



Funded by the  
**Waste Authority WA**

# Tackling Avoidable Food Waste in Western Australian Schools

## FINAL REPORT

*“My mum always says to bring the food home so I can eat it for afternoon tea or so she can see how much I ate and will ask me questions as to why I didn't eat it. I can always have a say on the grocery list so mum gets what I like/want to take to school”*

- Year 8 student, Melville Senior High School

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# Executive Summary

## 1. What is the challenge?

**Avoidable food waste** is food that has been discarded while still in a condition that most people would consider edible.

The Western Australian (WA) [Waste Wise Schools \(WWS\)](#) program has calculated that in WA schools, 3kg of avoidable food waste is discarded per student per year. This extrapolates to a total of 3 million whole fruit pieces, 1.3 million packaged food items and 3.5 million whole sandwiches discarded each year in schools across the state.

## 2. What did we do?

To address this challenge, WWS engaged a team from [BehaviourWorks Australia](#) and Monash University [Faculty of Education](#) to conduct a research project that targets avoidable food waste behaviours in WA schools. This work was conducted in three parts:

1. A **literature and practice review** of existing food waste behavioural research and practice, in order to unpack this challenge by using a behavioural lens, and to identify key audiences and priority behaviours that might help to reduce food waste in WA schools.
2. The **design, implementation and analysis of surveys** of WA school students, and the parents of WA school students, in order to explore priority behaviours from the perspective of these audiences.
3. A **design workshop with relevant WWS stakeholders** that drew on the insights gained from the surveys in order to develop food waste behaviour change initiatives ready for testing in WA schools.

## 3. Unpacking the challenge – review findings

A literature and practice review conducted by BWA found that the evidence base of food waste behaviours in schools is fragmented and patchy, and can only provide hints and broad guidance rather than examples of best, or even common, practice, that could be used to address avoidable food waste in WA schools. What is clear is that:

- Household size, age and income have been shown to predict the amount of food a household wastes, as well as knowledge of the issue and its impacts.
- When considering children's food waste behaviours in Australian schools, the overlap with food waste related behaviours of their parents (*interpersonal influences*) must be acknowledged, in addition to school environment (*contextual influence*), and the individual knowledge and skills of the child (*intrapersonal influences*).
- Children's food behaviours in school were shown to be changed by the opportunity to select foods, the familiarity of food, the ease with which it can be eaten, and the provision of prompts, reminders, incentives and fun. There is also evidence to suggest that the timing of when food is eaten in relation to play time can affect the amount of food eaten by children.

- Research has shown that individuals in the home report that they are motivated to reduce their food waste due to its financial impacts and a desire not to be wasteful, more than environmental or civic concerns. Barriers related to convenience and lack of priority have also been suggested.

No clear set of behaviours have been developed to address food waste in schools. Based on the review, the following possible behaviours (and their relevant target audiences) were identified to potentially reduce avoidable food waste in schools.

| Behaviour  | Target audience    |
|--|--------------------|
| <ul style="list-style-type: none"> <li>· Plan a week of lunches</li> <li>· Don't pack too much food</li> </ul>   | Parents            |
| <ul style="list-style-type: none"> <li>· Involve children in making their own lunches</li> <li>· Discuss with children what they like to eat and how much</li> </ul>     | Parents & children |
| <ul style="list-style-type: none"> <li>· Pack food that will keep and not spoil or go soggy</li> </ul>   | Parents            |
| <ul style="list-style-type: none"> <li>· Include foods that can eaten 'in stages'– e.g. cutting up fruit or sandwiches into pieces to eat throughout the day.</li> </ul> | Parents            |
| <ul style="list-style-type: none"> <li>· Invest in good lunchbox 'hard-ware' to reduce damage and spoiling of foods</li> </ul>   | Parents            |
| <ul style="list-style-type: none"> <li>· Bring leftovers home</li> </ul>   | Children           |
| <ul style="list-style-type: none"> <li>· Implement 'take food home' policy</li> </ul>  | Schools            |
| <ul style="list-style-type: none"> <li>· Schedule lunch after recess</li> <li>· Eat together as a class inside before play time</li> </ul>                               | Schools            |
| <ul style="list-style-type: none"> <li>· Longer lunches</li> </ul>   | Schools            |

### 3. Exploring behaviours – surveying target audiences

Based on the findings of the review, and the final table of recommended behaviours, the WWS team short-listed two behaviours for further exploration with their target audiences:



Parents involve their children in choosing, making and packing food from home that they take to school



Children bring home their avoidable food waste (leftovers) from school

A sample of parents of WA school students (n = 620) and of WA school students (n = 570) were surveyed to understand current participation in these behaviours, as well as the different beliefs to do with their benefits, disadvantages, social approval and disapproval, and enablers and barriers. The surveys generated the following key behavioural insights:

### **What insights were gained about: *Avoidable food waste in WA schools?***

1. Both parents and students report that food eaten at school is typically brought from home.
2. Parents believe, and students report, that all or most food that is brought from home to school is eaten.

While it is typical for survey respondents to answer more positively about a situation than it may be in reality, the data collected from WWS in schools supports the likelihood that this issue of avoidable food waste in schools is a cumulative one, namely small (and changing) numbers of students discarding small amounts of food waste each day in schools across the state.

The challenge is therefore to engage with this small group of students, who also do the right thing most days. Should WWS therefore seek to engage schools in reducing avoidable food waste through a deliberate and explicit approach or through a subtler behavioural nudge that ‘closes the door’ on this behaviour when it does occur?

### **What insights were gained about: *Parents involving children in choosing, making and packing food for school?***

1. Parents are more likely to involve children in choosing food for school rather than making or packing it, and this is more likely for high school (HS) aged children.
2. There is widespread acceptance of this behaviour and its benefits amongst parents and students.
3. There is an indication that students and parents want more involvement from children in choosing food for school, but time is the main barrier perceived by parents.
4. This behaviour was predicted by certain demographics such as the age of a parent’s children.

This suggests that while there is already widespread acceptance from the target audience of this behaviour and its benefits, parents currently involve children more in choosing food than they do in making and packing it. There is an opportunity therefore to enhance the impacts of this behaviour by encouraging more active involvement from children, rather than more passively choosing what to take to school.

While the age of the children is an important consideration (older children are more likely to be involved in this behaviour), a focus on promoting healthy eating, nutrition and responsibility to children are possible ‘hooks’ to encourage greater uptake. At the same time, perceptions of the extra time it requires need to be addressed, through promoting techniques and tools to help with meal planning and involving children in shopping.

Parent and student survey responses indicate that the home might be the site for change with regards to this behaviour, with potential support from the school.

### **What insights were gained about: *Students taking leftovers home?***

1. Students report that this behaviour is common, while parents report it only happens sometimes.
2. There is widespread acceptance of this behaviour and its benefits, although leftovers can have ‘bad press’ with parents due to perceptions of waste.
3. The school can be an active enabler of this behaviour, together with support from parents.
4. This behaviour was predicted by certain factors such as whether parents believed teachers or children thought it was a good idea.

This suggests that there is widespread acceptance of bringing home leftovers, and the benefits of this behaviour, by the target groups. If the problem of avoidable food waste in schools as indicated above is a cumulative one, then focussing on this behaviour may be a suitable way to address the issue. However, to counter the impression of leftovers being a negative sign of children not eating and to encourage greater uptake of this behaviour, it might be important to emphasise to parents the opportunity it has to facilitate greater involvement by children in choosing, making and packing food for school and therefore ensuring that they eat more.

Parent and student survey responses indicate the school might be the site for change with regards to this behaviour, with appropriate communication back to parents.

## **4. Designing and recommending solutions**

Drawing on initiatives designed during a workshop with WWS program stakeholders, and also on the behavioural insights generated from the surveys and the findings of the review, we recommend the following for WWS:

1. Develop and test a support package for schools to encourage students to return all leftovers and general food waste home.
2. Develop and test a program to encourage parents to involve children more in choosing, making and packing lunch for school.
3. Test an initiative to hold eating-time after play-time during the lunch-hour at schools.
4. Consider testing current WWS initiatives with regards to their impact on avoidable food waste in schools.

Each of these recommendations is developed further in this report, with particular consideration to the key partners needed, some of the resources required, what could be measured to track progress, and some questions that might still need to be answered. It is important to note that these initiatives are suggested for initial testing first, rather than broad-scale roll-out across all WWS member schools.

# 1. Introduction

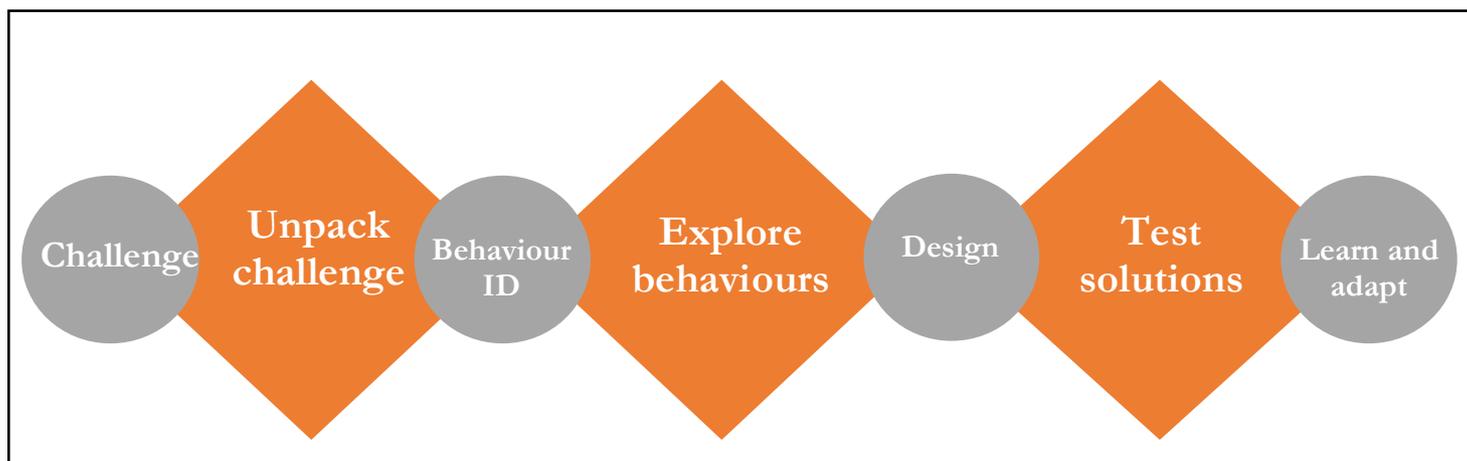
The Western Australian [Waste Wise Schools \(WWS\) program](#) supports primary and secondary schools in Western Australia (WA) with education strategies and resources to reduce waste to landfill and to develop positive environmental values amongst their students and the broader community.

A new focus of the program has been to reduce the amount of avoidable food waste that is found in the general waste streams of WA schools. Avoidable food waste includes whole fruit and vegetables, sandwiches, and packaged snacks that are all still edible before being discarded. WWS is keen to find ways to avoid this waste altogether (as opposed to composting or otherwise managing the issue on school grounds).

To address this challenge, WWS engaged a team from [BehaviourWorks Australia](#) and Monash University [Faculty of Education](#) to conduct a research project that targets avoidable food waste behaviours in WA schools. This work was conducted in three parts:

1. A **literature and practice review** of existing food waste behavioural research and practice, in order to unpack this challenge by using a behavioural lens, and to identify key audiences and priority behaviours that might help to reduce food waste in WA schools.
2. The **design, implementation and analysis of surveys** of WA school students, and the parents of WA school students, in order to explore priority behaviours from the perspective of these audiences.
3. A **design workshop with relevant WWS stakeholders** that drew on the insights gained from the surveys in order to develop food waste behaviour change initiatives ready for testing in WA schools.

This process followed the established BehaviourWorks Australia methodology for **unpacking challenges** using a behavioural lens, **exploring behaviours** from the perspective of the target audience, and then **designing interventions** ready for testing (see Figure 1).



*Fig 1: BehaviourWorks Australia methodology*

## 1.1. Report aims and structure

This report presents the outcomes of all three phases of the project and makes a number of recommendations for WWS to consider in order to reduce avoidable food waste in WA schools. The report is divided into three sections:

1. **Unpacking the challenge** – the findings of the literature and practice review of existing food waste behavioural research and practice (Section 2).
2. **Exploring the behaviours** – the outcomes and insights emerging from the surveys of parents and students with regards to prioritised behaviours (Section 3).
3. **Designing and recommending solutions** – an overview of draft initiatives designed during a workshop with WWS stakeholders and recommended next steps from the project team (Section 4).

To enhance the readability of this report, a number of the more detailed methods and analysis from the review and surveys have been included as appendices rather than embedded in the main document.

In order to provide further context to this project, this introduction concludes below by defining *avoidable food waste* as a key concept and also by providing some background to the issue of avoidable food waste internationally, in Australia, and in WA schools.

## 1.2. What is avoidable food waste?

Modern food production and consumption is an interconnected system at a global scale. Every aspect of this system – from agriculture through to manufacture, transport, retail, hospitality and consumption – has considerable levels of waste (FUSIONS, 2014, Quested et al, 2011). This project focuses on post-consumer food waste, and in particular, food that was still edible when discarded. This is classified by the United Kingdom-based Waste and Resources Actions Program (WRAP) as *avoidable food waste* and defined as:

*Food and drink thrown away because it is no longer wanted or has been allowed to go past its best. The vast majority of avoidable food is composed of material that was, at some point prior to disposal, edible ... In contrast to 'possibly avoidable', the category of 'avoidable' includes foods or parts of food that are considered edible by the vast majority of people. (WRAP, 2012a, p. 23)*

Unless otherwise noted, food waste referred to in this report will be considered avoidable food waste and based on the above definition.

