



Profiles of Australian households for food waste reduction interventions



FIGHT FOOD WASTE
Cooperative Research Centre
REDUCE - TRANSFORM - ENGAGE



Australian Government
Department of Industry, Science,
Energy and Resources

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Centres Program

This research was commissioned by the Project Steering Group for the Designing effective interventions to reduce household food waste project within Fight Food Waste Cooperative Research Centre. Project Steering Group members are:



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1. Executive Summary

This research project is part of the Australian Fight Food Waste Cooperative Research Centre's (FFW CRC) *Engage program* and focuses on the problem of household food waste. The project aims to develop a deeper understanding of Australians' attitudes and behaviours towards food waste and to identify commonalities in segments of the population that will assist in the development of targeted interventions.

A two-part approach was utilised to identify and explore different population segments:

1. Data-driven *segmentation analysis* that used existing data sets from national research conducted by the FFW CRC to cluster groups based on their behaviours, food waste amounts and demographics.
2. *Qualitative interviews* with individuals that represented the different segments in order to gain deeper insights into their food provisioning and food waste practices.

Three segments were identified through this process and detailed profiles for each were developed based on the collated data sets and interviews. The segments are as follows:

- **Over Providers** are typically represented by young families with children, often with both parents working. While they plan their food shopping, they tend to purchase and cook more than is needed. They waste the most food out of all three segments on a per household and per capita basis, and while they are motivated to change food related behaviours to reduce food waste, they feel that this would require some effort. This effort seems to stem from the added challenge that this segment has in negotiating the unpredictable tastes and appetites of their children (see Figure 1).
- **Under Planners** are typified by single or couple households, often without young children, and are the least likely to plan food shopping and cooking. At the same time, they are less likely to prepare too much food that goes uneaten. Under Planners are the least motivated to change their behaviours to reduce food waste. This is despite a belief that these changes would not require much effort. This segment seems to be generally disinterested in food shopping or cooking (see Figure 3).
- **Considerate Planners** are best represented by older couple-based households, many with children that no longer live at home. This segment engages in waste reduction behaviours across planning, shopping and cooking practices. They are slightly more motivated to reduce

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food waste than Over Providers, however, consider change to not require much effort. They express a strong interest and love for food and show pride in being organized (see Figure 5).

We also identified that all the segments disliked food waste and felt guilty when it happened, that many of their food-related practices are habituated and often performed unthinkingly, and that many household food practices are enacted within conditions imposed by what is available from food retailers.

Based on this segmentation process, we recommend that the *Over Providers segment is prioritised for food waste reduction interventions*, given their positive motivations to change and relatively higher food waste amounts.

While we consider Over Providers to be the priority segment, a number of recommendations were made for each segment. This includes key behaviours to target for each:

Table 1: key behaviours to target for each target

Over Providers	Under Planners	Considerate Planners
<ul style="list-style-type: none"> · When shopping, buy only food that is needed by their household · When cooking, prepare the right amount of food for their household (based on hunger levels and who will be home) · Cook regular meals that combine food that needs to be used up (including leftovers) 	<ul style="list-style-type: none"> · Make a meal plan for a set number of days · Check food stocks at home before food shopping · Make a complete shopping list before food shopping · Store food correctly at home after a food shop 	<ul style="list-style-type: none"> · Become mentors for Over Providers to help reduce their food waste

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We also recommend a range of messaging and intervention implications for each segment, including:

- **Over Providers:** Personalised food waste audits to make the problem real; context and time specific messaging to support behaviours where they occur; messages that leverage different emotional and social influencers; and engage children in food provisioning through school-based programs and with targeted advice for parents (see Figure 2).
- **Under Planners:** Emphasise the time efficiency aspects of planning behaviours; and change the supermarket choice environment to make food waste reduction implicit in choices (rather than actively engaging with this segment to change behaviours) (see Figure 4).
- **Considerate Planners:** While this segment is not a priority for food waste reduction interventions, we highlight their potential role as mentors for Over Providers and that changing supermarket choice environments also helps to further reduce their food waste.

The Over Providers



Figure 1: Over Providers

The Under Planners

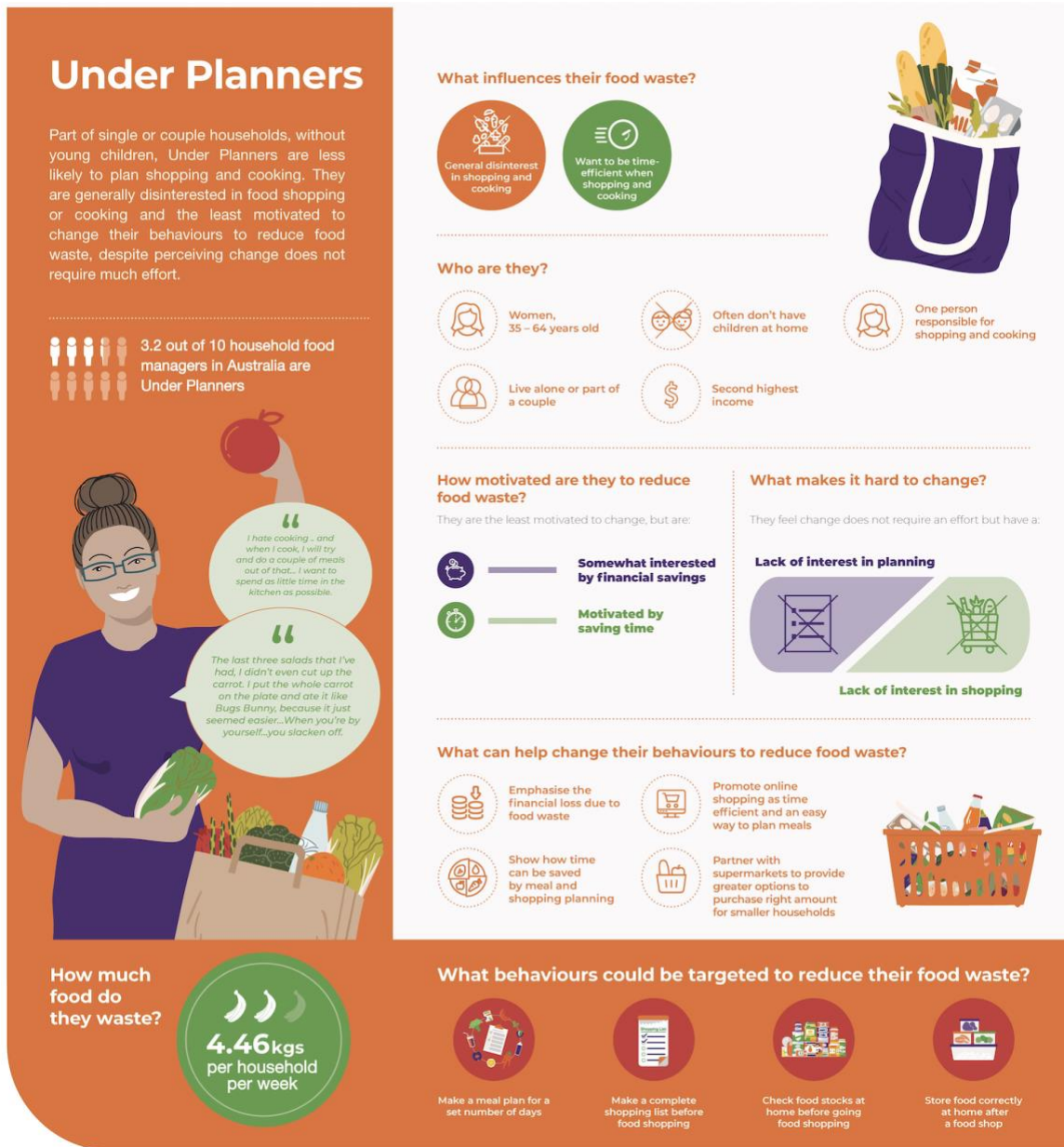


Figure 2: Under Planners

The Considerate Planners



Figure 3: Considerate Planners

2. Introduction

The Fight Food Waste Cooperative Research Centre (FFW CRC) aims to tackle the global food waste challenge by reducing food waste throughout the food value chain, transforming unavoidable waste into innovative high-value co-products, and engaging with industry and consumers to deliver behaviour change. As part of the CRC's *Engage program* focusing on household food waste, this research project seeks to gain a deeper understanding of Australians' attitudes and behaviours towards food waste and to identify commonalities in segments of the population that will assist in the development of targeted interventions.

This project contributes to these aims through a two-part approach that identified and explored different segments in the Australian population based on their behaviours and food waste outcomes.

Part 1 involved a data-driven segmentation analysis using existing data sets from national research conducted by the CRC that benchmarked Australian householders' attitudes, perceptions and behaviours in relation to producing and managing food waste (Karunasena, Pearson, and Fight Food Waste CRC, 2021^{1,2,3}). Multiple measures of household food waste were available, including data collected from a benchmark survey, as well as electronic diaries, and bin audits.

Once the segments were identified, Part 2 of this project involved conducting qualitative interviews with individuals that represented the different segments. These generated deep insights into their food provisioning and food waste practices, and helped to create segment profiles.

This report presents the project outcomes and is divided into the following sections:

1. A description of each segment profile identified. This draws on the findings of the segmentation analysis and the interviews to present a profile of each segment based on key behaviours, demographics, illustrative quotes and other variables.
2. Recommendations for engaging each of the segments in food waste reduction, including possible target behaviours, messages and interventions, and trusted information sources.
3. A detailed discussion of the segmentation analysis (Part 1), including the methods used, major decision points and results.
4. A detailed discussion of the interview process (Part 2), including the methods used and themes that emerged from the analysis.
5. Appendices for the more technical details of the segmentation analysis, the interview questions and participant recruitment criteria.

The segmentation overview and recommendations have been deliberately placed at the front of the report to make it easier for the reader to engage with the main outcomes of this project. The sections

that follow are more granular and technical in nature and are for those readers that wish to engage with this level of detail.

3. Segment Profiles

Three main segments were identified in the Australian population based on their demographics and food related behaviours:

1. **Over Providers.** Often young families with children, while this segment plans shopping, they tend to purchase and cook more than needed, and to waste the most food.
2. **Under Planners.** Often single or couple-based households without children, this segment is the least likely to plan shopping and cooking, but is also less likely to prepare too much food that goes uneaten.
3. **Considerate Planners.** Often older couple-based households with children that have left home, this segment is the most likely to plan shopping, almost never prepares too much food that goes uneaten, and prioritises old food for use.

Profiles of each segment based on key differentiating behaviours, demographics, food waste outcomes and other key variables are described in the remainder of this section. These are based on the detailed results from the segmentation analysis and interviews provided in Sections 4 and 5. This section also presents cross-cutting themes identified for all segments.

3.1. Over Providers

“And the kids can be unpredictable ... because they might eat a quarter of what you give them. Sometimes they eat it all, you just never know with them [but] at least 50% of the time you're throwing out a lot of their food.”

How much, and what, do they waste?

Across all data-sets collated by the CRC, this segment was found to consistently waste the most food weekly, on a per household and per capita basis. The households reported a **household weekly average of 6.33¹ kgs** and a **per capita average of 2.65 kgs** of food waste for Over Providers.

¹ The waste bin audits only reported the food wasted in the red bin. As such, weight of household waste per each segment and category level waste were adjusted using the factor 2.37 (Calculated total food waste/Food waste based on the bin audit = 4.22/1.78) when arriving at the total waste.

This segment wastes the most across all different food types measured, and the difference to other segments was most noticeable **for fresh vegetables** (1 kgs per household), **meat and seafood** (0.30 kgs per household), and **breads and other bakery items** (0.52 kgs per household)¹.

What are their demographic features?

Over Providers are best represented by young family households. They typically:

- Are both men and women
- Are aged under 45 years old
- Have children (aged 14 or younger) at home
- Have three or more people at home (usually families)
- Have two income earners (over half)
- Earn \$3000 or more per household a week (one in three)
- Share responsibility for planning, shopping and storing food

23.4% of the total CRC survey sample fell into the Over Providers segment.

What are their attitudes and food waste related behaviours?

Attitudes

Over Providers do not like the idea of food waste and feel bad about the food that they did waste. They also generally showed positive attitudes to different shopping and cooking behaviours that would reduce food waste, appreciating their cost saving, efficiency and waste reduction benefits.

Common behaviours that reduce food waste for this segment

The current food waste reduction behaviours of Over Providers are mainly concentrated to the planning end of the household food provisioning spectrum. Most of the time they:

- Make a weekly meal plan to help guide their shopping
- Check household food stocks (in the pantry and the refrigerator) before shopping

About half of the time they also make a complete shopping list before shopping.

