
Forgot about this item and it now looks or smells spoiled	12	3	6	3
Forgot about this item and it's now out of date	21	2	13	6
Didn't get around to eating this and now it is spoiled	17	1	12	3
Didn't get around to eating this and now it is out of date	9	3	2	4
Uncertain if this is still healthy to eat, been in an opened package	11	1	8	2
Don't like this item	5	2	1	2
Bought too much and can't get through it all	11	4	4	3
The packaging too large for my normal consumption of this item	3	0	3	0
Left overs that didn't get eaten	17	9	6	2
Other reason	0	0	0	0
Total	105	25	55	25

The medium food budget area had the greatest number of food waste instances (55), compared with 25 instances for both the high and low food budget areas. The main reason for food waste generally was forgetting about an item until it's now out of date (21 instances) followed by not getting around to eating an item until it is spoiled (17 instances, Photo 3).

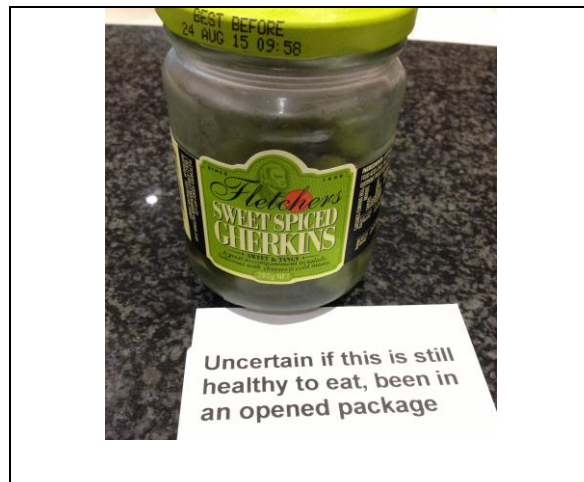
Photo 3 Uncertainty of an item being healthy to eat being in an opened package



The main reasons for food waste in households in the medium food budget area were

- forgetting about an item to the point of being out of date (13 instances);
- not getting around to eating to the point of spoilage (12 instances);
- uncertainty of an item being healthy to eat being in an opened package (Photo 4) (8 instances); and
- forgetting about an item to the point of looking or smelling spoiled or left overs that didn't get eaten (6 instances respectively).

Photo 4 Uncertainty of an item being healthy to eat being in an opened package



The main reason for food waste in households in the high food budget area was “left overs that didn't get eaten” (9 instances - Photo 5 – it appears that in the images provided that “too much” food was prepared, resulting in left overs). The main reasons in the low food budget area was “forgot about this item and it's now out of date” (6 instances). Buying too much so as not to get through an item was reasonably even across the suburbs (11 instances, including 3 serves of fruit and 2 or vegetables).

Photo 5 Left overs not being eaten



5.3 Exercise 3: *What is cooked and what is not eaten? (Day 2-6)*

During day 2-6 of the audit, households recorded what food was cooked, what was eaten, how food was prepared, where it was prepared, how many people participated in a meal, what shopping occurred, and what happened with left overs during the course of the 5 days.

Of the 24 households, 1 household didn't submit any data (from Greensborough).

Table 9 presents the average percentage of meals that are eaten from preparation in the home during days 2-6 of the audit.

Table 9 Meals eaten from preparation in the home

Type of meal	Total (%)	Food budget area (%)		
		High	Medium	Low
Breakfast	94	95	97	89
Lunch	91	92	89	92
Dinner	82	84	81	82
Other	87	93	76	91
Combined total	88	90	88	88

Notes: These percentages were averages of participant reported percentages of each meal for the period eaten at home.

Breakfast was the main meal that was eaten from preparation at home (94% of households), followed closely by lunch (91%). From the sample of 24 households, 82% of households prepared dinner during the 5 day audit with the remainder of dinner meals (18%) being eaten out at a restaurant or take away.

At a food budget level the following observations can be made:

- Across all four meal types, households from the high food budget area prepared the most meals at home; indicating less take away and eating out for these meals in this area;
- Households in the medium food budget area ate more meals prepared outside the home, particularly those classified as "other" which included cakes, nuts, fruit, ice cream, chips and biscuits.
- Households in the low food budget area ate less breakfast and dinners prepared at home compared with households in the other two areas, indicating more take away and eating out for these meals in this area;
- Over 90% of lunches were made at home;
- Across all households, of the dinners eaten during the five day audit, only 81-84% of dinners were eaten from preparations undertaken in the household. This equated to a total of 21 dinners being eaten from preparation not made within the household (e.g., meals at a restaurant, take away meals).

Table 10 presents the average number of people eating each meal across the three food budget areas (both out and in the home).

Table 10 Average number of people eating each meal

Type of meal	Total average	Food budget area		
		High	Medium	Low
Breakfast	3.1	3.1	4.1	2.3
Lunch	3.1	3.1	3.7	2.4
Dinner	3.6	3.8	4.4	2.7
Other	2.5	2.8	2.3	2.4
Combined total (*)	3.3	3.4	4.1	2.5

Notes: Average size of food budget area households– high (3.4 persons), medium (4.6 persons) and low (2.8 persons).
 (*) Does not include other meals.

As presented in Section 4.2 (page 14), the average size of the households was 3.4 persons. For each of the three areas represented the household size was 3.1 persons (high), 4.6 persons (medium) and 2.8 persons (low).