## 1.3. What do we know about the issue of avoidable food waste?

### Food waste as a global and national issue

Globally, it has been estimated that 30–50% of food produced for human consumption is lost or wasted each year in production, manufacture, retail, and in homes; equating to over 1 billion tonnes wasted annually (FAO, 2011). While food waste is generated across all stages of the food supply chain, a substantial proportion of food waste in industrialized countries occurs at the consumer level (Baker et al,

2009). WRAP (2012a) estimate that in UK households alone over 4 million tonnes of food and drink are wasted per year.

While it is apparent that Australians also waste significant amounts of food, it is difficult to find accurate and consistent information at national, state or household levels (Pearson et al, 2013; Mason et al, 2011). Amongst the Australian studies that are available on this issue, a commonly-quoted figure is the Australia Institute's (2009) estimate that households discard \$5.2 billion of avoidable food waste annually, equating to over \$200 per person per year (Baker et al, 2009).

## **Food waste in Western Australian schools**

In WA, it is estimated that around 50% of waste generated by households is organic (WA Waste Authority website<sup>1</sup>). While it is not clear what proportion of this is food waste, it would be fair to assume that this would be similar to that of other states. In Victoria, for example, around 40% of household waste is food (Sustainability Victoria, 2010).

When considering the issue in WA schools, comprehensive state-wide data is also lacking, as it is in most other Australian states. Based on recent waste audits in about 200 schools in the Perth area, WWS have identified over three kilograms of avoidable food waste per student per year (C. Williams, *pers comm*, 26/02/2016). Using these results (and acknowledging considerable variation in the data set), WWS estimate that each year, students in WA schools discard three million pieces of whole fruit, 1.3 million pieces of packaged foods and 3.5 million sandwiches.

In other Australian states, it is difficult to find data beyond the individual school level that gives an accurate measure of the extent of this issue across schools at a more macro level. The Wipe out Waste (WoW) program in South Australia audited school waste streams and estimated that on average 6% (by volume) of this waste was avoidable food, while an additional 10% was food scraps (WoW website<sup>2</sup>). While other sustainable-school programs in Australia encourage schools to conduct waste audits, the data is often not centrally collected and reported, nor is it detailed enough to record the amount of food waste within a school's waste stream that is avoidable.

UK-based studies by WRAP in 2011 and 2012 estimated that avoidable food waste in both primary and secondary schools in the UK was around 80% of all food waste (WRAP, 2011, 2012b). In the United States, Wilkie et al (2015) highlight a number of studies in schools that showed 20% to 50% of food waste was avoidable, with vegetables and fruit being among the more common items.

It should be noted that US and UK schools typically have cafeteria or food service systems, as opposed to food being brought from home as is more commonly the case in Australia. This difference might not just influence the total amount of food discarded – studies by Buerger et al (2002), WRAP (2012b) and Wilkie et al (2015) all suggest that food waste is less in schools where students bring food from home – but also limit the potential transferability of US and UK-based interventions to schools in WA.

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<sup>1</sup> <http://www.wasteauthority.wa.gov.au/publications/organics> accessed 28/02/2016

<sup>2</sup> <http://www.wow.sa.gov.au/nude-food.html> accessed 28/02/2016

## 2. Unpacking the challenge– review findings

This section presents the findings of the literature and practice review, which aimed to:

- Provide a broad summary of research and practice with regards to food waste behaviours, with a specific emphasis on schools.
- Identify existing food waste behaviour change programs in schools within Australia and internationally.
- Develop a list of behaviours that could reduce food waste in WA schools.

The underlying objective of this work was to ensure that existing research and practice on this issue informed the final selection of behaviours that are explored through surveys (Section 3) and then targeted for intervention design (Section 4).

This section has the following parts; (2.1) a brief outline of the review methodology, (2.2) a commentary on the nature and strength of the current evidence on food waste behaviours in schools, (2.3) a presentation of the review’s key findings, with particular emphasis on understanding food waste behaviours and their influencers; (2.4) an summary of current programs that address this issue; and (2.5) a summary of the review’s findings together with a list of food waste behaviours to potentially target in WA schools.

### 2.1. Review method

To ensure that evidence and examples gathered were relevant to WA schools, as well as to make the scope manageable, the review focused on food waste research and programs primarily from Australia, New Zealand, the US and the UK.

Three main sources for food waste research and practice were utilised:

1. Literature and reports provided by the WWS team.
2. A rapid review of relevant academic journals contained in Monash University’s databases (the procedure for this review is described in more detail in Appendix 1).
3. The review team’s own network and desk-top research of practitioners and researchers in school and/or community-based sustainability programs in Australia, New Zealand, the US and the UK.

The conduct of the review sought to be both systematic and rapid. Rapid reviews are an emerging method of efficiently synthesising research evidence in health policy and other settings where a broad overview of research evidence is required in a short timeframe. Unlike traditional systematic literature reviews (which take 12 – 18 months), rapid reviews focus on synthesised research evidence and/or high-quality or recent primary studies.

The research publications and practice materials gathered from the above sources were analysed with three considerations in mind: the main themes and/or findings that were reported; the particular behaviours and audiences that were targeted; and the strength and quality of the evidence that was cited.

## 2.2 Strength and nature of evidence base

The database search identified that a number of diverse outcomes have been evaluated in relation to food waste and food waste behaviours. The majority of evidence that has been accrued relates to household food waste, packaging waste or the nutritional content of school lunch programs. There was only scattered evidence relating to predictors or interventions of avoidable food waste, especially in the school environment.

One peer-reviewed study was found on each of the following topics: predictors of adolescents' attitudes, predictors of adolescents staying in school to eat lunch, school gardens, cooking workshops and silence during meal times. Topics with more available evidence included waste campaigns (two studies), behavioural nudges (seven studies) and recess and lunch schedules (four studies).

Only one of these topics (recess before lunch) had multiple similar studies, which adds weight to the conclusions that can be inferred about this intervention strategy. For the other topics discussed, particularly when there is only a single study, it is difficult to discern how representative or transferable the findings are, and conclusions should therefore be interpreted with care.

Although there were numerous studies on households - including households with children - no studies were identified which specifically considered the parents' role in influencing their child's food behaviours. The majority of school-based studies identified were concerned with nutritional content and consumption rather than avoidable food waste.

The substantial literature on household food waste is generally of high quality and includes nationally representative samples. Furthermore, there were numerous similarities with the factors identified across studies from different countries which adds reliability to the results presented. These studies however tended to focus on understanding current attitudes and behaviours with regards to food waste, rather than describing the impacts of any particular interventions aimed at changing behaviours.

For studies that were specifically focused on food waste at schools, the majority of these were based on national school lunch programs and were largely concerned with food consumption for adequate nutritional content. Those that looked at tray/plate waste in relation to avoidable food waste tended to have smaller sample sizes which may affect their generalisability.

While there were some large school-based studies and one randomized control study, much of the evidence identified in this review came from small-scale primary school studies. In addition, there are contextual differences that need to be taken into consideration. Much of the evidence about lunch waste comes from the US and refers to tray and plate waste in cafeterias. This is not necessarily transferable to the Australian context but can still inform some food behaviours here.

The results presented below should therefore be interpreted in light of this commentary on the nature and strength of the evidence gathered.

## 2.3. What do we know about food waste behaviour in schools?

### What do we mean by food waste behaviour?

The generation of food waste is not a behaviour itself, but rather the outcome of a complex interaction of other behaviours which in turn are influenced by broader contexts (Quested et al, 2011; Principato et al 2015). The UK's Love Food Hate Waste (LFHW) campaign identifies two main behavioural categories that lead to household food waste (LFHW website<sup>3</sup>):

1. Too much food is purchased and/or cooked.
2. Food is not used in time.

These broad categories are in turn the result of a series of specific behaviours related to the planning of meals, shopping, the storage, preparation and consumption of food, and its final disposal (Quested et al, 2011; EPA NSW, 2012).

When considering food waste behaviours in schools, these are primarily about students not eating, or only partially eating, food provided and then discarding it into the school's waste systems (WRAP, 2011). As with households, these are in turn the result of behaviours to do with the planning and selection of meals, the amount and type of food provided, the organisation of meal-times in schools and the disposal of waste (WRAP, 2011). The behaviours are not only those of students, but also of their parents, of teachers and of the school administrators (Boudet et al, 2014; WRAP, 2011).

### What influences food waste behaviours?

#### *Of individual and in households*

Behaviours are typically influenced by a mixture of factors that could be considered 'internal' to an individual – attitudes, values, knowledge, habits, skills and resources – as well as features that are 'external' such as government policy, cultural norms and available technology (Quested et al, 2011).

In the case of food waste, in addition to the internal and external influencers identified above, the role of food manufacturing and retail companies is also considered critical. This is because product labelling, shelf-life information, portion sizes, marketing and price promotions, can all interact with and influence individuals' food waste behaviours and can lead to more, or less, food being wasted (Quested et al 2011, FUSIONS 2014).

As previously discussed, there is a growing field of research to identify specific influencers of food waste related behaviours (particularly within households) and to understand their relationships. In households, positive relationships have been found between the amount of waste and the level of household income, as well as the number of young people in the household. Smaller sized households are also found to waste per capita more than larger sized ones (where greater resource sharing is possible). For individuals, inverse relationships have been found between the amount of food waste and an individual's knowledge of waste issues, concern about environmental and civic impacts, and sensitivity to food hygiene.

Appendix 2 summarises these common factors and their supporting studies.

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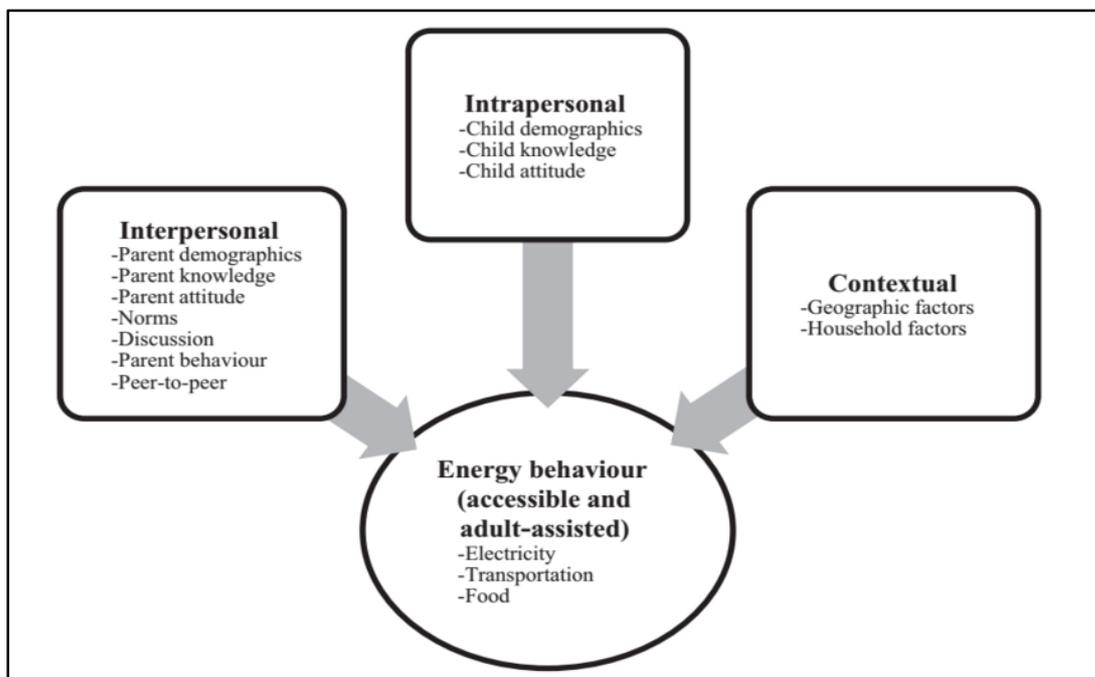
<sup>3</sup> <http://www.lovefoodhatewaste.com/content/facts-about-food-waste-1> accessed 28/02/2016

### *Of children and in schools*

A study of food waste in UK schools identified a series of operational, situational and behavioural causes of food waste (WRAP 2011), including crowded eating areas, short eating times, unappealing and unfamiliar food and a desire from children to play rather than eat.

There have also been a number of studies conducted in the US on tray/plate waste from cafeterias, with a specific focus on child nutrition (Byker et al, 2014). These have identified that factors such as: anxiety about eating, peer pressure, peer influence, familiarity with foods, time, and the need for social interaction, can all influence food consumption and therefore waste (Vander-Zanden & Pace, 1984). Beaulieu and Godin (2012) found that teenagers were less likely to eat lunch at school if there was a long delay in getting their lunch and if the weather was good.

A recent study by Bourdet et al (2014) on energy behaviours of young girls highlighted three categories of behavioural influencers for children: 1) *intrapersonal* (the child's own skill and knowledge in carrying out the behaviour), 2) *interpersonal* (the influence of parents and peers on behaviours), and 3) *contextual* (the built environment and household makeup). Figure 2 is an overview of these categories as developed by Bourdet et al (2014).