Common behaviours that increase food waste for this segment

Despite planning their shopping, Over Providers are most likely to:

- Buy extra for 'just in case' when shopping
- Prepare too much or extra for meals

While these over purchasing and cooking behaviours are possibly supported by Over Providers having the highest average income of the segments, a key influencer also seems to be the unpredictability of the tastes and appetites of their children. Over Providers buy and cook extra food to have something available 'just in case' their children did not like what was prepared for a meal or were hungrier than usual.

"I try and cook one thing for all of us, but sometimes my two-year-old [says] that something he liked yesterday, he won't like today ...I will generally plan a meal for our family, but also have something on the side just in case ... and he just eats a sandwich or whatever for dinner."

While Over Providers are most likely to prepare more than needed for a meal, they are also most likely not to eat leftovers. This seems to stem from:

- The unpredictability of their children's' tastes and appetites (refusing meals they have eaten previously)
- Typically having full fridges from purchasing more than needed (meaning that leftovers can be ignored in favour of 'fresher' options)
- Eating out or ordering take-away more often than other segments (and therefore ignoring leftovers that needed to be eaten)

"Sometimes it's like your healthy self on a Friday will do the shopping for the next week, and then you get to next Thursday night and you go, "Oh my God, I can't stand chicken and broccoli," so I, "Stuff it, I'm getting pie or whatever." So, it can depend on how you're feeling as well."

What are the emotional, cultural and social drivers to food use and waste in this segment?

While no cultural influences of food use and waste were identified for this segment, several social and emotional drivers emerged. Providing more food for a meal than might be needed for family and guests is considered an important expression of love and care as both a parent and a host. This behaviour by Over Providers seemed to be one that was learnt (and enacted almost instinctively) from their own parents.

"Because I don't like to leave people hungry and that can mean I am a bit of an over caterer ... think I've got that from my mom. I just never want anyone to leave my house hungry. I would hate for someone to come to my house for dinner and then go to Macca's on the way home. I just always, always over catering"

Both deep dive interviews with Over Providers also identified the strong social influence of health programs from local gyms on their food behaviours. Guided by the set menus from these programs, they willingly changed both what, and how much, they purchased and cooked.

What is their readiness for, and motivators and barriers to, changing how much they waste?

Over Providers are somewhat motivated to reduce the amount of food waste they generate. Common motivators identified include the potential to save money, to make a positive contribution to environmental issues and to set an example of doing the right thing for their children.

However, Over Providers also believe that some effort was needed to change their food planning, shopping, storage, and cooking behaviours in order to reduce food waste. In addition to the possible barriers to change stemming from the busyness and variability of weekly household schedules (something common to all segments), the challenge of negotiating the unpredictable tastes and appetites of their children was seen as a significant barrier to change.

"It's just unpredictable how much [our children will eat]. Our baby, 11-month-old, he's pretty good. He'll eat what I give him and he's a bit more predictable. But with the toddler, it's just next level. [I have] No idea."

Every week it could be something different; something different happens or work changes and appetite changes, and life.

3.2. Under Planners

"The last three salads that I've had, I didn't even cut up the carrot. I put the whole carrot on the plate and ate it like Bugs Bunny, because it just seemed easier... when I have my friends staying ... then I make the effort. When you're by yourself ... you slacken off."

How much, and what, do they waste?

There was some variation between the data-sets in how much food waste Under Planners generate compared to the other segments. They were found to produce a similar amount of waste to Considerate Planners in the electronic diary, a similar amount to Over Providers in the survey, and were in-between the other two groups in the bin audits.

We draw on the bin audits as the most objective measure of household food waste to position Under Planners as the second most wasteful of the three segments. Under Planners wasted a **household**

weekly average of 4.46 kgs and a **per capita average of 2.09 kgs** of food ². Of the different food types, **fresh vegetables** (0.47 kgs per household), **fresh fruit** (0.40 kgs per household) and, **bread and other bakery items** (0.38 kgs per household) stood out as being wasted the most by this segment.

What are their demographic features?

Under Planners are the most diverse in their living arrangements and are best represented by single or couple households without children. They typically:

- Are women
- Are aged between 35 – 64 years old
- Do not have children (aged 14 or younger) at home
- Either live alone or in a couple household (around half)
- Rely on a single income (around two in five)
- Earn between \$1000 - \$1999 per household a week (one in three)
- Have one person responsible for most aspects of household food provisioning

31.6% of the CRC survey sample fell into this segment.

What are their attitudes and food waste related behaviours?

Attitudes

Under Planners do not like the idea of food waste and feel bad about the food that they did waste. They also generally showed positive attitudes to shopping and cooking behaviours that would reduce food waste, appreciating their cost saving, efficiency and waste reduction benefits.

Common behaviours that reduce food waste for this segment

The main food waste reduction behaviour that defines the Under Planners is that they almost never prepare too much food which goes uneaten. If they prepare too much for a meal then this is typically done with a plan for those leftovers and this plan is then more than likely followed.

Common behaviours that increase food waste for this segment

As suggested by their name, Under Planners are the least likely of the segments to:

- Make a meal plan and check food stocks, in order to guide their shopping

²The waste bin audits only reported the food wasted in the red bin. As such, weight of household waste per each segment and category level waste were adjusted using the factor 2.37 (Calculated total food waste/Food waste based on the bin audit = 4.22/1.78) when arriving at the total waste.

- Make a complete shopping list before shopping
- Try and prolong the life of food

The planning and shopping elements of the food provisioning spectrum for Over Providers seem to generally be random and haphazard, and driven primarily by what is on special rather than what their household actually needs.

“I am motivated by what's on special. Every week I [look at supermarket] specials on the catalogues online. ... See what's on special and make a note of that. Make up a shopping list from that.... whether I need it or not.”

While not as likely to dine out or order takeaway as Over Providers, this segment did so more than the Considerate Planners.

What are the emotional, cultural and social drivers to food use and waste in this segment?

Under Planners interviewed also identified the influence their own up-bringing, and parental food-related behaviours, on their food provisioning and waste practices. While cultural drivers were not identified, this segment was the only one to mention negative emotions associated with food practices.

“I hate cooking anyway, and often when I cook, I will try and do a couple of meals out of that... I want to spend as less time in the kitchen as possible.”

This segment seems generally disinterested in food provisioning and regards it rather as a necessary chore to be endured and finished off as soon as possible. For some in this segment, this might be associated with living by themselves and not seeing the value in making an effort for just one person.

If care and love was associated with food provisioning, it was making sure that their pets had enough to eat and always checking pet food amounts before going shopping.

What is their readiness for, and motivators and barriers to, changing how much they waste?

Of the three segments identified in this study Under Planners are the least motivated to reduce the amount of food waste they generate. While saving money is of some interest, this lack of motivation may be tied to a general disinterest in food provisioning overall.

Conversely, Under Planners consider changing their behaviours to reduce food waste to be not too much effort. Unlike Over Providers, this group did not identify the same amount of variability and unpredictability in their regular lives and seemed to have a greater sense of control over their food provisioning practices (due perhaps to the smaller number in their households and the absence of children).

3.3. Considerate Planners

“I love to cook. And since I've been home, I've been cooking even more, but I'm very conscious to be sustainable so that we don't throw things out. So I'll make sure that if I overbuy, I know that I'm going to use it.”

How much, and what, do they waste?

The Considerate Planners wasted a **household weekly average of 3.72 kgs** and a **per capita average of 1.66 kgs** of food. Of the different food types, **fresh vegetables** (0.43 kgs per household), **fresh fruit** (0.31 kgs per household) and, **breads and other bakery items** (0.38 kgs per household)³ stood out as being wasted the most by this segment.

What are their demographic features?

This segment is typified by older couples - without children (often 'empty nesters') - one or both of whom are no longer working. They typically:

- Are women
- Are aged 55 or over
- Do not have children (aged 14 or younger) at home
- (Almost half) live in 2-people/couple households,
- (Around one in five) have no income earners at home
- (Around two in five) earn less than \$1000 per household per week.
- Have one person responsible for most aspects of household food provisioning, but shared disposal

45% of the CRC survey sample fell into this segment.

What are their attitudes and food waste related behaviours?

Attitudes

As with all other segments, Consider Planners do not like the idea of food waste and feel bad about the food that they did waste. Participants from this segment probably expressed the strongest negative responses to food waste when interviewed. They also show positive attitudes to shopping and cooking

³The waste bin audits only reported the food wasted in the red bin. As such, weight of household waste per each segment and category level waste were adjusted using the factor 2.37 (Calculated total food waste/Food waste based on the bin audit = 4.22/1.78) when arriving at the total waste.

behaviours that would reduce food waste, appreciating their cost saving, environmental sustainability, efficiency and waste reduction benefits.

Common behaviours that reduce food waste for this segment

Unlike the other segments, Considerate Planners exhibited key food reduction behaviours from across the entire food provisioning spectrum (planning, shopping, storage, cooking and reuse). They:

- Were most likely to make a meal plan
- Almost always check the cupboard and fridge/freezer
- Almost always made a complete shopping list before shopping
- Try to prolong the life of food (use storage containers or put food in fridge/freezer)
- Almost never prepare too much food which went uneaten
- Prioritise old food for use

They also tend to eat out or order takeaway the least of the segments, which probably ensured they are more likely eat what food (leftovers or otherwise) they have available in the home. This might be motivated to a degree by having the lowest overall income of all the segments. Like the Under Planners, this segment seems to have more control over food provisioning through more predictable weekly schedules. Additionally, there was greater control over food provisioning evident due to at least one member of the household not working and having more time to shop and cook, as well a greater repertoire of food related skills and experience gained over time (and in many cases from having had children at home).

Common behaviours that increase food waste for this segment

These were not identified in this segment based on the analysis of the collated data-sets from the CRC.

What are the emotional, cultural and social drivers to food use and waste in this segment?

Considerate Planners exhibit similar social and emotional drivers to food use and waste as Over Providers. The influence of their own parents' food provisioning practices was evident, and in one case, an interview respondent from this segment mentioned how her Italian background influenced her belief that food was a way of expressing love for her family.

"Some things I really make... like the big Italian mama ... I will make the biggest pot possible, but with the intention to use it all, to give it to the kids, to store it or to eat. ... I have an Italian background, my mum was [always] cooking, baking things from scratch ... So I think it's been instilled ... Yeah, just the love."

This belief leads her to cook more food than was needed by her immediate household, but she then had well-established practices of giving this extra food to her adult children when they come to visit.

Love for food and cooking was a feature of this segment, and was often shared by both members of the household. This love for cooking was matched by a love for being organised and in control of household food provisioning and tasks. This is expressed as a point of pride by Considerate Planners.

"I mean, my husband's more than happy to help, but I'm home so it makes sense that I focus on that and I've always been a little bit of a control freak when it comes to food because I'm a bit of a foodie. So, I do like it. I like to control that part."

What is their readiness for, and motivators and barriers to, changing how much they waste?

Like Over Providers, Considerate Planners are somewhat motivated to reduce the amount of food waste they generate. Common motivators identified include the potential to save money, to make a positive contribution to environmental issues and to set an example of doing the right thing.

Unlike Over Providers however, they consider that changing their food planning, shopping, storage, and cooking behaviours to reduce food waste would not involve much effort.

3.4. Themes that Cut Across all Segments

While the segmentation analysis highlighted the main differences between segments, the interviews also revealed three themes that were relevant across all segments and are important to consider when developing interventions to engage specific, or all, segments.

The habituated nature of household food practices

Almost all participants mentioned elements of food provisioning that they performed unthinkingly and repeatedly. This was especially apparent when they reflected on how much they prepared for a meal and the degree to which they portion control. Most just cooked what they 'normally did' (which was in turn influenced by what their parents did) or let ingredient amounts determine how much they cooked.

"My fallback position [on how much is cooked] is probably habit... I don't pay as much attention to my hunger levels as I probably could, and it's more about habit." (Under Planner)

"If I'm making a spaghetti bolognese or something, I would generally make more than what's required. I don't think much of it's a conscious decision ... I don't think about the portion sizes too much; I just make as much as I've got the ingredients for it. Like if I've got 600 grams of mince, that's what I'm making." (Over Provider)

Most dislike food waste yet waste food

Many participants expressed a strong dislike of food waste and all readily identified the waste reduction and money and time-saving benefits of practices such as planning before shopping, controlling portions and reusing leftovers.

"I used to get quite upset about the amount of food I would have to pull out of the fridge and throw out." (Under-prepared).

Yet despite this dislike of food waste, and obvious intentions to engage in practices that avoid it, participants from all segments admitted to regularly throwing out uneaten food.

"I'll have to admit that every week we are throwing stuff out of the fridge." (Considerate Planner)

Control over food practices is mediated by food retailers

The last theme that was identified across all segments was how their control over different food practices was influenced to different degrees by the particular conditions imposed on them by food retailers. This included impulse purchases while in supermarkets due to specials or promotions; or package or portion sizes only being available in certain sizes; or how pricing strategies discouraged them from buying the right amounts because it seemed cheaper to buy a larger package.

