In-home research

Australian household food waste

A summary of behaviours, attitudes, perceived and actual food waste

FIGHT FOOD WASTE
Cooperative Research Centre
REDUCE - TRANSFORM - ENGAGE

Australian Government
Department of Industry, Science, Energy and Resources

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This research was commissioned by the Project Steering Group for the *Designing effective interventions to reduce household food waste* project. It is part of a four-year research project delivered through the Fight Food Waste Cooperative Research Centre.

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Report background:

“Designing effective interventions to reduce household food waste” is a Fight Food Waste CRC’s research project. The project reports will provide evidence-based insights covering food waste behaviours and attitudes of Australian households, quantification of perceived and actual household food waste, advice regarding priority segments, identification of global best practise interventions, household food waste reduction interventions for priority segments, messages for selected intervention and cost-effective methodologies for evaluating the impact of selected interventions.

How to read the reports in this series:

This report is one of six reports published in the series “Australian household food waste”. A summary of the implications and evidence to support these is provided in “A summary of behaviours, attitudes, perceived and actual food waste” whilst the other five reports provide detailed results. These being: “Survey findings of behaviours and perceived food waste”, “Electronic-diary findings of recorded food waste and disposal methods”, “Kerbside bin audit findings of actual food waste”, “Focus group findings of attitudes to food waste”, and “Choice model findings of food waste reduction interventions”.

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1. Executive Summary

Following the Fight Food Waste Cooperative Research Centre (FFW CRC) 2019 benchmark study into Australians and food waste, it was apparent that householders underestimate the amount of food waste they produce, and it was deemed necessary to undertake further research to capture a better household measure of the amount of food waste produced and why it was happening.

This 2020/21 study achieves three measures of food waste as assessed by main and joint household food managers. The study starts with a self-report survey that asks householders to estimate food waste, then uses an electronic-diary that records food waste over a seven-day period, and finally, includes a physical bin audit to measure the food waste found in the bin (matched to the same period as the electronic-diary). The study compares the three food waste records and then, using focus group discussions, explores the causes and remedies for food waste.

1.1. Recommendations

The research suggests that consideration should be given to the following initiatives:

- A broad strategy should be considered that generates 'need recognition' for changed food management amongst the heavy food wasters of the wealthy, families with children and those under 35-years old.
- Facilitation: Social norms dictate that food waste avoidance is desirable so people will use tools, guidance on making structural changes to lifestyle, food management that facilitate positive change are needed.
- Reinforcement: Food management is an everyday activity that lends itself to the formation of habits as mental shortcuts reduce demand on the mind's limited thinking power. Once behaviour change is triggered, reinforcement strategies using multiple channels are needed to make sure positive behaviours become established.
- Education: After establishing the value of food waste, then build awareness of the environmental impact of food waste, focusing on the carbon emissions spent to grow, distribute and market the food.
- Tools as habit changers: There was extensive support in the focus groups and the choice modelling for tools that help. Household food managers want tools that help them achieve their goals (see need states) AND reduce food waste. Where these two align then food waste is likely to be lowered.
- Change strategies need to recognise the emotional needs at work and develop solutions that gratify these need states yet deliver better food waste outcomes. Four spaces were identified:
    - Food is planned, prepared, and provided my way (individualism)
    - Food is for us to nurture other and to bond around (belonging)

- Food needs to make everyone happy (freedom)
- Food is to be efficiently managed (control)

1.2. Change needs a number of ingredients

- People need to want to change, and this is currently uncommon because most people don't believe they personally waste a significant amount of food.
- Overcoming structural factors that impact directly on food waste such as busy, unpredictable lifestyles and stage of life pressures such as career peaking, parenting, caring for elderly family members, etc play a crucial role in triggering risky food waste behaviours.
- However, many also face logistical issues such as being located far from shops … *"I have to shop for a week because I'm a long way from the shops… so I tend to buy in case I need something".* These structural and logistical issues need to be acknowledged by individuals so that they can put strategies in place to minimise risky food waste behaviours.
- Many food managers are missing knowledge + experience + expertise as some have never been taught how to cook, or have negative food waste attitudes established and, as such, are unprepared to manage food in a way that minimises food waste.
- Habits need to shift, and this speaks to the heart of the challenge. Food is a low order issue with almost everything else deemed more important. Food management becomes a mental shortcut (a habit) that uses little cognitive energy. People say they are extremely busy and that they have no time to plan and manage food (especially families with younger children) which is code for everything else is more important than making sure I don't produce any food waste. So, habits needing change require conscious effort.
- Once need for change is triggered, it isn't attitudes that need to change; it is behaviours. Most participants found tools that make change appealing. They emphasised the need for ease and convenience. However, simple, easy-to-use and access tools are needed to compensate for adverse habits and a lack of knowledge, skills, and expertise.

1.3. Behaviours needing to change to reduce food waste

Many, if not all of these factors, are inter-related, making it difficult to say that one single behaviour is the cause of food waste. However, the evidence from the quantitative data analysis and supported by the conversations in the focus group discussions shows that the following behaviours have a positive impact on the amount of food waste a household produces. The following behaviours are in order of their impact on food waste, and include:

1. **Buying better**

- Regularly checking what food is in the fridge or freezer, which is critical knowledge that informs food purchases.
- Rotating food by moving oldest items to the top/front of fridge/freezer means the food manager knows what food is there and this informs better food purchases.
- Only buying what's on the shopping list (avoid buying 'just in case' which runs risks of wasting food).
- Those who buy too much food in the first place and have no way to eat it all will end up producing more food waste.

2. **No food waste is a goal**

- Those who claim to not waste any food at all (this demonstrates a strong desire to avoid food waste and means more proactive food waste behaviours are adopted).

3. **Prepare what's needed**

- Those who only prepare as much food as is needed (taking away any risk of making too much food). Conversely, those who cook too much food run the risk of this food being uneaten and the data shows a clear correlation with higher levels of food waste. Similarly, those who cook food 'just in case' are also likely to waste more food.

4. **Let consumers serve themselves**

- Those who let others serve themselves avoids plated food waste. Household members not finishing their meals means the leftover plate waste is almost certainly thrown away. This links to the earlier behaviours of allowing people to serve themselves ensuring the right amount of food is plated up.

5. **Better storage knowledge**

- Reading the storage instructions (they know how long they have to use the food).
- Being prepared to use food past its 'use by' or 'best by' dates (giving greater opportunity to use the food). Conversely those who strictly abide by these dates waste more food.

6. **Some new knowledge is needed**

- Learning how to use cooked leftovers (and being prepared to eat what is left over is linked to reduced food waste). Without a household demand for leftovers, food is often stored in fridge or freezer but is ultimately discarded. Households that have a culture of prioritising eating leftovers waste less food.
- Lack of knowledge about how to use left-over ingredients is linked to higher levels of food waste. Learning new skills and expertise or having access to tools that guide action here could reverse this relationship.

7. **Need to stick to a plan**

- Those who don't cook the meals they planned and substitute with take-away, go out for a meal or buy extra ingredients for a meal that they happen to feel like at that moment, produce more food waste.

1.4. The causes of food waste are complex

Many factors contribute to food not being eaten. Starting with a widespread attitude that there isn't a personal food waste problem, structural realities of life that make food management challenging (such as affordability and competing priorities that make food management a low order issue), lack of knowledge about food and how to repurpose and use ingredients, lack of cooperation between household members to minimise food waste, lack of food management expertise, entrenched attitudes that undermine food waste prevention (e.g. it is always better to have too much than too little in the fridge and on the table), behaviours that increase the risk of food being wasted (both conscious and unconscious [habits]), and finally, values that discount the environment and prioritise individual rights and preferences over all else.

1.5. Key food wasters

The groups wasting more food than the average, and thus are key target audiences for change strategies are:

- busy families (especially young families with children under 17 years)
- wealthy (those with household incomes over $3,000 per week, over $156,000 per year)
- those under 35 years of age

1.6. Few Australians realise they have an issue

Householders underestimate their food waste significantly. This was evident with self-reported results from the survey and electronic-diary being significantly below the actual amount measured in the bin audit.

Another important contributing factor to food waste and to the lack of awareness of the food waste issue is the widely held belief that the only issue is when food waste is sent to landfill. This has led to the strong position that composting is virtuous and hence there is little awareness of all the effort embedded in the food being lost. If unaddressed this could lead to adverse outcomes for the FOGO (food organics garden organics) bin introductions. People feel they are doing the right thing by disposing of food (either composting at home or in a FOGO bin) rather than addressing the root issue of eating all the food they buy and hence not wasting any of it.

1.7. Estimates of amount of food waste

The survey estimate was 2.03 kg of food waste per household per week and the electronic-diary found 2.89kg. The bin audit shows 1.78kg per household per week. However, this bin audit data does not include food disposed of by other methods such as being fed to pets, put in home compost bin, and down the sink. Using the bin audit result and adding these additional disposal amounts it is estimated that 4.22 kg of food is wasted

per household per week. The cost of this food waste is $41.02 per household per week. When adjusted for the number of people in the household, the estimated amount is 1.88 kg ($18.55) of food is wasted per person per week. According to the electronic-diary, fresh vegetables, meat and sea food, bread and bakery, meals, fresh fruits and drinks are the top 6 products wasted in Australia.

2. Methodology

The following section summarises the overall research design of the project. Please refer the individual reports for more details on the methodology for each data source (*"Survey findings of behaviours and perceived food waste", "Electronic-diary findings of recorded food waste and disposal methods", "Kerbside bin audit findings of actual food waste", "Focus group findings of attitudes to food waste" and "Choice model findings of food waste reduction interventions").*

2.1 Research project inclusions

1. A national self-report benchmark survey with 2885 main and joint household food managers (a shortened version of the 2019 survey)
2. A 7-day detailed electronic-diary record of food disposed of by 1462 respondents (a sub-set of the benchmark sample of 2885). These respondents completed an electronic-diary that recorded all the food waste the respondent was aware of and how it was disposed (i.e., in the red bin, down the sink, supplied to animals, placed in the compost or worm farm, etc)
3. Testing of potential interventions: all 1462 respondents who completed the electronic-diary also completed one or two discrete choice experiments where possible interventions designed to support better household food management behaviours were tested based on the respondent's weakest food management behaviour identified in the benchmark survey. There were three different models produced based on responses from 2597 respondents (some took part in two choice experiments because their household food management behaviours were equally weak in two areas).
4. The final element of the quantitative phase was a sub-set of 495 of the 1462 electronic-diary respondents who were selected for a physical food waste audit of their bin, carefully aligned to their 7-day electronic-diary record.

   The four quantitative data sets (ie. Survey, electronic-diary, testing potential interventions, and bin audit) are linked with an anonymous respondent ID and FFW CRC are able to make comparisons between each, with the physical bin audit capturing the most reliable evidence about the quantity of food waste. The accuracy of self-reported food waste has long been questioned, with self-reported food waste suspected of being highly inaccurate. The daily record kept by the electronic-diary has many advantages as it also captures food waste that is disposed of in ways that the physical bin audit

cannot measure (e.g., fluids disposed down the sink, composting and food fed to animals). The physical bin audit is highly accurate apart from where food waste is disposed of by other means.

5. Finally, qualitative research using 10 focus group discussions explored how the behaviours identified in the quantitative research actually led to food being wasted.

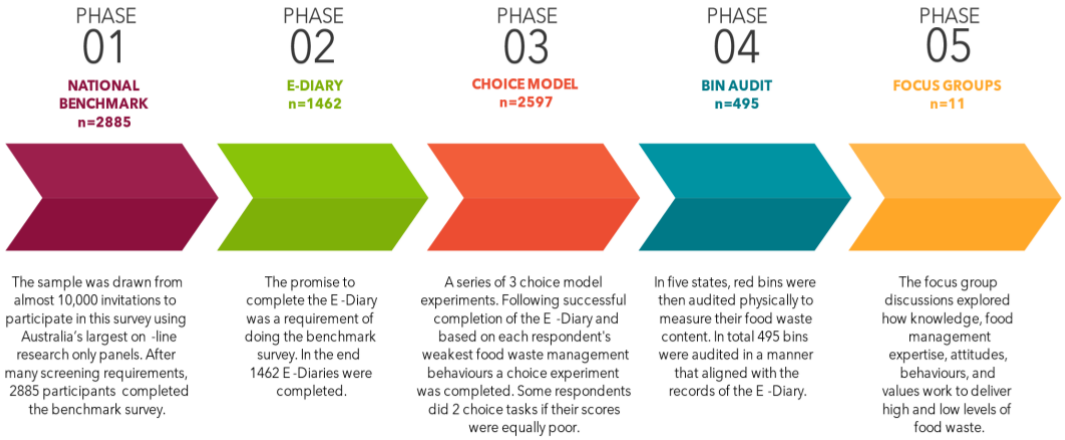


Figure 1: Research phases

The quantitative methodology is outlined in 2 below.

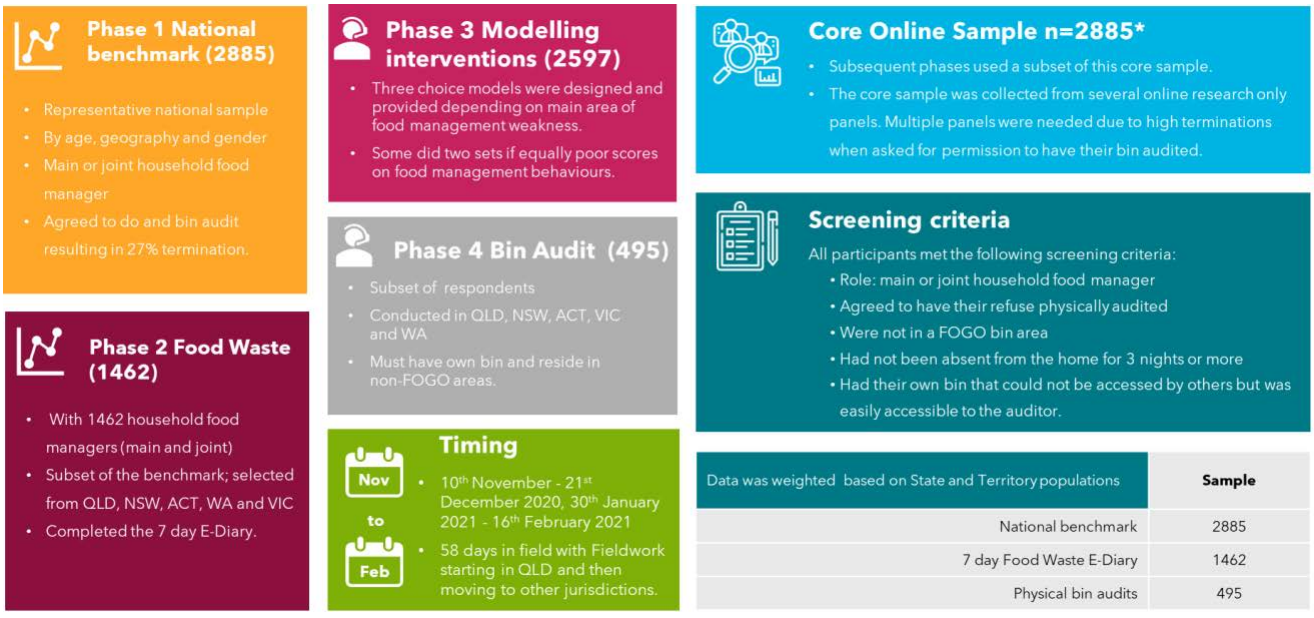


Figure 2: Method

The qualitative stage involved 10 virtual focus group discussions where participants were recruited directly from the survey sample based on demographics and whether they came from a household with above or below average food waste.

The details are outlined in Table 1 below.

Table 1: Qualitative method

Objectives of the focus group discussions

- To better understand causes of food waste
- To establish differences in behaviours between household types that lead to greater or less food waste
- To determine levels of knowledge, skills and experience in managing food in the household
- To explore lifestyles (the interactive effects of others in the households on food waste)

Timing

- 10th February to 5th March – 11 virtual focus group discussions

Screening criteria

All participants met the following screening criteria:

- **Completed phase 1**: the benchmark survey and an electronic food diary
- Agreed to be contacted to participate in qualitative research
- **Joint or main household food manager** – determined by benchmark survey responses, responsible for at least 3 of 5 household food management activities
- **Location:** lives in Australia

Method

	Household food management	Segment	State	Age	Food waste per capita
Group 1	Mainly responsible	Above average household income	Mixed ACT, NSW, VIC	Mixed 35-74	High
Group 2	Jointly responsible	Low food wasters	Mixed QLD, NSW, VIC	Mixed 25-74	Low
Group 3	Jointly responsible	Under 35 years old	Mixed QLD, NSW	Mixed 25-34	High
Group 4	Mainly responsible	Low in household food management skills	Mixed ACT, QLD, NSW, VIC	Mixed 55-64	Low
Group 5	Mainly responsible	Young family (Children mostly <17)	Mixed NSW, VIC, WA	Mixed 35-54	High
Group 6	Mainly responsible	Under 35 years old	Mixed NSW, VIC	Mixed 25-34	High
Group 7	Jointly responsible	Low in household food management skills	Mixed ACT, QLD, NSW, VIC	Mixed 25-74	High
Group 8	Jointly responsible	Young family (Children mostly <17)	Mixed QLD, NSW, SA, VIC	Mixed 25-54	High
Group 9	Mainly responsible	Low food wasters	Mixed QLD, SA, VIC, WA	Mixed 25-74	Low
Group 10	Jointly responsible	Above average household income	Mixed ACT, NSW, TAS, VIC	Mixed 35-64	High
Group 11	Mainly and jointly responsible	Under 35 years old	Mixed NSW	25-34	High and low

2.2 Sample Limitations

FFW CRC required participant permission for the physical bin audit from every respondent, irrespective of whether they were audited or not. This, and other sample requirements, led to a substantial proportion of the sample drawn for the study being terminated before having the opportunity to complete the survey. This potentially affected both the sample quality and the actual food waste behaviour of households by bringing a bias to the sample by only including those prepared to have their bin physically audited.

About 40% of the original sample was terminated for a variety of reasons, including:

1. The need for a weekly waste pick-up (many places in Australia have a 14-day one).
2. The sample could NOT include those people living in a FOGO bin collection area. This would have required two bins to be audited which was outside the scope of the contract, and food waste may have been hard to discern in the FOGO bin. The proportion of Australian households with a FOGO bin is rapidly rising and means the chance to replicate this study will be much harder/more costly in the future
3. Respondents needed a secure bin to ensure only one household's food waste was present.
4. The respondent needed to be present in the house for most of the week and not away from home.

2.3 Sample Profile

- 4921 Australian households cleared all the screener questions from the original 8289 who were invited to take part in the study.

- 71% agreed to do an electronic-diary and have the physical bin audit conducted (3568).
- 2885 (or 81%) completed the benchmark survey and 1462 completed the electronic-diary.
- 495 had physical bin audits conducted.

Despite the potential sample biases introduced by the requirements outlined above, the sample acquired across the three research phases closely resembled the Australian population in many respects. There was a slight skew away from people living alone (23% in the Australian population and slightly less in all phases), and there were similar but minor variations in other demographic categories.

Table 2: Sample profile Household structure

Household structure	Benchmark (n=2885)	E-diary (n=1462)	Physical bin audit (n=495)	Australian population*
Total sample	**%**	**%**	**%**	**%**
Household of unrelated people	3	2	3	4
Couple living together with no children	13	12	14	25
Couple living without children (child/children no longer reside in same household)	17	18	16	
Couple with children (<17 years old)	29	29	27	30
Single parent with children (<17 years old)	4	4	4	
Couple with adult children (>18 years old)	8	8	10	11
Single parent with adult children (>18 years old)	3	3	4	
Living alone	18	17	16	23
Other	5	5	5	5
Prefer not to say	0	0	0	2

The sample acquired across the three research phases for income also closely resembled the Australian population. There was a skew in the benchmark survey to lower income (22% in the Australian population and 30% in the benchmark survey). There were only minor variations in other categories.

Table 3: Sample profile Household income

Household income	Benchmark (n=2885)	e-diary (n=1462)	Physical bin audit (n=495)	Australian population*
Total sample	**%**	**%**	**%**	**%**
No / negative income	1	1	1	1
$1-$999	28	27	19	22
$1000-$1999	29	31	33	28
$2000-$2999	15	15	17	20
$3000+	16	18	19	18
Prefer not to say	8	8	12	11

The sample acquired across the three research phases for age varied from the Australian population. There was a skew in the benchmark survey away from those aged 18–34 years. This was to be expected with

considerable numbers of Australian youth still living at home and unlikely to play a significant role in household food management (a requirement of study participation).

As a result of the natural skews caused by the survey screener requirements, the data was only weighted by state/territory to make it representative of the Australian population mainly and jointly responsible for household food management.