**Fig 2.** Factors influencing child energy behaviour (Bourdet et al, 2014)

While this study focused on energy behaviours and specifically targeted girls in an out-of-school program, it is useful in illustrating the range of inter-related influences on children with regards to pro-environmental behaviour, and highlighting the significant mediating role of parents in children's behaviour. These issues are relevant when considering food waste behaviours in Australian schools as parents would provide a significant amount of a student's food, as well as have considerable influence on their children's behaviour.

A further insight into influencers of food waste in schools comes from the South Australian WoW program (WoW website<sup>4</sup>) which anecdotally identified the following reasons why students discard avoidable food waste:

- Too much food is packed.
- A fear of negative consequences of bringing home uneaten food.
- Food is not appealing or popular.
- Children don't have enough time to eat everything and still play.

The overlap between avoidable food waste behaviours in schools and the behaviours of parents at home is noteworthy, particularly in regards to what food is provided, how much food is packed and how parents react to uneaten food.

This review did not find any peer reviewed studies that actually looked at what influences parents' food waste behaviours in relation to their children, or that examined the parents' role in influencing their child's food waste behaviours. Of some relevance was an empirical study on Brazilian caregivers which found that stockpiling comfort foods, in order to demonstrate affection for children, promoted greater food waste (Porpino et al, 2016). This study also identified that too many choices, increased convenience, procrastination and unplanned routines all contributed to food being wasted.

### **What might change food waste behaviours?**

While the previous section provided a summary of different factors that might influence or predict food waste related behaviours, this section focuses on factors that have been found to motivate or influence actual *changes* in behaviours.

#### *Of individuals and in households*

Baker et al's (2009) survey of Australian households found that financial savings was the most important motivation for reducing food waste (cited by twice as many families as compared with environmental considerations). A study of New Zealand households by WasteMINZ (2014) also found that financial and efficiency motivations were the main reasons for potentially reducing food waste, as well as expressed desires to value what is bought and not waste it. Quested et al (2011) found a similar pattern amongst UK households.

A survey of Swiss-German households found that people with more positive attitudes and norms towards reducing food waste, and those who perceived fewer risks when consuming leftovers, showed a higher intention to reduce food waste and reported wasting less food (Visschers et al, 2016). This showed that the *intention* to avoid food waste was the strongest predictor of actually wasting less and that these intentions are in turn influenced by personal attitudes, perceived health risks and personal norms.

A qualitative analysis of UK households identified waste concerns and doing the 'right' thing as motivators, as well as highlighting the importance of food management skills (Graham-Rowe et al, 2014). Inconvenience, lack of priority and exemption from responsibility were considered barriers to making changes. The wish to avoid experiencing negative emotions (such as guilt, frustration, annoyance,

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<sup>4</sup> <http://www.wow.sa.gov.au/nude-food.html> accessed 28/02/2016

embarrassment or regret) was shown to underpin both the motivations *and* the barriers to minimising food waste.

While a lack of knowledge of food waste issues was identified in some studies as being a barrier to change (Sustainability Victoria, 2010; EPA NSW, 2012), there is some doubt as to whether an increase in knowledge would actually motivate change. As Baker et al (2009) argue, “Simply informing people about the nature and extent of the problem and providing simple strategies to reduce waste is unlikely to be successful... The problem is not a lack of awareness but of translating this into behaviour change” (p 12). Sustainability Victoria (2010) found that when survey respondents learnt about their food waste, they wanted to address the problem, but showed reluctance if it meant actual behavioural change.

This conclusion is supported by Redman and Redman (2014), who explored whether different types and domains of knowledge predicted sustainable behaviours. They found that declarative knowledge (factual information and knowledge that a person has) did not predict greater participation in more sustainable food or in waste behaviours, thus there may be evidence to move away from educational approaches that focus primarily on declarative knowledge.

It is worth noting that none of these studies on motivations to change behaviours in order to reduce food waste actually then measured whether this happened. Instead they reported on subjects’ beliefs of what might motivate them, although Visschers et al (2016) asked participants to self-report on whether food waste was reduced or not.

#### *Of children and in schools*

Only one peer reviewed study was found which attempted to promote healthy eating and eco-friendly (less waste) behaviours to school children. The Great Taste, Less Waste communication campaign at one elementary school in the US aimed to motivate children to bring more fruits and vegetables to school. However, following the campaign no significant changes were observed in the quality and type of food brought from home (Goldberg et al, 2014). This finding again suggests that communication and knowledge might not be enough to create change in the food-waste related behaviours of students.

As has already been discussed, much of the research on children’s food waste behaviours has come from the field of nutrition, and has predominately occurred in the US. Due to their cafeteria-based system, there is some limit to the relevance of these studies for the Australian context. However, some useful themes emerge in relation to what might change children’s eating habits in schools. These themes are summarised in Appendix 3 together with their supporting studies, and show children’s food behaviours in school can be changed by: the opportunity to select foods, the familiarity of food, the ease with which it can be eaten, and the provision of prompts, reminders, incentives and fun.

One area worth considering separately is the comparatively large amount of evidence that was identified in relation to the impact of scheduling lunch after recess on children’s food consumption. US research into behaviour at play- and eating-time identified that almost one fifth of schools gave students less than 20 minutes to eat lunch (Buergel et al, 2002). Children with play-time after eating-time often seem more anxious to go out and less interested in eating lunch.

In a study of 67 ethnically diverse elementary students from grades 1-3, Getlinger et al. (1996) showed that plate waste decreased when play-time was scheduled before eating-time rather than afterwards. A

similar outcome came from Rainville et al (2009), who also found that a longer eating period resulted in decreased food waste. From the school perspective, a study by Bark et al (2010) surveyed 195 principals regarding the benefits and difficulties with scheduling play before eating. Overall, principals reported improvements in student behaviour and increased consumption of lunch. However, principals also pointed out that children were often rowdy when entering the cafeteria following outside play and frequently needed adult mediation during eating time to resolve playground issues.

Again, it is worth noting that no research was identified that looked at the influence of parents in relation to food waste behaviours of students in schools. In addition, no studies were found which looked at the difference in food waste related behaviours between primary and secondary-aged students.

## 2.4. What programs currently target food waste in schools?

A number of programs that currently address food waste within and beyond schools were identified in Australia, New Zealand, the UK and the US. These programs are presented in more detail in Appendix 4. Some of the key messages that emerged from this review of practice are as follows:

- There are four categories of relevant programs; 1) household-based, 2) school-based, 3) school-based with a broader sustainability focus, and 4) school-based gardening and cooking focus.
- There are a growing number of household-focused programs addressing food waste as a specific issue.
- Only one current program was identified which specifically engaged school children in avoidable food waste. While other school-based programs with a broader sustainability focus have looked at food waste, this is often included in a more general focus on reducing school waste.
- Food waste issues in schools are typically addressed through litter-less lunch events (which focus on packaging) and managing the issue on site through composting or similar.
- While it is clear that specific schools have addressed avoidable food waste, it was not possible in this review to find information about what was done within schools and its impacts.
- While food gardening and cooking programs increase students' willingness to try different foods and have other dietary and cooking skill impacts, the link to a reduction in food waste is not clear.
- With regards to household food waste programs, there is an increasing focus on identifying and understanding specific behaviours which generate food waste and to conduct research that attempts to create benchmarks on current behaviours and attitudes. Complementary work in Australian schools has not yet been done, and exists elsewhere only to a limited degree.
- For either household or school-based programs, food waste issues are typically addressed through the provision of web-based (written or multi-media) information about the problem and tips to reduce an individual's waste. Active engagement with specific groups through social marketing and skills workshops have tended to focus on households rather than schools.
- There was a general lack of evaluation of impact and evidence of change from food waste programs.

## 2.5. Section summary and potential behaviours to target

When considering this review of research and practice with regards to avoidable food waste in schools, a number of key lessons emerge for WWS:

- The evidence base of food waste behaviours in schools is scarce and fragmented, and can only provide hints and broad guidance rather than examples of best (or even common) practice.
- Household size, age and income have been shown to predict the amount of food a household wastes, as well as knowledge of the issue and its impacts.
- When considering children’s food waste behaviours in Australian schools, the overlap with food waste related behaviours of their parents (*interpersonal influences*) must be acknowledged, in addition to school environment (*contextual influence*), and the individual knowledge and skills of the child (*intrapersonal influences*).
- Children’s food behaviours in school were shown to be changed by the opportunity to select foods, the familiarity of food, the ease with which it can be eaten, and the provision of prompts, reminders, incentives and fun. There is also evidence to suggest that the timing of when food is eaten in relation to play time can affect the amount of food eaten by children.
- Research has shown that individuals in the home report that they are motivated to reduce their food waste due to its financial impacts and a desire not to be wasteful, more than environmental or civic concerns. Barriers related to convenience and lack of priority have also been suggested.

### What behaviours could WWS target to reduce avoidable food waste in WA schools?

Unlike household food waste, no clear set of behaviours have been developed to address food waste in schools. Drawing on the research and practice assembled and reviewed above, Table 1 presents a set of possible target behaviours to reduce avoidable food waste in WA schools.

| Behaviour  | Target audience    |
|--|--------------------|
| <ul style="list-style-type: none"> <li>• Plan a week of lunches</li> <li>• Don’t pack too much food</li> </ul>   | Parents            |
| <ul style="list-style-type: none"> <li>• Involve children in making their own lunches</li> <li>• Discuss with children what they like to eat and how much</li> </ul>     | Parents & children |
| <ul style="list-style-type: none"> <li>• Pack food that will keep and not spoil or go soggy</li> </ul>   | Parents            |
| <ul style="list-style-type: none"> <li>• Include foods that can eaten ‘in stages’– e.g. cutting up fruit or sandwiches into pieces to eat throughout the day.</li> </ul> | Parents            |
| <ul style="list-style-type: none"> <li>• Invest in good lunchbox ‘hard-ware’ to reduce damage and spoiling of foods</li> </ul>   | Parents            |
| <ul style="list-style-type: none"> <li>• Bring leftovers home</li> </ul>   | Children           |
| <ul style="list-style-type: none"> <li>• Implement ‘take food home’ policy</li> </ul>  | Schools            |
| <ul style="list-style-type: none"> <li>• Schedule lunch after recess</li> <li>• Eat together as a class inside before play time</li> </ul>                               | Schools            |

|                           |         |
|---------------------------|---------|
| · Schedule longer lunches | Schools |
|---------------------------|---------|

**Table 1:** *Identified behaviours that reduce avoidable food waste in school*

The next section (3) describes how two priority behaviours were shortlisted from this tables and the insights gathered when surveying key target audiences about their current participation and beliefs about these behaviours. These insights were then drawn on to develop draft interventions that aim to reduce avoidable food waste in WA schools (Section 4).

### 3. Exploring behaviours – surveying target audiences

Based on the findings of the review, and the final table of recommended behaviours, the WWS team short-listed two behaviours for further exploration with their target audiences:



Parents involve their children in choosing, making and packing food from home that they take to school



Children bring home their avoidable food waste (leftovers) from school

These were targeted due to the opportunity for creating positive change within the household (the first behaviour), as well as providing an alternative to the problem of students discarding avoidable food waste at school (the second behaviour).

The underlying objective of this phase of the project was to provide insights about these two behaviours from the target audiences' (parents and students) perspective, which could then be used to inform the development of behaviour change initiatives for WWS to trial. This section comprises of the following: (3.1) an overview of the method used to explore the different behaviours; (3.2) a presentation of the main findings, with particular emphasis on the insights they provide about the challenge of avoidable food waste in WA schools and the two behaviours under investigation; and (3.3) a consideration of what these insights mean for possible initiatives that WWS could trial.

#### 3.1. Method overview

Two online survey instruments were developed to explore the selected behaviours from the perspectives of WA school students and of parents of WA school children. Appendix 5 shows the instrument used for school students and Appendix 6 shows that used for parents. Both sought to explore the audiences':

- Self-reports and beliefs about current rates of participation in each behaviour;
- Beliefs about the perceived advantages and disadvantages of these behaviours;
- Beliefs about who might approve or disapprove of these behaviours; and
- Beliefs about what might enable, or act as barriers to, the behaviours<sup>5</sup>.

The student survey instrument was shorter and less detailed than that for the parents, to ensure both easier comprehension and a higher rate of completion from this group. Both instruments were managed online through the [Qualtrics survey platform](#).

Students and parents were both approached through a national survey panel company, which pays those on its panels to take part in surveys. This strategy was considered the most effective way to achieve an adequate sized, and representative, sample for each target audience.

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<sup>5</sup> This survey design is conceptually based on I. Ajzen's Theory of Planned Behaviour with regards to the factors it is trying to measure from the target audience. See for e.g.: *Ajzen, I (2002) Constructing a TPB questionnaire: Conceptual and Methodological Considerations, Beilefeld University <http://www.uni-bielefeld.de/ikg/zick/ajzen%20construction%20a%20tpb%20questionnaire.pdf>*

The survey instruments and data collection process were given ethics approval by the Monash University Ethics Committee.