The average household size in this study is 3.4 people. More people ate dinner on average than other meals (and more than the average household size), with the same average of people eating breakfast and lunch across the households (less than the average household size). This indicates that more households eat dinner and potentially do it with guests, and more people skip breakfast and lunch than dinner, and potentially fewer households eat these meals with guests.

In regards to meals, at breakfast, lunch, and dinner there were close to average household size for both low and medium food budget areas. The high food budget area tracked similarly in breakfast and lunch, although more than the average household ate dinner indicating more guests for this meal. All suburbs ate other meals with lower than average people than the average household size, which is to be expected.

The preparation times for each meal across the five day audit are presented in Table 11, and the average time to prepare meals per food budget area and type is presented in Figure 5.

Table 11 Average time to prepare meals

Type of meal	Total time average (mins)
Breakfast	9
Lunch	19
Dinner	35
Other	6
Combined total (*)	21

Notes: (*) excluding "other" meals.

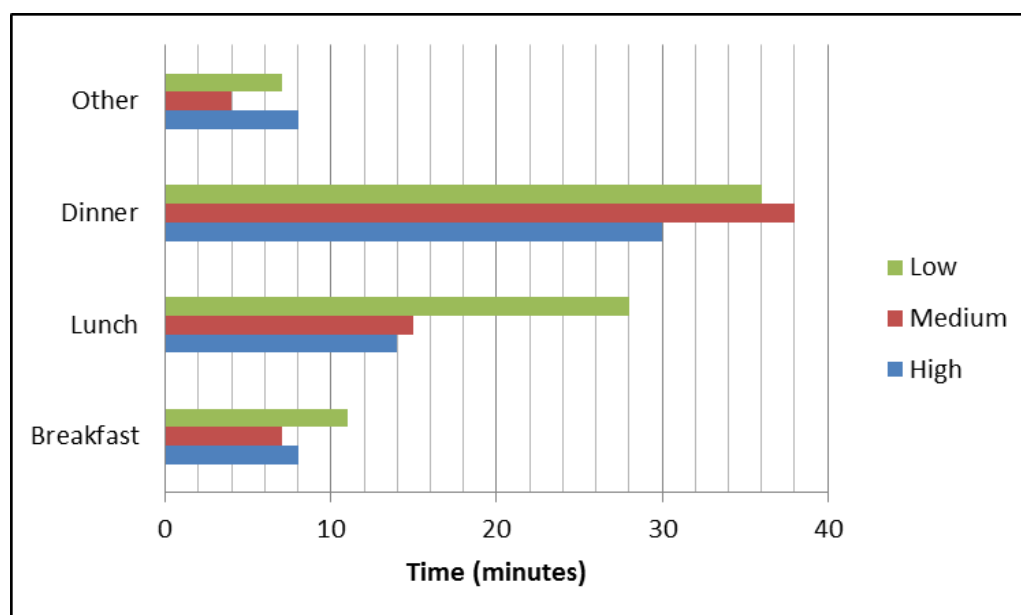


Figure 5 The average time to prepare meals per food budget area and meal type

Overall, dinner takes the longest (35 mins) and breakfast the quickest (9 mins) of the standard meals to prepare, with other meals quicker again (5 mins). On average low food budget households take longer to prepare breakfast and lunch, whereas households in the medium food budget area take the longest to prepare for dinner. Examples of meals prepared are presented in Table 12.

Table 12 Examples of meals prepared (excluding other meals)

Breakfast	Lunch	Dinner
Porridge	Salads	Pasta meals
Cereals and breads	Bread rolls or sandwiches filled	Rice meals
Milk	Pastries	Meat and vegetables
Jams	Left overs (pasta, curry, etc.)	Salads
Fruit	Soups	Prepared meals

An outcome of food preparation is the generation of leftovers as a result of overcooking, large portion sizes or not wanting to eat as much once served. Table 13 presents data on the existence of leftover food plans.

Table 13 Existence of leftover food plans

Type of meal	Total (days)	Food budget area		
		High	Medium	Low
With left over plan	54	21	16	17
With no left over plan	49	13	17	19
Days leftovers reported	103	34	33	36

Forty five percent of household days (24 households, 5 days each) were reported as having a leftover food plan, 41% were reported as not having a leftover food plan, and 4% household days were not reported as having food waste. Of the instances of food waste, causes included too much ingredients in packages, cooking larger meals for future meals, kids not wanting a particular food, and overestimation of meal sizes. Examples of alternative options to landfill for the waste included lunch for next day, composting, food for pets (chickens, dogs, etc.), storage in freezer, and lunchbox snacks.

5.4 Exercise 4: *What is not eaten?* (Day 7)

The last day of the audit (day 7) households repeated Exercise 2 (from day 1) where they identified food items from their kitchen, pantry, and fridge that needed to be thrown out. The validity⁸ of this data is in question due to the limited responses recorded by households or the fact that some households recorded the same data they had given in Exercise 2 (on day 1).

Therefore, all data reported in this section (Table 14, Table 15, Table 16, Photo 6 and Photo 7) present data from five households only (1 from high, 1 from medium and 3 from low food budget area) who completed Exercise 4 correctly by identifying wasted food items generated through day 2-6 of the audit (i.e. new food waste), including one household that claimed no waste. Table 14 presents a breakdown of food items identified as new waste on day 7 per food budget area.

Table 14 Food items identified as waste on day 7 of the audit per food budget area (*)

Type of food waste	Total instances	Food budget area		
		High	Medium	Low
Prepared meals	0	0	0	0
Fruit	4	0	2	2
Vegetables	4	2	0	2
Bread and cereal	0	0	0	0
Sauce	0	0	0	0
Meat and cheese	2	1	0	1
Drinks	0	0	0	0
Other	0	0	0	0
Milk products, eggs	2	0	1	1
Total	12	3	3	6

Notes: (*) Data only presented for 5 households only that reported "new" food waste, excluding the 7 households that submitted the same data from day 1.