"But if I need to make a dish that's got some basil in it, I can't buy in the shop, just a few sprigs of basil. And I end up with all this basil that just goes rotten. I can't tell you how many times I've tried to figure out how to store it and keep it, freeze it, whatever. Always gets thrown out..." (Considerate Planner)

3.5. Summary

This section presented the profiles of the three main segments identified by the segmentation analysis and then engaged through the interviews. A number of differences were highlighted based on demographics, particular provisioning behaviours and some of the different motivators for behaviours. The next section considers the implications for food waste reduction interventions and makes a number of recommendations for engaging the different segments.

4. Recommendations

This section considers which segments identified in the analysis might be prioritised for food waste reduction interventions. It then makes recommendations for engaging with each segment, including guidance on how they might be easily identified, what behaviours might be targeted and what messages and intervention types might be effective for that segment.

4.1. Prioritising Segments for Interventions

When considering the food waste outcomes and likelihood of change of the different segments, two possible approaches are apparent for prioritising which might be targeted by food waste interventions.

1. Prioritise based on overall food waste outcomes

This suggests that Over Providers are the obvious first target, followed by Under Planners and last by Considerate Planners.

2. Prioritise based on likelihood and willingness to change

Considerate Planners seem to be both the most willing, and also the most likely, to change their food provisioning behaviours to reduce food waste. The main issue here is that this segment already performs many of the behaviours associated with food waste and waste the least food.

While Under Planners perceive there to be less barriers to change their behaviours, they are not as motivated to change as Over Providers, and this might make it difficult to engage with them actively.

We therefore **recommend that first priority be given to Over Providers**, based on both their current food waste amounts and their willingness to change. However, practitioners should note that due to some of the barriers identified previously, this segment will need the most support (and potentially the most time) to change behaviours and reduce food waste.

4.2. Engaging with Over Providers

How can they be found?

Typically, these are young families with children under the age of 14. They are also more likely to shop at big supermarkets and eat out or order takeaway than other segments.

What behaviours should be targeted?

This segment already engages in a number of planning behaviours, however they often purchase more than is needed, prepare more than is needed and do not typically eat leftovers. Target behaviours for this segment could therefore include:

- When shopping, buy only food that is needed by their household
- When cooking, prepare the right amount of food for their household (based on hunger levels and who will be home)
- Cook regular meals that combine food that needs to be used up (including leftovers).

On average this segment makes a complete shopping list only about half the time, suggesting that this could also potentially be an additional target behaviour, but perhaps not prioritised as much as the others listed here.

What messages and other interventions would achieve change for this segment?

- *Make the problem real through personal food waste audits.* This segment does not necessarily need to be persuaded that food waste is bad and that target behaviours will reduce waste or save them

money. They are already aware of this generally. A greater focus on highlighting exactly how much food they waste as a household, and how much money they are losing (leveraging the influence of loss aversion) might therefore help to motivate change.

Engaging Over Providers in food waste audits of their households might therefore help to drive the greatest change by highlighting the scale of the problem at an immediate and personal level. These audits are not intended to make Over Providers feel even more guilty about their waste, but to provide them with a sense of greater control over the problem by highlighting specific food waste priorities, easy fixes they could make and providing a baseline against which they can measure change.

- *Support the target behaviours in the right contexts.* To support Over Providers in buying what is needed for their household (and not over-purchasing), messages and interventions need to be available in the context where this occurs. Supermarket-based reminders to purchase what is needed, and food promotion strategies that encourage buying the right amount rather than too much, are more likely to support this behaviour than messages that target Over Providers in their homes or at work.

Similarly prompts and pushes from apps or social media platforms that are timed to engage Over Providers when they are about to prepare meals and remind them to check hunger levels of their family, or how many will be eating, would be both context and time-specific interventions to support this target behaviour.

- *Flip the message (1).* There is an opportunity for intervention messaging to emphasise that serving the right amount for meals is actually caring for family and guests (rather than over-catering). 'Checking in' on how hungry children or guests are before a meal is the same as 'checking-in' to see how they are. A good host, and a good parent, cooks the right amount rather than makes people feel guilty about food waste by providing too much.
- *Flip the message (2).* Existing food practices within all segments are strongly habituated and occur without thought. Habit literature suggests that engaging householders in the development of *implementation intentions* for food waste related behaviours is a possible way of breaking old habits and creating new ones. Implementation intentions differ from setting more general goals in that they are specific commitments to engage in new behaviours at specific times, and in specific contexts. For Over Providers this could include avenues for them to commit to behaviours such as "The next time I cook at home I will first check my household's hunger levels" rather than asking them to make more general goals about reducing their household's food waste.

- *Get the children on board.* Recent programs from OzHarvest and MidWaste Regional Forum suggest that when schools raise students' food waste awareness and encourage children to be more involved in meal preparation, food practices at home can change to reduce food waste. Importantly, this would allow parents to tackle with the barrier of the unpredictability in children's tastes and appetites for parents by proactively involving their children in food provisioning decisions.

Over Providers could also be engaged with suggestions for how they can involve their children in food decisions and preparation, including ideas for recipes for meals that are easy for children to make.

- *Combine takeaways with use-it-up messages.* Over Providers manage the busy-ness and unpredictability of their lives with more frequent take-away orders. Suggestions to reduce this activity might be seen as not being sympathetic to their particular situations and could alienate this segment. Messages or campaigns that focus on combining take-aways 'mains' with a home-based 'use-it up' side dish or salad might help to bridge this issue and ensure that food in the fridge is not ignored.
- *Think long term when designing interventions.* To encourage new habits, the target behaviours must be enacted by Over Providers a number of times (rather than just once) before they become automatic and enacted without thinking. This means ensuring the messaging and interventions are delivered by practitioners for an extended period of time (potentially 1-2 years) rather than the usual months-long implementation, and that participants are rewarded/recognised for changes they make throughout this period to keep them engaged.

What trusted sources or communication channels can we draw on to engage with this segment?

There are two sources emerging from this analysis that could be leveraged to engage with Over Providers:

- *Health and fitness providers.* Combining meal plans with fitness plans encouraged both Over Providers interviewed to purchase and cook the appropriate amount of food for their households. The merging of food and physical health concerns presents a new opportunity for food waste campaigns to 'kill two birds with one stone' and to capture the attention of Over Providers that might not normally have an interest in food waste issues.
- *Their parents.* While all segments mentioned learning food practices from their parents, Over Providers seem a particularly relevant group to target with food waste messages based on "What would mum or dad do?". This potentially draws on the insights and skills of Considerate Planners (many who would have been parents in young families and therefore once were Over Providers

themselves) to 'mentor' this segment in the different practices they have learnt over the years that reduce food waste.

4.3. Engaging With Under Planners

How can they be found?

Under Planners are more likely to be people living by themselves or couples without children at home.

What behaviours should be targeted?

Under Planners almost never prepare too much food that goes uneaten, however do not typically engage with planning behaviours or seek to prolong the life of food. Specific target behaviours for this segment might therefore include:

- Make a meal plan for a set number of days
- Check food stocks at home before going food shopping
- Make a complete shopping list before food shopping
- Store food correctly at home after a food shop.

What messages and other interventions would achieve change for this segment?

- *Emphasise the money lost from food waste.* This segment was somewhat motivated to reduce food waste by the money that could be saved. Messaging that focuses on money that is lost (rather than saved) draws on loss aversion bias in order to make reducing food waste more relevant.
- *Emphasise the efficiency that comes from planning.* The general disinterest shown by this group in food provisioning suggests that they might be more motivated to change behaviours if they see how planning behaviours can make the necessary 'chores' of food shopping and cooking be completed more quickly and efficiently. Promoting online shopping as an efficient way to shop that doesn't require a trip to the supermarket and also allows for easy checking of current food stocks while ordering at home is another way to potentially achieve greater uptake of planning behaviours by Under Planners.

Meal specific ingredient selections and automatic, pre-populated, shopping lists (based on previous purchases) could also be included in supermarket web platforms or in specific smart phone Apps that are promoted to this segment.

- *Use 'Fido' to help Under Planners plan more.* While this recommendation is only based on the outcomes of the deep dive interviews, we were intrigued that both Under Planners were more likely to plan food shopping for their pets, but not for themselves. We wondered if planning shopping for pet food could be used to encourage greater interest and attention to planning for

their own food shopping. “Going shopping? Check pet food. Check human food” might provide a unique and left-of-field opportunity to encourage more planning behaviours.

- *Do the hard work for them.* The general lack of motivation to reduce their food waste, and their disinterest, and even dislike, of food provisioning practices, also suggests that any active engagement with this sector will be difficult and likely to be deliberately ignored.

Changing the ‘choice environment’ within the supermarket to offer a greater range of products that reduce food waste for Under Planners might be one way around this problem and ensures this segment avoids food waste without needing to think about it or to change their behaviours. This might include a greater selection of food portion or package sizes, changing promotion strategies to “buy-one-get-another-one-later” and changing pricing strategies in order to incentivise purchasing the right amount (rather focusing on the cheaper economies of scale from purchasing larger sizes).

Promoting food that keeps longer, or which has smarter packaging options to allow re-sealing, to this segment might be another option to ensure that food waste reduction is an implicit outcome for Under Planners rather than the result of active engagement about storage behaviours that would keep food for longer.

What trusted sources or communication channels can we draw on to engage with this segment?

While no trusted sources or communication channels explicitly emerged for Under Planners from this analysis, supermarkets and other food retailers are the more obvious information source that this segment would favour when they have to pay attention to food provisioning.

4.4. Engaging with Considerate Planners

Based on the previous prioritisation section, this segment should be the lowest priority for food waste reduction interventions. They already engage with the spectrum of food waste reduction behaviours and are the lowest food wasters of the three segments. We only give some very general guidance for this segment.

How can they be found?

Considerate Planners are more likely to be older couple-based households who no longer have children living with them.

What messages and other interventions would achieve change for this segment?

- *Make them mentors.* There is a good chance that Considerate Planners may once have been Over Providers themselves and have learnt a number of valuable food related skills and practices that

also reduce food waste. As already suggested, this presents a possible resource to draw on when engaging Over Providers. It has the additional advantage of further reducing the food waste of this segment, and generating new innovations, as they ‘walk the talk’ as food waste mentors and role models.

- *Change the choice environment in supermarkets.* As recommended for Under Planners, Over Providers would also benefit from a greater range in amount and package size options within the supermarkets, allowing them to buy the correct amounts needed for their smaller households. This would also be true for changing promotion strategies to “buy-one-get-another-one-later” and changing pricing strategies to incentivise purchasing the right amount (rather focusing on the cheaper economies of scale from purchasing larger sizes).

5. Segmentation Analysis

5.1. Detailed Methods

Given the aim of the research was to identify priority segments of consumers to assist in the development of future interventions, a data-driven behaviour-based segmentation approach was adopted. This approach utilised the benchmark survey data to undertake TwoStep Cluster Analysis in SPSS 25.0, using key behavioural variables to generate the cluster groups. Multiple iterations of potential clustering solutions were generated to find a solution that 1) had the best ‘fit’ for the data and 2) resulted in identifiable and meaningful segments of consumers.

Once the initial clusters were identified, detailed profiles of each segment were built using a combination of bivariate analyses (to identify significant differences between the identified clusters) and binomial logistic regression (to determine the relative importance of each variable in predicting cluster membership). This approach helps to determine what each group ‘looks like’ but also determines the key predictors of membership while controlling for the influence of other variables. Finally, the three waste measures from the benchmark survey, electronic diary, and bin audits were compared across the identified clusters to determine potential priority groups.

The initial clustering solutions, including the cluster profiles, were shared with the project working group and steering committee to ensure the process was transparent. Initial results were also shared to ensure that participants had the opportunity to provide expert insights and feedback on the proposed variables, cluster groupings, and profile characteristics of the identified groups. Additional cluster analyses with a fixed number of group solutions were also conducted to determine if a greater

number of meaningful segments could be identified – see Appendix 1 for a summary of the additional fixed groups analyses.

The final clustering solution, cluster profiles, and predictors of cluster membership are presented in the Detailed Results section below.

Data cleaning:

For the purpose of the Cluster Analysis, missing data was imputed using the median. All remaining analyses used the original data where cases with missing data were excluded on an analysis by analysis basis. Additional categorised variables were also generated to facilitate demographic comparisons (e.g. computing whether children aged 14 years or under lived in the household or not, collapsing income level and household composition to create fewer categories). Short variable labels were also created to facilitate reporting.