## 3.2. Survey findings

### Whom did we survey?

Table 2 shows the key demographic attributes of the parent and student samples. Appendix 7 provides additional information on gender, age range, employment state, education levels, location, size of household, and school grades represented within each of these samples.

| Parents of WA students surveyed  | WA students surveyed  |
|--|---|
| <ul style="list-style-type: none"> <li>• 620 respondents from across WA</li> <li>• 433 females, 187 males</li> <li>• Their age range was 30 – 50 years</li> <li>• 69% had at least one child in primary school (PS)</li> <li>• 44% had a least one child in high school (HS)</li> <li>• Most had two children in school</li> </ul> | <ul style="list-style-type: none"> <li>• 570 respondents from across WA</li> <li>• 110 primary school (PS) students (53 males and 57 females)</li> <li>• 460 high school (HS) students (107 males and 353 females)</li> <li>• Years 4 – 12 represented (did not attempt to target students below Year 4 due to concerns over their ability to comprehend the survey questions)</li> </ul> |

*Table 2: Features of student and parent samples*

While the survey samples could, in many respects, be considered broadly representative of the WA population, it is important to note that more females than males (for both samples) responded to the survey overall and more HS students responded than PS students. A higher representation of females in survey respondents is a common issue for social research studies (Cull et al 2005), and in this case would not present much of a problem based on the types of questions asked in the survey. However, the skew to HS students should be noted when interpreting the results of surveys and caution taken when considering what they might mean for the PS sector.

### What insights were gained about: *Avoidable food waste in WA schools?*

The two main insights discussed here include:

1. Both parents and students report that food eaten at school is typically brought from home.
2. Parents believe, and students report, that all or most food that is brought from home to school is eaten.

**INSIGHT 1: Both parents and students report that food eaten at school is typically brought from home**

The majority of parents report that their children take food from home to school five days a week (see Figure 3). The frequency is slightly higher if the children are in PS. We did not find any noticeable

differences between grade tiers within PS or HS in relation to how often the parents reported that their children bring food from home.

The majority of HS and PS students also report that they bring food from home to school five days a week, with HS students reporting this at a slightly lower frequency (see Figure 4).

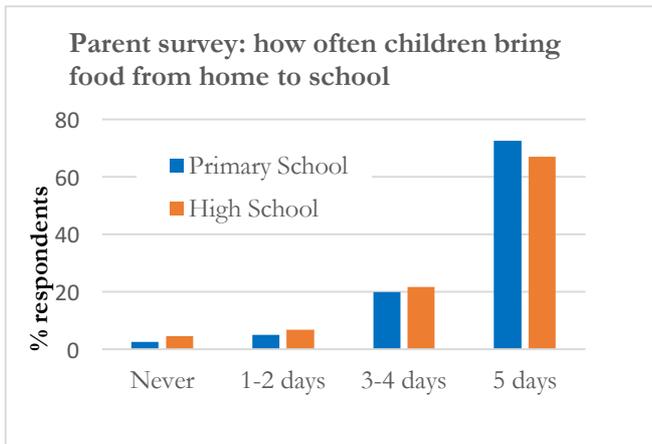


Fig 3: Percentage of parents reporting the frequency that their children bring food from home to school

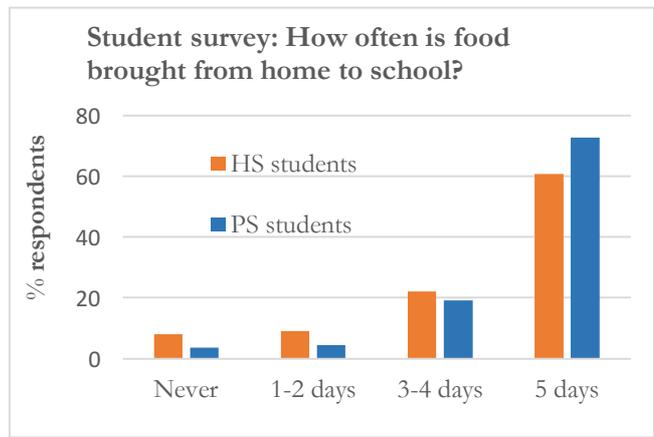


Fig 4: Percentage of PS (n = 110) and HS (n = 451) students reporting the frequency that they bring food from home to school

This confirms that food brought from home is a part of the problem of avoidable food waste in WA schools (as opposed to this coming mainly from canteen food). Therefore, a focus on parents and households – as represented in the two priority behaviours - is an important part of the solution to this issue.

**INSIGHT 2. Parents believe, and students report, that all or most food that is brought from home to school is eaten**

The majority of parents believe that their children eat all or most of the food from home that they bring to school (see Figure 5). The majority of HS and PS students report that, at school, they eat all or most of the food that they brought from home. HS students report more that they eat all of their food and PS students report more that they eat most of their food (see Figure 6).

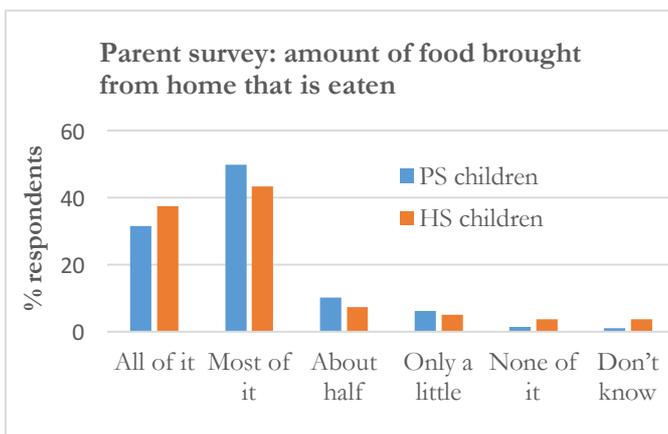


Fig 5: Percentage of parents reporting beliefs about amount of food their children bring to school they actually eat

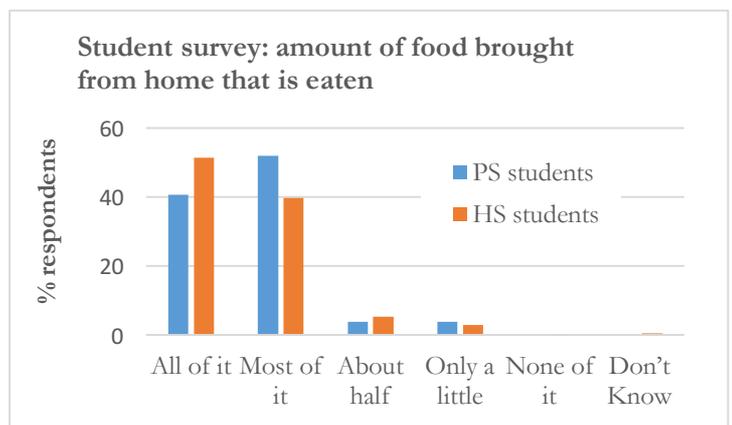


Fig 6: HS (n = 413) and PS (n = 106) student self-report on the amount of food from brought from home that they typically eat at school

This paints a picture that is possibly different to what WWS have found in school with regards to avoidable food waste. Parents and children are either reporting a more positive situation than reality, or WWS is reporting a situation that is worse than reality. The alternative is that the the problem of food waste in WA schools is a cumulative impact coming from a small number of students discarding edible food each day in different schools across the state.

Parents who believed that their children ate only half or less of the food brought from home were asked why they thought this was the case. This was also asked of students who reported that they only ate a little or none of the food they brought from home. Table 3 shows the main trends in answers to this question.

| Reason   | Parents' beliefs                   |                                    | Student reports       |                       |
|--|------------------------------------|------------------------------------|-----------------------|-----------------------|
|  | Number of parents with PS children | Number of parents with HS children | Number of PS students | Number of HS students |
| · <i>Too much food for them to eat</i>           | 8                                  | 4                                  | 1                     | 6                     |
| · <i>Did not like the food</i>                   | 15                                 | 12                                 | 2                     | 7                     |
| · <i>They wanted to go and do something else</i> | 52                                 | 29                                 | 5                     | 11                    |
| · <i>Don't have enough time to finish it.</i>    | 29                                 | 20                                 | 3                     | 8                     |
| · <i>Other</i>                                   | -                                  | -                                  | NA                    | 10                    |

Table 3: Frequency of reasons given by parents and students who reported that only half or less of food from home was eaten at school

While these results were not compared for statistical significance, there seems to be an indication that time available for lunch, in conjunction with the distractions of other activities, might be an issue that reduces the amount of food eaten by students. This echoes some of the findings in the literature and practice review.

### **What insights were gained about: *Parents involving children in choosing, making and packing food for school?***

The four main insights discussed here include:

1. Parents are more likely to involve children in choosing food for school rather than making or packing it, and this is more likely for HS aged children.
2. There is widespread acceptance of this behaviour and its benefits amongst parents and students.
3. There is an indication that students and parents want more involvement from children in choosing food for school, but time is the main barrier perceived by parents.
4. This behaviour was predicted by certain demographics such as the age of a parent's children.

**INSIGHT 1:** Parents are more likely to involve children in choosing food for school rather than making or packing it, and this is more likely for HS aged children.



The majority of parents reported that their children were involved in choosing food always or most of the time. Those with HS students reported they were always involved more often than those with PS students (see Figure 7).

This is supported by the student surveys, in that the majority of HS students report that they are always involved in choosing food for school, while the majority of PS students report that they are involved in choosing food most of the time. There is also a high frequency of HS students involved in choosing food most of the time (see Figure 8).

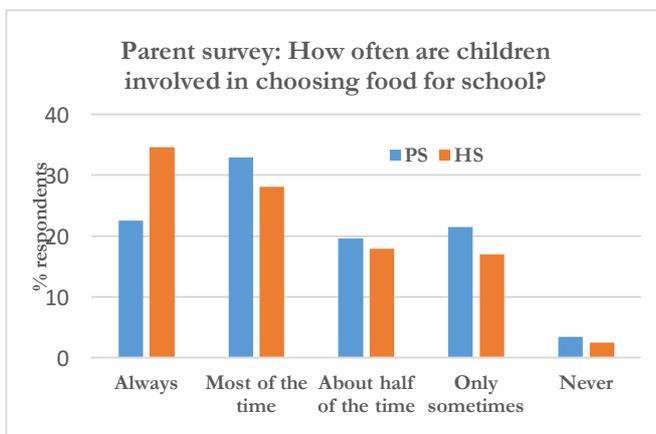


Fig 7: Percentage of parents reporting the frequency that their children are involved in choosing food for school

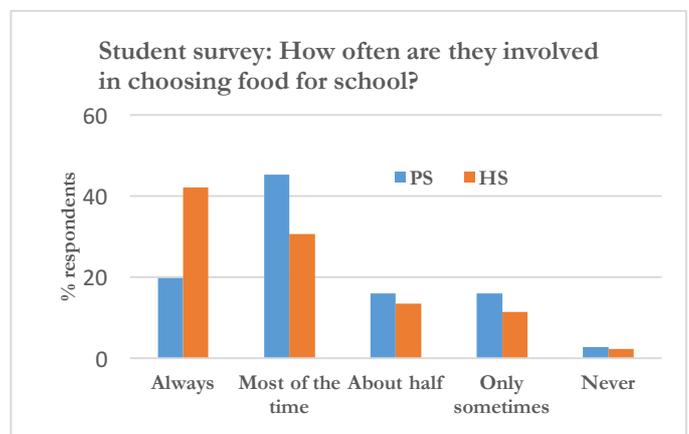


Fig 8: Percentage of HS (n = 394) and PS (n=106) students reporting the frequency of their involvement in choosing food for school

The majority of parents reported that their HS or PS children were involved in making and packing food only sometimes or never. Those with HS students reported higher frequencies for always involving children, while those with children in PS reported higher frequencies for never involving children in making and packing (see Figure 9).

This is again supported by the student surveys, in that the majority of HS students report that they are always involved in making and packing food for school, while the majority of PS students report that they are involved in making and packing food only sometimes or never. There are almost as many HS students reporting they only sometimes make and pack food as those reporting they do this most of the time (see Figure 10).