Table 4: Sample profile Age and Gender

Age group	Benchmark (n=2885)	e-diary (n=1462)	Physical bin audit (n=495)	Australian population*
Total sample	**%**	**%**	**%**	**%**
18-34	17	16	14	31
35-54	37	38	39	34
55-74	38	1	41	26
75+	7	5	5	9

Gender	Benchmark (n=2885)	e-diary (n=1462)	Physical bin audit (n=495)	Australian population*
Total sample	**%**	**%**	**%**	**%**
Female	62	63	66	51
Male	37	37	34	49
Other	0	0	0	0

3. Overall findings from the qualitative research

The research involves 10 focus group discussions to better understand causes of food waste, establish differences in behaviours between household types that lead to greater or less food waste, determine how levels of knowledge, skills and experience in managing food in the household impact food waste, and finally, explore lifestyles (the interactive effects of others in the households on food waste).

3.1. The question of what causes food waste is highly complex

The focus group discussions reveal that many factors contribute to food not being eaten. Starting with a lack of awareness that food waste is an issue, it is then the structural and logistical realities of life that make food management challenging (such as affordability and competing priorities that make food management a low order issue), lack of knowledge about food and how to repurpose and use ingredients, lack of cooperation between household members to minimise food waste, lack of food management expertise, entrenched attitudes that undermine food waste prevention (e.g. it is always better to have too much than too little in the fridge and on the table), behaviours that increase the risk of food being wasted (both conscious and

unconscious [habits]), and finally, values that discount the environment and prioritise individuality – *"If I want to waste food I have a right to do so".*

Many, if not all of these factors, appear inter-related. Knowledge about food management varies as does knowledge of the environmental issues surrounding food waste. Poor knowledge in these areas allows adverse attitudes to form which, in turn, lead to food management behaviours that increase the risk of food waste. Because of weak motivations to reduce food waste, many food waste risky behaviours become habits. Convenience dominates over careful planning, people fail to cooperate with each other because of competing interests and priorities, people put entertainment and socialising first over preventing food waste, and a preference to eat whatever food that provides instant gratification overrides the need to eat food that is planned for leaving it to be wasted.

3.2. Need recognition is missing

At the heart of the challenge facing those wanting to see food waste reduce is that many Australians don't feel responsible for the food that is wasted. This is either because they believe they "don't really waste much food", or they "just don't realise uneaten food impacts climate change". Almost all in the 10 focus groups think that composting and feeding food to animals negates any adverse environmental impact. The qualitative work affirms that in order to change behaviours, the first step is to ensure all Australians understand that **there is a need to change their own food management behaviours to reduce food waste.** The steps include:

1. Generate recognition that food waste is an important environmental issue that needs their personal attention and focus
2. Generate greater awareness that every household is producing more waste than it needs to (and that they think they do)
3. Cost the waste for household food managers (to prove it is costing the household a significant sum of money)
4. Provide tools and education that facilitates new and changed behaviour and reduces food waste
5. Build habits that mean less food waste.

3.3. Food waste situation analysis

The situation analysis derived from analysis of the focus groups shows that there are several factors that mean achieving a greater focus on food waste is not an impossible task and that right now is an opportune time.

Strengths

- Few Australians want to be seen as food wasters. It is not generally acceptable to be seen by others as wasting food. Many people would intervene if they saw food being wasted and would object to it in front of others even if the food were being wasted in someone else's home. There is not a fundamental opposition to wasting less food and this is a very positive starting point.
- Furthermore, in a COVID-19 world, many Australians have had time to focus on food and to think more about their knowledge, skill set, what food is better for them etc. Where food is often a chore in a busy world, over the last year, food has been more pleasurable for many.
- There was also greater interest in "what really matters" and this has come to include their relationships with family and friends, a rising concern for the environment and how food waste contributes to climate change.
- Moreover, stagnant wages growth for 80% of Australians over the last two or more decades means food affordability matters more and this links to a need to reduce the food that is wasted.

While there are some situational factors working in favour of a greater focus on food waste, there are also some very significant barriers to success. These will require energy and effort to challenge the entrenched views of people's perceived reality.

Weaknesses

- Most people underestimate their food waste with almost all believing that their own personal household food waste is relatively minimal. Most believe they personally don't have a problem!
- People define food waste differently (many don't know exactly what it is and what are the elements of food waste).
- Therefore, the need for them to change their personal food waste behaviours is almost non-existent. In behavioural change terms the need recognition for any change is low and, without it, few will look for help to change their behaviour.
- Knowledge of the link between food waste and environmental damage is confused and focuses on reducing landfill and not on minimising CO2 emissions generated through the food supply chain.

Many in the focus groups did not want to waste money and clearly there is an opportunity to calculate the average value of food waste and promote it to the Australian community. This will help get some attention on the problem, but for many, this message will bypass them. For many wealthy Australians (and a key food waste target), the cost of the wasted food is less important than the cost of their time to address the problem. Similarly, busy families (another key food waste target) are simply overwhelmed by the scope of their responsibilities and cannot find time to address the problem. The key to encouraging changed behaviours in

both audiences are simple tools, information, storage, education on 'use by' and 'best by' dates and other initiatives that **facilitate** changed behaviours.

Opportunities

- To stimulate need recognition by emphasising the dollar value of food wasted
- To stimulate action by promoting knowledge of food waste and its impact on climate change
- Provide tools that assist change in food waste generation.

It was apparent in the focus group discussions that people presently have some time and energy to focus on important issues like the environment and on food waste. However, this is unlikely to last as people revert to more normal lives post COVID-19. Instead, food waste practitioners will be faced with a world overloaded with information and even greater competition for the attention of food managers.

Threats

- COVID-19 was a short term opportunity and soon people will return to a frenetic lifestyle where food waste matters less
- In an attention-declining world, food waste will struggle to get its messages to the wealthy and busy families that need to reduce wasted food

3.4. Model of change

The qualitative research revealed that change will need a number of elements and that these elements will need to be staged.

The following figure illustrates the challenges facing food waste practitioners:

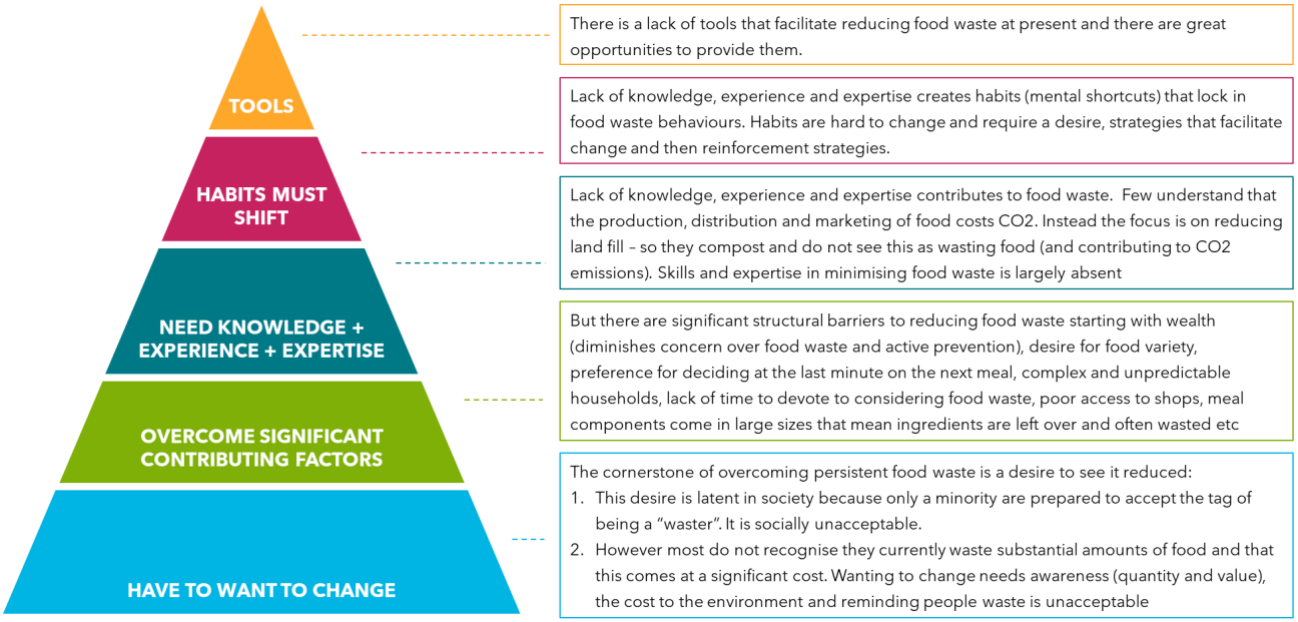


Figure 3: Model of change

People will need to want to change

Most agreed that a person must want to change, and most do not because they don't believe they personally waste a significant amount of food. Many in the focus groups declared… *"I don't waste food …if anything is left, it's composted … I never let it get to land fill so why do I need to change?".* Put another way, *"It's well and good for a supermarket to offer [measuring cups / fridge and freezer thermometers and to be free], but it's just going to end up in a drawer long term like the thermometer [because it's not an important enough issue to make me focus on it]"*. A change strategy will have to overcome these points of opposition particularly to prove the substantive food waste issue is personal, before householders will seek information on how to change their behaviours.

Overcome significant contributing factors

Lifestyles and the stage of life play a crucial role in driving food waste risky behaviours. As many busy families stated *"we just don't have time to cook the things we plan to. Things stay in the back of the fridge and go green and furry before we even notice" … "I never know who will be here for dinner" … "I never know who will be home on the week-end" … "Life is just too unpredictable [so I am preparing food just in case]" … "I have fussy eaters … whenever I try something new most of it isn't eaten [plated food is often thrown away]"* .

However, many also face structural issues such as being located far from shops … *"I have to shop for a week because I'm a long way from the shops… so I tend to buy in case I need something".* These issues need to be acknowledged so that strategies can be put in place to minimise risky food waste behaviours.

Need knowledge + experience + expertise

Some people report having never been taught how to cook, or their parents didn't drill into them the need to finish everything on their plate when they were young. As some outlined … *"My mother did everything for me when it came to food … I am totally unprepared to deal with preparing meals"* … and they often recognised their lack of knowledge and ability by saying that *"other people [in the group] seem to know so much about how to substitute and use ingredients in different ways … I have no idea at all".* Hearing how others manage food and are able to avoid waste triggered an interest in many. Simple practical tips that are easy to remember are a way of stimulating better behaviours.

Habits must shift

At the heart of the challenge is that food is a low order issue for many. Many report being extremely busy (especially families with younger children) and that *"we would never think what we were going to do for a meal next Monday … we need to get into the habit of thinking ahead … and planning ahead."* However, they also acknowledge the difficulties of changing entrenched food planning, purchasing, and preparing habits. "*this kind of change will take some effort because we are just not used to thinking about meals … we are in auto pilot most of the time."*

Tools

Once need for change is triggered it isn't attitudes that need to change; it is behaviours. Most focus group participants found tools that make change easier to be appealing. *"I'd love [an app that suggests meals you can make with ingredients, tells you what's in the fridge and when things are going to go off]. It would definitely assist me".* They emphasised the need for ease and convenience … *"It needs to be easy though … it wouldn't work if I have to spend more time entering all the food in my fridge and their expiry dates into the app".*

4. Overall findings from the quantitative studies

4.1. Food waste volume and cost outcomes

When compensating for food disposed of in the home, the data showed that **4.22 kg of food was wasted** per household per week. The conversion figure from the electronic-diary to the physical bin audit was a factor of 1.46 *(i.e., the electronic-diary accounted for 68% of the food waste found in the bin. See Assumptions for in-home food disposal compensation in Figure 4).* When adjusted for the number of people in the household, the data showed that 1.88 kg of food was wasted per person per week.

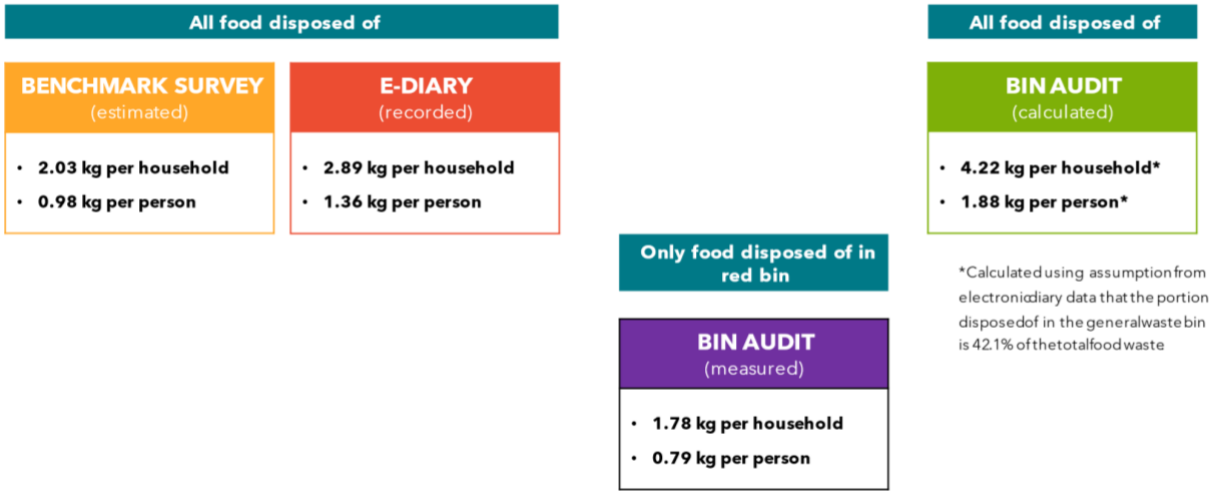


Figure 4: Quantity of food disposed

The following assumptions have been used for the calculations:

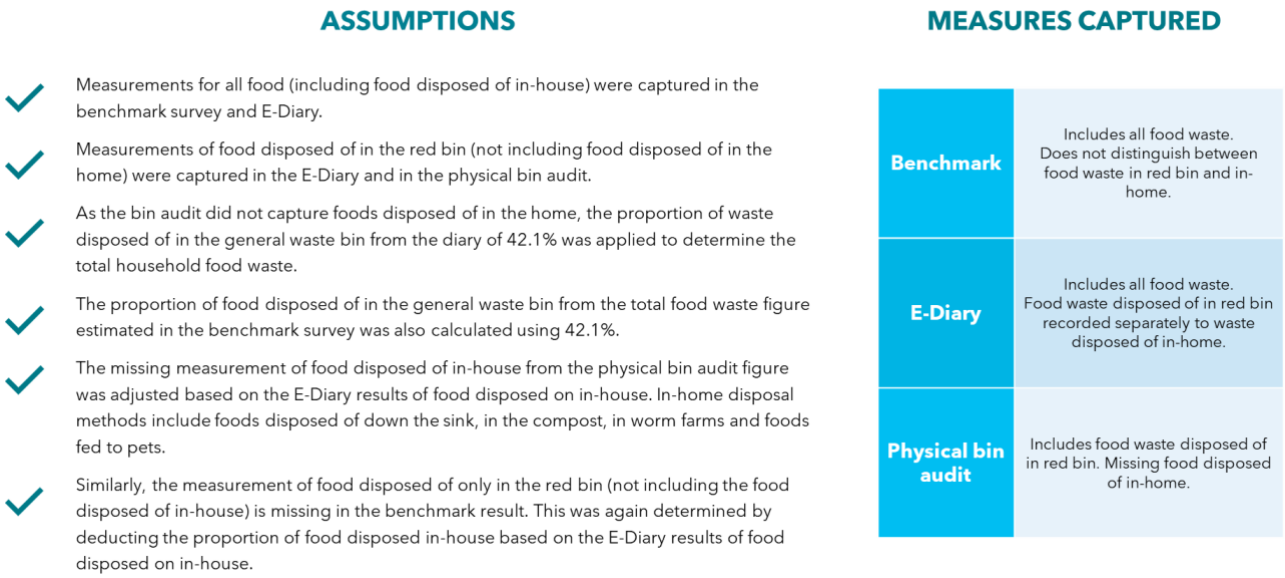


Figure 5: Calculation assumptions

The cost of food waste is $41.02 per household per week or $2,133 per household per year. This amounts to $18.55 per person per week. The costs are based on detailed data from the electronic-diary results which include cost estimates on almost 900 food products.

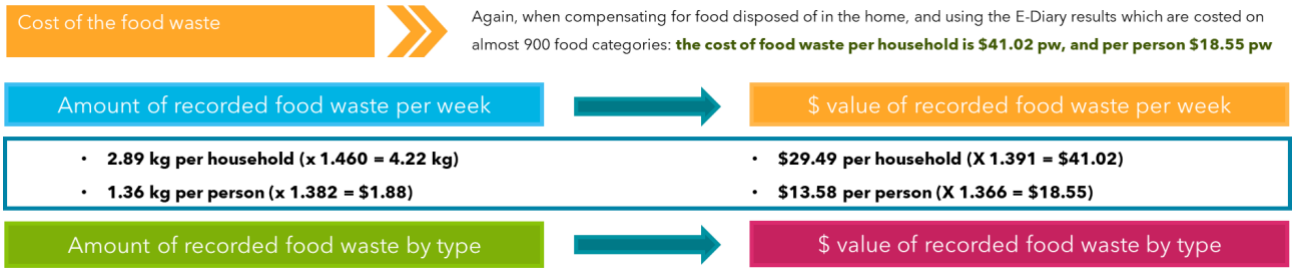


Figure 6: Value of food disposed

The sample comprised 53.9% of respondents who were the main household food manager planning for food shopping; doing the food shopping; unpacking and storing the food; doing the food preparation including cooking and disposing of food not eaten. The remaining 46.1% were only partly responsible for some of these roles in the household.

The two groups were quite different in the roles they played in food management, their knowledge of what occurred across many of the household food management roles including knowing about all the food waste that may be generated. Nevertheless, they were actively engaged, albeit to a lesser extent in the production of food waste, and their views matter.

The following chart highlights significant differences in the food waste estimates, electronic-diary records and the physical bin audits of their household bins.

While the physical bin audits showed little difference between the main household food manager and the joint household food managers (2.26 and 2.67 respectively), the electronic-diary records told a different story. In these, the main food managers recorded 1.06 kg per household per week in the electronic-diary, and the joint food manager recorded 2.22 kg of food waste per household per week. This high quantity of food waste was not reflected in the physical bin audit suggesting that the joint food mangers food volume estimates were higher than the amount of food waste produced and therefore more inaccurate. However, the results for food waste put directly into the red bin by the main household food manager did not align well with the bin audit and revealed a large discrepancy (2.26 kg per and not the 1.06kg recorded in the electronic-diary. In contrast the results from the joint household food managers were much closer (2.67 kg in the audit and 2.22 kg in the electronic-diary).

		BENCHMARK	E-DIARY	BIN AUDIT
MAIN HOUSEHOLD FOOD MANAGER	ONLY IN-HOUSE	1.15 kg per household* 0.64 kg per person*	1.06 kg per household 0.71 kg per person	2.26 kg per household* 1.18 kg per person*
	GENERAL WASTE BIN	0.84 kg per household* 0.46 kg per person*	1.28 kg per household 0.71 kg per person	1.64 kg per household 0.86 kg per person
JOINT HOUSEHOLD FOOD MANAGER	ONLY IN-HOUSE	1.20 kg per household* 0.48 kg per person*	2.22 kg per household 0.90 kg per person	2.67 kg per household* 0.99 kg per person*
	GENERAL WASTE BIN	0.87 kg per household* 0.35 kg per person*	1.30 kg per household 0.51 kg per person	1.94 kg per household 0.72 kg per person
TOTAL SAMPLE	ONLY IN-HOUSE	1.18 kg per household* 0.57 kg per person*	1.60 kg per household 0.74 kg per person	2.44 kg per household* 1.09 kg per person*
	GENERAL WASTE BIN	0.85 kg per household* 0.41 kg per person*	1.29 kg per household 0.62 kg per person	1.78 kg per household 0.79 kg per person

*Calculated using assumption from electronic diary data that the portion disposed of in the general waste bin is 42.1% of the total food waste

Figure 7: Food waste measures

When comparing the three studies, the quantity of food waste increased from 2.02 kg per household in the benchmark (0.98 kg per person) relying on an individual's estimate, to 2.89 kg as recorded in the electronic-diary over a 7-day period (1.36 kg per person), to 4.22 kg per household (1.88 kg per person) as weighed in the physical bin audit (and weighted by the proportion of food disposed of outside the red bin as recorded in the electronic-diary).