⁸ Of the 24 households, 11 households didn't submit any data (4 from high, 2 from medium and 5 from low food budget area), 8 households reported the same data as the audit on day 1 (3 from high and 5 from medium food budget area), and 1 household low food budget area reported no food that fell into the wasted categories.

More new food items were identified on day seven as needing to be thrown out in the low food budget area (6 items), compared with the medium area (3 items) and the high food budget area (3 items).

Fresh fruit and vegetables (Photo 6) accounted for the most instances (33% respectively), followed by milk products and eggs (17%), and meat and cheese (17 %).

Photo 6 Examples of wasted fruit and vegetables



Of the food categories wasted, the food budget area that had the most instances within each food category were:

- the high food budget area - vegetables (2 items); and meat and cheese (1);
- the medium food budget area - fruit (2 items), and milk products and eggs (1);
- the low food budget area – had the equal most reported waste for all categories reported (joint most with the high food budget area for vegetables and meat and cheese and the medium food budget area for fruit and milk products and eggs).

There were seven “causes” provided why households had identified new food items in the day seven audit as needing to be thrown out. These are listed per food category in Table 15 and the top 4 reasons (with more than 1 instance) described below:

- The main cause of food waste was “Not getting around to eating to the point of spoilage” (3 instances) with the main offending food item being fruit (e.g., Photo 7);
- The equal second cause was “Forgetting about this item and it’s now out of date” (2 instances). These were single cases of meat and cheese, and milk products and eggs;
- “Left overs not being eaten” (2 instances) were cases of vegetables being wasted (e.g., Photo 7);
- “Not liking an item” (2 instances) occurred with one item being fruit and the other vegetables.

Photo 7 Examples of food items and causes of waste



Table 15 Food identified as waste on day 7 (*)

Type of food waste	Total causal instances	Forgot about this item and it now looks or smells spoiled	Forgot about this item and it's now out of date	Didn't get around to eating this and now it is spoiled	Didn't get around to eating this and now it is out of date	Uncertain if this is still healthy to eat, been in an opened package	Don't like this item	Bought too much and can't get through it all	The packaging too large for my normal consumption of this item	Left overs that didn't get eaten	Other reason
Prepared meals	0	0	0	0	0	0	0	0	0	0	0
Fruit	4	0	0	2	0	0	1	0	0	0	1
Vegetables	4	0	0	1	0	0	1	0	0	2	0
Bread and cereal	0	0	0	0	0	0	0	0	0	0	0
Sauce	0	0	0	0	0	0	0	0	0	0	0
Meat and cheese	2	0	1	0	0	0	0	1	0	0	0
Drinks	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0
Milk products, eggs	2	0	1	0	1	0	0	0	0	0	0
Total**	12	0	2	3	1	0	2	1	0	2	1

Notes: (*) Only data for 5 households recorded.

Of the food wasted, Table 16 describes why it was wasted, and the breakdown by food budget area of these causal factors.

Table 16 Reasons for food waste per food budget area (*)

Cause of food waste	Total instances	Food budget area		
		High	Medium	Low
Forgot about this item and it now looks or smells spoiled	0	0	0	0
Forgot about this item and it's now out of date	2	0	1	1
Didn't get around to eating this and now it is spoiled	3	0	2	1
Didn't get around to eating this and now it is out of date	1	0	0	1
Uncertain if this is still healthy to eat, been in an opened package	0	0	0	0
Don't like this item	2	1	0	1
Bought too much and can't get through it all	1	1	0	0
The packaging too large for my normal consumption of this item	0	0	0	0
Left overs that didn't get eaten	2	1	0	1
Other reason	1	0	0	1
Total	12	3	3	6
Notes: (*) Only data for 5 households recorded.				

There were 6 single reasons for food waste in households in the low food budget area. The high and medium food budget areas each had 3 single reasons (Table 16).

No general conclusions about the trends across participants could be drawn due to the low response rates for this exercise (5 households only). One interesting point however was that fruit and vegetables dominated the food waste instances, as they had previously. The food budget area with the most waste instances was the reverse of the first audit. In the first audit the low budget food area had the lowest of the most reported categories. In the day 7 audit the low food budget area had the most waste instances, however triple the number of households that responded respective to the other areas this time around.

The causes were distributed across the categories, although the leading cause on day 7 "not getting around to eating to the point of spoilage" was the second highest cause on the day 1 audit. Of the 5 households that reported new instances of food waste (or no waste), 3 reported fewer instances than day 1.

5.5 Exercise 5: How do you feel? (Day 7)

On the last day of the audit, households provided reflections and feelings about participating in the food and food waste audit and what they had experienced across the 7 days. This involved completing a questionnaire about different statements regarding attitudes to food waste as well as purchase habits.

Three questions were posed:

- Did you think more or less food was wasted over the week than you thought would occur?
- What are your perceptions about the value of food wasted?
- What behavioural shifts have you made as a result of participating in the audit?

All households completed this section; except for 1 in the medium food budget area (therefore response rate was 96% across the three food budget areas).

Table 17 presents household responses related to the amount of food wasted during the audit period per food budget area.