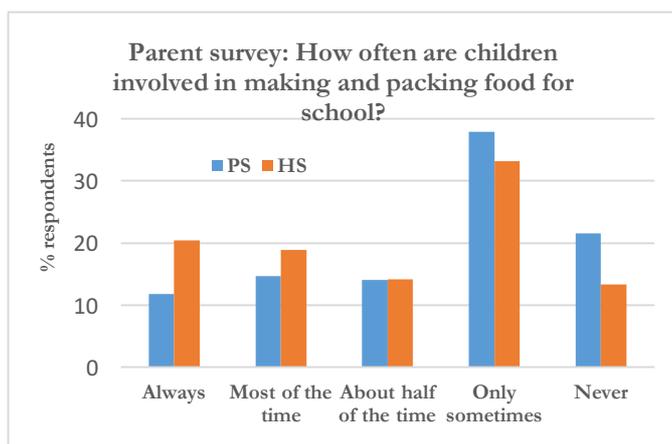


Fig. 9: Percentage of parents reporting the frequency that their children are involved in making and packing food for school

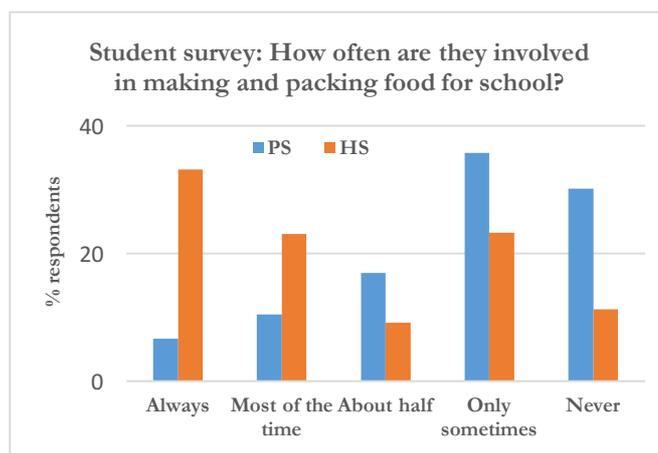


Fig. 10: Percentage of HS (n = 394) and PS (n=106) students reporting the frequency of their involvement in making or packing food for school

**INSIGHT 2: There is widespread acceptance of this behaviour and its benefits amongst parents and students**



Most parents believed that their children, the rest of their family, and teachers would think it a good idea to involve children in choosing, making and packing for school. Nearly half of parents did not name anyone who might think this would be a bad idea (see Table 4).

| Group                             | % of parents who believe that this group would think it a good idea | % of parents who believe that this group would think it a bad idea |
|-----------------------------------|---|--|
| • The children                    | 59.1  | 17.2   |
| • Your friends                    | 20.8  | 9.3  |
| • Your family                     | 44.3  | 12.9   |
| • Teachers at your child's school | 34.1  | 7.2  |
| • Other parents at the school     | 14.5  | 11.6   |
| • No-one I can think of           | 11.3  | 50.2   |

Table 4: Frequency of parent reported beliefs about whether different groups think involved children in choosing, making and packing food is a good or bad idea

Parents were asked to give their top 2-3 perceived benefits and disadvantages of this behaviour. Their most frequently-mentioned beliefs about the benefits of this behaviour were:

- If children are involved in choosing, making and packing food, they will be more likely to eat it.
- It teaches responsibility and independence to children by involving them more. Linked to this, although not mentioned as frequently, was the benefit of involving the children more in daily home tasks, providing more chances to interact as family, discussing healthy eating and boosting self-esteem.

- The opportunity to learn ‘life’ skills - cooking/food preparation, time management, decision making, planning – was also often mentioned as a benefit, as was the opportunity for children to learn more about nutrition and healthy eating.
- There was less waste and cost coming from children actually eating their food, and it would mean less work for the parent.

The most frequently-mentioned beliefs from parents about the disadvantages of this behaviour were:

- That children will pick unhealthy or the ‘wrong’ foods. ‘Wrong food’ concerns included unhealthy foods, expensive foods, the same foods all the time and packing too much or too little.
- Extra time would be required to involve children in these tasks. There would be more mess to clean and parents already feel rushed in the morning.
- The arguments that would occur with children about their choices.
- Also mentioned was a concern that children would forget or not leave enough time for this behaviour.

In responding to an open-ended question at the end of the student survey, students frequently mentioned that the issue of avoidable food waste in WA schools could be addressed through their greater involvement in choosing, making and packing food, showing their own understanding of the benefits of this behaviour to the challenge of food waste.

**INSIGHT 3: There is an indication that students and parents want more involvement from children in choosing food for school, but time is the main barrier perceived by parents**



Figure 11 shows that parents whose children are only involved about half the time or less in choosing food for school would only sometimes prefer them to be more involved in this behaviour. Figure 12 shows that parents whose children are only involved about half the time or less in making and packing food for school have roughly equal desires to involve HS children more and only sometimes, while those with PS children would like them only sometimes to be more involved.

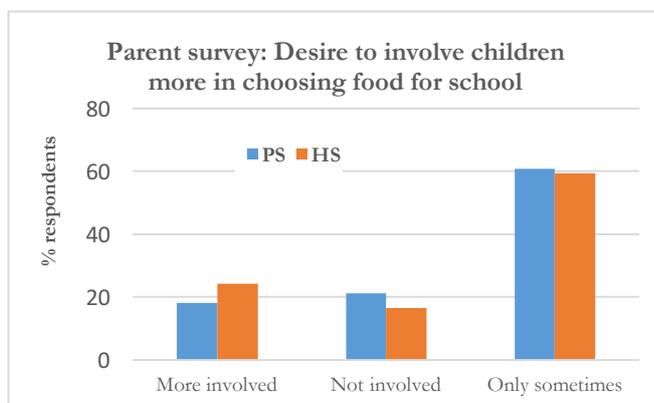


Fig 11: Percentage of parents with lower rates of involvement from children in choosing food reporting desires for more involvement

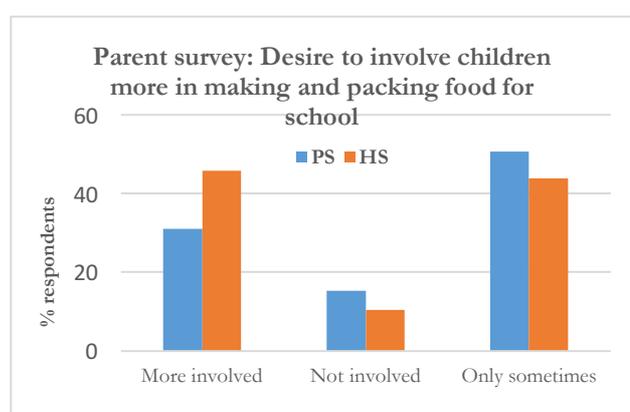


Fig 12: Percentage of parents with lower rates of involvement from children in making and packing food reporting desires for more involvement

This pattern is broadly mirrored in the results from the student surveys. Figure 13 shows that amongst students who are involved in choosing food for school only half the time or less, those of HS age are more keen to be involved compared to those of PS age. Figure 14 in turn shows that of students who are involved in making and packing food for school only half the time or less, both PS and HS students would like to be more involved only sometimes. HS students would prefer to be more involved than PS students.

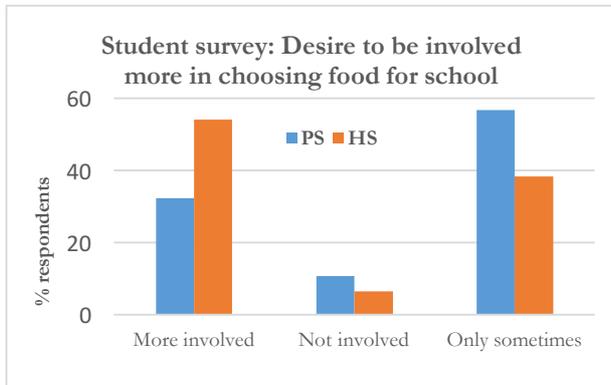


Fig. 13: Percentage of students with lower rates of involvement in choosing food reporting desires for more involvement

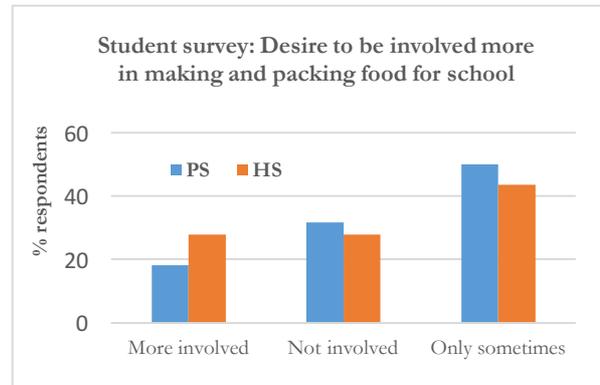


Fig. 14: Percentage of students with lower rates of involvement in making and packing food reporting desires for more involvement

Parents were asked to suggest what would help enable this behaviour more and what would be a barrier to this behaviour. Their most frequently mentioned beliefs about what would enable this behaviour include:

- A parental controlled selection of choices to ensure that children still selected healthy and appropriate food. There were also some suggestions of offering food that children like together with healthier options.
- Better planning and preparation – making lunch the night before, getting up earlier, having simple, pre-cut, easy to grab foods available, planning the week of lunches – and involving the children in this process, were also frequently cited as enablers.
- Involve children in shopping to make suitable choices together. Also suggested was that parents and children prepare food together (rather than leaving it all up to the children).
- Make the process fun and creative. There were some suggestions also for rewards for being involved – pocket money, a food treat or some money for school canteen.
- A range of ideas to do with parental ‘engagement style’ with children to involve them more - including discussions about healthy eating/food choices, starting young, starting simply, and making it children’s daily responsibility/role at home.
- There were also some requests for external help including from the school, from supermarkets and external websites/apps with ideas.

The most frequently mentioned beliefs from parents about what would act as barriers to this behaviour include:

- Lack of time.
- Disagreements over the food to be packed.

- Issues to do with children being fussy eaters or not wanting to be involved were also raised as potential barriers.
- Having little or too much choice was also frequently raised as a barrier to involving children in this task, although how this might be a barrier was not explained.
- Age was also seen as a barrier, with younger children not perceived as able to be involved as much in choosing, making or packing food for school.
- Barriers to do with food preparation itself – complicated to make, children lacking skills, the mess that is made – were also raised.

**INSIGHT 4: This behaviour was predicted by certain demographics such as the age of a parent's children**



Regression analysis of parents' reported frequencies of PS and HS children being involved in choosing, making and packing food for school were conducted against the following variables from the parent surveys: parental age, parental gender, parental levels of education, parental employment status, number of children in household, children's grade tier, and parental beliefs about whether children, family, or teachers would think it's a good or bad idea.

Appendix 8 provides the more detailed statistical analysis for the positive relationships found between different variables and the frequencies that parents report their children are involved in choosing or making and packing food for school.

In short, though, the results show that PS children are more likely to be involved in choosing food for school if:

- parents have higher levels of education;
- there are more children in the house;
- the children are in upper PS; and
- parents believe that children think it's a good idea.

Similarly, HS children are more likely to be involved in choosing food for school if:

- parents have higher levels of education; and
- parents believe that children think it's a good idea.

With regards to making and packing food for school, PS children are more likely to be involved if:

- parents are younger in age; and
- the children are in higher PS.

And HS children are more likely to be involved in choosing food for school if:

- parents are younger in age;
- parents believe that children think it's a good idea;
- parents believe that the family think it's a good idea; and

- parents believe that their children don't think it is a bad idea.

These results both confirm some of the trends noticed elsewhere for this behaviour (namely that the age of the child is a factor in their level of involvement) and also suggest that getting students interested in this behaviour will increase the chances of parents involving them.

## What insights were gained about: *Students taking leftovers home?*

The four insights discussed in this element include:

1. Students report that this behaviour is common, while parents report it only happens sometimes.
2. There is widespread acceptance of this behaviour and its benefits, although leftovers can have 'bad press' with parents due to perceptions of waste.
3. The school can be an active enabler of this behaviour, together with support from parents.
4. This behaviour was predicted by certain factors such as whether parents believed teachers or children thought it was a good idea.

**INSIGHT 1: Students report that this behaviour is common, while parents report it only happens sometimes**



The majority of PS and HS students report that they bring leftover food home. HS students also report that they eat the leftover food on the way home or at home (see Figure 15). Most parents report that their PS and HS children only sometimes bring home leftovers (see Figure 16). *These results need to be handled with caution however*, as there may have been some confusion from respondents due to an unclear question. Parents could answer this on the basis of their beliefs about how much food their child eats at school (i.e. "my child typically eats all or most of their food at school, so they would rarely or never bring home leftovers), rather than focus on what happens to food *if* the child does not eat it at school.

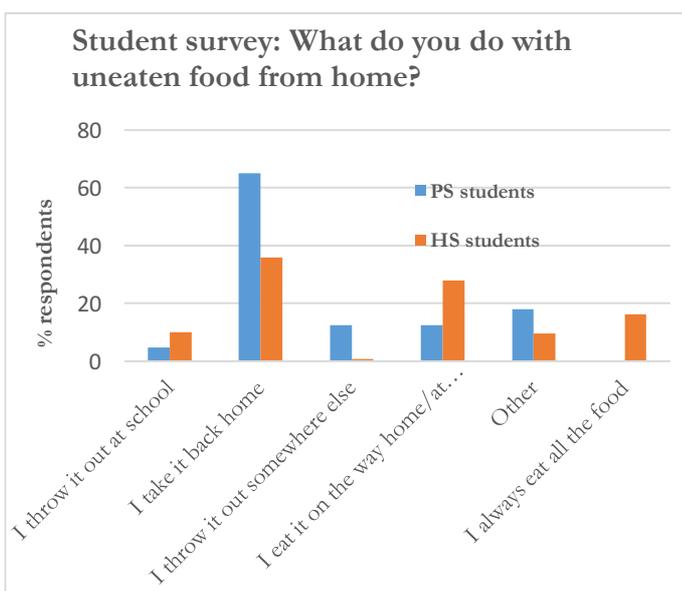


Fig. 15: Frequency of HS (n = 410) and PS (n = 119) students reported actions of what they do with food they did not eat

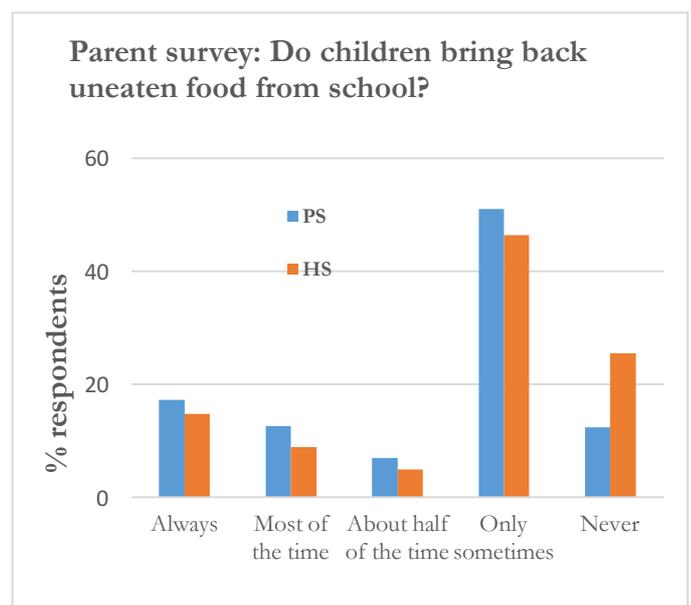


Fig. 16: Percentage of parental reports on frequency that children bring back food from home that they did not eat

**INSIGHT 2.** There is widespread acceptance of this behaviour and its benefits, although leftovers can have ‘bad press’ with parents due to perceptions of waste.