Estimated food waste (Benchmark)	e-diary food waste recorded	Assumed total food waste using bin audit data and diary conversion
• 2.02 kg per household • 0.98 kg per person	• 2.89 kg per household • 1.36 kg per person	• 4.22 kg per household* • 1.88 kg per person*

Estimated food waste	Kg per household	Kg per person
Food prepared at home	0.34	0.15
Takeaway and home delivery meals	0.09	0.04
Fresh vegetables	0.14	0.07
Frozen/canned/dried vegetables	0.04	0.02
Fresh fruit	0.12	0.06
Frozen/canned/dried fruit	0.04	0.02
Dairy	0.10	0.05
Meat and seafood	0.09	0.04
Bread and bakery (confectionary and snacks)	0.25	0.12
Drinks	0.10	0.05
Other (condiments, dried herbs, spices, spreads, oils etc)	0.06	0.03
Inedible food waste – possibly avoidable	0.26	0.13
Inedible food waste – unavoidable	0.40	0.20

e-diary food waste recorded	Kg per household	Kg per person
Meals	0.20	0.09
Fresh vegetables/ fresh herbs	0.32	0.15
Frozen/canned/dried vegetables	0.09	0.04
Fresh fruit	0.18	0.09
Frozen/canned/dried fruit	0.10	0.04
Dairy	0.16	0.07
Meat and seafood	0.26	0.12
Bread and bakery (confectionary and snacks)	0.25	0.11
Drinks	0.18	0.09
Other (Condiments, dried herbs, spices, spreads, oils, etc)	0.08	0.03
Staples-dried	0.08	0.04
Inedible food waste – possibly avoidable	0.38	0.19
Inedible food waste – unavoidable	0.60	0.29

Assumed total food waste by type	Kg per household	Kg per person
Food prepared at home	0.50	0.21
Takeaway and home delivery meals	0.14	0.07
Fresh vegetables	0.50	0.23
Frozen/canned/dried vegetables	0.00	0.00
Fresh fruit	0.36	0.17
Frozen/canned/dried fruit	0.01	0.01
Dairy	0.05	0.02
Meat and seafood	0.09	0.04
Bread and bakery (confectionary and snacks)	0.39	0.16
Drinks	0.01	0.00
Other (Condiments, dried herbs, spices, spreads, oils, etc)	0.34	0.16
Inedible food waste – possibly avoidable & unavoidable	1.83	0.81

*Calculated using assumption from electronic diary data that the portion disposed of in the general waste bin is 42.1% of the total food waste

Figure 8: Comparisons of food waste across the three food waste measures

According to the physical bin audits, the largest proportion of food waste was inedible food waste that is possibly avoidable and unavoidable (1.83 kg per household or 0.81 kg per household per person). This includes

anything inedible such as peels, skins, bones, shells, cores, and stems. The four other main forms of food waste are: fresh vegetables (0.50 kg per household or 0.23kg per person); food prepared at home (0.50 kg per household or 0.21kg per person); bread and bakery (0.39 kg per household or 0.16 kg per person); and then fresh fruit (0.36 kg per household or 0.17 kg per person).

4.2. Conversion factor electronic-diary to bin audit results for only red bin data

Given that physical bin audits will be rarely undertaken given the high costs involved, a key outcome of this study was to calculate the conversion factor from electronic-diary to physical bin audit. These costs are likely to be magnified as more green and FOGO bins are given to households and a measurement of food waste will require checking red as well as green and FOGO bins.

Figure 9: Electronic diary conversion factor

The conversion factor for foods recorded as being disposed of in the red bin on the electronic-diary compared with the physical red bin audit overall is 1.38.

5. Food waste volumetric outcomes – benchmark survey

The food waste study started with a regular online survey called the benchmark study. In this initial online survey respondents estimated the food they wasted. Essentially this was a guess and the results show food managers estimating their food waste at 2.03 kg per household on average across Australia. This is significantly lower than the quantities measured in the electronic-diary (2.89 kg per household) and estimated total (4.22 kg per household. This being bin audit and adding additional amounts from fed to pets, put in home compost bin, and down the sink). As has long been suspected, individuals significantly underestimate the quantity of food waste. The food waste estimate is highest in the ACT at 2.88 kg per household and lowest in Tasmania at 1.43 kg per household.

The breakdown in food waste while being much lower than other measures, has a similar pattern regarding the types of food waste that is most prominent. According to the estimate of individual food managers, the largest proportion of food waste is inedible food waste that is possibly both avoidable and unavoidable (0.66

kg per household). Possibly avoidable foods are foods considered edible by some but not by others, e.g. carrot peel.

Unavoidable food waste is food that cannot be eaten such as eggshells or chicken bones. The other main forms of food waste are food prepared in the home (0.34 kg per household), followed by bread and bakery items (0.22 kg per household), then fresh vegetables (0.14 kg per household), and then fresh fruit (0.12 kg per household).

Estimates of food waste were fairly uniform across all the food categories nationally. The stand-out difference in the benchmark was that ACT participants more than any others, felt that they could possibly avoid some of their food waste.

Table 5: Estimated food waste (in kg) - by state

average kg wasted per household	Total food waste	Food prepared at home	Takeaway and home delivery meals	Fresh vegetables	Frozen/ canned/ dried vegetables	Fresh fruits	Frozen/ canned/ dried fruit	Dairy	Meat and seafood	Bread	Bakery	Cakes/ desserts/ confection and snacks	Drink	Other	Possibly avoidable**	Unavoidable food waste**
TOTAL (n=2826)	**2.03**	**0.34**	**0.09**	**0.14**	**0.04**	**0.12**	**0.04**	**0.10**	**0.09**	**0.19**	**0.03**	**0.03**	**0.10**	**0.06**	**0.26**	**0.40**
NSW (n=847)	1.98	0.32	0.10	0.13	0.05	0.12	0.04	0.10	0.08	0.18	0.03	0.04	0.09	0.07	0.25	0.38
QLD (n=501)	1.99	0.34	0.08	0.14	0.04	0.12	0.03	0.09	0.10	0.21	0.03	0.03	0.12	0.04	0.25	0.38
VIC (n=542)	2.18	0.37	0.11	0.15	0.05	0.13	0.05	0.11	0.10	0.18	0.04	0.04	0.10	0.07	0.28	0.39
ACT (n=231)	2.88	0.50	0.11	0.20	0.05	0.22	0.03	0.13	0.11	0.22	0.03	0.04	0.14	0.07	0.45	0.57
WA (n=318)	2.00	0.31	0.08	0.15	0.03	0.11	0.02	0.09	0.08	0.18	0.03	0.02	0.10	0.05	0.28	0.46
SA (n=251)	1.80	0.25	0.07	0.11	0.03	0.12	0.02	0.09	0.08	0.17	0.03	0.02	0.10	0.05	0.24	0.42
NT (n=36)	2.36	0.48	0.08	0.18	0.02	0.11	0.03	0.11	0.05	0.18	0.03	0.03	0.13	0.07	0.36	0.48
TAS (n=100)	1.43	0.22	0.05	0.10	0.03	0.08	0.01	0.10	0.04	0.16	0.03	0.01	0.05	0.03	0.20	0.32

**Possibly avoidable foods are foods considered edible by some but not by others, e.g. carrot peel. Unavoidable food waste is food that cannot be eaten, such as eggshells or chicken bones.

Households with children (under 17 years) estimate that they waste significantly more food (2.36 kg per household) than the national benchmark average (2.03 kg per household). Estimates by single parents with children under 17 years was especially high (2.91 kg per household). Both groups felt that their food waste was mostly from food they prepared at home. Couples with adult children at home were most likely to feel that their food waste was unavoidable, yet once children had left home the empty nesters felt they could do more to avoid food waste. About a quarter of all households in Australia consist of only one person. This group estimated that they wasted the least food in the benchmark suggesting that more control over all the food activity stages from planning to disposing food waste may help minimise food waste.

Table 6: Estimated food waste (in kg) - by household structure

average kg wasted per household	Total food waste	Food prepared at home	Takeaway and home delivery meals	Fresh vegetables	Frozen/ canned/ dried vegetables	Fresh fruits	Frozen/ canned/ dried fruit	Dairy	Meat and seafood	Bread	Bakery	Cakes/ desserts/ confection and snacks	Drink	Other	Possibly avoidable**	Unavoidable food waste**
TOTAL (n=2826)	**2.03**	**0.34**	**0.09**	**0.14**	**0.04**	**0.12**	**0.04**	**0.10**	**0.09**	**0.19**	**0.03**	**0.03**	**0.10**	**0.06**	**0.26**	**0.40**
Unrelated people (n=73)	2.00	0.42	0.12	0.12	0.06	0.19	0.05	0.06	0.11	0.13	0.01	0.04	0.12	0.06	0.19	0.30
Couple living together with no children (n=362)	1.97	0.30	0.11	0.14	0.03	0.10	0.03	0.09	0.09	0.17	0.03	0.03	0.10	0.06	0.29	0.39
Couple with children (<17) (n=810)	2.36	0.45	0.14	0.16	0.06	0.15	0.05	0.14	0.11	0.20	0.05	0.05	0.13	0.08	0.23	0.37
Couple with adult children (>18) (n=233)	2.38	0.36	0.10	0.14	0.04	0.14	0.05	0.08	0.12	0.28	0.04	0.04	0.12	0.06	0.27	0.54
Single parent with children (<17) (n=107)	2.91	0.63	0.17	0.20	0.06	0.16	0.03	0.14	0.18	0.35	0.05	0.06	0.13	0.07	0.24	0.43
Single parent with adult children (>18) (n=86)	2.10	0.37	0.07	0.15	0.04	0.16	0.02	0.12	0.08	0.28	0.02	0.03	0.06	0.07	0.26	0.37
Empty nesters (n=486)	1.76	0.23	0.05	0.12	0.02	0.10	0.01	0.06	0.04	0.16	0.02	0.01	0.07	0.03	0.37	0.46
Living alone (n=508)	1.34	0.17	0.04	0.11	0.03	0.08	0.03	0.07	0.07	0.11	0.02	0.02	0.07	0.04	0.19	0.27

**Possibly avoidable foods are foods considered edible by some but not by others, eg carrot peel. Unavoidable food waste is food that cannot be eaten, such as eggshells or chicken bones.

Those aged 35–54 years thought that they wasted the most food (2.29 kg per household compared to national average 2.03). Households with children under 17 years were mainly in this age group so this aligned with the higher food waste reported earlier. Older participants (55–74 years) thought they wasted less food (1.75 kg per household) and were more likely to think waste could be avoided. The same pattern appeared in many food categories with takeaway/home delivery food waste showing the most difference between younger and older age groups. Those aged 18–34 years reported 0.15 kg of waste while those aged 75 and older report 0.03 kg per household.

Table 7: Estimated food waste (in kg) - by age

average kg wasted per household	Total food waste	Food prepared at home	Takeaway and home delivery meals	Fresh vegetables	Frozen/ canned/ dried vegetables	Fresh fruits	Frozen/ canned/ dried fruit	Dairy	Meat and seafood	Bread	Bakery	Cakes/ desserts/ confection and snacks	Drink	Other	Possibly avoidable**	Unavoidable food waste**
TOTAL (n=2826)	**2.03**	**0.34**	**0.09**	**0.14**	**0.04**	**0.12**	**0.04**	**0.10**	**0.09**	**0.19**	**0.03**	**0.03**	**0.10**	**0.06**	**0.26**	**0.40**
18-34 (n=482)	2.32	0.42	0.15	0.15	0.07	0.13	0.06	0.14	0.10	0.19	0.06	0.06	0.13	0.09	0.21	0.35
35-54 (n=1055)	2.29	0.43	0.12	0.16	0.05	0.14	0.05	0.13	0.12	0.21	0.04	0.04	0.11	0.07	0.24	0.39
55-74 (1090)	1.75	0.23	0.05	0.12	0.02	0.10	0.02	0.07	0.07	0.17	0.02	0.02	0.09	0.04	0.31	0.42
75+ (199)	1.46	0.17	0.03	0.09	0.01	0.08	0.02	0.05	0.06	0.12	0.03	0.02	0.06	0.03	0.28	0.42

According to estimates of food waste, it is those on average household incomes who reported most food waste (2.28 kg per household compared to the national average of 2.03 kg per household). The lowest food waste volume was reported by those with no income (1.64 kg per household and 1.81 kg per person by those earning $1-$999 household income per year. The physical bin auditing and electronic-diary results shows those with the higher household income are least accurate in their estimated food waste.

Table 8: Estimated food waste (in kg) - by income

average kg wasted per household	Total food waste	Food prepared at home	Takeaway and home delivery meals	Fresh vegetables	Frozen/ canned/ dried vegetables	Fresh fruits	Frozen/ canned/ dried fruit	Dairy	Meat and seafood	Bread	Bakery	Cakes/ desserts/ confection and snacks	Drink	Other	Possibly avoidable**	Unavoidable food waste**
TOTAL (n=2826)	**2.03**	**0.34**	**0.09**	**0.14**	**0.04**	**0.12**	**0.04**	**0.10**	**0.09**	**0.19**	**0.03**	**0.03**	**0.10**	**0.06**	**0.26**	**0.40**
No income / negative income (n=35)	1.64	0.25	0.15	0.07	0.02	0.08	0.03	0.05	0.10	0.14	0.03	0.04	0.07	0.02	0.28	0.31
$1-$999 (n=832)	1.81	0.28	0.08	0.13	0.04	0.11	0.03	0.08	0.08	0.17	0.03	0.03	0.10	0.05	0.24	0.34
$1000-$1999 (n=816)	2.28	0.37	0.10	0.14	0.05	0.13	0.05	0.13	0.11	0.23	0.04	0.04	0.11	0.06	0.29	0.43
$2000-$2999 (n=444)	2.25	0.38	0.11	0.17	0.04	0.15	0.03	0.11	0.10	0.21	0.03	0.03	0.09	0.07	0.29	0.44
$3000+ (n=473)	1.81	0.35	0.10	0.12	0.04	0.10	0.03	0.09	0.08	0.13	0.02	0.03	0.08	0.05	0.22	0.37
Prefer not to say (n=226)	2.01	0.32	0.07	0.15	0.03	0.11	0.02	0.09	0.08	0.16	0.02	0.02	0.12	0.06	0.29	0.47

**Possibly avoidable foods are foods considered edible by some but not by others, eg carrot peel. Unavoidable food waste is food that cannot be eaten, such as eggshells or chicken bones.

Food waste is disposed of in many ways other than the red bin, with 47% of households tipping some food waste down the sink (sometimes to almost every time); 37% placing waste in the green waste bin; 36% feeding some food to animals; 30% composting waste and 12% putting food waste in their worm farm.

Figure 10: Food disposal methods

6. Food waste outcomes from the electronic-diary

The electronic-diary data which includes food disposed of through all means shows that **2.89 kg of food is wasted** per household per week, or 1.36 kg wasted per person per week.

Amount of recorded food waste per week

- **2.89 kg per household**
- **1.36 kg per person**

$ value of recorded food waste per week

- **$29.49 per household**
- **$13.58 per person**

Amount of recorded food waste by type

	Kg per household	Kg per person
Meals	0.20	0.09
Fresh vegetables/ fresh herbs	0.32	0.15
Frozen/canned/dried vegetables	0.09	0.04
Fresh fruit	0.18	0.09
Frozen/canned/dried fruit	0.10	0.04
Dairy	0.16	0.07
Meat and seafood	0.26	0.12
Bread and bakery (confectionary and snacks)	0.25	0.11
Drinks	0.18	0.09
Condiments, dried herbs, spices, spreads, oils	0.08	0.03
Staples-dried	0.08	0.04
Inedible food waste - possibly avoidable	0.38	0.19
Inedible food waste - unavoidable	0.60	0.29

$ value of recorded food waste by type

	$ per household	$ per person
Meals	3.27	1.46
Fresh vegetables/ fresh herbs	5.52	2.59
Frozen/canned/dried vegetables	1.24	0.54
Fresh fruit	1.65	0.76
Frozen/canned/dried fruit	1.49	0.66
Dairy	0.80	0.39
Meat and seafood	6.19	2.83
Bread and bakery (confectionary and snacks)	2.44	1.11
Drinks	1.10	0.55
Condiments, dried herbs, spices, spreads, oils	2.86	1.25
Staples-dried	0.65	0.30
Inedible food waste - possibly avoidable	2.27	1.15
Inedible food waste - unavoidable	-	-

Figure 11: Food waste and value (includes all food disposed of) - by total sample

The electronic-diary data shows 1.28 kg of food is disposed on in the red bin per household per week. This amount does not include food disposed of via other means such as fed to pets, put in home compost bin/worm farm, or tipped down the sink.

Amount of recorded food waste

- **1.28 kg per household**
- **0.51 kg per person**

$ value of recorded food waste

- **$8.31 per household**
- **$4.13 per person**

Amount of recorded food waste by type

	Kg per household	Kg per person
Meals	0.15	0.08
Fresh vegetables/ fresh herbs	0.02	0.01
Frozen/canned/dried vegetables	0.11	0.07
Fresh fruit	0.05	0.03
Frozen/canned/dried fruit	0.08	0.04
Dairy	0.13	0.07
Meat and seafood	0.01	0.01
Bread and bakery (confectionary and snacks)	0.02	0.01
Drinks	0.15	0.08
Other (condiments, dried herbs, spices, spreads, oils, etc)	0.29	0.17
Staples-dried	0.11	0.06
Inedible food waste - possibly avoidable	0.12	0.06
Inedible food waste - unavoidable	0.04	0.02

$ value of recorded food waste by type

	$ per household	$ per person
Meals	0.44	0.20
Fresh vegetables/ fresh herbs	0.55	0.28
Frozen/canned/dried vegetables	0.41	0.21
Fresh fruit	0.65	0.31
Frozen/canned/dried fruit	1.31	0.66
Dairy	0.13	0.06
Meat and seafood	0.15	0.07
Bread and bakery (confectionary and snacks)	0.86	0.44
Drinks	0.00	0.00
Other (condiments, dried herbs, spices, spreads, oils, etc)	1.26	0.66
Staples-dried	2.29	1.10
Inedible food waste - possibly avoidable	0.25	0.13
Inedible food waste - unavoidable	-	-

Figure 12: Food waste and value (only food disposed of in red bin) - by total sample

6.1. Most wasted food products (by value)

e-diary food waste recorded by product → volume and $ value of recorded food waste

Food description	Food category	Kg per household	$ per household	Kg per person	$ per person
1. Beef steak - red meat (cooked)	Meat and seafood	0.02	**0.60**	0.01	0.30
2. Noodle meal home made/ pre prepared - ready to eat	Meals	0.02	**0.48**	0.01	0.19
3. Bread roll	Bread and bakery (confectionary and snacks)	0.02	**0.48**	0.01	0.21
4. Salad - raw, fresh	Fresh vegetables/ herbs	0.02	**0.37**	0.01	0.18
5. Cheese - dairy and non-dairy	Dairy and dairy alternatives	0.02	**0.33**	0.01	0.17
6. Other home made meal (with meat)	Meals - cooked food and ready-to-eat food & drinks	0.04	**0.22**	0.02	0.12

*foods recorded as wasted <0.02kg/household not shown. Unavoidable inedible foods priced at zero value.

Figure 13: Top recorded food products wasted (includes food disposed in-house)- by value

The electronic-diary estimate of food waste found Victoria recorded the least food waste (2.73 kg per household) and South Australia the highest (3.05 kg per household). The national average for estimated food waste in the electronic-diary is 2.89 kg per household with all results (except the NT with only 19 respondents) falling within 5.5% of the national average.

Table 9: Recorded food waste (includes all food disposed of) - by state

By state (kg)	TOTAL (n=1462)	NSW (n=382)	QLD (n=280)	VIC (n=287)	ACT (n=134)	WA (n=177)	SA (n=131)	NT (n=19)	TAS (n=52)
Total food waste	**2.89**	**2.97**	**2.92**	**2.73**	**2.97**	**2.83**	**3.05**	**1.57**	**2.97**
Meals	0.20	0.21	0.21	0.18	0.17	0.22	0.21	0.12	0.25
Fresh vegetables/ fresh herbs	0.32	0.33	0.32	0.30	0.33	0.30	0.34	0.26	0.31
Frozen/canned/dried vegetables	0.09	0.11	0.11	0.07	0.05	0.08	0.09	0.03	0.18
Fresh fruit	0.18	0.20	0.18	0.17	0.21	0.14	0.19	0.06	0.17
Frozen/canned/dried fruit	0.10	0.12	0.11	0.07	0.02	0.10	0.16	0.00	0.24
Dairy	0.16	0.15	0.15	0.15	0.20	0.15	0.18	0.11	0.12
Meat and seafood	0.26	0.26	0.29	0.21	0.18	0.24	0.35	0.10	0.36
Bread and Bakery (Confectionary and snacks)	0.25	0.26	0.25	0.25	0.22	0.27	0.31	0.16	0.19
Drinks	0.18	0.18	0.21	0.16	0.14	0.21	0.16	0.09	0.21
Condiments, dried herbs, spices, spreads, oils	0.08	0.10	0.09	0.05	0.05	0.07	0.09	0.03	0.08
Staples-dried	0.08	0.10	0.10	0.09	0.05	0.08	0.06	0.07	0.08
Inedible food waste - possibly avoidable	0.38	0.34	0.36	0.42	0.45	0.40	0.36	0.27	0.37
Inedible food waste - unavoidable	0.60	0.61	0.53	0.61	0.90	0.57	0.56	0.26	0.40

The electronic-diary reflects a similar pattern as the benchmark regarding age, with the youngest category of 18–34-year-olds recording the most food waste (3.59 kg per household), and the 55–74-year-old age group the least (2.38 kg per household). The benchmark saw this pattern in many of the food categories. Males

recorded more food waste than did females (3.04 kg per household compared to 2.80 kg per household) with the largest difference being the type of food wasted (meat and seafood) where males recorded wasting 50% more than females.