Table 17 Households' response to amount of food waste that occurred during the audit period

Response	Total	Food budget area		
		High	Medium	Low
More waste than expected	9	2	4	3
Less waste than expected	8	2	1	5
Not surprised by waste	6	4	2	0
Total	23	8	7	8

There were distinct differences amongst households as to the amount of food waste expected. There were 9 households (39%) who responded that "more waste than expected" was generated within the 7 day audit period⁹. Within food budget areas, households from the medium area had a greater response to this. Participants noted the following:

"Previously, we did not think much about food waste. This exercise forced us to identify food and to be alert with buying habits. There was more waste than I thought; as I previously thought I had no waste."

"What I have noticed is that I cut out more than I should. As I do not make a list or think about what I want to eat for the week. Half the fruit goes out after 7 - 10 days and I do not eat all the vegetables."

"Slightly more waste than first considered. Very little fresh fruit and vegetable wastage. Need to plan better and not buy items that we only use once and no more than that."

There were 8 households (35%) who responded that "less waste than expected" was generated. A greater majority of households from the low food budget area responded to this. Participants noted the following:

"Nothing I'm pretty good with waste so no surprises."

"Results as I thought."

There were 4 high food budget area households who were "not surprised by waste", along with 2 from the medium area. Participants noted the following:

"Not really. All organic waste goes to compost and chickens (so nothing goes into the rubbish except packaging)."

⁹ This is interesting because only 5 households reported actual "new" waste data on day 7. This could indicate that the other 4 households got confused when they included the 'waste' items identified on day 1, instead of what was really generated over the new 7 day period.

“It was about what I thought. If there is left over salad, cooked meat, pasta etc. - I usually find a way to use it for lunches the next day. I found a few things I had forgotten in the pantry and fridge at the start of the exercise which were past the use by date that I tossed out, which was disappointing as I don’t like wasting food.”

“Not surprised. Most of our waste comes from dinner when the kids decide not to eat but on most days they are pretty good. I was happy with the small amount of food that was out of date. I thought it might be more. I like to keep a clean organised pantry and fridge so I can turn over the food regularly.”

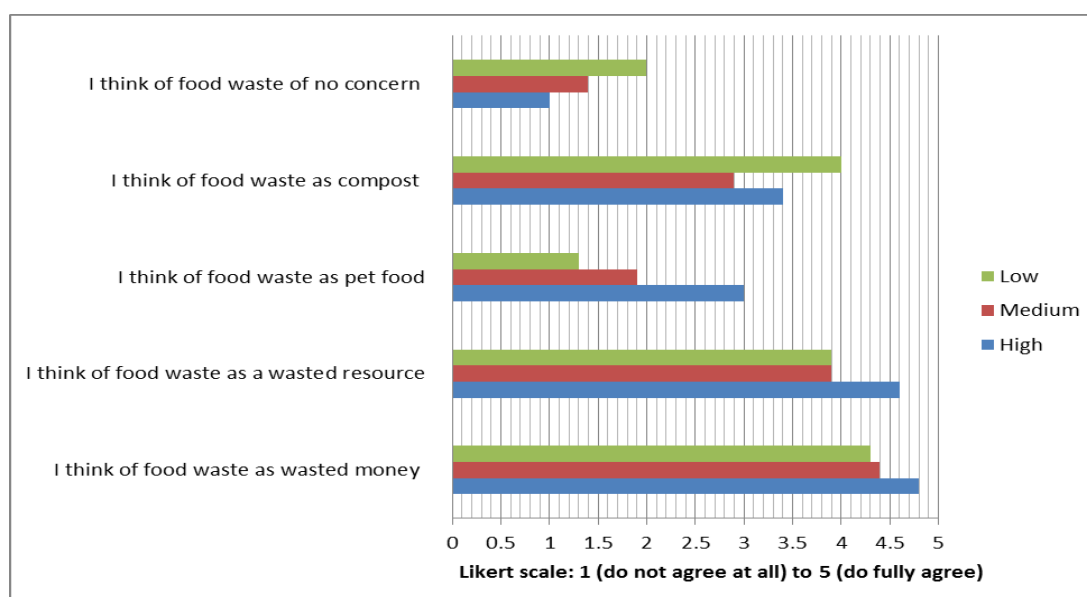
These insights seem to align with the results in the first day food audit (Table 6) where the high and low food budget areas had half the food waste instances respectively than the medium food budget area. Perceptions in Table 17 show that where more food was wasted in the medium food budget area, more households thought food waste was higher than expected. Where food waste was lower, the high food budget were more not surprised by results, and the low food budget area agreed more that there was less food wasted than expected.

Households were asked their perceptions regarding the value of food wasted and asked to grade them from 1 (do not agree at all), to 5 (do fully agree), a Likert scale. The average perception results across the total households are presented in Table 18 and the breakdown of perceptions by food budget area are presented in Figure 6.

Table 18 Household perceptions regarding the value of food wasted

Perceptions	Total
I think of food waste as wasted money	4.5
I think of food waste as a wasted resource	4.1
I think of food waste as pet food	2.1
I think of food waste as compost	3.5
I think of food waste of no concern	1.5

Figure 6 Perceptions by food budget area



Insights regarding the value of food waste across the three food budget areas:

- All households identified “food waste as wasted money” (4.5) as their most fully agreeable, rather than “as compost” (3.5) and “as pet food” (2.1).
- The level of agreement is highest in the high food budget area in all categories except for the compost response.
- The lowest agreement is in the low food budget area in all perceptions, except compost, where agreement is highest.
- Generally households disagree that food waste is of no concern, however the level of disagreement is not as strong in the low food budget area.