5.2. Detailed Results

Cluster analysis

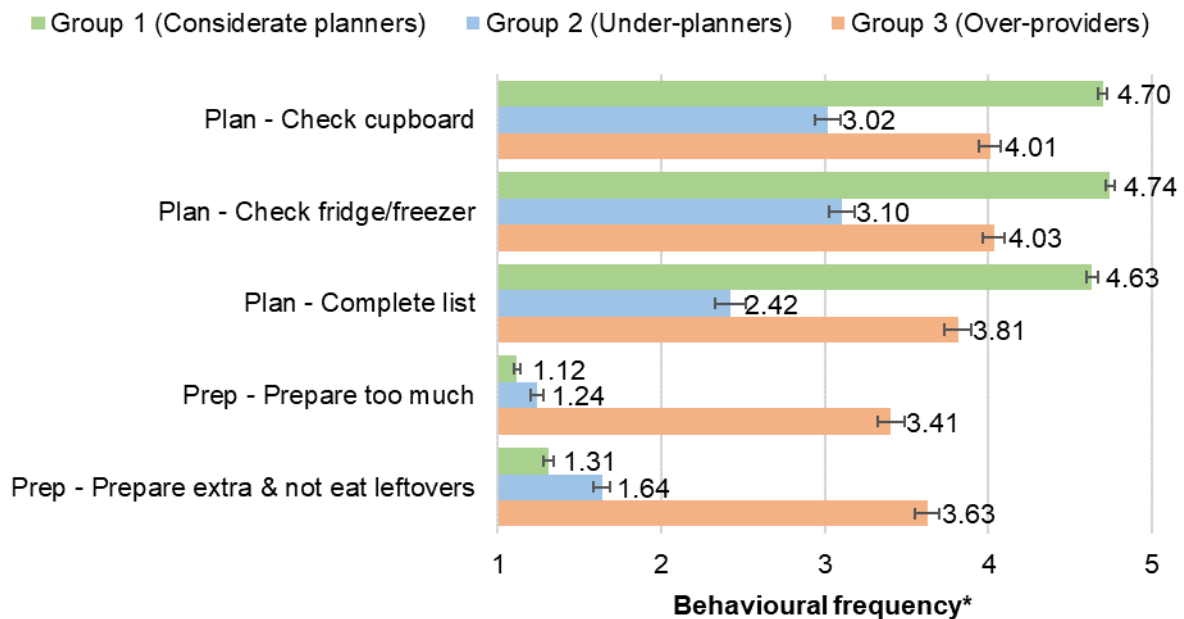
Initially all 32 behavioural variables from the survey were included in the TwoStep Cluster Analysis. While a 3-cluster solution was identified, it represented a poor fit for the data (Silhouette measure of cohesion and separation=0.20). After trialling different combinations of behaviours, and seeking feedback from the working group and steering committee, the top 5 most important predictors of cluster membership from the initial analysis were retained for the final analysis. The included behaviours were:

- Before shopping - Checking what food is already in the cupboard
- Before shopping - Checking what food is already in the fridge/freezer
- Before shopping - Writing a complete list of everything needed
- When preparing food - Preparing too much food which is not all eaten, and disposing of the extra food straight away
- When preparing food - Preparing extra food, store these leftovers to be eaten later on, but ending up disposing of them.

This analysis also resulted in a 3-cluster solution but the cluster quality improved to 'good' (silhouette=0.50, according to Rousseeuw and Kaufman (1990), any result greater than 0.50 is considered strong evidence of cluster structure). Cluster 1 represented 45.0% of the survey sample (n=1,260), Cluster 2 represented 31.6% of the sample (n=886), and Cluster 3 represented 23.4% of the sample (n=657).

Profiles of Australian households for food waste reduction interventions

On average, the three groups engaged in the five clustering behaviours differently. As shown in Figure 6, Group 1 almost always checked the cupboard & fridge/freezer and made a complete shopping list before shopping and almost never prepared too much food which went uneaten – as such, Group 1 was labelled “Considerate Planners”. Group 2 planned ahead sometimes or half of the time and rarely prepared too much/extra food that went uneaten – Group 2 was labelled Under Planners. Finally, Group 3 planned ahead most of the time but they also often prepared too much/extra food that went uneaten – Group 3 were labelled Over Providers.

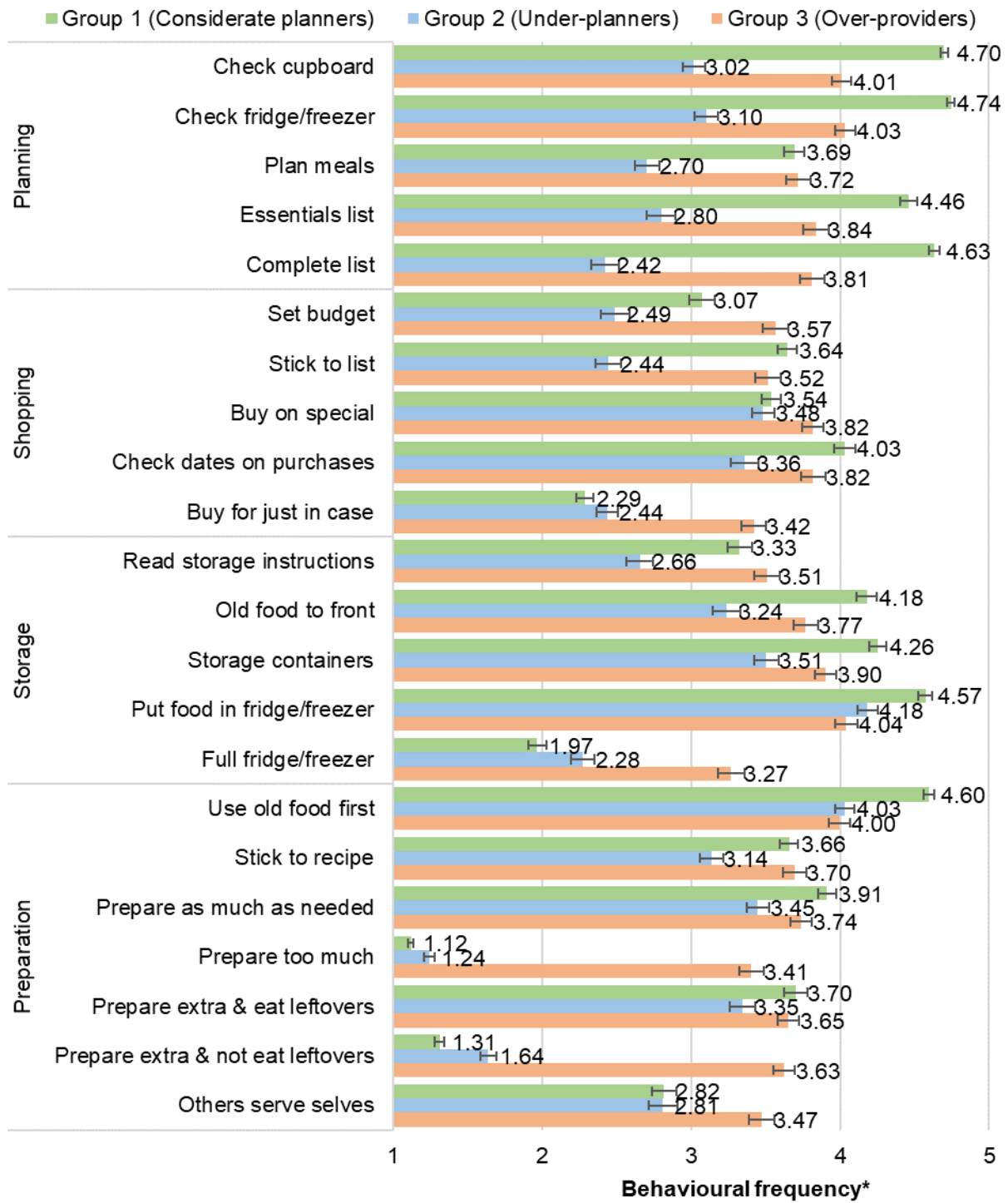


*1= Rarely / Never (less than 10%), 2=Sometimes (about 25%), 3=Half the time (about 50%), 4= Most times (about 75%), 5=Almost every time (over 90%)

Figure 4. Group comparison – behaviours included in cluster analysis

In addition to the five behaviours used in the cluster analysis, the three groups also differed across a range of planning, shopping, storage, and preparation behaviours. In general, Group 1 (“Considerate Planners”) were most likely to plan ahead, try to prolong the life of food (e.g. used storage containers or put food in fridge/freezer), and prioritise old food. Group 2 (Under Planners) were least likely to plan ahead or follow a plan while shopping (e.g. sticking to a budget/list), they were also least likely to try and prolong the life of food. Meanwhile, Group 3 (Over Providers) attempted to plan ahead but they were also the most likely group to buy for just in case and have a full fridge/freezer.

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*1= Rarely / Never (less than 10%), 2=Sometimes (about 25%), 3=Half the time (about 50%), 4= Most times (about 75%), 5=Almost every time (over 90%)

Figure 5. Group comparison – other behaviours

Cluster profiles

Once the behaviour-based groups were identified, cluster profiles could be created to get a sense of what each group 'looked like' in relation to other characteristics.

Table 1 presents the demographic characteristics of each group. As seen below, the majority of Considerate Planners do not have children (aged 14 or younger) at home, almost half live in 2-people/couple households, the majority are aged 55 or over and are women; around one in five have no income earners at home; and 40% earn less than \$1000 per week. Similarly, the majority of Under Planners also do not have children at home and are women. Around half either live alone or in a couple household. The majority are aged between 35 and 64 years. Around two in five rely on a single-income and one in three earn \$1000-\$1999 per week. Unlike the other two groups, the majority of Over Providers have children aged 14 or below at home. The majority have three or more people at home (usually family households) and are aged under 45 years. Almost half are male and over half have two income earners. Around one in three earn \$3000 or more per week.

Table 2. Group comparison – demographic characteristics

		Group 1 (Considerate planners)	Group 2 (Under- planners)	Group 3 (Over- providers)
Kids	No kids	78%	73%	38%
	Kids (<14y)	22%	27%	62%
Household size	1 person	19%	28%	14%
	2 people	46%	33%	21%
	3 people	14%	16%	32%
	4 people	14%	14%	23%
	5 or more people	7%	9%	11%
Household composition	Living alone	19%	25%	11%
	Couple/single parent, no children home	40%	27%	14%
	Couple/single parent, adult children home	13%	13%	10%
	Couple/single parent with children home	22%	27%	61%
	Other	6%	8%	5%
Age group	18-24	1%	2%	4%
	25-34	10%	13%	29%
	35-44	14%	21%	35%
	45-54	17%	17%	14%
	55-64	26%	21%	12%
	65-74	24%	18%	5%
	75+	10%	7%	2%
Gender	Male	34%	36%	49%
	Female	66%	64%	51%
	Other	0.1%	0.5%	0.0%
Income earners	1	37%	44%	30%
	2	39%	36%	58%
	3 or more	6%	7%	7%
	No income earners in household	18%	13%	5%
Income level	Less than \$500 p/w	14%	13%	8%
	Between \$500-\$999 p/w	25%	22%	16%
	Between \$1000-\$1999 p/w	32%	34%	29%
	Between \$2000-\$2999 p/w	17%	18%	16%
	\$3000 or more p/w	13%	14%	32%

Profiles of Australian households for food waste reduction interventions

As shown in Figure 8, the distribution of the three segments across Australia is generally the same, with the exception of a smaller percentage of Over providers living in the ACT (3%) compared to the other two groups (6%).

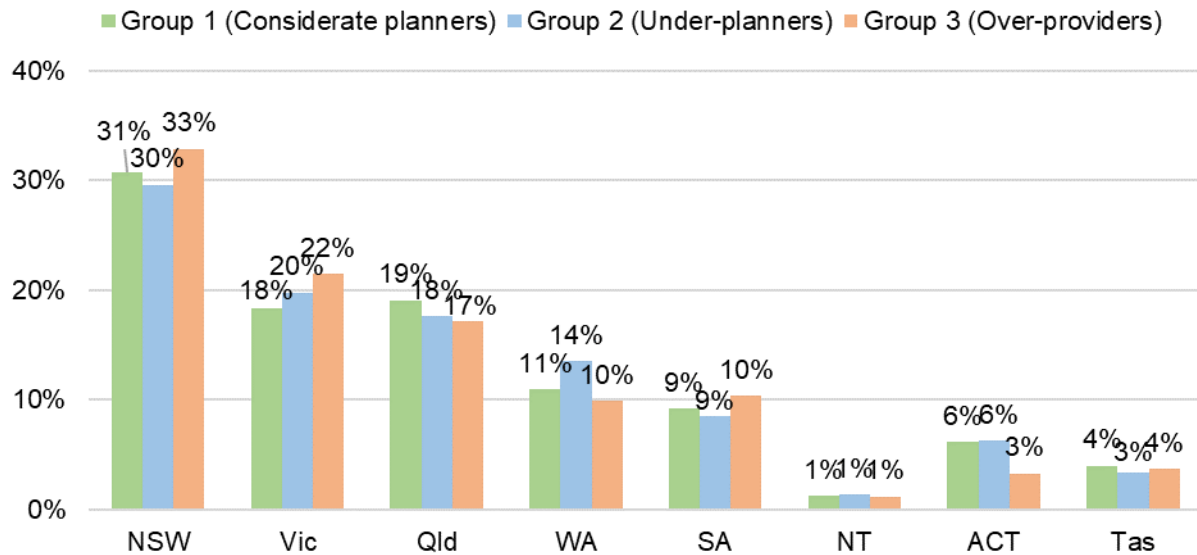


Figure 6. Group comparison – state

In addition to demographic characteristics, we were also interested in seeing if there were any notable differences between the three groups in relation to other characteristics such as food responsibilities, food acquisition habits, motivations to reduce food waste, and perceived effort to change – see Figures 9 through 12.