Table 10: Recorded food waste (includes all food disposed of) - by age and gender

By age (kg)	TOTAL (n=1462)	18-34 (n=237)	35-54 (n=552)	55-74 (n=594)	75+ (n=79)
Total food waste	**2.89**	**3.59**	**3.14**	**2.38**	**2.95**
Meals	0.20	0.25	0.25	0.15	0.16
Fresh vegetables/ fresh herbs	0.32	0.41	0.35	0.27	0.17
Frozen/canned/dried vegetables	0.09	0.20	0.13	0.02	0.02
Fresh fruit	0.18	0.25	0.21	0.14	0.14
Frozen/canned/dried fruit	0.10	0.27	0.15	0.01	0.02
Dairy	0.16	0.23	0.16	0.12	0.17
Meat and seafood	0.26	0.40	0.32	0.16	0.16
Bread and Bakery (Confectionary and snacks)	0.25	0.25	0.30	0.19	0.39
Drinks	0.18	0.23	0.18	0.17	0.15
Condiments, dried herbs, spices, spreads, oils	0.08	0.17	0.10	0.02	0.03
Staples-dried	0.08	0.14	0.11	0.05	0.06
Inedible food waste - possibly avoidable	0.38	0.29	0.33	0.43	0.57
Inedible food waste - unavoidable	0.60	0.49	0.56	0.64	0.91

By gender (kg)	TOTAL (n=1462)	Female (n=921)	Male (n=540)
Total food waste	**2.89**	**2.80**	**3.04**
Meals	0.20	0.19	0.22
Fresh vegetables/ fresh herbs	0.32	0.31	0.33
Frozen/canned/dried vegetables	0.09	0.07	0.12
Fresh fruit	0.18	0.18	0.18
Frozen/canned/dried fruit	0.10	0.08	0.14
Dairy	0.16	0.16	0.15
Meat and seafood	0.26	0.22	0.32
Bread and Bakery (Confectionary and snacks)	0.25	0.25	0.26
Drinks	0.18	0.18	0.17
Condiments, dried herbs, spices, spreads, oils	0.08	0.06	0.11
Staples-dried	0.08	0.08	0.10
Inedible food waste - possibly avoidable	0.38	0.39	0.35
Inedible food waste - unavoidable	0.60	0.61	0.58

The electronic-diary aligns strongly with the benchmark results regarding the significantly larger food waste measurements for families with children under 17 years (4.37 kg per household compared to average of 2.89 kg per household).

Also, those living alone measured lower levels of food waste (1.69 kg per household) compared to the average of 2.89 kg per household). There are other weak correlations with the benchmark study where couples without children measured less waste (2.18 kg) as did 'empty nesters' (2.36 kg per household).

Table 11: Recorded food waste (includes all food disposed of) – by household structure

By household structure (kg)	TOTAL (n=1462)	Unrelated people (n=31)	Couple with no children (n=180)	Couple with children <17 (n=431)	Couple with adult children >18 (n=119)	Single parent with children <17 (n=52)	Single parent with adult children >18 (n=42)	Empty nesters (n=270)	Living alone (n=252)
Total food waste	**2.89**	**2.02**	**2.18**	**4.37**	**2.79**	**3.11**	**2.66**	**2.36**	**1.69**
Meals	0.20	0.16	0.12	0.33	0.23	0.22	0.36	0.14	0.10
Fresh vegetables/ fresh herbs	0.32	0.14	0.26	0.48	0.29	0.34	0.31	0.26	0.17
Frozen/canned/dried vegetables	0.09	0.02	0.03	0.25	0.04	0.09	0.04	0.03	0.02
Fresh fruit	0.18	0.15	0.15	0.28	0.15	0.24	0.18	0.12	0.12
Frozen/canned/dried fruit	0.10	0.02	0.02	0.33	0.02	0.06	0.00	0.01	0.01
Dairy	0.16	0.15	0.15	0.23	0.15	0.24	0.15	0.08	0.12
Meat and seafood	0.26	0.14	0.09	0.52	0.21	0.30	0.17	0.15	0.11
Bread and Bakery (Confectionary and snacks)	0.25	0.22	0.11	0.41	0.34	0.31	0.31	0.19	0.13
Drinks	0.18	0.18	0.13	0.25	0.16	0.15	0.24	0.14	0.14
Condiments, dried herbs, spices, spreads, oils	0.08	0.05	0.04	0.20	0.02	0.07	0.05	0.03	0.02
Staples-dried	0.08	0.06	0.04	0.17	0.08	0.13	0.12	0.03	0.04
Inedible food waste - possibly avoidable	0.38	0.27	0.39	0.34	0.45	0.43	0.24	0.49	0.27
Inedible food waste - unavoidable	0.60	0.46	0.64	0.58	0.67	0.52	0.48	0.69	0.43

The measurement provided by the electronic-diary revealed that high income households had more food waste (4.65 kg per household compared to the average of 2.89 kg per household). This was significantly more than lower income households (under $50,000 HHI households produced 2.33 kg per household and $50,000–$100,000 HHI households produced 2.49 kg per household). This indicates a strong correlation between household income and food waste. Although not significant at the 99% level, prima facie, food waste trends upwards as income increases. This correlation between income and food waste was not clear in the benchmark study where there was only one significant correlation — the income category ($1000–$1999 per week).

The electronic-diary approach has been a much more powerful tool for predicting food waste based on income than the benchmark approach.

Table 12: Recorded food waste (in kg) - by weekly household income

By household income (kg)	TOTAL (n=1462)	No income / negative income (n=10)	$1-$999 (n=387)	$1000-$1999 (n=447)	$2000-$2999 (n=219)	$3000+ (n=279)	Prefer not to say (n=120)
Total food waste	**2.89**	**1.85**	**2.33**	**2.49**	**2.73**	**4.65**	**2.69**
Meals	0.20	0.00	0.17	0.20	0.20	0.29	0.18
Fresh vegetables/ fresh herbs	0.32	0.18	0.25	0.27	0.28	0.57	0.26
Frozen/canned/dried vegetables	0.09	0.00	0.03	0.04	0.06	0.33	0.03
Fresh fruit	0.18	0.01	0.14	0.18	0.16	0.29	0.15
Frozen/canned/dried fruit	0.10	0.03	0.01	0.03	0.08	0.44	0.01
Dairy	0.16	0.10	0.12	0.16	0.15	0.22	0.13
Meat and seafood	0.26	0.14	0.16	0.18	0.27	0.59	0.17
Bread and Bakery (Confectionary and snacks)	0.25	0.08	0.23	0.23	0.26	0.33	0.25
Drinks	0.18	0.00	0.18	0.17	0.15	0.23	0.21
Condiments, dried herbs, spices, spreads, oils	0.08	0.00	0.03	0.04	0.04	0.26	0.03
Staples-dried	0.08	0.00	0.05	0.07	0.07	0.18	0.05
Inedible food waste – possibly avoidable	0.38	0.54	0.39	0.36	0.40	0.34	0.47
Inedible food waste – unavoidable	0.60	0.78	0.56	0.57	0.64	0.59	0.75

7. Food waste outcomes from the physical bin audit

The physical bin audit is the most accurate food waste measurement as it has been carefully collected, separated, and weighed by professional food auditors. However, it fails to capture the food waste disposed of in green bins, composted, fed to animals, used in worm farms, and tipped down the sink.

To compensate, the physical waste measurement was indexed by the proportion of food waste disposed of by the methods outlined above. The electronic-diary provided the measure indicating only 42.1% of food waste (by weight) ends up in the red waste bin. With the rapidly expanding FOGO services across the country this will likely decline even further.

With this adjustment, the physical bin audit shows 4.22 kg of food per household is wasted across Australia. This is more than the electronic-diary measure of 2.89 kg per household and significantly higher than the benchmark estimate of 2.03 kg per household.

Amount of food waste from bin audit

- **1.78 kg per household**
- **0.79 kg per person**

assuming **42.1%** of total food waste disposed of in red bin

Assumed total food waste

- **4.22 kg per household**
- **1.88 kg per person**

Amount of food waste from bin audit by type

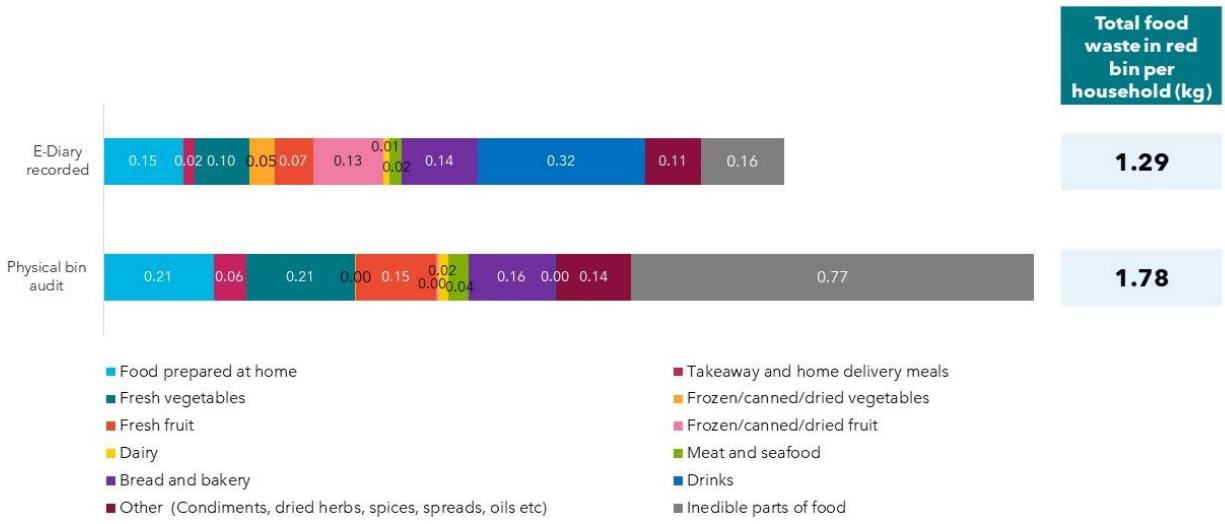
	Kg per household	Kg per person
Food prepared at home	0.21	0.09
Takeaway and home delivery meals	0.06	0.03
Fresh vegetables	0.21	0.10
Frozen/canned/dried vegetables	0.00	0.00
Fresh fruit	0.15	0.07
Frozen/canned/dried fruit	0.00	0.00
Dairy	0.02	0.01
Meat and seafood	0.04	0.02
Bread and Bakery	0.16	0.07
Drinks	0.00	0.00
Other (condiments, dried herbs, spices, spreads, oils, etc)	0.14	0.07
Inedible food waste – possibly avoidable & unavoidable	0.77	0.34

Assumed total food waste by type

	Kg per household	Kg per person
Food prepared at home	0.50	0.21
Takeaway and home delivery meals	0.14	0.07
Fresh vegetables	0.50	0.23
Frozen/canned/dried vegetables	0.00	0.00
Fresh fruit	0.36	0.17
Frozen/canned/dried fruit	0.01	0.01
Dairy	0.05	0.02
Meat and seafood	0.09	0.04
Bread and bakery	0.39	0.16
Drinks	0.01	0.00
Other (Condiments, dried herbs, spices, spreads, oils, etc)	0.34	0.16
Inedible food waste – possibly avoidable & unavoidable	1.83	0.81

Figure 14: Food waste from the bin audit and estimate for total food waste

7.1. Food waste result between recorded and physical bin audit (only food disposed of in red bin)



**For those who did the physical bin audit.*
Base: Total n=495 Note: Food given to animals, tipped down the drain, put into compost/ worm farm or put in green waste/organics bin were not included in this food waste calculation for comparison.

Figure 15: Food waste result between recorded in electronic-diary and physical bin audit (only food disposed of in red bin)

The physical bin auditing process did not highlight any significant differences in food waste appearing in the red bins between the states/territories in any of the key food categories (at the 99% confidence level). The highest measure of food waste was in New South Wales at 1.88 kg per household and the lowest was in Western Australia with 1.70 kg per household, closely followed by Victoria with 1.71 kg per household. However, the variation across the states and territories is low with 5.6% more waste than the average in the case of NSW and 5.6% less than the average in the case of Western Australia.

Table 13: Recorded food waste via bin audit (in kg) - by state

By state (kg)	TOTAL (n=495)	NSW (n=104)	VIC (n=121)	QLD (n=68)	WA (n=103)	ACT (n=99)
Total food waste	**1.78**	**1.88**	**1.71**	**1.83**	**1.70**	**1.79**
Food prepared at home	0.21	0.13	0.18	0.21	0.21	0.34
Takeaway and home delivery meals	0.06	0.11	0.04	0.05	0.09	0.02
Fresh vegetables	0.21	0.24	0.19	0.23	0.17	0.23
Frozen/canned/dried vegetables	0.00	0.01	0.00	0.00	0.00	0.00
Fresh fruit	0.15	0.18	0.14	0.14	0.11	0.17
Frozen/canned/dried fruit	0.00	0.01	0.00	0.01	0.00	0.00
Dairy	0.02	0.03	0.01	0.02	0.01	0.03
Meat and seafood	0.04	0.04	0.07	0.03	0.02	0.01
Bread and bakery	0.16	0.18	0.11	0.21	0.20	0.15
Drinks	0.00	0.00	0.00	0.00	0.00	0.01
Other (Condiments, dried herbs, spices, spreads, oils etc)	0.14	0.09	0.18	0.16	0.11	0.18
Inedible parts of food	0.77	0.86	0.78	0.78	0.77	0.65

The bin auditing process did reveal differences by age in the amount of food waste appearing in the red bin with the 35–54-year-old category having more food waste than the average (2.16 kg per household) and the 55–74-year-old category producing less food waste than the average (1.42 kg per household).

The bin auditing process did not highlight any significant differences (99% confidence level) in food waste quantity between gender, nor in any of the key food categories. The only exception was in inedible food waste where females were more likely to report lower waste levels than males (0.67 kg per household compared to 0.96 kg per person for males).

Table 14: Recorded food waste via bin audit (in kg) - by age and gender

By age (kg)	TOTAL (n=495)	18-34 (n=71)	35-54 (n=195)	55-74 (n=202)	75+ (n=27)
Total food waste	**1.78**	**1.97**	**2.16**	**1.42**	**1.16**
Food prepared at home	0.21	0.31	0.27	0.14	0.08
Takeaway and home delivery meals	0.06	0.06	0.10	0.03	0.02
Fresh vegetables	0.21	0.30	0.23	0.17	0.12
Frozen/canned/dried vegetables	0.00	0.00	0.00	0.00	0.00
Fresh fruit	0.15	0.17	0.20	0.10	0.09
Frozen/canned/dried fruit	0.00	0.00	0.01	0.00	0.00
Dairy	0.02	0.01	0.02	0.03	0.00
Meat and seafood	0.04	0.05	0.05	0.03	0.02
Bread and bakery	0.16	0.15	0.23	0.11	0.14
Drinks	0.00	0.00	0.00	0.00	0.00
Other (Condiments, etc)	0.14	0.10	0.15	0.16	0.07
Inedible parts of food	0.77	0.81	0.92	0.63	0.62

By gender (kg)	TOTAL (n=495)	Female (n=328)	Male (n=166)
Total food waste	**1.78**	**1.67**	**2.01**
Food prepared at home	0.21	0.21	0.22
Takeaway and home delivery meals	0.06	0.05	0.07
Fresh vegetables	0.21	0.19	0.25
Frozen/canned/dried vegetables	0.00	0.00	0.00
Fresh fruit	0.15	0.15	0.16
Frozen/canned/dried fruit	0.00	0.00	0.01
Dairy	0.02	0.02	0.02
Meat and seafood	0.04	0.04	0.04
Bread and bakery	0.16	0.16	0.17
Drinks	0.00	0.00	0.00
Other (Condiments, dried herbs, spices, spreads, oils etc)	0.14	0.16	0.11
Inedible parts of food	0.77	0.67	0.96

The bin auditing process did reveal differences by household structure in the amount of food waste appearing in the red bin with couples with children under 17 years having more food waste (2.39 kg per household) and those living alone producing less food waste than the average (1.00 kg per household). The bin audit highlights the recurrent theme that people living by themselves have the lowest food waste footprint consistent with the benchmark and electronic-diary modules. The bin auditing process did not highlight any significant differences in food waste between household structures in any of the key food categories, at the 99% confidence level. The only exception was in inedible food waste which was 0.38 kg per household for those living alone while it was 0.77 kg per household on average.

Table 15: Recorded food waste via bin audit (in kg) - by household structure

By household structure (kg)	TOTAL (n=495)	Unrelated people (n=14)	Couple with no children (n=69)	Couple with children <17 (n=135)	Couple with adult children >18 (n=49)	Single parent with children <17 (n=20)	Single parent with adult children >18 (n=21)	Empty nesters (n=81)	Living alone (n=78)
Total food waste	**1.78**	**2.34**	**1.35**	**2.39**	**2.10**	**2.21**	**1.41**	**1.29**	**1.00**
Food prepared at home	0.21	0.60	0.14	0.33	0.31	0.20	0.11	0.10	0.07
Takeaway and home delivery meals	0.06	0.05	0.05	0.09	0.07	0.07	0.01	0.03	0.05
Fresh vegetables	0.21	0.19	0.10	0.27	0.27	0.30	0.23	0.16	0.16
Frozen/canned/dried vegetables	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fresh fruit	0.15	0.36	0.16	0.18	0.13	0.20	0.26	0.07	0.11
Frozen/canned/dried fruit	0.00	0.00	0.01	0.00	0.00	0.03	0.00	0.00	0.00
Dairy	0.02	0.01	0.04	0.01	0.06	0.00	0.00	0.00	0.01
Meat and seafood	0.04	0.06	0.03	0.05	0.04	0.05	0.03	0.02	0.04
Bread and bakery	0.16	0.34	0.09	0.25	0.23	0.28	0.06	0.09	0.08
Drinks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other (Condiments, dried herbs, spices, spreads, oils etc)	0.14	0.09	0.14	0.18	0.13	0.10	0.14	0.12	0.09
Inedible parts of food	0.77	0.64	0.61	1.03	0.87	0.97	0.56	0.71	0.38

The correlation between household income and food waste is evident in the bin audit as can be seen in the upward trending food waste numbers with income. They rise from 1.33 kg of food waste per household with those earning under $50,000 HHI per annum through to 2.27 kg per household for those earning $100,000 - $150,000 HHI per annum.

Table 16: Recorded food waste via bin audit (in kg) - by weekly household income

By household income (kg)	TOTAL (n=495)	No income / negative income (n=3)	$1-$999 (n=93)	$1000-$1999 (n=165)	$2000-$2999 (n=84)	$3000+ (n=92)	Prefer not to say (n=58)
Total food waste	**1.78**	**0.93**	**1.33**	**1.64**	**2.27**	**2.14**	**1.62**
Food prepared at home	0.21	0.07	0.12	0.16	0.29	0.32	0.23
Takeaway and home delivery meals	0.06	0.00	0.04	0.06	0.07	0.08	0.05
Fresh vegetables	0.21	0.00	0.14	0.19	0.28	0.27	0.18
Frozen/canned/dried vegetables	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fresh fruit	0.15	0.00	0.10	0.13	0.19	0.23	0.12
Frozen/canned/dried fruit	0.00	0.00	0.01	0.00	0.01	0.00	0.00
Dairy	0.02	0.00	0.02	0.02	0.02	0.03	0.02
Meat and seafood	0.04	0.67	0.01	0.03	0.05	0.04	0.06
Bread and bakery	0.16	0.00	0.12	0.15	0.27	0.18	0.10
Drinks	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Other (Condiments, dried herbs, spices, spreads, oils etc)	0.14	0.07	0.18	0.13	0.19	0.11	0.12
Inedible parts of food	0.77	0.13	0.58	0.76	0.92	0.88	0.73

8. What behaviours are linked to food waste?

Regression analysis (using a one-way ANOVA model) was undertaken on the electronic-diary data to establish if there were any relationships between the behaviours measured in the benchmark data and the food waste recorded in the electronic-diary.