The results and the breakdown by food budget area of what behavioural shifts may occur as a result of participating in the food and food waste audit are presented in Table 19.

Table 19 Behavioural shifts from participating in food and food waste audit

	Total	Food budget area		
		High	Medium	Low
Will change behaviour having completed the waste exercises	12	4	4	4
Won't change behaviour having completed the waste exercises	9	3	2	4
No opinion	2	1	1	0
Total	23	8	7	8
Notes: One household in medium food budget area did not provide a response.				

Having participated in a week long food and food waste audit, there was a strong level of engagement within households (12 households (52%)) who indicated that they would change their behaviour having completed the waste exercises. This is a promising result and demonstrates that small changes can be made when households are presented with a different way of looking at waste generated in the kitchen. Comments included:

"It has made me think about how much waste there is after meals. I should prepare a list of our meals for the week and try to only buy what we need. I will try to reduce my household budget. This was an extremely good exercise. It makes you realize the waste and hopefully will improve how I prepare my meals for the week. I know that I go to the shops too many times a week for small shops. I would be better off, shopping once a week for a large shop and only get what I need on the occasional other day."

"Happy how this works in terms of compost and dog. Will be more vigilant about pantry audits and watching 'use by dates'. I work 4 days per week so like to make large quantities and freeze meal portions, to make life easier at the end of the day. I have free standing freezer which I store prepared meals, cakes for lunches, the weeks supply of bread and rolls and meat. Prepared meals are stored in decor boxes with plastic labels to identify. Thank you for the opportunity to be part of the study, it was a really interesting exercise."

"This is a brilliant study. Before this, we did not even know what the purpose of the worm farm was. This study taught us to be mindful of food. We learned new stuff. Thanks!"

"If I get a compost bin and I am shown how to use it properly, I will begin using it."

Some of the above responses indicate a desire to implement pre waste solutions such as plan better, manage purchasing and use appropriate storage more vigilantly. Comments also indicate positive sentiment regarding waste management techniques in the home such as worm farms, pet food and composting.

There were however, 9 households (39%) who indicated that they would not change their behaviour and 2 households (9%) who did not have an opinion. Participant comments included:

"No - I buy multiple of products if on sale so the cost of food varies each week depending what's on sale and how much of each product I buy. I am very conscious of planning meals and buying perishable foods appropriately. If something in the fridge is running close to the use by date I cook accordingly. If I buy multiple products due to sales I try and keep an eye on use by dates so as not to have waste. My pantry can have products passed use by date that I have kept as I do not think they would spoil."

"We eat mostly plant based diets so our rubbish waste is small. Our veg/fruit scraps go to our parent's veggie gardens for compost. Council should promote healthy eating through farmers markets etc. This is the best way to reduce waste. People need to be educated about whole plant foods and the environmental impact of eating highly processed and packaged foods. Teach people about growing their own, community schemes and awareness."

"Compost bins attract unwanted rodents - rats etc."

These comments tend to indicate positive practises (such as planning) already implemented by households show that some people are doing well and only need to make minor changes if any.

5.6 Exercise 6: *What would you change? (Day 7)*

The final exercise of the 7 day audit gave households the opportunity to record ideas that might help them to reduce food waste. No matter if households generated more or less food waste than they expected, they all provided good reflections about what they could do to reduce waste. There were 6 households who saw participating in the audit to be a very useful exercise. Households were provided with a range of options as presented below in Table 20, where they identified at least one change to make to reduce food waste.

Table 20 Strategies identified by households of what they will do to reduce food waste in the future

How retailers sell	Instances
Less packaging	4
Avoid specials	4
Avoid bulk	3
Buy smaller amount fresh food	2
Buy Australian/local/seasonal	2
How food is packaged	Instances
Less packaging	5
Buy fresh	5
Avoid bulk	3
Buy right amount	3
Bring your own shopping bag	2
How I prepare and cook	Instances
Cook less	7
Make better plans	6
Make better use of what's in the kitchen	3
How I store food	Instances
Freeze and fridge better	9
Cover food	5
Check date	3
Buy less	2
Notes: Alternatives where more than one participant referred to a strategy are presented in this table (i.e. there were other strategies identified once).	

In regards to pre waste strategies, 6 households commented about how important it is for them to plan their meals, with the following comments made:

"Plan, Plan, Plan. Shop according to plan and not ad hoc (or) aimless impulse buying."

"I used to have a meal plan. I intend to do that again as it helps with deciding how to use up vegetables and fruits before it goes bad."

"Plan next meal to utilise any fresh produce not used."

There were 7 households that identified cooking less as a good idea to reduce waste occurring. Examples of how this may be implemented are as follows:

“Not cook so much pasta with the bolognaise sauce.”

“Don’t make foods kids don’t like. Big leftovers and parents usually eat unnecessarily. Eat less/prepare less = less time in kitchen. Use borderline “use by” foods (meat, veg) sooner. Be more aware of what’s in fridge.”

“Cook less than before and control the amount of cooking.”

Another area that had broad support from households was to utilise the fridge and freezer better to keep food from going off. There were 9 households that looked at this as a future area of interest. Comments here included:

“Make sure food is visible when opening fridge and freezer.”

“Plan to immediately freeze extra serves of food after I prepare them and heat them up on busy days for meals or to be used as work lunches.”

“Adjust the dial on veg draws in the fridge when there is more or less in the draws noticed this affected the veg going limp.”

“Make sure the fridge is cold and fruits / veg stay in the fridge instead of outside basket.”