The majority of respondents in most groups are mainly responsible for all food-responsibilities. However, compared to the other groups, more Considerate Planners share responsibilities for food disposal, and more Over Providers share responsibilities for planning, shopping, and unpacking/storing food. Over Providers also shop at a range of stores, buy take-away, and dine out more often than the other groups while Considerate Planners generally shop, buy take-away, and dine out least often.

Profiles of Australian households for food waste reduction interventions

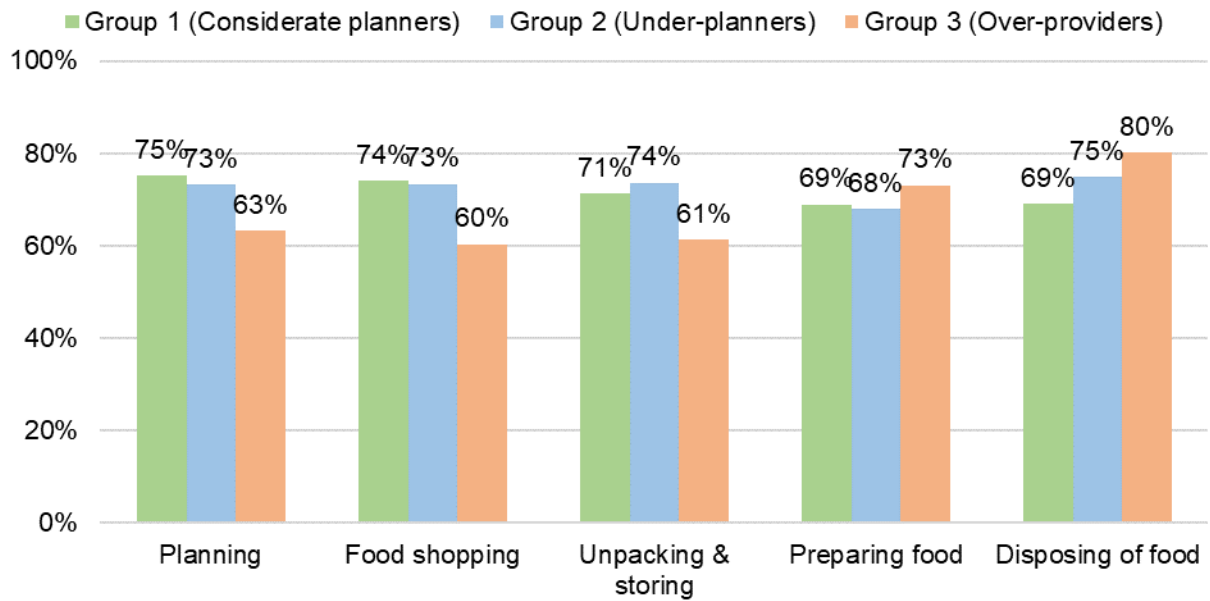


Figure 7. Group comparison – food-related responsibilities (mainly responsible for...)

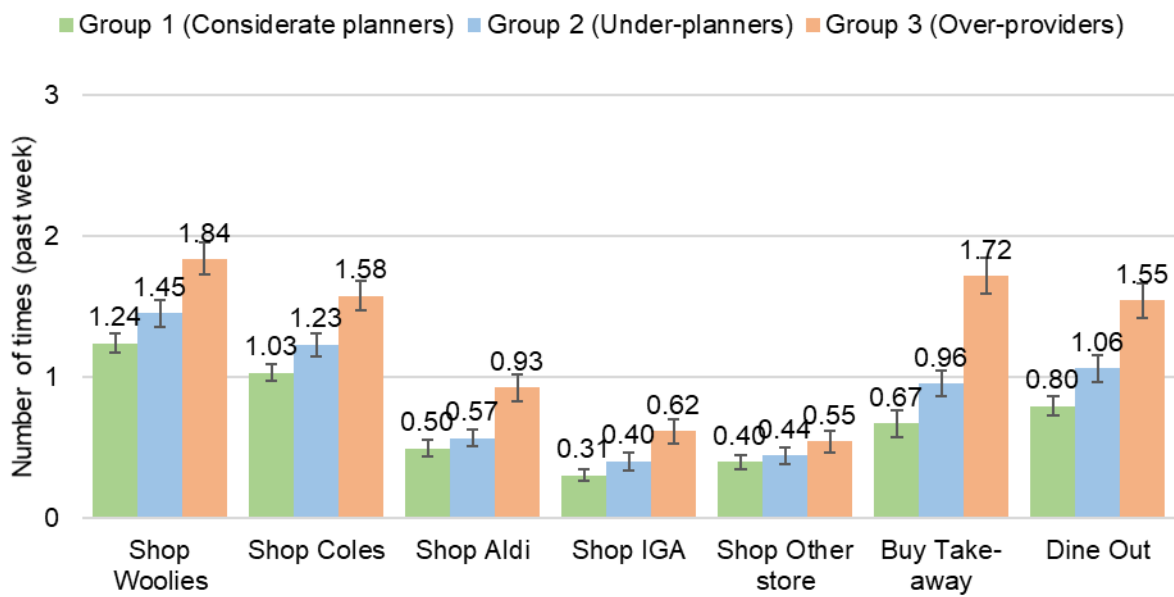
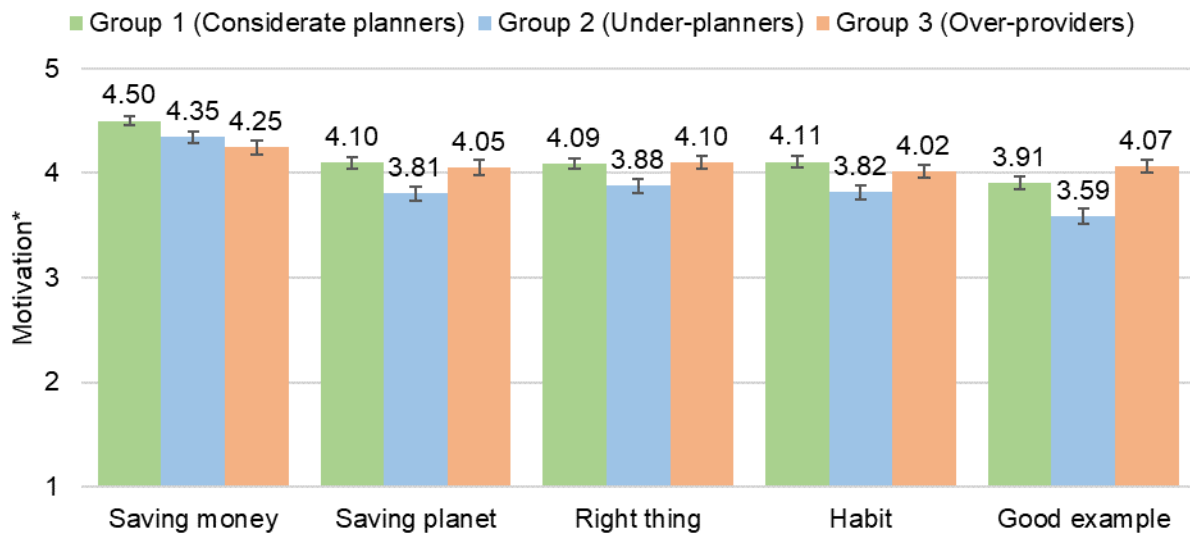


Figure 8. Group comparison – shopping/acquiring food in the past 7 days

In general, Considerate Planners and Over Providers were somewhat motivated to reduce the amount of food waste they generate, whereas Under Planners were the least motivated – with the exception of being somewhat motivated by saving money. In contrast, Considerate Planners and Under Planners

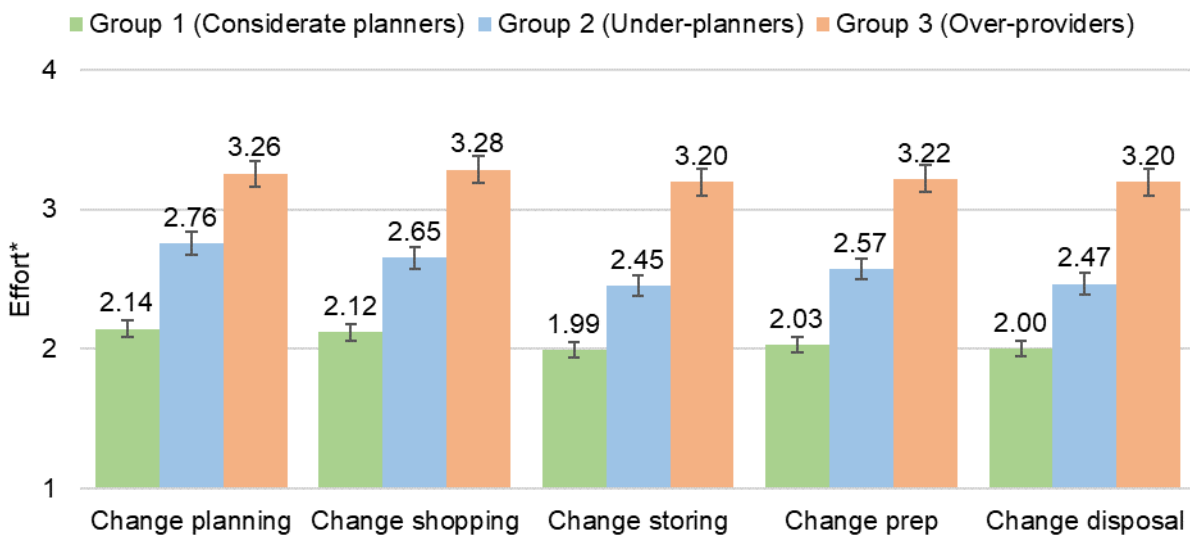
Profiles of Australian households for food waste reduction interventions

consider changing their behaviour to reduce food waste to be not much effort, while Over Providers consider changing to be some effort.