The dependent variable was the amount of food waste classified as very low (less than 1kg per household), low (1.99–1.99 kg per household), medium (2.00–3.99 kg per household) and high (anything over 4.00 kg per household).

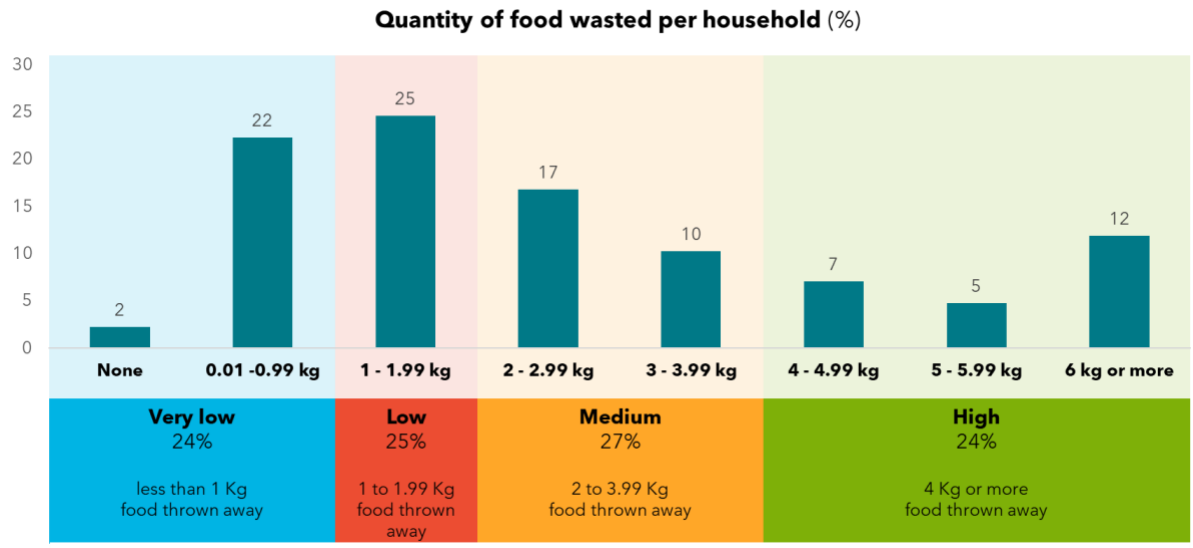
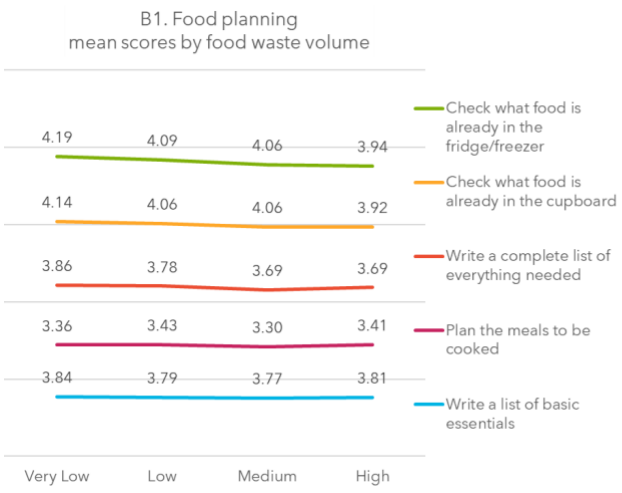


Figure 16: Classification of very low to high food wasters

In the food planning behaviours, there was a relationship with "checking what food is already in the fridge/freezer" and lower food waste. As people reported doing this less, they produced more food waste. Getting people to review what they already have in the fridge and freezer before shopping is the first step in reducing food waste.

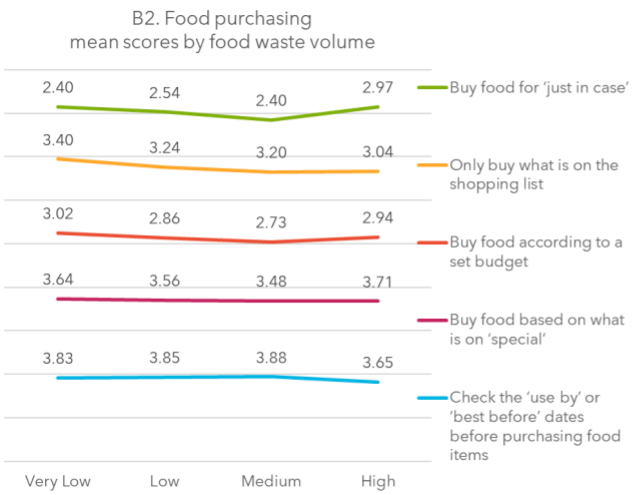


Rank ordered by most significant outcome variable (different by food waste volume)

Rank	Variable	F	p-value	Significant?	Relationship
1	Check what food is already in the fridge/freezer	2.874	0.035	✓	Negative (weak)
2	Check what food is already in the cupboard	2.344	0.071	✗	-
3	Write a complete list of everything needed	1.205	0.307	✗	-
4	Plan the meals to be cooked	0.754	0.520	✗	-
5	Write a list of basic essentials	0.157	0.925	✗	-

Figure 17: Food planning relationships with level of food waste

When it came to buying food, there were two behaviours that were measured in the benchmark study that linked to high food waste. Buying food 'just in case' had a positive relationship with high food waste, whereas only buying what was on the shopping list was linked to lower food waste. Getting people to only buy what they need and avoid buying what is deemed 'just in case' will likely lower food waste.

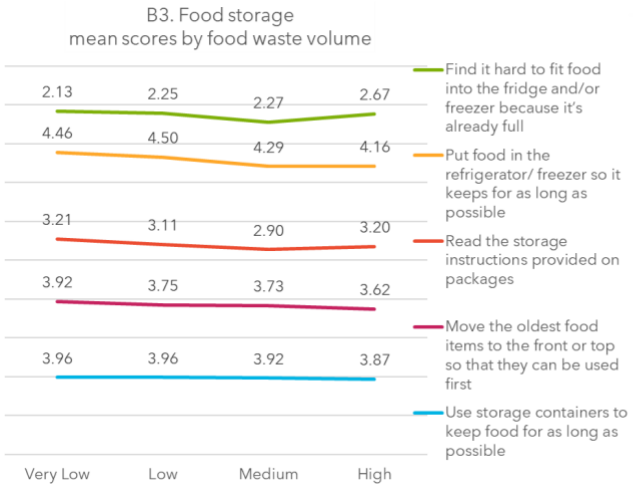


Rank ordered by most significant outcome variable (different by food waste volume)

Rank	Variable	F	p-value	Significant?	Relationship
1	Buy food for 'just in case'	19.550	0.000	✓	Positive
2	Only buy what is on the shopping list	4.170	0.006	✓	Negative (weak)
3	Buy food according to a set budget	2.506	0.058	✗	-
4	Buy food based on what is on 'special'	2.470	0.060	✗	-
5	Check the 'use by' or 'best before' dates before purchasing food items	2.182	0.088	✗	-

Figure 18: Food purchasing and its relationships with level of food waste

Storing food matters to the amount of food waste generated. Those who find it "hard to fit food into the fridge and/or freezer because it's already full" have high levels of food waste. Similarly, those who "put food in the refrigerator/freezer" (rather than the freezer) are more likely to have high levels of food waste. Overall, those who "read the storage information on packaging" produce less food waste, although there is a group who perhaps view the storage instructions too strictly and throw away anything risky who also produce extremely high levels of food waste. Finally, those who practice food rotation produce less food waste.

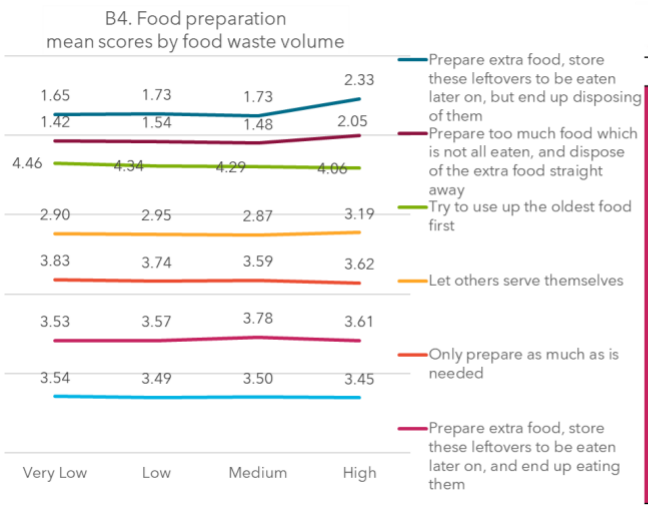


Rank ordered by most significant outcome variable (different by food waste volume)

Rank	Variable	F	p-value	Significant?	Relationship
1	Find it hard to fit food into the fridge and/or freezer because it's already full	12.401	0.000	✓	Positive
2	Put food in the refrigerator/ freezer so it keeps for as long as possible	10.092	0.000	✓	Negative
3	Read the storage instructions provided on packages	4.028	0.007	✓	Negative (weak)
4	Move the oldest food items to the front or top so that they can be used first	2.943	0.032	✓	Negative (weak)
5	Use storage containers to keep food for as long as possible	0.453	0.715	✗	-

Figure 19: Food storage and its relationships with level of food waste

The way people prepare food can impact the amount of food waste markedly. There is a group who "prepare extra food to be eaten later on" who are high food wasters. Those who have no plan to store or eat later on are also likely to be high food wasters. Those who let others serve themselves are high food wasters. Those who try to use up the oldest food first are low food wasters, as are those who only prepare as much as needed.



Rank ordered by most significant outcome variable (different by food waste volume)

Rank	Variable	F	p-value	Significant?	Relationship
1	Prepare extra food, store these leftovers to be eaten later on, but end up disposing of them	24.588	0.000	✓	Positive
2	Prepare too much food which is not all eaten, and dispose of the extra food straight away	22.316	0.000	✓	Positive
3	Try to use up the oldest food first	10.331	0.000	✓	Negative
4	Let others serve themselves	3.796	0.010	✓	Positive (weak)
5	Only prepare as much as is needed	3.151	0.024	✓	Positive (weak)
6	Prepare extra food, store these leftovers to be eaten later on, and end up eating them	2.409	0.066	✗	
7	Stick to ingredients in a recipe	0.306	0.821	✗	

Figure 20: Food preparation and its relationships with level of food waste

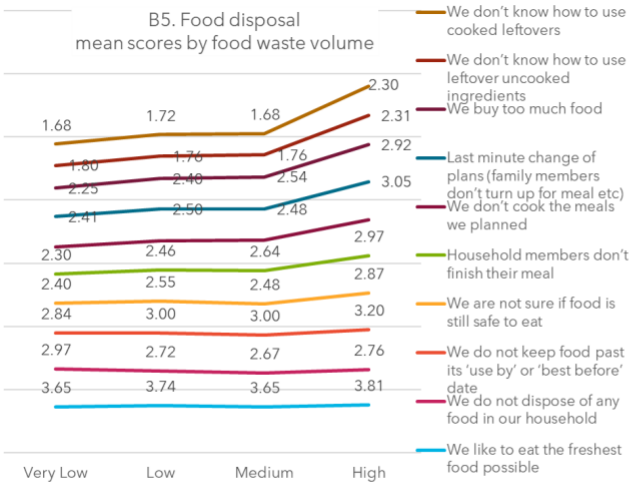
However, the strongest relationships are found between food waste and household food management behaviours. Where food management skills, knowledge and expertise are lacking, food waste increases markedly.

This includes not knowing:

- how to use cooked leftovers
- how to use leftover uncooked ingredients
- how much food to buy
- whether the food is safe to eat and how to use ‘use by’ or ‘best before’ dates.

The analysis shows that the amount of food waste is also compounded by the complexities of modern life such as:

- last minute changes in plans
- not preparing the food that was planned, often because of last minute changes to the number of people eating, dietary preferences etc.



Rank ordered by most significant outcome variable (different by food waste volume)

Rank	Variable	F	p-value	Significant?	Relationship
1	We don't know how to use cooked leftovers	26.096	0.000	✓	Positive
2	We don't know how to use leftover uncooked ingredients	20.151	0.000	✓	Positive
3	We buy too much food	18.585	0.000	✓	Positive
4	Last minute change of plans (family members don't turn up for meal etc)	18.551	0.000	✓	Positive
5	We don't cook the meals we planned	18.935	0.000	✓	Positive
6	Household members don't finish their meal	15.584	0.000	✓	Positive
7	We are not sure if food is still safe to eat	7.857	0.000	✓	Positive
8	We do not keep food past its 'use by' or 'best before' date	4.168	0.006	✓	Positive (weak)
9	We do not dispose of any food in our household	3.024	0.029	✓	Negative (weak)
10	We like to eat the freshest food possible	1.813	0.143	✗	-

Figure 21: Food disposal and its relationships with level of food waste

9. What interventions might reduce food waste?

Three discrete choice modelling experiments were conducted testing sets of interventions, tailored to each individual's core behavioural weaknesses in the areas of:

- planning and shopping for food
- storing food
- preparing and disposing of food.

Respondents were asked to choose whether this group or bundle of activities, if they were available, would help them when planning and shopping and reduce the need to dispose of food. In all cases, the base case was where there were no interventions. Interestingly, some respondents believed they were helped to reduce food waste just by having the issue brought to their attention.

Respondents were asked, "If this group of activities were available, do you think they would assist you when planning and shopping to dispose of less food?"

Results (% believe interventions would help them reduce food waste)

	No interventions	Three targeted interventions	If optimal interventions delivered
Planning & shopping food (n=1065)	14 →	49 →	61
Storing food (n=683)	25 →	79 →	79
Preparing and disposing of food (n=849)	19 →	57 →	73

Figure 22: Experiments testing interventions

9.1. Planning and shopping

The planning and shopping experimental design had five intervention attributes, and each had five levels. The design is outlined in Figure 23, and the red cells represent the base case:

Behaviour to improve	Activity that would assist you				
	1	2	3	4	5
1. Get better at meal planning	None	Paper based booklet that provides suggestions on planning meals (for example, planning three dinners through to every meal for a week)	App that provides suggestions on planning meals (for example, planning three dinners through to every meal for a week), creates shopping lists based on that suggestion	App that helps plan meals, keep track of the food purchased to create a recipe selected through the app, and sends reminders about leftover ingredients from a recipe	App that helps plan meals, creates a shopping list that connects to user's favourite supermarket, keep track of the food purchased to create a recipe selected through the app, and sends remirders about leftover ingredients from a recipe
2. Get better at making shopping lists	None	Paper based form that allows you to make shopping lists based on the meals you plan for the week	App that allows you to make shopping lists based on the meals you plan for the week	App that allows you to make shopping lists based on the meals you plan for the week and add other family members view and contribute to the list and tick off items from the list.	"Love a list" challenge is a 4-week challenge you sign up to, to see how well you can stick to a list
3. Get better at calculating portions	None	Ready reckoner (paper) that shows how much food is needed for 1, 2, 3, 4 or 5 people. You look up, say spaghetti bolognaise, look at column with the right number of adults having the meal, and it tells you quantity of mince meat, mushrooms, tomatoes, etc needed	Web/mobile based App with a portion calculator when planning. Consumer clicks on an icon, say spaghetti bolognaise, adds the number of adults having the meal, and it would suggest the quantity of mincemeat, mushrooms, tomatoes, etc needed	Portion calculator when online shopping provided by major supermarkets. Consumer clicks on an icon, say spaghetti bolognaise; add the number of adults having the meal, it suggests the quantity of mince meat, mushrooms, tomatoes, etc needed	"Wasteless coach" is a 4 -week challenge you sign up to, which helps you become better at calculating amount to be purchased based on number of portions
4. Getting better at checking the fridge properly before shopping	None	Advertising on social media to remind people to look at what is in the fridge freezer/ take a photo of the fridge freezer	Paper based form that allows you to record what is in the fridge and freezer and what you need to shop for	An App that allows you to record what is in the fridge and freezer and what you need to shop for	"Love a check-list challenge" is a 4 -week challenge you sign up to, to see how well you check the fridge and freezer BEFORE going shopping
5. Get better at buying visually imperfect fruit and vegetables	None	Instore marketing that encourages buying of visually imperfect fruits and vegetables	Short videos/ posts that are shared in social media which informs visually imperfect fruits and vegetables are too good to throw away	TV advertising that encourages purchase of visually imperfect fruits and vegetables as they are too good to throw away	"Waste Heroes" is a four-week competition where you share photos and stories of how you appreciate visually imperfect fruit and vegetables

Figure 23: Planning and shopping choice model design

The modelling revealed that respondents believed all five intervention types would help them reduce their food waste. Figure 24 shows the role each intervention plays in helping people reduce food waste, with the levels indicated within the box the most powerful levers tested. For example, helping people calculate meal portions was an important initiative — having a ready reckoner showing how much food is needed for numbers of people was the most powerful idea for those who struggled with planning and shopping.

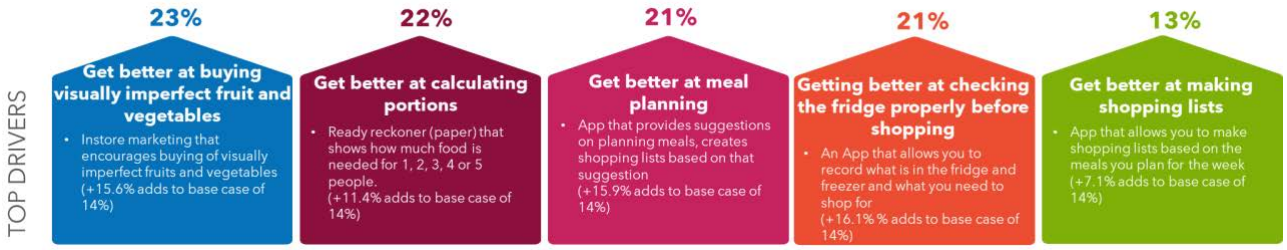


Figure 24: Planning and shopping interventions and relative impact on reducing food waste

The base case (i.e., with no interventions) indicated that 14% would have improved behaviours on reducing food waste simply by bringing the issue to their attention. However, by leveraging only the three most powerful interventions, up to half the sample (49%) indicated their food waste could be improved. If the five optimal initiatives were implemented, then 61% of the sample would be helped to reduce food waste.

Figure 25 highlights one set of strategies that could be used to change food waste behaviours.

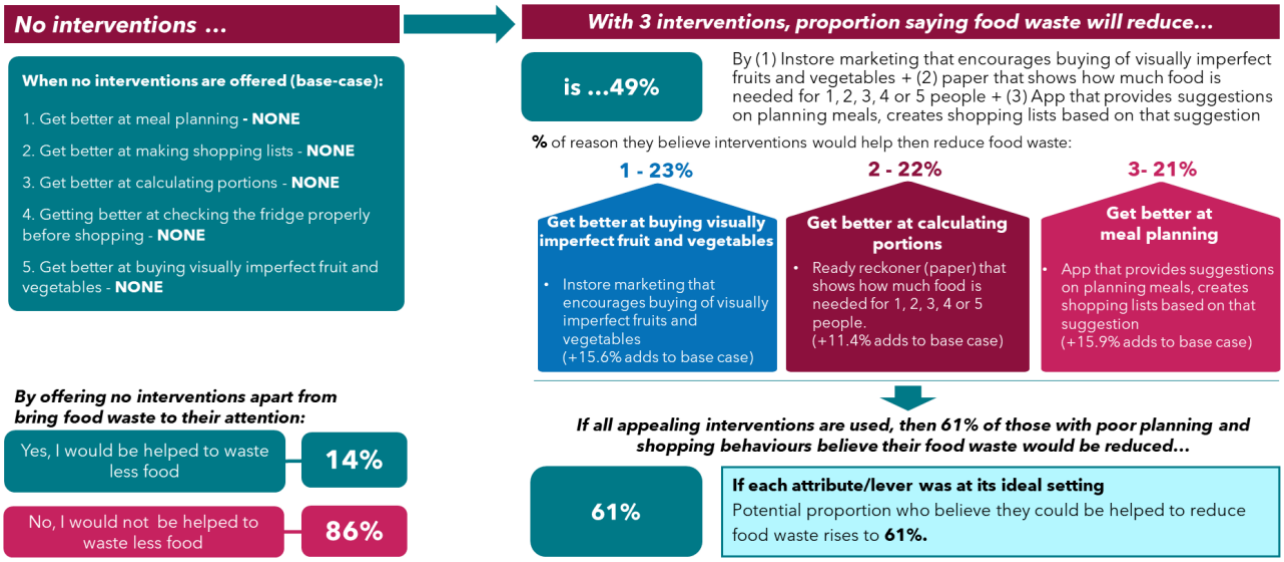


Figure 25: Scenario showing likely impact on food waste with optimal intervention strategies employed

Storing interventions

The storing food set of interventions in the experimental design had three intervention attributes, and each had four or five interventions. Figure 26 outlines the design and the red cells represent the base case.