Most parents believed almost equally that teachers, their family and their children thought it would be a good idea for children to bring back any food that they did not eat at school. Over half of parents did not name anyone who might think this would be a bad idea (see Table 5).

| <b>Group</b>                             | <b>% of parents who believe that this group would think it a good idea</b> | <b>% of parents who believe that this group would think it a bad idea</b> |
|--|--|---|
| • <i>The children</i>                    | 25.3   | 16.9  |
| • <i>Your friends</i>                    | 14.2   | 6.8   |
| • <i>Your family</i>                     | 28.8   | 11.8  |
| • <i>Teachers at your child's school</i> | 28.5   | 5.0   |
| • <i>Other parents at the school</i>     | 10.5   | 4.5   |
| • <i>No-one I can think of</i>           | 29.3   | 53.8  |

*Table 5: Frequency of parent reported beliefs about whether different groups think involved children in choosing, making and packing food is a good or bad idea*

Parents were asked to give their top 2-3 perceived benefits and disadvantages of this behaviour. Their most frequently-mentioned beliefs about the benefits of this behaviour were:

- That food brought back could be reused (and reduce waste).
- It will allow parents to monitor how much/what their children are eating or not eating. Linked to this was the perceived benefit that it will help parents know what to pack for future lunches.

The most frequently-mentioned beliefs from parents about the disadvantages of this behaviour were:

- To do with the risk of food spoiling in the children’s bags and the potential mess associated with leftovers bring brought home. The risk of children leaving leftovers in their bags overnight, over the weekend or over the holidays, was also identified.
- An equally frequent response was that there were no perceived disadvantages.
- A number of respondents focused rather on the consequences of their children not having eaten all their food at school and the waste of food rather than the disadvantages of children bringing home leftovers.

In responding to an open-ended question at the end of the student survey, students frequently mentioned that the issue of avoidable food waste in WA schools could be addressed by their taking leftover food home. Students also suggested:

- The need for this behaviour to be supported by the school, such as fewer general waste bins being available and teachers monitoring for the behaviour. Set eating times were also suggested to reduce the amount of leftovers and allow for greater monitoring.

- A collection box could be established in the school to collect unwanted food for other students to eat or to be donated to charity.

**INSIGHT 3.** The school can be an active enabler of this behaviour, together with support from parents



For students who reported taking leftover food home, Table 6 shows their reasons for this behaviour. For those who throw leftover food away at school, Table 7 shows their reasons for this behaviour.

| Reason                                   | Number of PS students | Number of HS students |
|--|-----------------------|-----------------------|
| • <i>Teacher told me to</i>              | 3                     | 1                     |
| • <i>Parents told me to</i>              | 31                    | 13                    |
| • <i>It's just what I've always done</i> | 42                    | 96                    |
| • <i>I want to eat it later</i>          | 13                    | 42                    |
| • <i>Other</i>                           | -                     | 14                    |

Table 6: Frequency of reasons given by HS and PS students for bringing leftover food home

| Reason   | Number of PS students | Number of HS students |
|--|-----------------------|-----------------------|
| • <i>Teacher told me to</i>                    | -                     | 1                     |
| • <i>Parents told me to</i>                    | 1                     | 1                     |
| • <i>Don't want my parents to see it</i>       | 2                     | 16                    |
| • <i>That's what my friends do</i>             | 1                     | 6                     |
| • <i>It's just what I've always done</i>       | 2                     | 14                    |
| • <i>It's rubbish and should go in the bin</i> | 2                     | 16                    |

Table 7: Frequency of reasons given by HS and PS students throwing leftover food away at school

Parents were asked to suggest what would help to enable this behaviour more and what would be a barrier. Their most frequently-mentioned beliefs about what would enable this behaviour include:

- That children would bring home leftovers if the parents told them, reminded them or set rules, or educated children about why they should bring home (no waste etc.).
- The school could help in this area – teachers reminding, monitoring, restricting access to bins, no bins etc.
- Not scolding their children if leftovers are brought home.
- A number of respondents who were unsure of what would help children bring home leftovers.
- Some respondents also believed that encouraging their children to bring leftovers home for reuse would enable this behaviour, as would equipping them with a proper lunchbox to store leftovers.

The most frequently-mentioned beliefs from parents about what would act as barriers to this behaviour include:

- That children worry that they would get into trouble if they brought leftovers home.
- That there were no barriers to getting children to bring home leftovers, with an equal number also being unsure of what these could be.

- Issues with mess or food spoiling were also cited as beliefs of barriers which prevent leftovers being brought home.
- Children forgetting, the difficulty of monitoring if children actually have leftovers, the social norms and (too many bins) infrastructure at school which make it easy to throw food away. A lack of time for kids to pack away leftovers and poor containers were also cited.
- A small number of respondents indicated that they did not want children to bring back leftovers.

**INSIGHT 4:** This behaviour was predicted by certain factors such as whether parents believed teachers or children thought it was a good idea



Regression analyses of parents' reported frequencies of PS and HS children bringing leftovers back from school were conducted against the following variables: parental age, parental gender, parental levels of education, parental employment status, number of children in household, children's grade tier, and parental beliefs about whether children/family/teachers think it's a good/bad idea.

Appendix 9 provides more detailed statistical analyses for the positive relationships found between the different variables and the frequencies with which parents report their children bring home leftovers (bearing in mind the potential problems identified with that question in the survey).

The regression analysis showed that PS children are more likely to bring leftovers home if:

- they are in upper PS; and
- parents believe that teachers think it's a good idea.

The regression analysis showed that HS children are more likely to bring leftovers home if:

- parents believe that children think it's a good idea.

### 3.3. What do these insights tell us about possible interventions to address avoidable food waste in WA schools?

By way of summary, the main insights gathered from the surveys are re-capped below, together with some considerations on how these may inform possible efforts to address the challenge of avoidable food waste in WA schools.

#### **What insights were gained about: *Avoidable food waste in WA schools?***

1. Both parents and students report that food eaten at school is typically brought from home.
2. Parents believe, and students report, that all or most food that is brought from home to school is eaten.

This suggests that; parents and students are reporting a more positive situation than in reality, or that WWS believes the problem is worse than reality, or that the problem is the cumulative result of small numbers of students discarding small amounts of avoidable food waste each day in schools across the state. While it is typical for survey respondents to answer more positively about a situation than it may be

in reality, the data collected from WWS in schools supports the likelihood that this issue is a cumulative one, namely small (and changing) numbers of students discarding small amounts of food waste each day. The challenge for addressing this issue is therefore one of engaging with this small and shifting group, who also do the right thing most days. Should WWS therefore seek to engage schools in reducing avoidable food waste through a deliberate and explicit approach (such as a general campaign or education program) or rather through a subtler behavioural nudge that ‘closes the door’ on this behaviour when it does occur?

**What insights were gained about: *Parents involving children in choosing, making and packing food for school?***

1. Parents are more likely to involve children in choosing food for school rather than making or packing it, and this is more likely for HS aged children.
2. There is widespread acceptance of this behaviour and its benefits amongst parents and students.
3. There is an indication that students and parents want more involvement from children in choosing food for school, but time is the main barrier perceived by parents.
4. This behaviour was predicted by certain demographics such as the age of a parent’s children.

This suggests that while there is already widespread acceptance from the target audience of this behaviour and its benefits, parents currently involve children more in choosing food than they do in making and packing it. There is an opportunity therefore to enhance the impacts of this behaviour by encouraging more active involvement from children, rather than more passively choosing what to take to school.

While the age of the children is an important consideration (older children are more likely to be involved in this behaviour), a focus on promoting healthy eating, nutrition and responsibility to children are possible ‘hooks’ to encourage greater uptake. At the same time, perceptions of the extra time it requires need to be addressed, through promoting techniques and tools to help with meal planning and involving children in shopping.

Parent and student survey responses indicate that the home might be the site for change with regards to this behaviour, with potential support from the school.

**What insights were gained about: *Students taking leftovers home?***

1. Students report that this behaviour is common, while parents report it only happens sometimes.
2. There is widespread acceptance of this behaviour and its benefits, although leftovers can have ‘bad press’ with parents due to perceptions of waste.
3. The school can be an active enabler of this behaviour, together with support from parents.
4. This behaviour was predicted by certain factors such as whether parents believed teachers or children thought it was a good idea.

This suggests that there is widespread acceptance of bringing home leftovers, and the benefits of this behaviour, by the target groups. If the problem of avoidable food waste in schools as indicated above is a cumulative one, then focussing on this behaviour may be a suitable way to address the issue. However, to counter the impression of leftovers being a negative sign of children not eating and to encourage greater

uptake of this behaviour, it might be important to emphasise to parents the opportunity it has to facilitate greater involvement by children in choosing, making and packing food for school and therefore ensuring that they eat more.

Parent and student survey responses indicate the school might be the site for change with regards to this behaviour, with appropriate communication back to parents.

## 4. Designing and recommending solutions

The behavioural insights generated above enable a more targeted and deliberate approach to designing possible behaviour change programs that WWS might be able to implement to reduce avoidable food waste in WA schools.

This section: describes a facilitated behaviour change design workshop conducted with a number of WWS stakeholders (4.1); provides an overview of workshop outcomes and, based on this (4.2), presents a number of recommendations and next steps that outline how to advance this research project towards testing possible initiatives within WA schools (4.3).

### 4.1. Workshop overview

Once the survey data had been collated and analysed, a design workshop was conducted with a group of WWS stakeholders. This workshop aimed to:

- Present participants with the results and analyses from student and parent surveys.
- Generate discussion on, and sense-checking of, the findings with participants.
- Engage participants in the design of draft interventions that aim to reduce avoidable food waste in WA schools.

Appendix 10 provides a more detailed overview of the workshop structure and process. Participants were invited from the following key stakeholder groups:

- WWS team;
- HS and PS teachers;
- Parent representatives; and
- Waste education officers from local councils, regional councils and other organisations.

These stakeholder groups were considered critical to provide an on-the-ground sense-check of the behavioural insights gathered from the surveys, to utilise stakeholders' experience and creativity in the design of possible interventions to address avoidable food waste, and to ensure that these interventions would be appropriate (and realistic) for WA primary and secondary schools.

### 4.2. Workshop outcomes

Appendix 11 presents the main 'headline' ideas for avoidable food waste behaviour change initiatives generated by participants during the workshop. These could be broadly grouped into three main categories:

1. Ideas to ensure leftover food goes home.
2. Ideas that target both students and parents in order to encourage parents to involve children more in choosing, making and packing food for school.
3. Ideas to raise awareness about the issue of avoidable food waste in schools more generally.

Appendix 11 also shows the five draft initiatives that groups then developed from the initial ideas brainstorm. These included:

- Two initiatives to support schools in ensuring that leftover food goes home with students.
- A workshop and online app initiative that provides training, support and ideas for parents with regards to school lunches generally and to involve their children in choosing, making and packing food for school.
- An awareness raising initiative that involves art installations and displays of avoidable food waste collected from a school over a period of time (being careful to avoid normalising the amount of food waste a school typically generates)
- A community-led school garden initiative to involve students in growing, harvesting and preparing food.

The recommendations presented below use these different draft initiatives to propose a way forward for WWS to reduce avoidable food waste in WA schools.

### 4.3. Recommendations and conclusion

Drawing on the initiatives designed during the workshop, and also on the behavioural insights generated from the surveys and the findings of the review, we recommend the following for WWS:

1. Develop and test a support package for schools to encourage students to return all leftovers and general food waste home.
2. Develop and test a program to encourage parents to involve children more in choosing, making and packing lunch for school.
3. Test an initiative to hold eating-time after play-time during the lunch-hour at schools.
4. Consider testing current WWS initiatives with regards to their impact on avoidable food waste in schools.

Each of these recommendations is further developed below, with particular consideration to the key partners needed, some of the resources required, what could be measured to track progress, and some questions that might still need to be answered. It is important to note that these initiatives are suggested for testing first, rather than attempted broad-scale roll-out across all WWS member schools.

By way of conclusion, and before the different initiatives are presented in detail, it is worth considering how they might be thought of in relation to each other. When thinking about their implementation for testing, WWS could:

- Short-list one or two initiatives to trial, while ignoring or ‘shelving’ others. If this approach was taken, then possible criteria to help short-list initiatives would be:
  - Whether they are supported by the evidence base reviewed

- Whether they are cost-effective based on WWS resources
  - Whether they are easy to implement within WWS's established program approach and across a range of schools in WA
- Look to implement a combination of the initiatives at the same time within a school or a school district. While each individual initiative would impact the challenge of avoidable food waste in its own right, there is a possible complementarity between all that would be worth exploring for possible added impact, if WWS has the resources and interest.
- Think about sequencing the initiatives so that they happen one after the other in a school or school district. This might be worth considering if there is interest in all four initiatives, but resources or time are restricted. This might also enable a more gradual, step-by-step, 'change management' approach to tackling food waste in schools, rather than overwhelming schools with everything at once.