In regards to the retail environment, 5 households want focus on less packaging, 5 households will look to buy fresher produce, and 4 households will avoid specials, in order to help reduce food waste. This is articulated in the following statements:

“Try and reduce purchasing of overly packaged items.”

“Avoid food that is over packaged, especially in plastic. Attempt to buy fresh food that avoids packaging where possible.”

“Stop looking at specials and buy what we use. We don’t need to buy for the end of the world.”

In terms of post waste ideas, 65% of the households use a compost bin, while only 35% of households give food scraps to animals. This correlates to the perceptions in Table 18 where more households rated the value of food waste as compost more than animal feed.

6 Outcomes from the face to face interviews

This section provides insights gained from face to face interviews (see Section 4.3) with eight households. Questions that were posed are listed in Appendix 1. Table 21 provides insights gained by the face to face interviews with eight households.

Table 21 Insights from the face to face interviews with eight households

Household			Attitude towards fresh and frozen food and their own judgment of themselves as cook	Instance of planning	Some quotes from interviews	Researcher notes
Household	Total number of person	Number of children				
1	4	2	Fresh food, she sees herself as a good cook.	Buys from list prepared at home, but also looks at what is on special or what looks nice.	<i>We plan to have leftovers and he takes it to work. I know how much my family eats, so we don't often have to put anything back in the fridge for the next day... there are some things that slip, you know, there are some things that I might have used once for a weird recipe that is still sitting in there. So, yeah, you know, I certainly have been guilty of having jars of stuff in the fridge that have been there for 10 years!!.</i>	Audit shows that there is often 50% of dinner left to next day. This links with leftovers being used for lunch the following day at work.
2	2	0	Both fresh and quick pizza from freezer, does not see himself as a good cook.	Very much so.	<i>Do you plan? Very much so, it's a bit like John Lennon, sort of life is what happens to you when you make other plans. But we are very good planners, but even being good planners we're still wasting 10%.</i> <i>Look I suppose buying less might be more intelligent. I reflect on other friends in Banyule and the fact that their shopping trolleys are full up and their fridges are fuller and their pantries are fuller. But they like to have the security of choice and depending if they have children, whereas we're a bit more frugal and thrifty.</i> <i>In terms of how far do you take the topic of where our food comes from, do you want to grow your own, where can you join a sustainability group, where are the farmer's markets, you know are you concerned about genetically modified, are you concerned about food miles.</i>	Did not report any food waste on day 1 nor day 7. Report they were surprised over a little more waste than expected

Household			Attitude towards fresh and frozen food and their own judgment of themselves as cook	Instance of planning	Some quotes from interviews	Researcher notes
Household	Total number of person	Number of children				
3	3	1	We do not eat ready-made meals. Considers herself as a confident cook.	Before I took up job I did more planning.	<i>Now that other daughter's not here I still make the same quantity and freeze the leftover. But I know I've got some things in the fridge that are probably past their shelf life and depending on what they're sitting in, if it's like peppercorns sitting in a vinaigrette although it's past it's shelf life I might still be using it because I think if it's still sitting in vinegar it's okay. I know organic food is very expensive so I don't tend to look at buying that. Those sorts of things I'm very wishy washy on knowing the exact shelf life of cooked food. If you've cooked a casserole how long staying in the fridge again it would last. Seven days is normally okay I think it's been in there too long. And I normally go by okay we had that last Friday night, if we get to Friday and it's still there it has to go out</i>	Wasted some food, various item, for example bottles and jars with food products. Small amounts of leftover from cooking.
4	5	3	It's all organised due to busy lifestyle. Try to avoid unnecessary purchases. Considers herself as a good cook	I have a two-week rotating menu. On weekends we eat leftovers from the week. Fridays is takeaway day.	<i>I'm pretty sure that where we go for greengrocery, I don't buy vegetables from the supermarkets because I figure they've been there for like three or four months in their fridges so... If there were apples, say there was apples there (at the greengrocer) and one was from Australia and one was overseas, I would buy the Australia brand definitely.</i>	Forgot about some food in refrigerator. Feed leftovers to dog. Surprised about little waste.
5	4	2	Considers herself as a good cook, concerned about origin of food. Follows recipe occasionally	Plan a few days ahead. Purchase fresh food regularly. Buy vegetables and chop them and put in	<i>I'm always checking specials so I tend to buy in bulk, especially meat. I've got a big freezer so I freeze meat. Yeah. I generally go on the smell and what it looks like so... I try not to have leftovers wasted.</i>	Throws away vegetables pretty often according to food audit day 1

Household			Attitude towards fresh and frozen food and their own judgment of themselves as cook	Instance of planning	Some quotes from interviews	Researcher notes
Household	Total number of person	Number of children				
				freezer.		
6	3	1	Considers herself as a good cook	Does not generally plan meals. Plan when we have people for dinner. Does not like prepared meals from freezer.	<i>Yeah, I think I'm pretty savvy with what my per kilo prices are with fruit and veg and what, you know, quality is. Because I definitely think it's really important to buy things that are Australian grown for starters. You want it to be fresh so you want it to last a while, and if it's a packaged product, the longer the shelf life the healthier it is [laughs] sometimes.</i> <i>Do you know when food needs to be disposed of? Well the main thing is the nose; the nose knows.</i>	Very little waste reported. Eats a lot of fruit and veggies.
7	2	0	I am a reasonable cook. Do not cook a lot of readymade meals, more expensive.	Does not plan meals ahead. Would like to increase fresh fruit. Does not buy a lot of frozen food. Buys for a week.	<i>Some of the time I buy too much because during the week it's a single meal and then weekends and occasionally it's with my partner. I prefer the food coming from Australia. So I rarely buy garlic that's imported anymore. I put, nearly everything goes in the fridge except for potatoes, onions, garlic. Every other fruit, apples, banana, and fruit. Every other vegetable goes into the fridge. I think that perfect looking food in general means that there's something wrong with it because no fruits and vegetables with the perfect shine and a perfect this and a perfect look...</i>	Cooks a little too much. Some fruit and vegetables are not eaten. Does not care that much about waste of resources and money.