Behaviour to improve	Activity that would assist you					
	1	2	3	4	5	6
1. Using better tools to help storing of food in fridge	None	Free fridge thermometers to help you keep fridge (4 degrees C) and freezer (minus 5 degrees C) at the ideal temperatures	Free colourful fridge and freezer tags for food that needs to be used soon (everyone in the household knows what food needs to be used next)	Freezer and fridge storage packs (inc. freezer marker pen and reusable and microwavable containers) **($10)**	**Free** freezer and fridge storage packs (inc. freezer marker pen and reusable and microwavable containers)	"Become a Marie Kondo in the kitchen" is a 4 -week challenge you sign up to, to that will transform your food storing skills
2. Getting better at organising the fridge (so you can see what's there)	None	Fridge storing tips to allow you to use leftovers later on (Fridge magnet or pocketbook)	Free pocketbook guide to storing food in fridge e.g. guidelines on how long leftovers, meat, vegetables etc can be kept)	"Zero Down Your Fridge" app that provides tips and recipes for foods that might go bad soon in your fridge or freezer	"Love an easy to see fridge and freezer challenge" is a 4 -week challenge you sign up to, to see whether you over stock your fridge and freezer, or if not	
3. Getting better at storing leftovers	None	Promoting on social media the need to label leftovers with a description and the date it was put in fridge	Promoting on social media how to make different meals using leftover food that has been stored in fridge	Promotion on social media that makes specific suggestions on how best to store leftovers	"Become a Marie Kondo in the kitchen" is a 4 -week challenge you sign up to, to that will transform your food storing skills	

Figure 26: Storing interventions choice model design

The modelling reveals that using better tools to help store food in the fridge and freezer was critical to reducing food waste. Figure 27 shows the role each intervention plays in helping people reduce food and the levels within the box are the most powerful lever tested. The sample completing this choice model (who all had poor behaviours regarding storage of food) indicated that 'providing free freezer and fridge storage packs including the pen' would help them reduce their food waste. This was followed by getting better at organising the fridge with 'storing tips provided by a fridge magnet or pocketbook' the preferred solution.

Figure 27: Storing interventions and relative impact on reducing food waste

The base case (i.e., with no interventions) indicates that 25% will have improved food waste behaviours simply by bringing the food waste issue to their attention. However, by leveraging the three most powerful interventions, 79% indicated their amount of food waste could improve. Figure 28 highlights one set of strategies to change food waste behaviours.

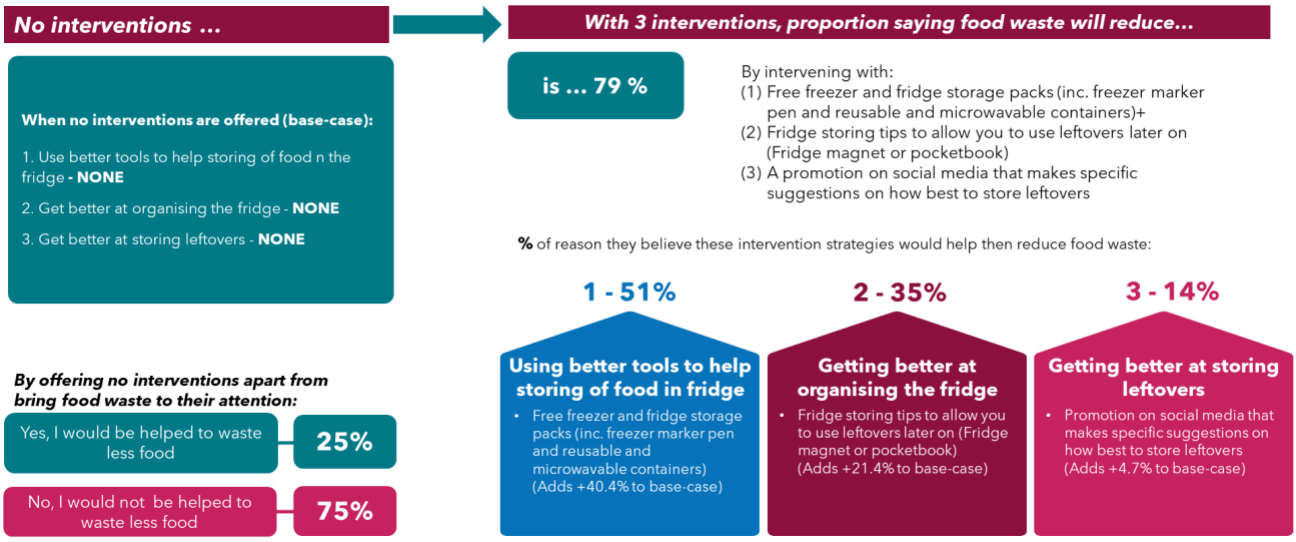


Figure 28: Scenario showing likely impact on food waste with optimal intervention strategies employed

Preparing and disposing

The preparing food and disposing of food set of interventions experimental design had five intervention attributes and each had five levels. Figure 29 outlines the design and the red cells represent the base case.

Behaviour to improve	Activity that would assist you				
	1	2	3	4	5
1. Using better tools to get the portions right	None	Supermarkets distributing measuring cups for portion sizes (for pasta and rice) **($10)**	Supermarkets distributing **free** measuring cups for portion sizes (for pasta and rise)	Introducing visual cues on packaging e.g. Portion sizes to be marked with dotted lines	"Wasteless coach" is a 4 -week challenge you sign up to, which helps you become better at calculating portions when preparing a meal
2. Getting better at calculating portions when preparing a meal (to avoid cooking too much food)	None	Paper poster that shows how much food you need to cook (paste, rice, mashed potatoes etc) for various numbers of people	Pocket guide portion calculator where you look up the number of people cooking for and it tells you how much to prepare	Web/Mobile App with a calculator where you enter the number of people being cooked for and it tells you how much to prepare	"Wasteless coach" is a 4 -week challenge you sign up to, which helps you become better at calculating portions when preparing a meal
3. Learning how to use leftover food better	None	Paper based form suggesting planning meals with ingredients to be used in more than one meal (for example, mince in spaghetti bolognaise one night and tacos the next night)	An App that suggests planning meals with ingredients to be used in more than one meal (for example, mince in spaghetti bolognaise one night and tacos the next night)	Events where people cook with surplus food in a unique, fun, and musical atmosphere.	"Love a multiple meal challenge" is a 4 -week challenge you sign up to, to see how well you can use the same ingredients in more than one meal
4. Serving the right amount of food on the plate (to avoid too much plated leftover food)	None	Paper based form showing you how much food you really need to serve per person based on their age and activity level	An App showing you the healthy serving size based on their age and activity level	"Love a smaller plate challenge" is a 4 -week challenge you sign up to, that encourages the use of a smaller plate and allows you to see how well you went using a smaller plate	"No Food Waste" campaign empowering the community to 'ask what's on their plate' to show food waste is not acceptable.
5. Get better at sensing whether food is still good to eat or not	None	Advertising about the meaning of food date labels ('Use by' and 'Best before') e.g. Facebook, Instagram, Television, Magazines	Having both 'Use by' and 'Best before' labels on food and advertising their meaning	Pocket guide you keep in the kitchen that shows how to use your sense of smell and taste to recognize if food is still good to eat	Online guidelines on how to use your sense of smell and taste to recognise if food is still good to eat

Figure 29: Preparing and disposing interventions choice model design

The modelling reveals 'learning how to use leftover food better' is important for reducing food waste. Figure 30 shows the role each intervention plays in helping people prepare and dispose of food and the levels within the box are the most powerful lever tested. The sample completing this choice model (who all had poor behaviours regarding preparing food and disposing of food) indicated that 'an app that suggests planning

meals with ingredients that can be used in more than one meal' would help reduce their food waste. This is followed by getting better at calculating portions when preparing a meal using a 'paper poster that shows how much food to cook for certain number of people' as the preferred solution.

Figure 30: Interventions and relative impact on reducing food waste

While a small number (19%) claimed just bringing the issue to their attention would help them reduce food waste, by leveraging the three most powerful interventions, 57% say their food waste will be improved. If all five optimal levers are used, then 73% of those who did the experiment indicate a positive outcome on their food waste quantity. Figure 31 highlights one set of strategies to change food waste behaviours.

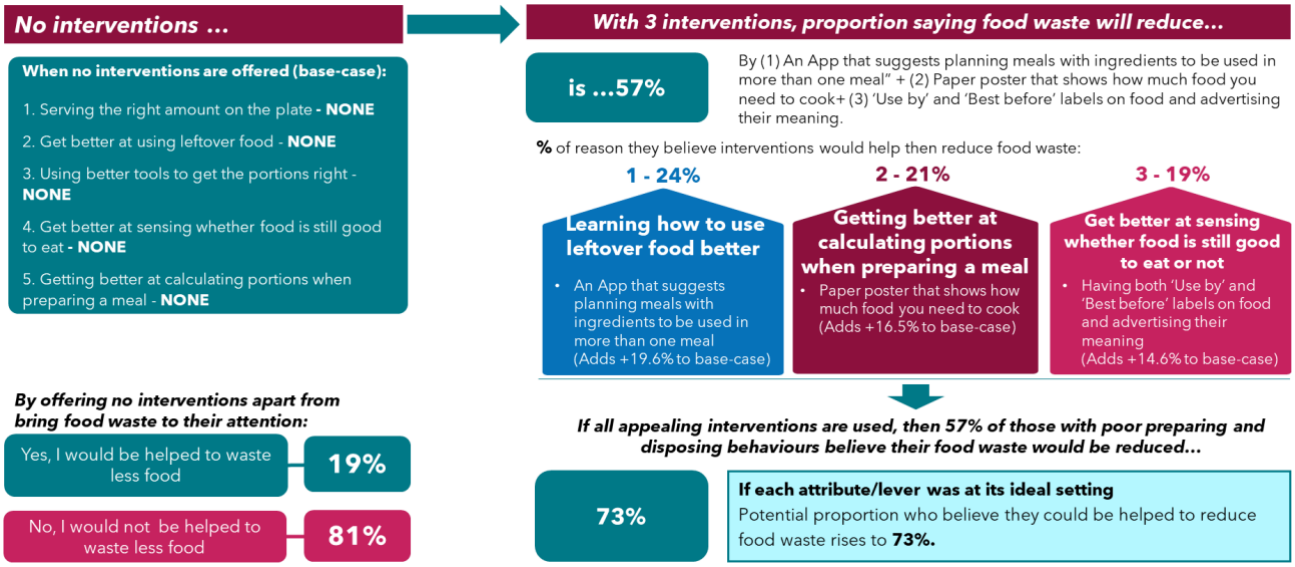


Figure 31: Scenario showing likely impact on food waste with optimal intervention strategies employed

10. Future research considerations

There are a number of critical considerations for future research. These include, in order of importance:

- Providing electronic kitchen scales in conjunction with the electronic-diary will markedly improve the accuracy of food waste records (estimating weight by using eight by cups is particularly problematic for food with awkward shapes). Standard Cup Measures (SCMs) were not available for most inedibles (stems, stalks, bones, fat trimming etc).
- Valuing inedibles needs to be handled in a more systematic way. In this report possibly-avoidable inedibles have been costed at the same cost as the fresh food and unavoidable food waste has been valued as zero. A logic for this needs to be developed for future electronic-diary studies as it was out of scope for this study.
- The electronic-diary could be enhanced with further listings. Especially of complete meals (e.g. Spaghetti Bolognese, Moussaka). It needs a list of 100–200 commonly prepared meals. Close substitute products were accepted where information about specific items could not be found. There is scope to increase the number of items in the electronic-diary even more to make the electronic-diary costing more accurate.
- It would be better to get an annual average price to better reflect the value of food waste. A better method for pricing would be beneficial that gathers prices over the year and is able to control for seasonal variations and specials. (Prices were sourced where possible from the Woolworths price list or Woolworths online. Online prices were quoted for the Sydney suburb of Pagewood 2035 during November and December 2020. Coles online and other price sources were referenced when information was not available on Woolworths online. Woolworths brands were used to indicate price and weight in preference to non-Woolworths brands where possible. An analysis of average prices for item categories was beyond the scope of this study.

Appendix A – methodological notes

In-home food waste social research survey sample recruitment

Respondents were recruited to complete the benchmark survey initially and were asked to consent to being recontacted for an electronic-diary, and bin audit, if applicable. They were informed of the additional phases of the research before commencing the survey, then in greater detail after completing it in order to collect information to recontact them. All respondents recruited gave informed consent to participate in the project and were entitled to discontinue the research project at any point, should they wish to.

This information included:

- First and last name
- Email address
- Postcode
- Suburb
- State
- Residential address (if applicable for the bin audit. SA, Tas and NT excluded.)

The respondents were recruited from the following:

Instinct and Reason:
Instinct and Reason send out invitations to participate in research via email to this panel. Interested respondents clicked through a link on the email to complete the survey on the Lime platform. Instinct and Reason is ISO 20252:2019 accredited. This certifies that Instinct and Reason meet the internationally recognised best practice in market, opinion and social research. Instinct and Reason adheres to strict privacy and confidentiality guidelines, and is independently audited for continued commitment to these guidelines. The Instinct and Reason Privacy Policy can be found: https://www.instinctandreason.com/privacy-policy/

Social media:
Paid Facebook advertisements were posted with a generic royalty-free image of food to grab attention and a brief description of the project, targeting people by region. Interested Facebook users then clicked through the advertisement and were taken to the survey on the Lime platform.

Family & friends referral:
Through word of mouth, we invited friends and family to check their eligibility to participate in the research. Friends and family of Instinct and Reason staff were required to meet the same eligibility criteria as respondents recruited by other means, and were not given any additional information or insights into the research that would bias their participation. If interested, they were sent a link to complete the survey on the Lime platform.

Lucid Marketplace:
Respondents in the Lucid database were invited to participate in the study. The survey was hosted by Instinct and Reason on the Lime platform and monitored by Instinct and Reason staff. The Lucid Marketplace is an independent, third-party company, operating under their Lucid Quality Program, with data-checking procedures. The Lucid Marketplace is used solely for market research purposes. No personally identifiable information is stored in the marketplace, and Lucid adheres to ESOMAR guidelines.

TEG Insights:
Respondents in the TEG Insights database were invited to participate in the study. The survey was hosted by Instinct and Reason on the Lime platform and monitored by Instinct and Reason staff. TEG Insights provides access to over 1 million consumers for market research, and is part of the wider TEG Propriety Limited group of companies. TEG Insights is ISO accredited under ISO 20252:2019.

Department of Environment and Science, Queensland
The survey link was shared by the DES to the Queensland mailing list to invite interested members of the community to participate, though this was not a successful strategy in recruiting participants for the study.

Screening questions

The screening questions, as shown in the appendix under the Benchmark survey, screened out those living in apartments in the bin audit states, and those away from home for more than 3 days in the previous week. Additionally, respondents were informed of the physical bin audit phase of the research. Due to having specific criteria to participate, the data could be skewed towards low food wasters willing to have their bins observed.

Electronic diary

- The respondents were asked to complete the diary for 7 consecutive days, and were given additional time the day after the bin collection to fill in any missed final meals
- The invitation was sent after completing the survey. They were given suggestions to:
    - Complete the diary after each meal
    - Complete the diary at the end of the day or start of the next day
- The day of the week respondents were invited to the diary varied based on timing for their bin audits, either based on their set council collection date (provided to us in their benchmark survey), or when we were sending out a bin auditor to their area. The invitations were usually sent within the week of finishing the survey.
- The link will work on a computer, tablet or smartphone, though we encouraged the respondents to fill it out on a computer for optimal viewing
- A link to view visual, downloadable instructions was provided at the start of the diary alongside the written instructions. The PDF could be accessed again via a pop out window on the first meal of every day
- The diary date was pre-set to the date it was filled in on to minimise errors and effort required by respondents
- Some ACT respondents were invited to start on the same day due to bin strikes, and were asked to start a new bag for the 7-day period, keeping any food disposed of that would usually go in their general waste bin in this separate bag

Bin audit

The audit process was modified for the ACT for audits commencing from the week of 23rd November 2020 due to truck driver strikes in the territory. The following letter was sent to the Department of Water and Environmental Regulation in response to a query of concern over the bin strikes affecting the methodology:

As a result of the ongoing bin audits after this date, we modified our methodology to ensure any truck driver strikes did not affect the contents of the bins; we requested that the participants keep any food they disposed of in a separate bag for the period of the 7 days when they filled out the diary, to be picked up by the auditors at the end of the week. As such, the contents of the bin bags were not put out with the general waste bin during regular or modified council collections during the diary week, and the full contents of the bags were able to be picked up at the end of the week.

instinct and reason will run data checking and data cleaning to remove any participants' data where the food waste audited varies significantly differently from the electronic diaries filled out. Additionally, the bin auditors' will be consulted to confirm, based on their experience and expertise, that the contents of the audits were of an expected volume.

We propose to conduct further bin audits in late January or February 2021 to make up any lost sample that may have been caused by the truck driver strikes.

Analysis

Assumptions

As the food waste recorded in the questionnaire did not ask for specifics on what types of bread were disposed of, the weight of the bread was converted from slices by calculating the average bread weight from the electronic-diary bread categories, and converting this into a $ value. The average weight to allocate to a bread slice for the questionnaire was 0.077 kg per slice.

For the bin audits, the auditors could not visually distinguish between foods in 47 categories, for example between bread and other baked goods. As such, the 13 categories were used.

Additionally, the bin auditors had an element of discretion; some foods auditors deem as unavoidable food waste, others may classify as potentially avoidable. This may have led to differences in categorisation.

Considerations for replication of the study:

- Respondents could be informed that some respondents will have their bins audited, or blindly bin audited to avoid data skew. This could involve explaining the nature of bin audits and the regularity by which they are undertaken by local councils without residents' permission or knowledge, and that a similar thing will be involved in the research. There was a concern amongst those that did not participate in the research that their bins were being looked through, and the knowledge was lacking that this was a regular process.
- One diary link – multiple diary links were sent as the diary could not 'fit' onto one. If only one is sent, it would streamline the process, though increase the risk that participants would not click the final link and complete the choice model
- Automatic email reminders – rather than mail merge, but still appear to be sent "personally" (ensure it does not get flagged as spam)
- Disclose the name of the commissioning organisation to encourage participation
- Offer a higher incentive that people feel rewards them for their time

- Ethics Committee paragraph at end of reminders removed or edited – technical enquiries mistakenly sent to committee instead of replying to Instinct and Reason
- Consider making a smaller measurement than 1 tablespoon in the quantity dropdown on the diary

Technical data collection and analysis

Significance testing

Significance testing (z-test, t-test and Chi squared test) was used to determine if there is a significant difference between different variables. It was used to determine if a particular group of respondents have different attitudes or behaviours of the total population. Using a 99% confidence level is like saying if we completed this study 100 times, 99 of those studies would result in the same outcome. For scale questions, nett results like 'strongly agree and agree' and 'strongly disagree and disagree' were netted in our report for significance testing. This helps to identify the significant difference at high confidence level (99%) by summing the separate proportion.

Discrete choice models

The survey also includes an important component using discrete choice modelling to examine responses to a series of possible set of food waste programs and activities.

Three experiments tested interventions aimed at helping people reduce food waste.

- Planning & shopping
- Storing food
- Preparing and disposing of food

The modelling assists in understanding the key factors which underpin peoples' decision-making and the likely outcome.

A traditional survey generally relies on the 'direct question' method – asking people to make conscious decisions and individually assess the importance of certain factors in attracting them to stay or in influencing them to go. However, in the real-world, people make decisions based on a bundle or combination of certain things existing and some aspects of the choice can operate at an unconscious level. The traditional survey would tell us that people (at a conscious level) would prefer their community with all the benefits without considering the possible trade-offs and relative tipping points that would be made at both a conscious and unconscious level (e.g., in having certain things less than optimal providing some other things exist). It is actually hard for people to disentangle consciously and accurately what motivates them to choose one thing over another (i.e., what actually drives choice).

A choice experiment overcomes these problems. It requires that individuals be forced to make a trade-off between two or more options (sometimes also allowing 'none or neither' as a valid response) based on one scenario involving a bundle or combination of things, and then to choose again for another scenario involving another specific combination, and then again, for up to between 4 and 5 scenarios.