**Initiative 1: *Support package for schools to encourage students to return all leftovers and general food waste home***

|   |   |
|---|---|
| <b>What is it?</b>                        | A package of different approaches, resources, communication materials and measurement frameworks that allow WWS to support a school in encouraging students to return leftovers and general food waste home.  |
| <b>Why do this?</b>                       | <ul style="list-style-type: none"> <li>· This would potentially remove avoidable food waste issue entirely from a school.</li> <li>· Insights from surveys suggest that: <ul style="list-style-type: none"> <li>- avoidable food waste is an issue that is the cumulative impact of a shifting minority of students disposing food from home that they did not eat at school; and</li> <li>- encouraging students to take food waste home would be accepted by parents who see it as an opportunity to monitor their children’s food consumption at school, re-use uneaten food and reduce food waste as a result.</li> </ul> </li> <li>· The school is paying to manage what is essentially household food waste.</li> </ul> |
| <b>Target group</b>                       | School students   |
| <b>Processes</b>                          | <p>Schools could trial one or an appropriate combination of the following:</p> <ul style="list-style-type: none"> <li>· A sweeping school policy or rule.</li> <li>· Active monitoring by teachers during recess and lunch-times.</li> <li>· A short-term initiative or competition with active involvement from students (as suggested by Project 1 in Appendix 11).</li> <li>· Removal of general rubbish bins in school.</li> </ul>  |
| <b>Resources required</b>                 | <ul style="list-style-type: none"> <li>· Examples of framing messages/communication for parents, e.g. “all food goes home so you can reduce waste”, “all food goes home to keep you in the loop”.</li> <li>· Examples of relevant school policies.</li> </ul>   |
| <b>What is needed to trial initiative</b> | <ul style="list-style-type: none"> <li>· A small number of schools willing to test this initiative.</li> <li>· The development of measures to identify impacts through (for example): <ul style="list-style-type: none"> <li>- Detailed waste audits;</li> <li>- Observations of student behaviour; and/or</li> <li>- Surveys or interviews with parents.</li> </ul> </li> </ul>  |
| <b>Questions to consider</b>              | <ul style="list-style-type: none"> <li>· How might this look in high schools as opposed to primary schools?</li> <li>· How much does this initiative simply ‘shift’ the problem to another context, rather than actually reducing avoidable food waste overall?</li> </ul>  |

**Initiative 2: Program to encourage parents to involve children more in choosing, making and packing lunch for school**

|   |  |
|---|--|
| <b>What is it?</b>                        | A package of different approaches, resources, communication materials and measurement frameworks that WWS might implement to engage parents in this issue and encourage them to involve their children more in choosing, making and packing food for lunch.  |
| <b>Why do this?</b>                       | <ul style="list-style-type: none"> <li>· There is evidence that children involved in choosing, making and packing food for school eat more of it.</li> <li>· Insights from surveys suggest that increasing children’s involvement would be accepted by parents and students who understand its benefits in reducing waste.</li> <li>· It provides an opportunity to engage households in nutrition, healthy eating and food skills.</li> </ul>   |
| <b>Target group</b>                       | Households (parents and children)  |
| <b>Processes</b>                          | <p>WWS could trial one or an appropriate combination of the following:</p> <ul style="list-style-type: none"> <li>· A series of workshops for a school community run in partnership with local council or Love Food Hate Waste.</li> <li>· The development of an app or other online resource to support parents with lunch ideas and ways to engage their children (as suggested by Project 3 in Appendix 11).</li> <li>· A partnership with local council or Love Food Hate Waste to develop school-based activities or resources about food skills and healthy eating.</li> </ul> |
| <b>Resources required</b>                 | This would depend on the particular approach above chosen by WWS   |
| <b>What is needed to trial initiative</b> | <ul style="list-style-type: none"> <li>· An appropriate partner organisation.</li> <li>· A small number of schools willing to test this initiative.</li> <li>· The development of measures to identify impacts through (for example): <ul style="list-style-type: none"> <li>- Detailed waste audits;</li> <li>- Observations of student behaviour; and/or</li> <li>- Surveys or interviews with parents.</li> </ul> </li> </ul>   |
| <b>Questions to consider</b>              | <ul style="list-style-type: none"> <li>· How might this look in high schools as opposed to primary schools?</li> <li>· Can a focus on the home be linked to possible food waste impacts in a school?</li> <li>· How can the impacts of this initiative be maintained in the long term?</li> </ul>  |

### **Initiative 3: *Hold eating-time after play-time during school lunch hour***

|   |   |
|---|---|
| <b>What is it?</b>                        | A deliberate rescheduling of set play and eating times within a school to ensure that children eat more of the food that they brought from home.  |
| <b>Why do this?</b>                       | <ul style="list-style-type: none"><li>· Despite this strategy not being addressed during the design workshop, some of the strongest evidence uncovered from the literature review showed the positive impacts that this approach can have on the amount of food eaten by children at school. More food being eaten would in turn reduce food waste.</li><li>· It is relatively easy to implement and measure.</li></ul>       |
| <b>Target group</b>                       | <ul style="list-style-type: none"><li>· Schools</li><li>· School students</li></ul>   |
| <b>Processes</b>                          | WWS would partner with a small group of schools to develop and trial an appropriate approach (with regards to timing, context etc.) to this initiative.   |
| <b>What is needed to trial initiative</b> | <ul style="list-style-type: none"><li>· A small number of schools that are willing to test this initiative or that are already taking such an approach.</li><li>· The development of measures to identify impacts through (for example):<ul style="list-style-type: none"><li>- Detailed waste audits;</li><li>- Observations of student behaviour; and/or</li><li>- Surveys or interviews with teachers.</li></ul></li></ul> |
| <b>Questions to consider</b>              | <ul style="list-style-type: none"><li>· How might this look in high schools as opposed to primary schools?</li><li>· Would this be supported by the Department of Education (WA)?</li></ul>   |

**Initiative 4: *Test current WWS initiatives in schools with regards to impacts on avoidable food waste***

|   |  |
|---|--|
| <b>What is it?</b>                        | A focus on including measures to test the impacts on avoidable food waste when current WWS initiatives are implemented in member schools.  |
| <b>Why do this?</b>                       | <p>Project 5 in Appendix 11 suggested the opportunity that school vegetable gardens might have on reducing avoidable food waste. Vegetable gardens are already a well-established initiative that schools undertake when participating in sustainability programs such as WWS. While the literature and practice review did not identify the impacts of these on avoidable food waste in schools, it was clear that this is more to do with a lack of measurement than a lack of impact.</p> <p>There is therefore an opportunity for WWS to implement an ‘impact measurement’ program when member schools set up initiatives such as gardens, to test their impacts on waste overall in the school, and avoidable food waste in particular.</p> |
| <b>Target group</b>                       | Schools  |
| <b>Processes</b>                          | WWS would partner with schools who were about to launch a garden, or other appropriate initiative, and conduct baseline audits and regular monitoring to measure its impacts.  |
| <b>What is needed to trial initiative</b> | <ul style="list-style-type: none"> <li>· A small number of schools.</li> <li>· The development of measures to identify impacts through (for example): <ul style="list-style-type: none"> <li>- Detailed waste audits;</li> <li>- Observations of student behaviour; and/or</li> <li>- Surveys or interviews with teachers.</li> </ul> </li> </ul>  |
| <b>Questions to consider</b>              | <ul style="list-style-type: none"> <li>· What other initiatives could be considered in addition to school gardens?</li> <li>· Could this be embedded in some of the existing work of the WWS team with schools?</li> </ul>   |

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# Appendix 1 - Systematic review methodology

A rapid review methodology was employed to investigate food waste relevant behavioural research. Rapid reviews are an emerging method of efficiently synthesising research evidence in health policy and other settings where a broad overview of research evidence is required in a short timeframe. Unlike traditional systematic literature reviews, rapid reviews focus on already synthesised research evidence of a high quality (Khangura et al 2012).

## *Search strategy*

A comprehensive search was initially conducted of research conducted from 1 Jan 2006 until 16 February 2016, however due to low search yields, these date restrictions were removed. The following databases were searched:

- PsychInfo, Scopus
- Web of Science
- ERIC
- Australian Education Index
- First 50 pages of Google Scholar.

Search terms included combinations of key words including; student, school parent, teacher, food waste, lunchbox waste, lunch/tray/plate waste, edible waste, lunch consumption. The reference lists of studies included in the review were also scanned to identify further relevant references.

## *Screening and selection*

Study citations were screened for inclusion if they included attitudes, beliefs, intentions, behaviours or interventions regarding avoidable food waste. Whilst priority was given to identifying systematic reviews, due to the lack of research in this area, inclusion criteria were broadened from systematic reviews and recent high quality primary evidence to also include smaller primary studies.

The majority of studies found in the search were concerned with the nutritional aspects of food consumption and waste, especially those studies conducted on schools.

## *Data extraction and quality appraisal*

Data that was extracted from relevant studies included; predictors or interventions studies, location, outcomes and authors' conclusions. This information was used to inform a commentary on the implications of the review for understanding beliefs and attitudes towards avoidable food waste and the identification of potential interventions.

Due to the wide variation in study type and quality utilised, comment is provided below on the quality and generalisability of the findings and the confidence that can be drawn from the conclusions.

## Appendix 2 - Summary of behavioural predictors for individual and household food waste

| Factor   | Examples  |
|--|---|
| <b>Demographic and socio-economic variables</b>    | <p><i>Income.</i> Various studies have found that higher income households waste more than poorer households (Baker et al, 2009; WRAP, 2007; Koivupuro et al., 2012). Sustainability Victoria (2010) found that middle income families also tended to waste more food than lower income ones.</p> <p><i>Age.</i> In the UK, people older than 65 years tended to waste 25% less food than the national average (Questa et al, 2011). In Victoria, those between the ages of 18 – 24 were found to waste the most food of all age groups (Sustainability Victoria, 2011).</p> <p><i>Household size and type.</i> Baker et al (2009) found that Australian households of over four people tended to waste less food per capita, compared to smaller households. Share houses, single-person-houses and those with children were also more likely to waste food than other household types (Baker et al, 2009; Sustainability Victoria, 2010, WasteMINZ 2014).</p> <p><i>Gender.</i> Some studies have also found that women waste more than men (Buzby &amp; Guthrie, 2002), while other stated that females are more likely to reduce waste than males (Barr, 2007).</p> |
| <b>Knowledge of food waste</b>                     | <p>Barr (2007) found that individuals with a good knowledge of problems linked to food waste are more likely to avoid wasting food. Based on their review of literature, Pearson et al (2011) also argued that a lack of awareness of food waste leads individuals to waste more food. However, Baker et al (2009) showed through their study that despite high levels of awareness, Australian household still did not engage in appropriate behaviours to reduce food waste.</p>  |
| <b>Concern regarding food waste related issues</b> | <p>Recent studies have shown that individuals with high environmental and civic consciousness waste less food (Williams et al., 2012; Barr, 2007). Thus, individuals who are more concerned about the environmental impacts caused by food waste may also be more likely to change their behaviour towards the wastage of food.</p>   |
| <b>Food hygiene sensitivity</b>                    | <p>Both WRAP (2007) and Williams et al. (2012) demonstrated that a high sensitivity to food hygiene and a lack of knowledge concerning expiration dates on food labels are factors which can lead to an increase in food waste.</p>   |

## Appendix 3 - Influencers of children's eating behaviours at school

| Influencers                             | Supporting research  |
|---|--|
| <b>Control of food selection/choice</b> | <p>A school-based intervention compared a Serve Only option to an Offer vs Serve option which allowed students to select different food items offered in the lunch meal. In the Offer vs Serve option, students were more likely to consume a greater amount of the fruits and vegetables that they selected (Perry et al 2004).</p> <p>Just and Wansink (2009) measured plate waste in a camp where half the children in camp were given a portion of carrots for lunch and the other half were given the option of choosing between carrots and celery. When children had no choice they ate 69% of the carrots, whereas when children had chosen the carrots, they ate 89%.</p> |
| <b>Reminders</b>                        | Perry et al (2004) also found that the number of children eating fruit increased by simply having cafeteria workers provide a verbal prompt.   |
| <b>Unfamiliar food</b>                  | Summer (2014) evaluated the implementation of a vegetarian day at 33 schools. The trial resulted in a decrease in the number of students participating in school lunches, participating students took less food, and their plate waste increased by 60%, compared to a control group. However, over an intermediate period, whilst the amount of food taken was still decreased, there was no statistical change in plate waste.   |
| <b>Fun</b>                              | A study by Jones et al (2014) used a gamification approach to encourage fruit and vegetable consumption in kindergarten-8 <sup>th</sup> grade students. The intervention involved a heroes and villains narrative which was shared with the children in stages. During the intervention, fruit consumption increased by 66% and vegetable consumption by 44%. However, it was unclear whether these gains would continue post-intervention.  |
| <b>Incentives</b>                       | Just and Price (2013) conducted an intervention study on the role of incentives (small monetary or lottery ticket) that resulted in 27.7% more children eating at least one serving of fruits and vegetables. A 33% decrease in the number of servings thrown away was also reported.  |
| <b>Removing barriers</b>                | Just and Wansink (2009) showed that fruit presented at eye level in cafeterias, compared to below eye level, increase selection by more than 100%. Wansink et al (2013) conducted a field experiment to make fruit as easy to consume as possible. An intervention that pre-sliced apples led to an increase in the selection of apples and a 30% reduction in overall food waste (some barriers such as children missing some teeth or having braces can make biting difficult).  |