Household			Attitude towards fresh and frozen food and their own judgment of themselves as cook	Instance of planning	Some quotes from interviews	Researcher notes
Household	Total number of person	Number of children				
8	4	2	Love cooking and experimenting. Avoids ready-made meals	I look at what is in the pantry. I like to be organised. Do weekly shopping. Always plan for leftovers	<i>I'll look at my list and go right, well I'm not going to cook that particular dish, I'll adapt and change and do it that way. So I'll go out with a list and then go well that meal required those ingredients but because I've seen these ingredients I'll do something else instead, like I'll do a stir-fry instead or something. So I sort of, yeah, flexible but ...Fresh food is tastier, it's better for you. Like I'll look at the use by or the best before and things like that, but also use a bit of common sense with it as well. There are certain things that do actually do alright a bit longer.</i>	Do not eat everything, but do not plan for so many leftovers. Difficult to serve correct amount to child.

7 Discussion

This section provides a brief discussion comparing the insights gained through this study of 24 households in the Banyule City Council and those of other studies conducted internationally. As discussed in Section 3 - Background, similar studies have been undertaken, and these also provided background to this study.

Caveats

Notable is the information given about "specials" and that the high income households are somewhat more concerned about "specials" when buying food and do also to some greater extent see food waste as a waste of money.

There is always the risk of social desirability bias with self-reporting in diaries and interviews; people respond more to what they believe is socially desirable rather than to be truthful in surveys and questionnaires [35, 36]. People that choose to participate in a food waste study are probably more committed than average.

Food category types wasted

Similar trends in this study have been observed as per studies in other advanced economies in the world in terms of what food categories are wasted the most. Figure 1 describes that in both samples of UK and Finnish households, vegetables, fruit, prepared meals and breads and cereals had some of the highest percentage avoidable waste amongst food categories.

Similarly these categories were amongst the highest food waste instances for the Banyule participants on the day 1 food audit (Table 6). Of the new waste reported on day 7, again vegetables and fruit dominated, although there was a limited response rate (Table 14). Both the UK and Finnish study had markedly larger sample sizes.

Reasons for food waste

Similar trends in this study have been observed as per studies in other advanced economies in the world in terms of why food is wasted. Figure 2 described that in samples of UK, Swedish and Finnish households, spoiled/moulded food; expiry date overrun; plate leftovers; and over preparation were the highest percentage avoidable waste amongst food waste causes.

Similar categories ('forgot about this item and it now looks or smells spoiled', 'forgot about this item and it's now out of date', 'didn't get around to eating this and now it is spoiled', 'left overs that didn't get eaten', etc.) of this nature had the highest food waste causes for the Banyule participants on the day 1 food audit (Table 8). Of the new waste reported on day 7, again similar causes were identified most ('forgot about this item and it's now out of date', 'didn't get around to eating this and now it is spoiled', 'left overs that didn't get eaten'), although there was a limited response rate (Table 16). Both the UK and Finnish study had markedly larger sample sizes, with the Swedish study closer but still around three times the sample size.

Similarities of Banyule study with other studies

The participating households showed a high degree of interest as well as knowledge about food practices [31]. The participating households were not all planning meals or planning before going to shops. This is similar results to what other studies have shown [37, 38].

Differences (new insights) compared with other studies

In the interviews the participants showed a high degree of knowledge and efforts in eating healthy and trying to reduce food waste. Among these households they also put time into planning meals and shopping lists, however notable is that for a majority (6 out of 8) of these households the female is working part time. This issue has not been addressed in the studies that this report refers to.

The participants in this study noted that waste of food is both a waste of money and a waste of resources. This is somewhat different to other studies that usually show that money is of much higher concern [2, 38]. Saving money is therefore a useful argument to make consumers reduce their food waste. However, the underlying issues may be multi-faceted as for avoiding wasteful behavior or simply saving money to be able to spend on other products [38]. Due to the small sample in this study it may be useful to review other studies as well and focus on communication that reducing food waste saves money. It is also possible that the participating group in this study have a higher awareness about the world's limited resources compared to the average consumer.

Evans (2011) showed that many households showed anxiety over food and the risk of food. In the face to face interviews in this study, the households showed that they reflected about how to behave and that they see themselves as good cooks. These food confidences tend to be larger than their anxiety. However the reasons for food waste (Table 8) shows that uncertainty of food safety accounted for 10% of the waste instances.