Choice Modelling is typically used when the need is to understand the dynamics of consumer choice in a category. It relies on an integrated behavioural theory of decision-making, incorporating Lancastrian consumer thinking (from the field of psychology) and random utility theory (from economics).

ANOVA

Analysis of Variance (ANOVA) were used to examine the relationship between food waste volume (in weight) and different food management behaviours. ANOVA is a statistical test that compares the means of groups to determine if there is a difference between them, comparing the relationship between factors that cause a rise in food waste. The F test produces a p-value to determine whether the relationship is significant or not.

ANOVA has validating the relationship between food waste volume and 5 different food management stages.

- Food planning
- Food purchasing
- Food storing
- Food preparing and
- Food disposal

Based on the results of the cross-tabulations, those variables indicative of being strong outcome measures of the food waste volume were tested for significance using ANOVA. Nevertheless, it is clear from the descriptive results, and the significance of the ANOVA models, that there is a strong relationship between the food waste volume and food management behaviours.

Survey platform – Limesurvey

LimeSurvey was used as the online platform to conduct the survey, store and deliver the results. LimeSurvey is a proven platform and has been widely adopted by the world's leading Market Research agencies and IT departments in over 1000 companies.

LimeSurvey is an online survey application written in PHP based on a MySQL, sqlite, PostgreSQL or MSSQL database, distributed under the GNU General Public License. As a web server-based software it enables users using a web interface to develop and publish on-line surveys, collect responses, create statistics, and export the resulting data to other applications.

- Features:
- Unlimited number of surveys at the same time
- Unlimited number of questions in a survey
- Unlimited number of participants to a survey
- Multi-lingual surveys
- User-management
- 28 different question types with more to come
- WYSIWYG HTML editor
- Quotas management
- Integration of pictures and movies into a survey
- Creation of a printable survey version
- Conditions for questions depending on earlier answers (Skip Logic / Branching)
- Piping and Micro-tailoring using a powerful expression engine
- Re-usable editable answer sets
- Ready-made importable questions
- Assessment surveys
- Anonymous and Not-Anonymous survey

- Open and closed group of participant surveys
- Optional public registration for surveys
- Sending of invitations, reminders and tokens by email
- Option for participants to buffer answers to continue survey at a later time
- Cookie or session-based surveys
- Template editor for creating your own page layout
- Extended and user-friendly administration interface
- Back-office data entry possibility
- Survey expiry dates for automation
- Enhanced import and export functions to text, CSV, PDF, SPSS, R, queXML and MS Excel format
- Basic statistical and graphical analysis with export facility
- Screen Reader Accessibility
- W3C compliance
- Supporting more than 50 different languages in frontend and backend
- A detailed manual is available in several languages in the official LimeSurvey Online Manual

Treatment of outliers

Outliers are observations that are numerically distant from the rest of the data. In large samples of data, some data points will be further away from the sample mean than what is deemed reasonable. Outliers are expected for large sample sizes and should not automatically be discarded if that is the case. Outlier points can therefore indicate faulty data, erroneous procedures, or areas where a certain theory might not be valid. However, a small number of outliers not due to any anomalous condition are to be expected in large samples.

Outliers were removed if:

- any household with more than 15 people in Z3 (n=9) – removed for Z3 but not the rest of the survey
- food waste volume in benchmark survey greater than or equal to 14000 grams (n=50)
- food waste volume in electronic-diary greater than or equal to 16000 grams.

Data weighting

Sometimes because of unexpected sampling results, a weighting strategy will be applied to adjust for any disproportionate sampling according to the demographic profiles of the population. Weighting is used to manipulate sample data to better represent a population. What this means is that each case or respondent is assigned a weight factor to reflect it's important relative to other cases or respondents. The weight factor is then applied to increase or decrease the total number of cases in the sample that possess certain characteristics.

'Proportionally Weighting' is the most common method of weighting that used. Sample is weighted proportionately with the weight factor is applied to alter the distribution of characteristics of the sample to better represent the population.

Per Capital Food Waste Calculation Methodology

Conversion of children to adults

To arrive at a per capita food waste figure for children in surveyed households, the study had to derive a conversion rate to identify the food waste that could be attributed to any children in the household. This calculation is based on the *Australian dietary guidelines* 2013. According to this guideline (pages 30 and 33), the recommended daily number of serves of different food groups varies as per the age group and gender. The following table shows the average for both men and women.

Table 1: Average of recommended daily average serves for males and females

Age	Veg	Fruit	Grains	Lean Meat	Milk, Yogurt	Additional serves	Total Serves	Average serves
0_1yrs	2	0.5	1.5	1	1.5	0	6.5	12.55
1-2yr	3	0.5	4	1	1.5	0	10	
2_3yr	2.5	1	4	1	1.5	1	11	
4-8yrs	4.5	1.5	4	1.5	2	2	15.5	
9-11yrs	5	2	4.5	2.5	2.75	3	19.75	
12-18yrs	5.25	2	6.25	2.5	3.5	3.25	22.75	20.88
19-50yrs	5.5	2	6	2.75	2.5	2.75	21.5	
51-70yrs	5.25	2	5	2.25	3.25	2.5	20.25	
70+	5	2	3.75	2.25	3.75	2.25	19	

Based on the Australian dietary guideline (2013), a child (0- 11 years), is recommended to consume a daily average serve of 12.55 whereas an adult, a daily average serve of 20.88. Accordingly, a child is recommended to consume 0.60 of the amount of an adult (12.55/20.88).

Therefore, the study have assumed a child's food consumption, and hence their contribution to food waste, is 0.60 of that of an adult. Furthermore, the benchmark? survey used different age categories than those in the table above. Consequently, anyone aged 14 and below is considered as a child and, therefore, having a contribution of 0.60 of that of an adult in the *"Australian household food waste"* report series.

Reference: NHMRC 2013. https://www.nhmrc.gov.au/about-us/publications/australian-dietary-guidelines#block-views-block-file-attachments-content-block-1

Appendix B – Survey Forms

Benchmark survey

Introduction

Welcome. Thank you for participating in this study about food in your home.

This research will involve a 15-minute survey you will undertake now about how your household handles food, followed by an electronic-diary and audit of food you dispose of, in the coming weeks.

Once you qualify for this survey, we will provide more information about what is involved in the second part of the research, and collect some contact details for you to participate.

This research is commissioned by Central Queensland University, and has been reviewed and approved by its Human Research Ethics Committee. All research data will be stored securely by Central Queensland University for a minimum of 15 years, in accordance with Central Queensland University policy. If you have any complaints or concerns about the research project, please email ethics@cqu.edu.au or phone (07) 4923 2603 quoting the following number 0000022444 within 24 hours if at all possible.

I1 Do you agree to participate and answer all questions honestly?

DO NOT ROTATE	**S/R**	
Yes	◯1	CONTINUE
No	◯2	THANK AND CLOSE

Screening questions

Thank you for agreeing to participate. We just need to check some details with you to make sure they match with the types of people we need to speak to.

S1 Please indicate which of the following age groups you belong to:
Choose one of the following:

DO NOT ROTATE	**S/R**	
17 or under	◯1	THANK AND CLOSE
18-24	◯2	CHECK QUOTAS
25-34	◯3	CHECK QUOTAS
35-44	◯4	CHECK QUOTAS
45-54	◯5	CHECK QUOTAS
55-64	◯6	CHECK QUOTAS

65-74	○7	CHECK QUOTAS
75+	○8	CHECK QUOTAS

S2 Please enter your Postcode:
Only numbers may be entered in this field.

S3 Just thinking about the last 7 days, were you personally away from home for three nights or more?

Please choose one answer

DO NOT ROTATE	**S/R**	
No- I was **not** away from home for three nights or more	○1	CONTINUE
Yes- I was away from home for three nights or more	○2	THANK AND CLOSE
Don't know / prefer not to say	○99	THANK AND CLOSE

S4 Which of the following does your household have?

Please choose <u>all that apply</u>

DO NOT ROTATE	**M/R**	
<u>Shared</u> General Waste bin (Dark Green or Black body with **Red lid) –** other households in the building/apartment complex <u>use the same rubbish bin</u> as you	☐1	THANK AND CLOSE
<u>Own</u> General Waste bin (Dark Green or Black body with **Red lid) –** <u>You have your own rubbish bin</u> just for use by your household	☐2	CONTINUE **[ALL MUST CODE 2 TO CONTINUE]**
Food scraps/waste bin – (trialled in select suburbs) Usually a Dark Green or Black body with **Burgundy lid**	☐3	THANK AND CLOSE
Green Waste/Organics bin – Dark Green or Black body with **Green lid**	☐4	CONTINUE
Compost bin (a place for food scraps and garden waste)	☐5	CONTINUE

Worm farm	☐6	CONTINUE
Dog	☐7	CONTINUE
Cat	☐8	CONTINUE
Chickens/poultry	☐9	CONTINUE
Other animals	☐10	CONTINUE

[ONLY ASK THOSE WHO QUALIFY FOR BIN AUDIT IE CODE 1 AT S3 AND ONLY CODE 2 AT S4]

S5a How frequently do you put out your general waste bin on the curb/street to get emptied?

I/my household put out our waste bin on the curb/street **once a week** to be emptied	○1	CONTINUE
I/my household put out our waste bin on the curb/street **once a fortnight** to be emptied	○2	CONTINUE
I/my household put out our waste bin on the curb/street **once a month** to be emptied	○3	CONTINUE
I/my household don't put out our waste bin on the curb/street, we empty our rubbish into a communal bin	○4	THANK AND CLOSE

[ONLY ASK THOSE WHO QUALIFY FOR BIN AUDIT IE CODE 1 AT S3 AND ONLY CODE 2 AT S4]

S5b On which morning of the week does your general waste bin get collected?

Monday mornings	○1	CONTINUE
Tuesday mornings	○2	CONTINUE
Wednesday mornings	○3	CONTINUE
Thursday mornings	○4	CONTINUE
Friday mornings	○5	CONTINUE
Saturday mornings	○6	CONTINUE
Sunday mornings	○7	CONTINUE
I don't know	☐98	THANK AND CLOSE
N/A - my household does not have its own bin	☐99	THANK AND CLOSE

[ONLY ASK THOSE WHO QUALIFY FOR BIN AUDIT IE CODE 1 AT S2 AND ONLY CODE 2 AT S2]

S6 Thinking of your general waste bin, how easy is it to empty?

Our bin is easily accessible from the street, and the truck driver does not need to get out of his truck to access it	○1	CONTINUE
Our bin is generally accessible but the waste management workers sometimes need to get off the truck to move it somewhere they can empty it	○2	CONTINUE
The garbage truck cannot reach our bin from the street, the waste management workers need to search for the bin to empty it	○3	THANK AND CLOSE
Our bin remains inside the property and is emptied separately to the regular garbage collection times	○4	THANK AND CLOSE

[ASK ALL]

S7 To what extent do you contribute to the following in your household:

Please do not include alcohol when answering any of the following questions.

Please choose one answer that fits best for each stage of the food handling process

		S6.1	**S6.2**	**S6.3**	**S6.4**	**S6.5**
	DO NOT ROTATE	**Planning** for food shopping	**Doing** the food shopping	**Unpacking and storing** the food	Doing the **food preparation including cooking**	**Disposing** of food not eaten
		S/R	**S/R**	**S/R**	**S/R**	**S/R**
[**MUST CODE 1 OR 2** FOR S6.1 or S6.2 or S6.3 or s6.4 or S6.5 for **AT LEAST 3 ACTIVITIES]** **[RECRUIT A SPREAD OF CODES, FROM ONLY MAINLY RESPONSIBLE**	I'm mainly responsible	○1	○1	○1	○1	○1
	I'm equally responsible	○2	○2	○2	○2	○2

FOR ONE ACTIVITY, TO MANY]						
	I'm partly responsible	○3	○3	○3	○3	○3
	I'm not responsible/ I'm rarely responsible.	○4	○4	○4	○4	○4

[ASK ALL]

Thank you for answering those questions.

Before we start the survey, we would like to invite you to participate in the other very important part of this research. It involves filling out an electronic-diary for one week to record food that is disposed of in your household. Upon completion of this, you will receive a $10 gift card for your time, and also go in the draw to win 1 of 5 movie vouchers.

For a portion of this survey's participants, the food in their general waste bins will be counted and compared with this diary to help us to more accurately define what food gets disposed of. This will be done during the regular weekly Council bin collection by our partner Waste Audit & Consultancy Services. **No action will be required by you in this process.**

The data will be aggregated and if your bin is included, you will **not be identified** in any way. **Only food contents** will be recorded, and this will be strictly confidential and only for the purposes of this research.

S8 Do you agree to participate in this part of the research?

Please choose <u>all that apply</u>

[ROTATE CODES 1-2]		
Yes, I would like to complete an electronic-diary for 7 days, recording all food disposed of in my household. I consent to the food waste in my bin being counted and compared with my electronic-diary. I understand that I will not be identifiable in any way and that the bin audit is strictly for research purposes	○1	CONTINUE
No, I do not wish to participate in this research	○2	THANK AND CLOSE

[ONCE CODES 1 AND 2 SELECTED, SHOW I3]

Thank you. Please provide your contact details below to register your interest.

Please be assured all your personal information is treated in the strictest of confidence and we adhere to the Market and Social Research Privacy Principles. You can read Instinct and Reason's privacy policy **here.**

We will contact you again in the near future once the research starts.

[ALL FIELDS ARE MANDATORY]

First Name	
Surname	
Phone number	
Email address	

Residential address

Note: we require your residential address to ensure we include a good spread of people across Australia for the bin audit.

Unit number (leave blank if not applicable)	
Street number	
Street name	
Suburb	
State	
Postcode	

MAIN SURVEY

SECTION A: CONTEXTUAL, KNOWLEDGE, CONSUMPTION BEHAVIOURS

[ASK ALL]

A1 Which statement best describes your household?
Please choose only one of the following:

DO NOT ROTATE	**S/R**
I/we do a **main food shop** and then do **'top up' shopping** as we need things	○1
I/we do a **main food shop only**. We don't do 'top up' shopping	○2
I/we don't do main food shopping. We only **shop as we need** things	○3

[ASK ALL]

A2 **How many times** in the last 7 days did you, or other members of your household, shop at a retail outlet (not online) for food items?
Please insert number of times for each shop/ store

Supermarket DO NOT ROTATE	Number of times shopped at in last 7 days
	Insert number
Woolworths	
Coles	
Aldi	
Other supermarket (please specify)	
I don't know	◯98
I didn't shop at an instore retail outlet in the last 7 days	Not applicable ◯99

[ASK ALL]

A3 **How many times in the last 7 days** did you, or other members of your household, order take-away or home delivery? That is, food or meals that were prepared outside your home and **brought/sent to your home to be eaten**. Please exclude any meals that you had if you were away from home for the night.

[ASK ALL]

A4 **How many times in the last 7 days** did you, or other members of your household, 'eat out' for **a meal** - including at cafes, restaurants or someone else's home (include dinner, lunch or breakfast)? Please exclude any meals that you had if you were away from home for the night. *Please type in the number*

	A3	A4
DO NOT ROTATE	Ordered takeaway/ home delivery– how many times?	Eating out – how many times?
	S/R	**S/R**
Only numbers may be entered in this field.		

SECTION B: FOOD PLANNING, PURCHASING, STORAGE, PREPARATION, and DISPOSAL

[ASK ALL]-**Planning**

B1 Before **going shopping for food**, how often do you, or another member of your household, do the following?
Please choose one answer in each row

	ROTATE STATEMENTS	Almost every time (over 90%)	Most times (about 75%)	Half the time (about 50%)	Sometimes (about 25%)	Rarely / Never (less than 10%)	Don't Know/Not applicable
A	Check what food is already in the **cupboard**	○5	○4	○3	○2	○1	○99
B	Check what food is already in the **fridge/freezer**	○5	○4	○3	○2	○1	○99
C	**Plan** the meals to be cooked	○5	○4	○3	○2	○1	○99
D	Write a **list** of **basic** essentials	○5	○4	○3	○2	○1	○99
E	Write a complete **list** of **everything** needed	○5	○4	○3	○2	○1	○99

[ASK ALL] -**Purchasing**

B2 When doing the **main** food shopping, how often do you, or other members of your household, do the following?
Please choose one answer in each row

	ROTATE STATEMENTS	Almost every time (over 90%)	Most times (about 75%)	Half the time (about 50%)	Sometimes (about 25%)	Rarely / Never (less than 10%)	Don't Know/Not applicable
A	Buy food according to a set **budget**	○5	○4	○3	○2	○1	○99
B	Only buy what is on the shopping **list**	○5	○4	○3	○2	○1	○99
C	Buy food based on what is on **'special'**	○5	○4	○3	○2	○1	○99

D	Check the **'use by' or 'best before'** dates before purchasing food items	○5	○4	○3	○2	○1	○99
E	Buy food for '**just in case**'	○5	○4	○3	○2	○1	○99

[ASK ALL]-**Storage**

B3 When **storing food**, how often do you, or other members of your household, do the following? *Please choose one answer in each row*

	ROTATE STATEMENTS	Almost every time (over 90%)	Most times (about 75%)	Half the time (about 50%)	Sometimes (about 25%)	Rarely / Never (less that 10%)	Don't know / Not applicable
A	Read the storage **instructions** provided on packages	○5	○4	○3	○2	○1	○99
B	Move the oldest food items to the **front or top** so that they can be used first	○5	○4	○3	○2	○1	○99
C	Use storage **containers** to keep food for as long as possible	○5	○4	○3	○2	○1	○99
D	Put food in the **refrigerator/ freezer** so it keeps for as long as possible	○5	○4	○3	○2	○1	○99
E	Find it hard to fit food into the fridge and/or freezer because it's **already full**	○5	○4	○3	○2	○1	○99

[ASK ALL] – **Preparation**

B4 When **preparing food**, how often do you, or other members of your household, do the following? *Please choose one answer in each row*

[Keep D-F together when rotating]

	ROTATE STATEMENTS	Almost every time (over 90%)	Most times (about 75%)	Half the time (about 50%)	Sometimes (about 25%)	Rarely / Never (less than 10%)	Don't Know/Not applicable

A	Try to use up the **oldest** food first	○5	○4	○3	○2	○1	○99
B	Stick to **ingredients** in a recipe	○5	○4	○3	○2	○1	○99
C	Only prepare as much as is **needed**	○5	○4	○3	○2	○1	○99
D	Prepare too much food which is not all eaten, and **dispose of** the extra food **straight away**	○5	○4	○3	○2	○1	○99
E	Prepare extra food, store these leftovers to be eaten later on, and **end up eating them**	○5	○4	○3	○2	○1	○99
F	Prepare extra food, store these leftovers to be eaten later on, but end up **disposing of them**	○5	○4	○3	○2	○1	○99
G	Let **others serve** themselves	○5	○4	○3	○2	○1	○99

[ASK ALL]-**Disposal**

B5a In relation to the **reasons why food is not eaten** in your household, and hence needs to be disposed of, how much do you agree with the following?

Please choose one answer per row

DO NOT ROTATE	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Don't Know	Not applicable
We **do not** dispose of **<u>any</u>** food in our household	○5	○4	○3	○2	○1	○98	○99
We **buy too much** food	○5	○4	○3	○2	○1	○98	○99
We like to eat the **freshest** food possible	○5	○4	○3	○2	○1	○98	○99

We do not keep food past its **'use by' or 'best before'** date	○5	○4	○3	○2	○1	○98	○99
We are not sure if food is still **safe** to eat	○5	○4	○3	○2	○1	○98	○99
We don't **cook the meals** we planned	○5	○4	○3	○2	○1	○98	○99
Last minute change of plans (family members don't turn up for meal etc)	○5	○4	○3	○2	○1	○98	○99
Household members don't **finish their meal**	○5	○4	○3	○2	○1	○98	○99
We don't know how to use **cooked leftovers**	○5	○4	○3	○2	○1	○98	○99
We don't know how to use **leftover uncooked ingredients**	○5	○4	○3	○2	○1	○98	○99
Other, please specify: _____							

SECTION C: MOTIVATION

[ASK ALL]

C1 How motivated are you to reduce the amount of food that is not eaten and hence disposed, of in your household?