*1=Very unmotivated, 2=Somewhat unmotivated, 3=Neither, 4=Somewhat motivated, 5=Very motivated

Figure 9. Group comparison – motivation to reduce food waste



*1=No effort at all, 2=Not much effort, 3=Neutral, 4=A fair bit of effort, 5=A lot of effort

Figure 10. Group comparison – perceived effort to reduce food waste

The final key comparison between the three groups was the amount of food waste generated over the past 7 days – measured via the benchmark survey (self-report, n=2785), electronic diary (self-report, n= 1396), and waste bin audits (n= 463). Amounts were compared at the total level as well as per capita (children under 12 given 0.60 weighting). However, waste bin audits only reported the food wasted in the red bin. As such, weight of household waste per each segment was adjusted using the factor 2.37 (Calculated total food waste/Food waste based on the bin audit = 4.22/1.78) when arriving at the final figure for total waste. As shown in Figure 13, Considerate Planners produce least food waste overall and per capita and Over Providers generally produce the most amount of waste overall and per capita. Under Planners produce a similar amount of waste to Considerate Planners in the electronic diary, a similar amount to Over Providers in the survey, but in-between the other two groups in the bin audits. As shown in Figure 14 When household food waste is broken down into different food types, Over Providers still waste the most food across all types (based on food waste audits)

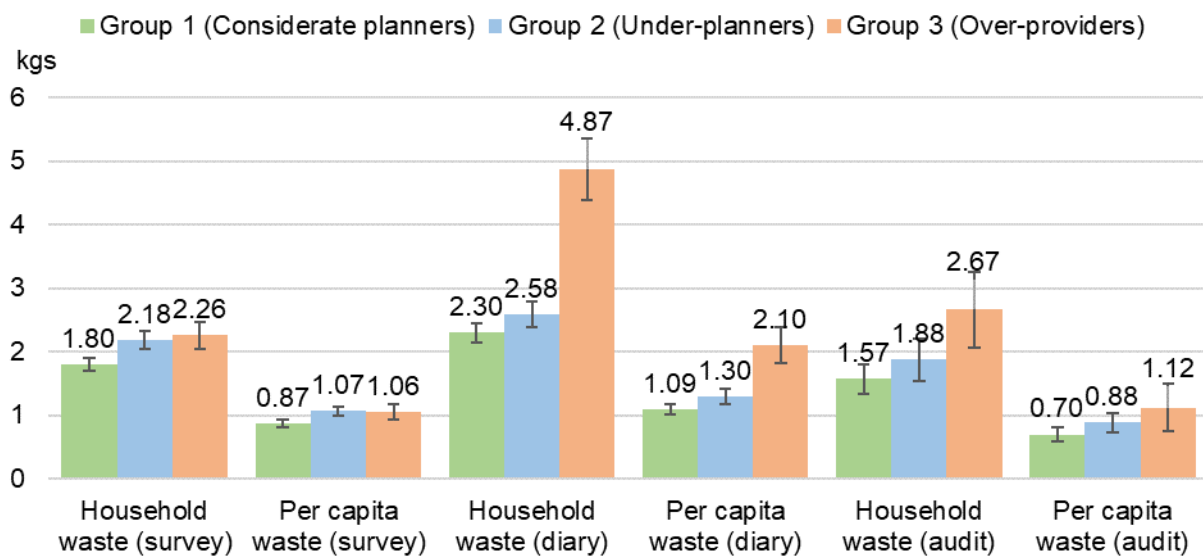


Figure 11. Group comparisons – food waste generated (mean kgs)

Profiles of Australian households for food waste reduction interventions

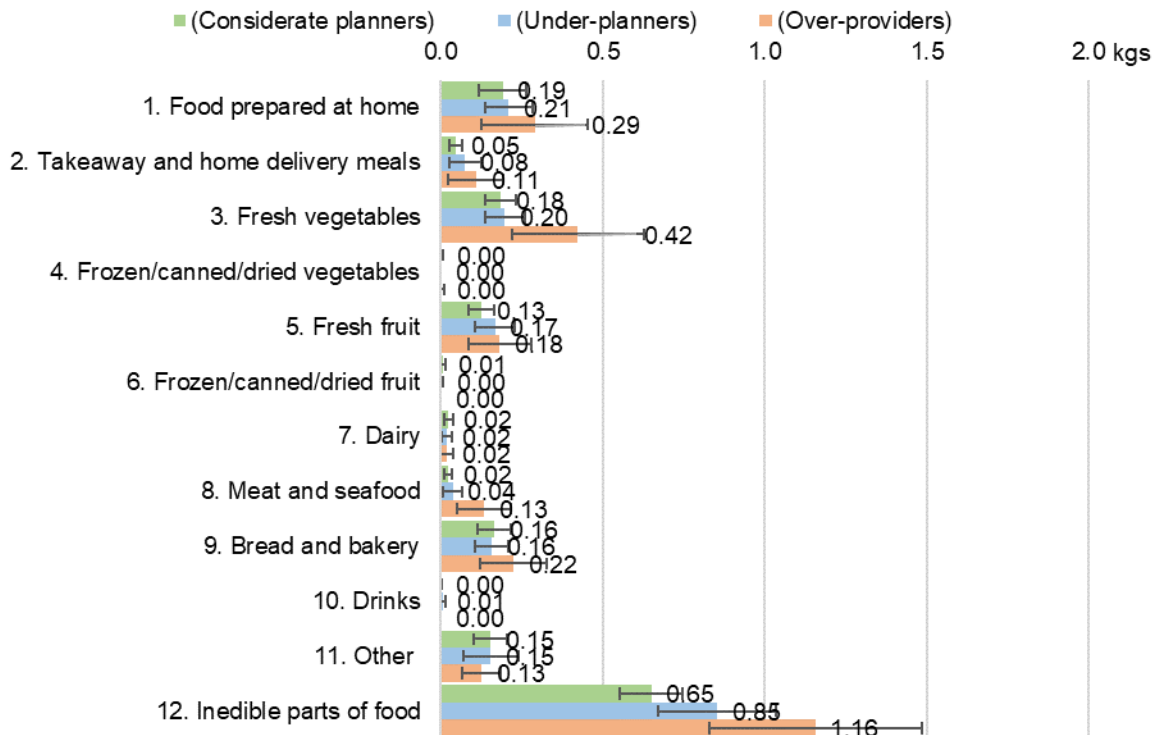


Figure 12. Group comparisons – food waste types (mean kgs) recorded in household audits.

Predictors of cluster membership

In addition to reviewing the cluster profiles, we also wanted to know what factors predicted if a respondent was more or less likely to be classified into one group compared to the other two groups. The results from these analyses are presented in Table 2 on the following page.

In addition to reviewing the cluster profiles, we also wanted to know what factors predicted if a respondent was more or less likely to be classified into one group compared to the other two groups. The results from these analyses are presented in Table 2 on the following page.

The overall model explained between 21%-29% of variance in group membership for **Considerate Planners**. People were more likely to be Considerate Planners if they were female, a couple with no children (vs. living alone), older, motivated to save money & the planet, and if they shared food disposal responsibilities. Whereas people were less likely to be Considerate Planners if they believed changing behaviours related to planning & preparation required more effort or if they shopped at Woolworths, Coles, & Aldi or dined out more often in the past 7 days.

The model explained less of the variance in group membership for **Under Planners** (8%-11%). People were more likely to be in this group if they were living alone (vs. couple with no children) and believed that changing food planning behaviours is more effort. They were less likely to be Under Planners if

they had children at home, were motivated by saving the planet, habit, or setting a good example, or if they shared food preparation responsibilities.

Finally, the model explained the most variance in membership for **Over Providers** (27%-40%). People were more likely to be Over Providers if they had children at home, were motivated by setting good example, believed that changing behaviours related to storage and preparation is more effort, shopped more often at Woolworths, Coles & Aldi, bought take-away more often, or if they shared responsibilities for shopping. Whereas they were less likely to be in this group if they were older or female (i.e. younger people & males were more likely to be in this group), lived in the ACT, were motivated by saving money, shopped at other stores more often, or if they shared responsibilities for preparation & disposal.

Table 3. Predictors of group membership (binary logistic regression)

Predictors	<i>Considerate</i>		<i>Under</i>		<i>Over</i>	
	<i>Planners</i>		<i>Planners</i>		<i>Providers</i>	
	β	<i>p</i> - value	β	<i>p</i> - value	β	<i>p</i> - value
Children aged 14 or younger at home	0.79	0.264	0.65	0.044	1.87	0.010
Gender (Female)	1.39	0.002	1.21	0.073	0.46	0.000
Total number of people in household	1.07	0.233	1.03	0.546	0.95	0.444
Household - Living alone (comparison)						
Household - Couple/single parent, no children home	1.72	0.001	0.54	0.000	1.04	0.876
Household - Couple/single parent, adult children home	1.18	0.455	0.76	0.189	1.30	0.354
Household - Couple/single parent with children home	1.24	0.378	0.66	0.091	1.33	0.345
Household - Other	0.96	0.869	0.92	0.727	1.24	0.498
Age group	1.21	0.000	0.97	0.431	0.77	0.000
Number of income earners	1.01	0.946	0.88	0.105	1.26	0.026
Household income	1.01	0.552	1.01	0.553	0.98	0.042
Motivation - Saving money	1.19	0.008	1.07	0.327	0.72	0.000
Motivation - Saving planet	1.14	0.039	0.88	0.030	1.05	0.573
Motivation - Right thing	0.98	0.707	1.00	0.998	1.00	0.980
Motivation - Habit	1.08	0.185	0.87	0.010	0.99	0.844
Motivation - Good example	1.00	0.959	0.80	0.000	1.54	0.000

Profiles of Australian households for food waste reduction interventions

Effort - Change planning	0.84	0.011	1.35	0.000	0.85	0.055
Effort - Change shopping	0.93	0.277	1.02	0.824	1.10	0.247
Effort - Change storing	0.90	0.111	0.92	0.189	1.27	0.002
Effort - Change prep	0.85	0.025	1.01	0.840	1.24	0.008
Effort - Change disposal	0.99	0.885	0.90	0.127	1.16	0.070
Shop Woolies	0.90	0.011	1.00	0.945	1.13	0.009
Shop Coles	0.87	0.001	1.02	0.609	1.12	0.020
Shop Aldi	0.87	0.026	0.92	0.150	1.17	0.027
Shop IGA	0.90	0.062	1.01	0.799	1.02	0.786
Shop Other store	1.03	0.605	1.01	0.818	0.85	0.020
Buy Take-away	0.94	0.090	0.97	0.463	1.08	0.021
Dine Out	0.92	0.025	1.01	0.745	1.05	0.263
Share responsibilities - food planning	0.79	0.220	1.13	0.527	1.04	0.862
Share responsibilities - food shopping	0.73	0.086	0.82	0.254	1.94	0.001
Share responsibilities - unpacking/storing food	1.25	0.190	0.77	0.125	0.88	0.528
Share responsibilities - food preparation	0.90	0.491	1.85	0.000	0.55	0.001
Share responsibilities - disposing of food	2.10	0.000	0.79	0.103	0.58	0.002
State - New South Wales (comparison)						
State - Victoria	0.89	0.373	1.02	0.886	1.14	0.433
State - Queensland	1.08	0.567	0.90	0.453	1.05	0.792
State - Western Australia	0.99	0.946	1.08	0.638	0.95	0.796
State - South Australia	0.85	0.371	0.96	0.811	1.31	0.214
State - Norther Territory	0.99	0.977	0.77	0.544	1.40	0.521
State - Australian Capital Territory	1.18	0.439	1.28	0.240	0.53	0.031
State - Tasmania	1.10	0.731	0.62	0.085	1.51	0.216

6. Interviews

6.1. Detailed Methods

A number of interviews were conducted with representatives from the different segments to get a rich understanding of the different drivers, barriers and enablers that underpinned the key differentiating food provisioning practices. A panel company was engaged to recruit two people for each of the three segments, and based their recruitment on specific demographic features and responses to screening questions (see Appendix 2).

A series of interview questions (see Appendix 3) were developed in consultation with the CRC project working group. These questions aimed to explore three food practices that were representative of the behaviours most predictive of segment membership. These practices included:

- Planning before shopping
- Portion control when preparing meals
- Storing leftovers from a meal that are then not eaten

The interviews sought to understand how participants commonly engaged with these practices, how much they actively thought of, or paid attention to, them and their attitudes to, perceived social norms/influencers associated with, and perceived control of the practices.

Six interviews were conducted and each lasted about 30-40 minutes. All were audio-recorded and the transcribed text was then thematically analysed. Some codes were set deductively based on the specific interest areas mentioned above and other codes emerged more inductively from the analysis (Braun & Clarke, 2006; Cho & Lee, 2014).

Based on this thematic analysis, a number of themes were identified that 'cut-across' all segments while other were specific to the particular segments.

6.2. Detailed Results

Cross cutting theme 1: The habituated nature of food practices

Almost all participants mentioned specific food provision which they performed unthinkingly and repeatedly in a typical day or week of their lives. The unthinking nature of these practices became particularly apparent when participants could not explain why they performed a particular practice as they did, other than say it was something they "had always done".

I do make a list, but I don't always do what I feel I should do, which is to open the fridge and have a look at everything. I really don't know why I don't do this, but I particularly don't look into crisper ... I seriously don't know why I don't open the fridge and really just look at every single shelf ... (Under Planner)

This influence of habits was especially apparent when participants reflected on how much they prepared during a meal and the degree to which they portion control. Most just cooked what they 'normally did' or let ingredients amounts determine how much they cooked. They did not typically check on the hunger levels of other household family members or use any other measures to gauge how much to cook.

"I think I wouldn't be very good cooking for one ... because I've always been used to cooking for at least three to four, I do still cook for that amount." (Considerate-planner)

"My fallback position [on how much is cooked] is probably habit... it's probably I don't pay as much attention to my hunger levels as I probably could, and it's more about habit." (Under Planner)

"If I'm making a spaghetti bolognese or something, I would generally make more than what's required. I don't think much of it's a conscious decision ... I don't think about the portion sizes too much, I just make as much as I've got the ingredients for it. Like if I've got 600 grams of mince, that's what I'm making. I'm not going to go, "All right, I'll do 300 grams in this recipe." I'll make what I've got." (Over Provider)

When reflecting on how these habits became ingrained, a number of participants pointed to the influence of their own up-bringing and what they saw their parents do.