8 Conclusions

There are many opportunities for Banyule City Council, the Metropolitan Waste Management Group through to other local and state governments to capitalise on the insights gained through this study of food and food waste diaries of households. These include:

- The positive participation response (especially filling in the questionnaire) indicates that making households practice some food waste measurement may be a useful approach within the municipality. Providing residents with the ability to observe, record and report their daily activities, practices and actions around food planning, procurement, storage, cooking and eating may be beneficial. This 'hands-on' approach (the actual observation of waste and recording) had positive impact upon many of the households in their reflections. It provides a first-hand insight and reflection which normally does not occur with a hectic lifestyle. Providing residents with the food and food waste diary in accessible ways (e.g., online, web-application (app), hard copy) may be the key to success of such an approach.
- To make people become aware of their food waste, Banyule could arrange for "measuring food waste day". Households and residents could be engaged through community groups, schools, etc. to report by mail or through a dedicated website how much they have been wasting that specific day. This would be done with the purpose of making people act and less about the statistics in the reports.
- While there were some differences among the socioeconomic groups, there is little evidence for communicating in different ways to each group. The same messages and approach should be taken amongst all groups.
- Planning of meals is crucial to reducing food waste. Education programs should emphasize this including not falling into the trap of purchasing store specials or buying extra when it is not needed. This is an issue of money and resources as they were almost equally important, averaging over 4 in perceptions of importance on the Likert scale.
- There were some perceptions from participants that over packaging food increases waste. Although reducing packaging may reduce packaging waste, the perception that this may reduce food waste may in fact be an anomaly. Fit for purpose packaging may do this, which may in fact increase packaging, such as portioning packaging, or less permeable packaging. Further investigation of this perception from households may be warranted and build upon research looking at packaging's role in minimising food waste across the supply chain [5].

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Appendix 1: Interview questions and rationale

Household interviews were conducted by Banyule Council staff after the information gathered through the data collection kits was completed. The aim of the interviews was to gain more in-depth understanding of householders' practices associated with the data gathered in the first instance. This was to help inform potential strategies and programs designed to reorient selected practices. Firstly the following checklist was followed by the interviewer to assure that ethics protocol and interview process was followed correctly:

- Participants have read research information sheet
- Participants have signed a consent form
- Participants have been reminded that they can withdraw consent at any time
- Audio recorder switched on
- Post-interview checklist
- Copy of consent form posted to participant following the interview

The following describes the follow up interview questions with 8 households and rationale for these questions following the data collection kit submissions. Note that while these questions were posed, in some cases not all were responded to.

Theme 1: Food planning

Of the households that plan their shopping and meals let's find out more detail about how and why they do this. Let's go back into their history to find out if this is a habit passed down or something they developed over time out of necessity and if so how do they maintain this practice and what are some instances where the practice gets thrown out the window.

Of the households that don't plan (they scribble a rough list) let's ask them how they came up with this method of food planning. Let's describe a household who practices more detailed planning and ask them what they think about this idea, how this would or wouldn't fit into their life and why?

Do you plan how you will shop for food?

If yes, please describe the process you generally use.

Why do you plan or not plan in this way? What did your family do growing up? Can you think of a time where your food planning didn't work out and tell us why this happened and how it worked out?

If you don't plan your food shopping, please describe the process you use.

Why do you do it this way? What did your family do growing up? Can you think of a time where you did do more detailed planning and tell us why this happened and how it worked out?

Theme 2: Food purchasing

People were keen to buy fresh as a change in their habits. Households were asked as to how they plan to do this and the kinds of things that might make this difficult for them. They were also keen to avoid specials. They were asked what it is about the specials that draw them in.

Which shopping outlets do you visit? How often do you visit these (i.e., less frequently to buy in bulk, weekly shopping list or local convenience)? How far are they from your home or work? What mode of transport do you use?

Do you purchase fresh food regularly? Why or why not?

How would you go about increasing your fresh food consumption? Where would you source it from? When would you have an opportunity to do this? What would make it difficult to do this?

When visiting a shop do you buy food according to a set meal plan? Why or why not?

If you buy food that is not on your meal plan, what prompts you to do this?

Do you purchase food products on special when you see them? Why or why not?

If so, what draws you to a special? How do you make the decision that you need this item?

If not, why do you decide not to? How do you make the decision that you do not need this item?

Theme 3: Food preparation

The majority of respondents said they want to cook less food to waste less. Households were probed as to how they measure and decide on quantities to cook, whether they have had and training, experience or passed down knowledge in these issues.

16 out of 23 households included food from the garden in their meals. Households that did were asked why they do it, how long have they been doing it, and whether they grow specific things for eating or random. Those who don't were asked what would make it easy or difficult for them to do this.

Do you measure the amount of food you will use per person? Why or why not?

How do you decide on the quantity of food you will prepare?

Do you cook 'ready-made meals'? Why or why not?

How were you served food as a child? (One meal per plate, buffet style, eat everything on your plate, no going back for seconds).

Do you grow food in your garden?

If so, what are you growing? Do you plan what to grow according to what meals you like to prepare and eat or is it more random? Did you come from a household that grew food in your childhood?

If not, do you have the space to grow food? Do you have the time or inclination? Did you come from a household that grew food in your childhood?

Theme 4: Food consumption, storage and disposal

The majority talked about refrigerating or freezing better. Households were probed this to find out what this might mean for them. 63% of households use a compost bin for food scraps. How do they think about this (As food waste, as garden nutrients, etc.)?

Do you often have left overs? Why or why not?

If so, where do they often end up (waste, meals the next day, frozen, etc.)?

What do you store fresh or left over food in?

Do you have a method for knowing how long it has been in the fridge or freezer?

Which fresh foods do you think are better refrigerated and which are better left out?

Do you compost? Why or why not?

If so, where and how do you use this compost? Does this compost make your garden better or healthier? Did you compost food growing up?

If not, do you have the space, time, inclination to compost? What turns you off the idea of composting? Did you compost food when you were growing up?

Do you think food waste is a problem in Australia? What leads you to believe this?