Please choose only one of the following:

REVERSE LIST FOR HALF OF RESPONDENTS 1-5. DO NOT RANDOMISE ORDER	**S/R**
I'm already doing this most of the time	○1
I do this, but just some of the time	○2
I don't do this, but have decided to start doing it	○3
I don't do this, but I am thinking about it	○4
I don't do this and at the moment I have no plans to start doing so	○5

[ASK ALL]

C2 When you last chose to do something to reduce the amount of food you disposed of, how much was that motivated by:

Please choose as many as apply

		D2a How motivated					
	ROTATE STATEMENTS	Very motivated	Somewhat motivated	Neither	Somewhat unmotivated	Very unmotivated	Not sure
		S/R					
A	**Saving money** (from the cost of food not eaten)	○5	○4	○3	○2	○1	○99
B	**Saving the planet** (scarce water, energy and other resources are used up in the food not eaten)	○5	○4	○3	○2	○1	○99
C	Doing the **right thing** (providing benefits for others in society)	○5	○4	○3	○2	○1	○99
D	**Habit** (based on upbringing/culture/spiritual beliefs)	○5	○4	○3	○2	○1	○99
E	Setting a **good example** (for family and friends)	○5	○4	○3	○2	○1	○99
	[Other please specify: _____						

SECTION D: CHANGING BEHAVIOURS

[ASK ALL]

D1 If you were to change your food purchasing, storing, preparing and disposal behaviours to reduce the amount of food not eaten and hence disposed of, how much effort would be required?

		No effort at all	Not much effort	Neutral	A fair bit of effort	A lot of effort	Don't Know

A	Changing your food **planning behaviours**	○5	○4	○3	○2	○1	○99
B	Changing your food **shopping** behaviours	○5	○4	○3	○2	○1	○99
C	Changing food **storing** behaviours	○5	○4	○3	○2	○1	○99
D	Changing your food **preparation** behaviours	○5	○4	○3	○2	○1	○99
E	Changing your food **disposal** behaviours	○5	○4	○3	○2	○1	○99

D2 In your opinion?
Please select one answer

[Show below D1]

		Almost every time (over 90%)	Most times (about 75%)	Half the time (about 50%)	Sometimes (about 25%)	Rarely / Never (less than 10%)	Don't Know
A	It is **possible to avoid having uneaten food** that needs to be disposed of	○5	○4	○3	○2	○1	○98

SECTION E: FOOD DISPOSED OF

[ASK ALL]

E1 In the past **7 days,** how much of the following food types do you estimate was disposed of in your household?

Include all food and liquids:

- put in the bin
- put into the compost
- put in the worm farm
- tipped down the sink
- fed to pets
- disposed of by any other household members

Please choose one answer in each row

	Food Category	Some examples of this category	Unit of measurement 1 cup= 250ml or 250g	Type in number of cups that disposed of in the last 7 days
1	**Food prepared at home**	Includes dishes prepared at home as well as ingredients such as cooked pasta, rice etc.	one cup	
2	**Takeaway and home delivery meals**	Includes takeaway meals consumed at home and home deliveries eaten at home.	one cup	
3	**Fresh vegetables**	Includes salads, fresh herbs and some items that are seeded but considered as vegetables such as avocado and tomato	one cup	
4	**Frozen/canned/dried vegetables**	Includes frozen potatoes, canned beetroots, dried mushrooms etc.	one cup	
5	**Fresh fruits**	Includes fresh bananas, oranges, berries, apples etc.	one cup	
6	**Frozen/canned/dried fruit**	Includes frozen blue berries, tinned peaches, dried sultanas etc.	one cup	
7	**Dairy**	Includes milk, yogurt, cheese, butter etc.	one cup	
8	**Meat and seafood**	Includes chicken, beef, pork, fish, prawns, sausages, processed meats etc.	one cup	
9	**Bread**	Includes whole loaves and sliced bread, bread rolls etc.	one slice	
10	**Bakery**	Includes biscuits, pastries, pies, muffins, donuts etc.	one cup	
11	**Cakes/desserts/confectionaries and snacks**	Includes cakes, desserts, chips, nuts etc.	one cup	
12	**Drink**	Includes tea, coffee, juices, soft drinks etc.	one cup	
13	**Other**	Includes dairy alternatives, meat alternatives, flour, rice, noodles, cereal, pasta, beans, lentils etc.	One cup	
14	**Possibly avoidable**	Includes peels, stems, outer leaves etc.	one cup	

15	**Unavoidable food waste**	Includes anything inedible such as skins, bones, shells, cores, tea bags, coffee grounds etc.	one cup	

[ASK ALL]

[ONLY PIPE IN BINS THEY USE FROM S4.]

E2 Thinking about the food that you dispose of, where do you dispose of it?

Please choose one answer in each row

	[DO NOT ROTATE]	Almost every time (over 90%)	Most times (about 75%)	Half the time (about 50%)	Sometimes (about 25%)	Rarely / Never (less than 10%)	Not applicable	Don't Know	
A	Put in general **rubbish bin** (Dark Green or Black body with **Red lid)**	○5	○4	○3	○2	○1	○99	○98	**[SHOW CODE A TO ALL]** **CONTINUE**
B	Put in **green waste/organics bin** (Dark Green or Black body with **Green lid)**	○5	○4	○3	○2	○1	○99	○98	**[ONLY SHOW CODE B IF CODE 4 IS SELECTED AT S4]**
C	Put in home **compost bin**	○5	○4	○3	○2	○1	○99	○98	**[ONLY SHOW CODE C IF CODE 5 IS SELECTED AT S4]** CONTINUE

D	Put in **worm farm**	○5	○4	○3	○2	○1	○99	○98	**[ONLY SHOW CODE D IF CODE 6 IS SELECTED AT S4]** CONTINUE
E	Give to **animals** (dog, chickens etc)	○5	○4	○3	○2	○1	○99	○98	**[ONLY SHOW CODE E IF CODES 7, 8, 9 OR 10 SELECTED AT S4]** CONTINUE
F	Tip down the **sink** (this includes liquid, for example milk)	○5	○4	○3	○2	○1	○99	○98	**[SHOW CODE F TO ALL]** CONTINUE
G	Other, please specify: _____								

Demographics

Z1 Please indicate your gender:
Please choose one of the following:

DO NOT ROTATE	**S/R**	
Male	○1	CHECK QUOTAS
Female	○2	CHECK QUOTAS
I identify as [OPEN ENDED BOX IF CODE 3]	○3	CONTINUE

Z2 Which of the following best describes your residence?

Please choose only one of the following:

	S/R	
Separate house	◯1	CONTINUE
Semi-detached terrace house, townhouse etc.	◯2	CONTINUE
Flat, unit, apartment	◯3	CONTINUE
Other residence (specify) _____	◯95	CONTINUE

Z3 How many people in each age group usually live at your household? (Please include them if they live there half the time or more).

Please insert number of people in each row

[A NUMBER IN AT LEAST ONE FIELD MUST BE 1 OR GREATER. NOT ALL FIELDS MANDATORY]

	Insert number
0-4 year olds	
5-9 year olds	
10-14 year olds	
15-19 year olds	
20-24 year olds	
25-34 year olds	
35-44 year olds	
45-54 year olds	
55-64 year olds	
65-74 year olds	
75 years old or older	

Z4 Which of the following best describes your household?

Please choose only one of the following:

Household of unrelated people	◯1	CHECK QUOTAS
Couple living together with no children	◯2	CHECK QUOTAS

Couple with children (<17 years old)	○3	CHECK QUOTAS
Couple with adult children (>18 years old)	○4	CHECK QUOTAS
Single parent with children (<17 years old)	○5	CHECK QUOTAS
Single parent with adult children (>18 years old)	○6	CHECK QUOTAS
Couple living without children (child/children no longer reside in same household)	○7	CHECK QUOTAS
Living alone	○8	CHECK QUOTAS
Other (specify) _____	○95	CHECK QUOTAS
Prefer not to say	○99	CONTINUE

Z5 How many income earners are there in your household?

DO NOT ROTATE	**S/R**	
1	○1	CHECK QUOTAS
2	○2	CHECK QUOTAS
3 or more	○3	CHECK QUOTAS
There are no income earners in my household	○99	CONTINUE

Z6 Which of the following best describes your household income? (**before tax per week**)

(This refers to the total income from all household occupants, and includes income from wages and salaries, government benefits, pensions, allowances and any other income you usually receive. It is before deductions for tax and superannuation contributions)

Please choose only one of the following:

Negative income	○1
No income	○2
$1-$149 per week ($1-$7,799 per year)	○3
$150-$299 per week ($7,800-$15,599 per year)	○4
$300-$399 per week ($15,600-$20,799 per year)	○5
$400-$499 per week ($20,800-$25,999 per year)	○6
$500-$649 per week ($26,000-$33,799 per year)	○7
$650-$799 per week ($33,800-$41,599 per year)	○8

$800-$999 per week ($41,600-$51,999 per year)	○ 9
$1,000-$1,199 ($52,000-62,399 per year)	○ 10
$1,200-$1,399 ($62,400-$72,799 per year)	○ 11
$1,400-$1,549 ($72,800-80,599 per year)	○ 12
$1,550-$1,699 ($80,600-$88,399 per year)	○ 13
$1,700–$1,799 ($88,400-$93,599 per year)	○ 14
$1,800–$1,899 ($93,600-$98,799 per year)	○ 15
$1,900–$1,999 ($98,800-$103,999 per year)	○ 16
$2,000–$2,199 ($104,000-$114,399 per year)	○ 17
$2,200–$2,399 ($114,400-$124,799 per year)	○ 18
$2,400–$2,599 ($124,800-$135,199 per year)	○ 19
$2,600–$2,799 ($135,200-$145,599 per year)	○ 20
$2,800–2,999 ($145,600-$155,999 per year)	○ 21
$3,000–3,499 ($156,000-$181,999 per year)	○ 22
$3,500–3,999 ($182,000-$207,999 per year)	○ 23
$4,000–4,499 ($208,000-$233,999 per year)	○ 24
$4,500–4,999 ($234,000-$259,999 per year)	○ 25
$5,000–5,999 ($260,000-$311,999 per year)	○ 26
$6,000 or more ($312,000+ per year)	○ 27
Prefer not to say	○ 99

Thank you very much for your time today.

Do you have any comments in relation to this survey?

Please write your answer here:

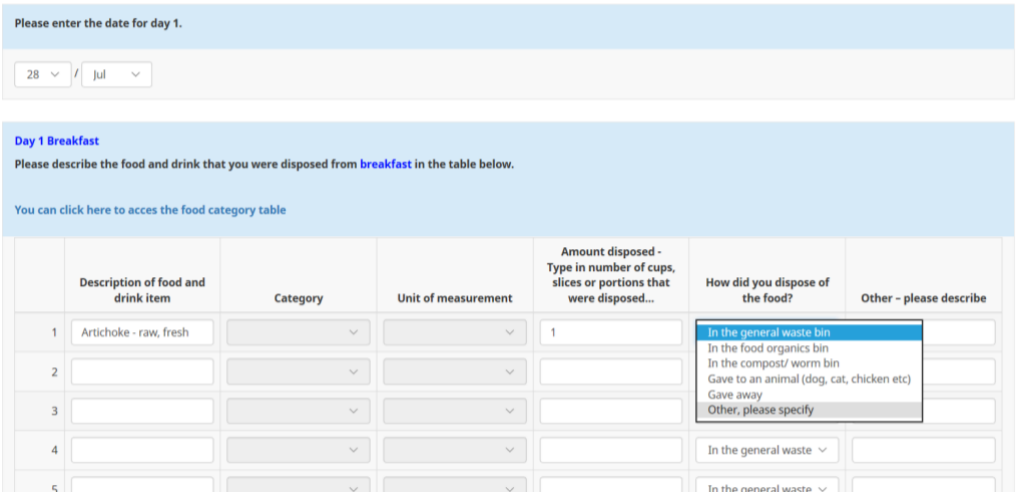
Please click 'submit' to send your responses to us.

Thanks for agreeing to participate in our research. We will contact you again in next few weeks once we start this research.

Please note: due to a large number of potential people interested in this research, your participation may not be guaranteed.

Appendix C – Electronic diary

Electronic diary interface



A dropdown list of food appeared when letters were typed into the 'description of food and drink item' field. The list narrowed down in alphabetical order to match the letters typed in as a 'smart form'. After 5 rows of foods were added, an additional 5 blank rows would appear, up to 15 rows.

The categories were automatically set based on the food description chosen, and are shown in the appendix below. The unit of measurement was also set to 'cups', except where slices of bread and bread rolls were concerned.

The other fields had dropdown lists including quantities of cups and where the foods were disposed of.

Finally, the 'Other – please describe' field allowed free text typing.

A button appeared below the diary rows to submit the meal and move on to the next meal. The order of meals each day was as follows:

- Breakfast
- Lunch
- Dinner
- Between meals (including any foods disposed of at any other time, such as when clearing out the fridge)

Electronic diary food categories

	Food Category	**Some examples of this category**	**Unit of measurement** **1 cup= 250ml** **or 250g**
2.0	**Fresh vegetables/herbs**	Includes any fresh vegetables/ herbs not listed	
2.1	Fresh vegetables	Unprocessed fresh vegetables considered perishable and not preserved by canning,	one cup

		freezing or drying. Includes some items that are seeded but considered as vegetables such as cucumber, capsicum and tomato	
2.2 (category1 in food waste bench mark)	Fresh salad leaves	Unprocessed salads which include lettuce and leafy greens	one cup
2.3	Fresh herbs		
3.0	**Processed vegetables, legumes and pulses, meat alternatives. Includes frozen.**	Includes any processed vegetables, legumes, pulses not listed	
3.1	Processed vegetables/ salad.	Vegetables and vegetable-based salads which have been canned, frozen or dried. This includes canned corn, beetroot, vegetable mixes, tomatoes	
3.2	Legumes, pulses, peas, beans,	Tofu, tempeh, dried and canned beans (eg soy, borlotti, red kidney beans, baked beans), chickpeas, lentils,	one cup
4.0	**Fresh fruit**	Includes any fresh fruit not listed	
4.1	Fresh fruit	Unprocessed fresh fruit considered perishable and not preserved by canning, freezing, drying or other types of processing	one cup of chopped
5.0	**Processed fruit**	Includes any processed fruit not listed	
5	Processed fruit	Processed fruits which have been preserved by canning, freezing, drying or other types of processing such as tinned fruit, toffee apples.	one cup
6.0	**Meals – cooked food and ready to eat food & drinks**	Includes any meals not listed	
6.1	MEALS- a combination of ingredients to make a meal or dish (home cooked or pre-prepared)	Home cooked meals or dishes (eg casseroles, stews, lasagne, baked dinner, stir fry, spaghetti bolognese) and pre-prepared meals or dishes eg from supermarket to be heated up at home	one cup

		either from fresh or frozen (calorie-controlled meals, whole pizzas with topping)	
6.7 (category7 in food waste bench mark)	Any meal or dish, snack or beverage bought as a **takeaway** intended to be consumed **at home.** Uneaten take-away and home deliveries eaten at home	Example: -Thai, Chinese, Indian -pizza, hamburgers, hot dogs, kebabs, takeaway chicken -takeaway tea/coffee/drinks	one cup
8.0	**MEAT -as a basic ingredient, not combined with other ingredients to make a meal**	Includes any meat /fish/meat alternatives, not listed	
8.1	Meat, poultry - raw/uncooked	Raw or uncooked meat such as poultry (chicken/ turkey/ duck), beef, lamb, pork. Skin/fat trimmings included. Doesn't include seafood.	one cup of chopped
8.2	Meat, poultry -cooked or processed (ie preserved, cured, salted, smoked, pickled, frozen)	Stand-alone cooked meat . Meat and poultry that isn't combined with other ingredients to make a dish. This includes poultry (chicken/ turkey/ duck), beef, lamb, pork. Skin/fat trimmings included. Eg BBQ Pork chops (rather than part of a baked dish) , steamed chicken breast (rather than strips as part of a stir fry) Incudes meat and poultry that has been preserved or cured. eg ham, bacon, devon, prosciutto, spam, frankfurt, cabanossi, salami, salted fish, beef jerky, chicken roll.	one cup of chopped
9.0	**SEAFOOD -as a basic ingredient, not combined with other ingredients to make a meal**		
9.2	Seafood- raw, uncooked	Any type of seafood that hasn't been cooked or processed in any way but remains in its natural form.	one cup of chopped
9.3	Seafood – cooked or processed (ie preserved, cured, salted, smoked, pickled, frozen)	Any type of seafood that has been cooked (eg by frying steaming, baking) or has been preserved or cured in some way (through eg	one cup of chopped

		smoking, salting, freezing) eg salted fish, frozen fish fingers, tinned tuna	
12.0	**Condiments, dried herbs and spices, spreads, oils**	Includes any condiments, dried herbs and spices, spreads, oils not listed	
12.1	Condiments	Salt, pepper, stock- cubes, liquid, powdered. Other similar items not listed in the rest of section 12	one tablespoon
12.3	Dried Herbs and powdered Spices	Includes any dried, ground or powdered herbs and spices	one tablespoon
12.4	Spreads	Eg Vegemite, jam, peanut butter, honey, nut spreads eg Nutella	one tablespoon
12.5	Sauces, dips, gravy, marinades, dressings, oils, vinegars	Eg soy, taco, tomato, ketchup, BBQ, salsa, chutney, mayonnaise hummus, pesto, tzatziki. Any cooking oil and vinegar	one tablespoon
11.0	**Dairy and dairy alternatives**	Includes any dairy and dairy alternatives not listed	one cup
11.1	Dairy and dairy alternatives	Milk, cheese, dairy buttermilk, cream, yogurt, butter, dripping, eggs (excluding eggshells).	one cup
11.2	Dairy alternatives	Dairy alternatives eg margarine, almond or soy milk, non-dairy buttermilk, vegan cheese, coconut yogurt, non-dairy spreads eg Nutelex Meat alternatives, soy meat alternatives (eg soy sausages, soy mince)	
10.0	**Bakery- bread, cakes, desserts**	Includes any bakery items not listed	one cup
10.1	Bread	Bread and bread rolls, bread sticks	one slice of sandwich bread – standard size, not thick sliced
10.2	Bakery	Muffins (English and high top), crumpets, scones, donuts, sweet buns	one cup
10.3	Cakes/ desserts	Any cake including (cheesecake, cupcakes, pavlova, friands) ice-cream, custard tarts,	one cup

		pudding (sweet eg Xmas pudding), other desserts	
10.4	Biscuits (sweet)	Eg Monte Carlos, Anzac, Tim Tams	one cup
10.5	Pastries and pies-anything with a pastry (sweet)	Apple pie, strudel, choux pastry snails, fruit pies	one cup
10.6	Pastries and pies -anything with a pastry (savoury)	Meat pie, cheese and spinach roll, sausage roll, pastry quiche	one cup
13.0	**Staples – dried**	Includes any dairy and dairy alternatives not listed	one cup
13.1	Staple foods	Includes pasta, couscous, breakfast cereal, noodles, pastry bases (eg shortcrust, filo, pizza base)	one cup
13.2	Grains and flour	Grains (eg wheat, oats, barley, cornmeal, polenta, rice) and flour (eg wheat, semolina, coconut, gluten free, almond meal)	one cup
13.3	Other baking ingredients	Cake mix, baking powder, dry yeast, breadcrumbs, gelatine, jelly, sugar and sugar substitutes, vanilla	one cup
13.4	Nuts and seeds	Nuts (eg almond, pistachio, hazelnut, peanut) and seeds (eg sesame, pepitas, chia), not herb seeds	one cup
15.0	**Confectionery and snacks**	Includes any confectionary and snacks not listed	one cup
15.1	Confectionary	Chocolates, lollies, licorice, chewing gum	one cup
15.2	Sweet snacks	Fruit bars, muesli bars	one cup
15.5	Savoury snacks	Chips, popcorn, rice cakes, crackers (rice, wheat cracker, gluten free)	one cup
17.0	**Inedibles**	Includes any inedibles not listed	one cup/one cup chopped
17.1	Peelings/ stems/ outer leaves	Peelings from vegetables including potato and carrot peel, broccoli stems, cabbage leaves, spring onion/shallot tops and bean and sprout ends	one cup

17.2 (category 18 in food waste bench mark)	Skins (bananas etc.)	Skins mainly from fruit such as bananas, oranges, lemons, limes, pineapples, mangoes, melons and kiwi fruit	one cup of chopped
17.3 (category 19 in food waste bench mark)	Bones/ pips/ corn cobs/ eggshells/ cores	Includes anything inedible such as chicken bones, T-bones, ribs, fish bones, corn cobs, eggshells, fruit and vegetable pips, seeds and cores, crab and prawn shells, tea bags and coffee grounds, etc.	one cup of chopped
20.0	**Beverages- hot or cold**	Includes any beverages hot or cold not listed and their base ingredients	one cup
20.1	Beverage-solid form- (needs to be mixed with a liquid to drink it) and cast offs	All fresh or used tea/coffee bags, loose leaf tea, coffee grounds and instant coffee, powdered drink additives eg milo, cocoa, salvital,	one cup
20.2 (category 21 in food waste bench mark)	Beverage- liquid form, ready to drink	Includes coffee and tea, fruit juice, flavoured milk beverages, soft drinks, cordial, water and alcoholic beverages such as beer, lager, cider, spirits and wines	one cup

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