I tend to just go on instinct. I came from a large family, it's probably a fear of running out of food. (Over Provider)

Probably because I make too much. I come from a family where you sort of eat big and even though there's only two of us, I have always done that. (Under Planner)

Cross cutting theme 2: Most dislike food waste yet waste food

Participants were not made aware of the food waste focus on this research, yet many expressed a dislike of food waste and all identified the waste reduction or money/time benefits of engaging in planning before shopping, controlling portions and reusing leftovers.

"I'm quite conscious of food waste. I hate food waste. I just loathe it." (Considerate Planner)

"I used to get quite upset about the amount of food I would have to pull out as a fridge and throw out." (Under Planner)

Yet despite this dislike of food waste, participants from all segments admitted to still throwing out food.

"I'll have to admit that every week we are throwing stuff out of the fridge." (Considerate Planner)

"I think I've always thrown more stuff out than I wanted to." (Under Planner)

"So, I think that food, although it hasn't been thrown out, it's in the fridge now, but there's a fair chance it will get thrown out." (Over Provider)

Cross cutting theme 3: Control over food practices is mediated by food retailers.

The last theme that was identified across all segments was how their control over the different practices was mediated to different degrees by different conditions imposed on them from supermarkets. This may have been impulse purchases which results in more being bought than needed, even if they had previously planned their food shopping:

"we follow the list and we ended up packing in a lot of other stuff in the trolley. I may have only a little list and I think, "Oh, there's only a few things on there, I'll just go to the shop and get those things." Walk out with \$100 worth of stuff..." (Considerate Planner)

Or how the proportions that are available in the supermarket are too big for their requirements and they end up throwing out unused ingredients:

"But if I need to make a dish that's got some basil in it, I can't buy in the shop, just a few sprigs of basil. And I end up with all this basil that just goes rotten. I can't tell you how many times I've tried to figure out how to store it and keep it, freeze it, whatever. Always gets thrown out..." (Considerate Planner)

Or how pricing strategies discouraged them from buying the right amounts because it seemed cheaper to buy a larger package:

"I bought a half cabbage and I really should have bought a quarter ... There's a quarter that's been sitting in that fridge now for too long, and I should have actually bought the quarter, but the scales of economy made me buy the half" (Under Planner)

Segment specific themes: Over Providers

Participants from all segments discussed busy, and sometime unpredictable, lifestyles due to work or social commitments. This variability often made it difficult to plan meals in advance or to reuse leftovers. Not only did both of the Over Providers interview have these challenges, they also needed to manage the tastes and appetites of their children. This created an additional factor to account for when planning shopping, and made it especially difficult to prepare the right amount for meals or to reuse leftovers.

"It's just unpredictable how much [our children will eat]. Our baby, 11-month-old, he's pretty good. He'll eat what I give him and he's a bit more predictable. But with the toddler, it's just next level. [I have] No idea."

"And the kids can be unpredictable. Definitely over the last week there's been plenty of pasta thrown in the bin, because they might eat a quarter of what you give them. But sometimes they eat it all, you just never know with them. So at least 50% of the time you're throwing out a lot of their food."

A common coping mechanism with this unpredictability was to buy, or prepare, something extra just in case children did not like what is given to them.

"I try and cook one thing for all of us, but sometimes my two-year-old goes that something he liked yesterday, he won't like today. So, I will generally plan a meal for our family, but also have something on the side just in case he cracks it, and he just eats a sandwich or whatever for dinner."

"You'll get the kids decide that they want to eat all their dinner and they want more, or you've eaten and you're still hungry. It's better to [buy] a little bit extra ... so you want to have it there"

One Over-provider also associated cooking more than was needed with caring for her family and visitors. This was part of being a good parent and a good host.

"Because I don't like to leave people hungry and that can mean I am a bit of an over caterer ... think I've got that from my mom. I just never want anyone to leave my house hungry. I would hate for someone to come to my house for dinner and then go to Macca's on the way home. I just always, always over catering"

Both Over Providers also separately mentioned an exercise program that they were doing, or had done, which included meal planning and portion control. Set through their local gym, the meal plans were accompanied by recipes, the amounts required, and were linked to the online shopping platforms of their supermarket.

"We did this 28-day fitness challenge thing. It's an app that ... had a meal plan. The meal plan was linked to the Woolworth's website. You can just add it on meals and it automatically made a shopping list with all the ingredients"

Segment specific themes: Under Planners

In contrast to others, interviewees from this segment expressed negative emotions associated with shopping and cooking.

"I hate cooking anyway, and often when I cook, I will try and do a couple of meals out of that... I want to spend as less time in the kitchen as possible."

"I do the main shopping. And then pack it away which I hate."

"It's that rebel streak that comes up again for me. - This is what you should do [with regards to shopping and cooking], and then I don't want to do it."

There was often a sense of food provisioning being regarded as a necessary chore that had to be endured and finished off as soon as possible. For one interviewee this was associated with living by herself for a long time and not seeing value in making an effort if it was just for her.

"This is so embarrassing. The last three salads that I've had, I didn't even cut up the carrot. I put the whole carrot on the plate and ate it like Bugs Bunny, because it just seemed easier. ... trying to keep preparation to the minimum... when I have my friends staying, of course, then I make the effort. When you're by yourself ... you slacken off."

"I don't consider [portion control] much at all. Because I just open the box. And I put it in the microwave and that's it."

The main motivators of planning before shopping were to ensure that specials and discounts were identified and that their pets had enough food. Beyond this, shopping tended to be described as being a little random and haphazard, with less concern expressed about how much was purchased.

"I am motivated by what's on special. Every week I [look at supermarket] specials on the catalogues online. ... See what's on special and make a note of that. Make up a shopping list from that.... whether I need it or not."

I don't really- [meal plan], I sometimes check-what's in the cupboard and the fridge. But my main priority, is the only thing that I really do check is the dog food. Because we can eat baked beans but he can't."

At the same time, portion control was not an issue for one respondent. Due to dietary constraints associated with her partner's chronic illness, they predominantly ate pre-packaged and portioned frozen meals. These usually provided the right amount of food and there was little leftover.

"With the pre-packaged meals we use- it's primarily frozen. my husband and I share one. And it's perfect. So we don't throw any of that away."

For the other interviewee, the small size of her fridge prevented over-shopping, and while she did cook more than was needed, leftovers were welcomed in that they meant she did not need to think of new meals for a few days

"Most of the time, I will have a plan. Yeah, it will be like, "I'm going to eat those tomorrow." Or, "I'm going to keep those in the fridge for two days and I'll eat them in two days' time."

Participants from this segment were the only one not to mention getting tired of leftovers. Most other participants interviewed mentioned how they, or other household members, did not want to repeatedly eat the same leftovers. These seemed to be of less concern for the Under Planners interviewed.

Segment specific themes: Considerate Planners

Neither of the Considerate Planners interviewed had children living at home and one reflected on how she now has more time for food shopping and cooking because she was not working and her children had both left home. This has enabled greater attention to what food was purchased, what was cooked and to ensure that leftovers are reused.

"I mean, we love fresh produce. I love to cook. And since I've been home, I've been cooking even more, but I'm very conscious to be sustainable so that we don't throw things out. So, I'll make sure that if I overbuy, I know that I'm going to use it. I'm not going to end up thinking, "I bought this but I want to throw it out."

Having more time has also freed her to pursue her long-held passion for cooking (to the extent that she now has her own Instagram page), something that came across in the interviews with both Considerate Planners. Both mentioned how much they loved cooking and trying out new recipes and dishes, a sentiment that was notably absent from the other two segments.

“we both like to cook as well. So, I'll buy ingredients that he might want to cook a meal with. For instance, I don't like to make spaghetti bolognese but he does a better job than the Italian restaurant.”

For one Considerate planner, her love of cooking was tightly tied to her identity as a parent and to her cultural background,

“Some things I really make... like the big Italian mama ... I will make the biggest pot possible, but with the intention to use it all, to give it to the kids, to store it or to eat. ... I have an Italian background, my mum was [always] cooking, baking things from scratch ... So I think it's been instilled ... Yeah, just the love.”

Not only was being a ‘foodie’ part of the self-identity of both Considerate Planners, but both also identified, with some pride, as being very organised and of being in control of food provisioning for their household.

“I'm just an organised person. I've worked in office administration for a lot of years. I'm just very good at organising things. I don't like to forget things, so I make sure that I've got lists of things and stuff. I'm a list writer.”

“I mean, my husband's more than happy to help, but I'm home so it makes sense that I focus on that and I've always been a little bit of a control freak when it comes to food because I'm a bit of a foodie. So, I do like it. I like to control that part.”

In addition to their love of cooking and for being organised, both Considerate Planners also mentioned their many years of experience with shopping and cooking for their household. While both now lived alone with their partners, one frequently referenced food practices that she did, and learnt, when her children were still at home. For both Considerate Planners, there was a sense that they had accumulated a store of knowledge and skills that helped them to manage their shopping, how much they made for a meal and their re-use of leftovers.

“As for other things like cooking just off the top of your head, I pretty already know what we need. Based on experience of cooking dishes over and over.”

“Probably, I think just experience over the years, just because I'm over 55, I think just that I've cooked for a very long time now.”

It was striking that while they still prepared more than needed for meals, or sometimes overbought, they had specific plans for the leftovers and the skills to reuse them in future meals.

“if I make a risotto for instance, that's enough for four people. So, I will make that, knowing I've got today and tomorrow sorted for dinner”

“Even though I might overbuy, but if I've got bananas, for example, I'll freeze them or make a banana bread. I make sure I make a sauce, if I've got too many tomatoes, I'll make some salsa, put in the freezer. So, I do stock freeze a lot of stuff, and meals and stuff. Because when my kids come ... if I've got things in the freezer, I'll give them a container to take home.”

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APPENDIX 1. FIXED GROUP SOLUTIONS

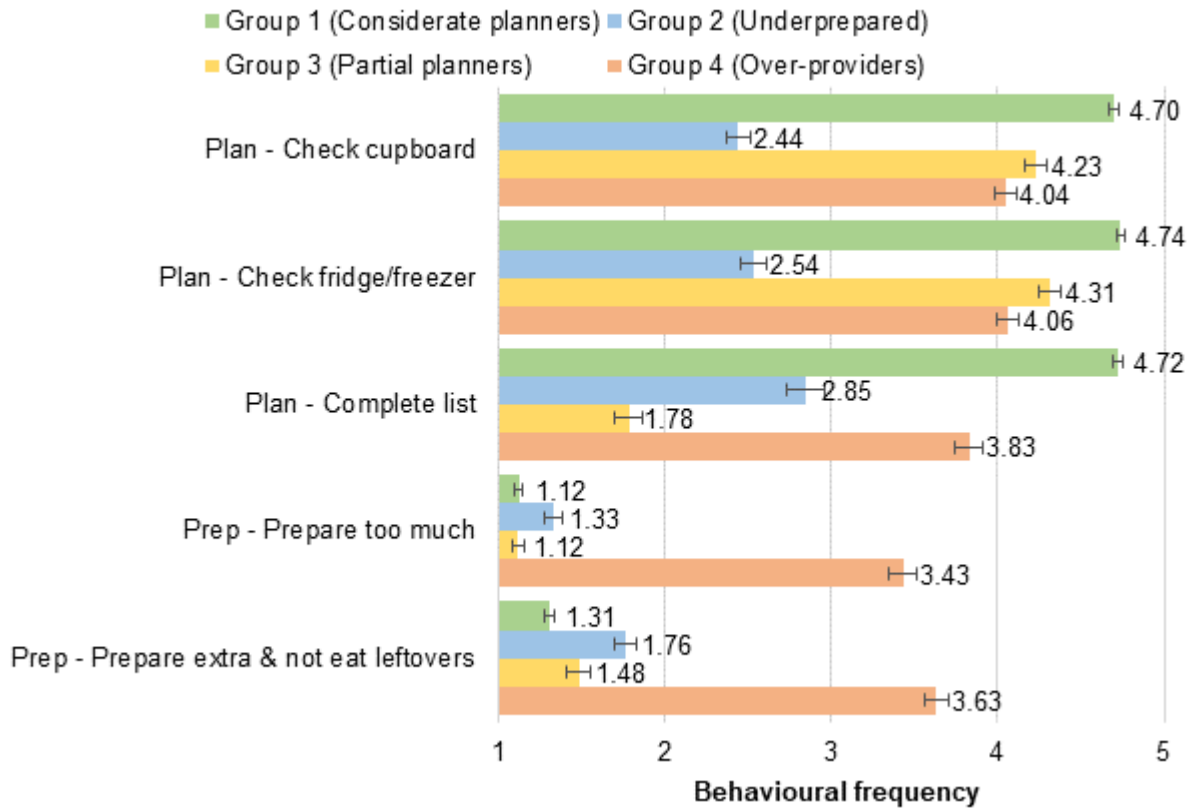
4-GROUPS

TwoStep Cluster Analysis was also conducted using a fixed four-group solution. While the silhouette measure was borderline ‘good’ (0.49), it was not as strong as the three-group solution. The groups were also less evenly distributed – with over 40% of the sample in Cluster 1 and only 13% in Cluster 3. Clusters 1, 2, and 4 were very similar to the clusters identified in the three-group solution in terms of their behaviours and demographic profile. For the clustering behaviours, Cluster 3 often checked the fridge/cupboard before shopping, only sometimes used a complete shopping list, and rarely over-prepare (i.e. ‘partial planners’). Cluster 3 also had a very similar demographic profile to Cluster 2, which made them harder to identify and would have made recruitment for the interviews difficult.

Cluster	Cases	Percent
1	1,209	43.1
2	598	21.3
3	356	12.7
4	640	22.8

Figure A1. Four-group comparison – behaviours included in cluster analysis

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5-GROUPS

TwoStep Cluster Analysis was also conducted using a fixed five-group solution. While the silhouette measure was still 'fair' (0.45), it was not as strong as the three- or four-group solutions. The groups were also even less evenly distributed than the four-group solution – with only 9% in Cluster 5. Clusters 1, 2, 3, and 4 were very similar to the clusters identified in the four-group solution. For the clustering behaviours, Cluster 5 rarely engaged in the planning behaviours before shopping, and sometimes over-prepared food (i.e. 'improvisers'). As per Cluster 3, Cluster 5's demographic profile also looked very similar to Cluster 2.

Cluster	Cases	Percent
1	1,180	42.1
2	402	14.3
3	334	11.9
4	632	22.5
5	255	9.1

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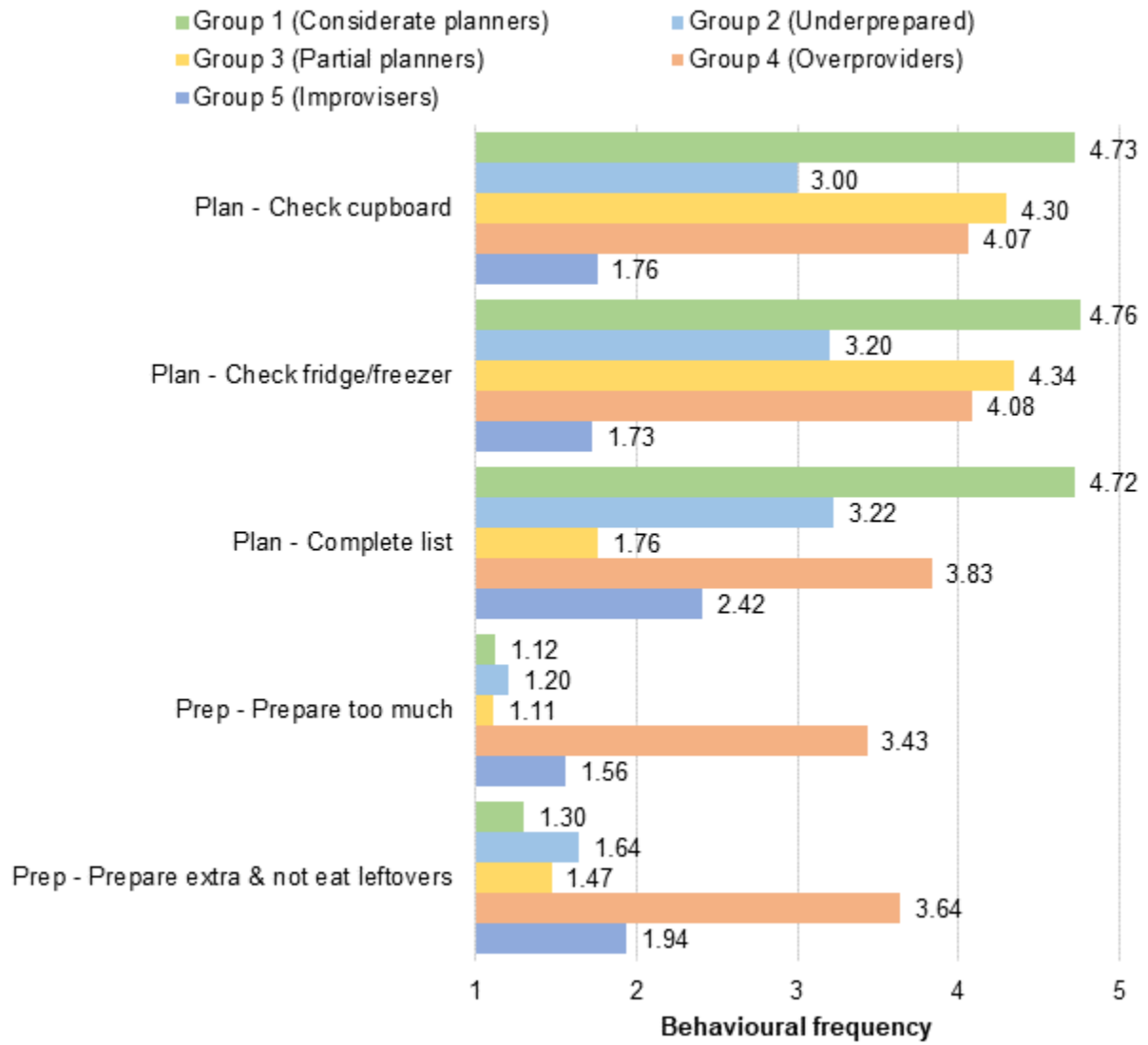


Figure A2. Five-group comparison – behaviours included in cluster analysis

Appendix 2. Recruitment Demographics and Screening Questions

Recruitment summary

We are looking for sample of six participants, each with a particular characteristic profile. The matrix below collates these for each participant in the sample.

	Participant 1	Participant 2	Participant 3	Participant 4	Participant 5	Participant 6
Characteristics	<i>Considerate planner 1</i>	<i>Considerate planner 2</i>	<i>Underprepared 1</i>	<i>Underprepared 2</i>	<i>Over-provider 1</i>	<i>Over-provider 2</i>
<i>Food responsibilities</i>	Mainly/ equally responsible	Mainly/ equally responsible	Mainly/ equally responsible	Mainly/ equally responsible	Mainly/ equally responsible	Mainly/ equally responsible
<i>Gender</i>	Female	Female	Female	Female	Male	Female
<i>Age</i>	55+	55+	35-64	35-64	18-44	18-44
<i>Household size</i>	2 people (couple)	2 people (couple)	1 person	2 people (couple)	3+ people	3+ people
<i>Children (under 14) at home</i>	No	No	No	No	Yes	Yes
<i>Check cupboard/fridge/freezer before shopping</i>	Almost every time (over 90%)	Almost every time (over 90%)	Half the time (about 50%) or less	Half the time (about 50%) or less	Most times (about 75%)	Most times (about 75%)
<i>Store & dispose of leftovers</i>	Rarely / Never (less than 10%)	Rarely / Never (less than 10%)	Rarely / Never (less than 10%)	Rarely / Never (less than 10%)	Half the time (about 50%) or more	Half the time (about 50%) or more

Screening requirements and questions:

All participants

- x6 aged 18+
- x6 That answer 'Mainly responsible' or 'Equally responsible' in response to: *Overall, in your household, to what extent do you contribute to food shopping (including planning & unpacking), preparation (including cooking), and disposing of food not eaten?*

Response options:

- I'm mainly responsible
- I'm equally responsible
- I'm not responsible/I'm rarely responsible

Considerate Planners

1. x2 women, aged 55 or over, live with their partner, do not have children at home
2. Both respondents must answer 'Almost every time (over 90%)' or 'Most times (about 75%)' in response to: *Before going shopping for food, how often do you, or another member of your household, check what food is already in the cupboard/fridge/freezer?*

Response options:

- Almost every time (over 90%)
- Most times (about 75%)
- Half the time (about 50%)
- Sometimes (about 25%)
- Rarely / Never (less than 10%)

3. Both respondents must answer 'Rarely / Never (less than 10%)' in response to: *When preparing food, how often do you, or other members of your household, prepare extra food to be eaten later on, but end up disposing of it?*

Response options:

- Almost every time (over 90%)
- Most times (about 75%)
- Half the time (about 50%)
- Sometimes (about 25%)
- Rarely / Never (less than 10%)

Underprepared

1. x2 women, aged between 35-64, no kids at home
2. x1 living alone, x1 living with partner

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3. Both respondents must answer 'Half the time (about 50%)', 'Sometimes (about 25%)', or 'Rarely / Never (less than 10%)' in response to: *Before going shopping for food, how often do you, or another member of your household, check what food is already in the cupboard/fridge/freezer?*

Response options:

- Almost every time (over 90%)
- Most times (about 75%)
- **Half the time (about 50%)**
- **Sometimes (about 25%)**
- **Rarely / Never (less than 10%)**

4. Both respondents must answer 'Rarely / Never (less than 10%)' in response to: *When preparing food, how often do you, or other members of your household prepare extra food to be eaten later on, but end up disposing of it?*

Response options:

- Almost every time (over 90%)
- Most times (about 75%)
- Half the time (about 50%)
- Sometimes (about 25%)
- **Rarely / Never (less than 10%)**

Over Providers

1. x2 parents, aged 44 years or under, with 3 or more people at home & 1 or more children (aged 14 or younger) at home
2. x1 male, x1 female
3. Both respondents must answer 'Most times (about 75%)' in response to:

Before going shopping for food, how often do you, or another member of your household, check what food is already in the cupboard/fridge/freezer?

- Almost every time (over 90%)
- **Most times (about 75%)**
- Half the time (about 50%)
- Sometimes (about 25%)
- Rarely / Never (less than 10%)

4. Both respondents must answer 'Half the time (about 50%)' or 'Most times (about 75%)' or 'Almost every time (over 90%)' in response to:

When preparing food, how often do you, or other members of your household, prepare extra food, prepare extra food to be eaten later on, but end up disposing of it?

Response options:

- **Almost every time (over 90%)**
- **Most times (about 75%)**
- **Half the time (about 50%)**
- Sometimes (about 25%)
- Rarely / Never (less than 10%)

Appendix 3. Interview Questions

Question 1: Can you describe the planning that you do before going shopping and what that involves?

(probe) What does planning look like, probe (is it planning for a list of things to buy or is it meal planning. I.e plan for 4-5 days of main meals and convert that to a shopping list.)

(probe) do you take into consideration who is at home during the week, unexpected events/takeout etc

(probe) if buy just in case - what events are you expecting?

*(probe) when shopping, how much do you actually think about buying the right amount of food for your household? (**habituated**)*

Sub-questions:

- In your opinion, what are the advantages and disadvantages of planning before shopping? (**attitude to the practice, can include emotional aspect**)
- In your opinion, what makes it easy or difficult to plan before shopping? (**control over practice**)
- Who in your household, or beyond, influences how you plan your shopping, how and why? (**social/cultural norms**)
- If you wanted to do more planning before shopping than you normally do, what might help you to do so? (**possible additional intervention points**)

Question 2: Thinking back over the past week or two, can you describe any times in your household when you made too much food for a meal and this has to be thrown out?

Sub-questions:

- When you do prepare too much food, why is that? (**to pick up control and social/cultural norms**)
- Why did you think you needed to throw the food out?
- When preparing a typical meal, how much do you actually think about and plan the amount you need to make? (**pick up habitual nature of behaviour**)
- Who in your household, or beyond, influences how much you prepare for mealtimes? (**social/cultural norms**)
- In your opinion, what are the advantages and disadvantages of preparing the right amount for mealtimes in your household? (**attitude to the practice, can include emotional aspect**)

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- In your opinion, what makes it easy or difficult for you to prepare the right amount for mealtimes? **(control over practice)**
- If you wanted to make sure that you prepare the right amount for mealtimes, what might help you to do so? **(possible additional intervention points)**

Question 3: Thinking back over the past week or two, can you describe any times in your household when you have stored leftovers but these were not eaten?

Sub-questions:

- When leftovers are not eaten in your household, why is that? **(to pick up control and social/cultural norms)**
- When you do have leftovers (meals, products or ingredients) from preparing/buying too much, how much do you actually think about, or plan for, when these might be eaten? **(pick up habitual nature of behaviour)**
- Who in your household, or beyond, influences whether leftovers get eaten or not? **(social/cultural norms)**
- In your opinion, what makes it easy or difficult for leftovers to actually get eaten? **(control over practice)**
- In your opinion, what are the advantages and disadvantages of eating leftovers? **(attitude to the practice, can include emotional aspect)**

If you wanted to make sure that leftovers are eaten in your household, what might help? **(possible additional intervention points)**

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