## Appendix 4 - Summary of food waste related programs

| Program type                            | Examples  | Comments   |
|---|---|--|
| <b>Food waste specific (schools)</b>    | <ul style="list-style-type: none"> <li>Edible Education (UK)</li> </ul>   | <ul style="list-style-type: none"> <li>Run as a pilot with a small number of UK primary schools and raised student awareness on the overall issue of food waste in society. No results available which measured the impact on student's food waste related behaviours.</li> </ul>  |
| <b>Food waste specific (households)</b> | <ul style="list-style-type: none"> <li>Love Food Hate Waste (LFHW) – UK, New Zealand, Victoria and New South Wales.</li> <li>Think.Save.Eat (UN)</li> <li>FoodWise (Australia)</li> </ul> | <ul style="list-style-type: none"> <li>There has been little evaluation of the impacts of these programs to date.</li> <li>Quested et al (2011) argue that the reduction in household food waste in the UK since the establishment of LFHW is an indication of its impact, yet are unable to attribute direct causation between what the program does and this reduction.</li> <li>A LFHW session was delivered to children aged 9-11 in primary schools in the UK (Carver, 2014). The study found that while children are capable of recognising food waste as a problem, they struggled to grasp the main environmental concepts which the campaign is based upon. No statistical difference in knowledge of environmental or sustainable concepts was found after the program session.</li> <li>LFHW NSW have given grants to some school focused programs, but these are only just starting with no detail of the intervention nor impacts.</li> </ul> |
| <b>Waste focused (schools)</b>          | <ul style="list-style-type: none"> <li>Waste Wise Schools (WA)</li> <li>Wipe out Waste (SA)</li> <li>ResourceSmart Schools (Vic)</li> <li>Enviro Schools (New Zealand)</li> </ul>         | <ul style="list-style-type: none"> <li>The Wipe out Waste program has shown some activity in highlighting the issue of avoidable food waste as part of its Nude Food campaign and making recommendations to parents on what to include in lunch boxes.</li> <li>The majority of other programs include this issue in a broader focus on reducing waste in schools. Food is usually specifically addressed in relation to reducing packaging from lunches or as part of establishing composting systems to deal with the issue on site.</li> <li>While there is an indication of a shift in actually focusing on avoidable food waste this is usually very broad with no data on impact readily available.</li> <li>While individual schools would have focussed on this issue, the scope of this review did not make it possible to identify and contact them individually.</li> </ul>   |
| <b>Food focused (schools)</b>           | <ul style="list-style-type: none"> <li>Gardening and cooking programs (e.g. Stephanie Alexander Kitchen Garden program).</li> </ul>   | <ul style="list-style-type: none"> <li>A range of these programs have tried to engage students with food and in particular focus on establishing a relationship with healthy and sustainable food behaviours.</li> <li>Caraher et al (2010) conducted a review of how school-based cooking interventions evaluated dietary change and found that two of the four studies reviewed reported improvements in the diversity and nutritional quality of school lunches served and children's willingness to try and consume target vegetables. While no evaluation of impacts on school food waste was included, this could conceivably be an outcome.</li> </ul>  |

# Appendix 5 – Students survey instrument

## Upper primary – lower high school survey

Thank you for filling out this survey. We are interested in whether you bring food from home to eat at school, what you do with any left overs, and whether you help at home in choosing and making food to bring to school.

No one will see your answers other than the university researchers, so please be as honest as possible. This is NOT a test, there are no right or wrong answers – just answer the questions as is right for you.

If you do not understand a question, then please leave it and go onto the next one. Click the ‘Next’ button if you agree to take part in this survey.

NB: For further information about this survey, please **click here** to open an explanatory statement.

### About You

1. Are you a (*tick*): boy/girl
2. What is your home postcode (fill in text)
3. What grade are you in (*drop box option*)?
4. How many brothers and sisters do you have (*drop box option*)?
5. **(conditional on previous answer)**: In your family, are you the: Youngest child/middle child/oldest child
6. What is the name of your school?

### About Eating Lunch at School

7. In a normal week, do you bring food from home to school (*tick only one*):  
Always/sometimes/never

*(remainder of survey is conditional on students ticking ‘always’ or ‘sometimes’)*

8. On a normal day, how much of the food from home do you eat at school (*tick only one*)?: All of it/About half of it /Only a little/Don’t know
  - **(if ‘half’ or ‘only a little’ ticked)** Why do you only eat that much (*tick as many as are right for you*):
    - There is too much food for me to eat
    - I do not like it
    - I want to go out and play
    - I don’t have enough time to finish it

9. On a normal day, what do you do with the food from home that you don't eat (*tick only one*)?
- Throw out at school
    - Why (*tick as many as are right for you*):
      - Teacher told me to
      - Parents told me to
      - I don't want my parents to see I have left overs
      - That's what my friends do
      - I don't like leftover food in my bag
  - Take back home
    - Why (*tick as many as are right for you*):
      - Parents told me to
      - Teacher told me to
      - That's what my friends do
  - Throw out somewhere else (like on the way home)
    - Why (*tick as many as are right for you*):
      - Parents told me to
      - I don't want my parents to see I have left overs
      - That's what my friends do
  - Eat it on the way home

### **About Bringing Lunch from Home**

10. At home, how often do you get to choose the food that you bring to school (*tick only one*)?  
Always/Sometimes/Never
- (**if 'no' ticked**) Would you like to? Yes/no/sometimes
11. At home, how often do you get to make and pack the food that you bring to school (*tick only one*)? Always/Sometimes/Never
- (**if 'no' ticked**) Would you like to? Yes/no/sometimes
12. On a normal day, do you usually like the food that you bring from home (*tick only one*)?  
Always/Sometimes/Never
13. In Western Australia, there are many schools in which food that could be eaten is thrown into the rubbish bin.

*In the box below, please write down any ideas you have about how to solve this problem (these could be for you, your parents or your teachers).*

## Middle to upper high school survey

Thank you for filling out this survey. We are interested in whether you bring food from home to eat at school, what you do with any left overs, and whether you help at home in choosing and making food to bring to school.

No one will see your answers other than the university researchers, so please be as honest as possible. This is NOT a test, there are no right or wrong answers – just answer the questions as is right for you.

If you do not understand a question, then please leave it and go onto the next one.

Click the 'Next' button if you agree to take part in this survey.

NB: For further information about this survey, please **click here** to open an explanatory statement.

### About You

1. Are you a (*tick*): boy/girl
2. What is your home postcode (fill in text)
3. What grade are you in (*drop box option*)?
4. How many brothers and sisters do you have (*drop box option*)?
5. **(conditional on previous answer)**: In your family, are you the: Youngest child/middle child/oldest child
6. What is the name of your school?

### About Eating Lunch at School

7. In a normal week, do you bring food from home to school (*tick only one*): Always/sometimes/never

*(remainder of survey is conditional on students ticking 'always' or 'sometimes')*

14. On a normal day, how much of the food from home do you eat at school (*tick only one*): All of it/About half of it /Only a little/Don't know
  - **(if 'half' or 'only a little' ticked)** Why do you only eat that much (*tick as many as are right for you*):
    - There is too much food for me to eat
    - I do not like it
    - I want to go and do something else
    - I don't have enough time to finish it
    - Other (please write down):
8. On a normal day, what do you do with food from home that you don't eat (*tick only one*)?
  - Throw out at school
    - Why (*tick as many as are right for you*):

- Teacher told me to
- Parents told me to
- I don't want my parents to see I have left overs
- That's what my friends do
- I don't like leftover food in my bag
- Other (please write down):
- Take back home
  - Why (*tick as many as are right for you*):
    - Parents told me to
    - Teacher told me to
    - That's what my friends do
    - Other (please write down):
- Throw out somewhere else (like on the way home)
  - Why (*tick as many as are right for you*):
    - Parents told me to
    - I don't want my parents to see I have left overs
    - That's what my friends do
    - Other (please write down):
- Eat it on the way home

### **About Bringing Lunch from Home**

9. At home, how often do you get to choose the food that you bring to school (*tick only one*)?  
Always/Sometimes/Never
- (**if 'no' ticked**) Would you like to? Yes/no/sometimes
10. At home, how often do you get to make and pack the food that you bring to school (*tick only one*)?  
Always/Sometimes/Never
- (**if 'no' ticked**) Would you like to? Yes/no/sometimes
11. On a normal day, do you usually like the food that you bring from home (*tick only one*)?  
Always/Sometimes/Never
12. In Western Australia, there are many schools in which food that could be eaten is thrown into the rubbish bin.
- Why do you think this is?
  - Please write down any ideas you have to solve this problem (these could be for you, your parents or your teachers).

# Appendix 6 – Parents survey instrument

## WA parents of children that go to school – survey

Thank you for filling out this survey. We are interested in understanding the typical activities in your household with regards to choosing and making food for children to take to school and what happens with anything that is left over.

This survey is completely anonymous and the information that is collected will be used to inform the design of programs to reduce avoidable food waste in WA schools.

Please fill out every questions completely based on what happens in your household.

Click the 'Next' button if you agree to take part in this survey.

NB: For further information about this survey, please **click here** to open an explanatory statement.

### About You

1. What gender do you identify with? Male/Female/other
2. What age range do you belong to (*drop box option*)?
3. What is your postcode?
4. What is your highest education qualification you have achieved (*drop box option*)?
5. What is your occupation (*drop box option*)?
6. How many children are there in your house?
  - How many in primary school
    - What grade are they in
  - How many in high school
    - What grade are they in
7. What is your relationship with the children in your household? Father/Mother/Step-parent/other
8. How often do your children take food from home to school?
  - Always
  - Sometimes
  - Never

*(remainder of survey is conditional on ticking 'always' or 'sometimes')*

### About Making Packed Lunches for School

9. **(If 'parent and child' or 'only child')** How often are children in your household involved in choosing the food that they bring to school (*tick only one*)? Always/Sometimes/Never
  - **(if 'no' ticked)** Would you them to be more involved in choosing the food that they take to school? Yes/no/sometimes
10. How often are children in your household involved in making and packing the food that they bring to school (*tick only one*)? Always/Sometimes/Never

- (if 'no' ticked) Would you like them to be more involved in making and packing food to take to school? Yes/no/sometimes
11. What do you think are the benefits of your children being involved in choosing, making or packing food to take to school?
12. What do you think are the disadvantages of your children being involved in choosing, making or packing food to take to school?
13. Amongst those you know, who might think that it is a good idea to have your children being involved in choosing, making or packing food to take to school? [*tick as many as you wish*]
- Your children
  - Your friends
  - Your family
  - Teachers at your child's school
  - Other parents at the school?
  - Others (please write)
14. Amongst those you know, who might think that is a bad idea to have your children being involved in choosing, making or packing food to take to school? [*tick as many as you wish*]
- Your children
  - Your friends
  - Your family
  - Teachers at your child's school
  - Other parents at the school?
  - Others (please write)
15. In your experience, what can **help** with involving your children in choosing, making or packing food to take to school?
16. In your experience, what can **make it hard** to involve your children in choosing, making or packing food to take to school?

### **About Your Children Eating Packed Lunches at School**

17. In a typical school day, how much of the food that they bring from home do you think your children eat? All/half/only a little/don't know
- (if anything other than 'all' is ticked) Why do you think that they only eat that much (*tick as many as are right for you*):
    - i. There is too much food for them to eat
    - ii. They do not like the food
    - iii. They want to go and do something else
    - iv. They do not have enough time to finish it

v. Other (please write down):

18. Do your children bring back any food from home that they did not eat at school? Yes/no
- Why or why not?
19. In your opinion, what are the benefits of your children bringing back any food from home that they did not eat at school?
20. In your opinion, what are the disadvantages of your children bringing back any food from home that they did not eat at school?
21. Amongst those you know, who thinks it is a good idea to have your children bring back any food from home that they did not eat at school? [*tick as many as you wish*]
- Your children
  - Your friends
  - Your family
  - Teachers at your children's school
  - Other parents at the school?
  - Others (please write)
22. Amongst those you know, who thinks it is a bad idea to have your children bring back any food from home that they did not eat at school? [*tick as many as you wish*]
- Your children
  - Your friends
  - Your family
  - Teachers at your children's school
  - Other parents at the school?
  - Others (please write)
23. In your experience, what might **help** to ensure your children bring back any food from home that they did not eat at school?
24. In your experience, what might **make it hard** for your children to bring back any food from home that they did not eat at school?

## Appendix 7: Survey respondents' characteristics

This Appendix provides details about some of the demographic characteristics of the respondents to the two main surveys of this study: that of Parents of students who go to WA schools, and Students who go to WA schools. Characteristics described here include: gender, age range, employment state, education levels, location, size of household, and school grades represented.

### PARENTS of WA students

#### 1. Gender

The majority of respondents were female (n=433, 69.7%), and n = 187 (30.1%) were male. One respondent identified as Other.

#### 2. Age

Most respondents were aged between 30 and 50 years old (see Fig 1.)

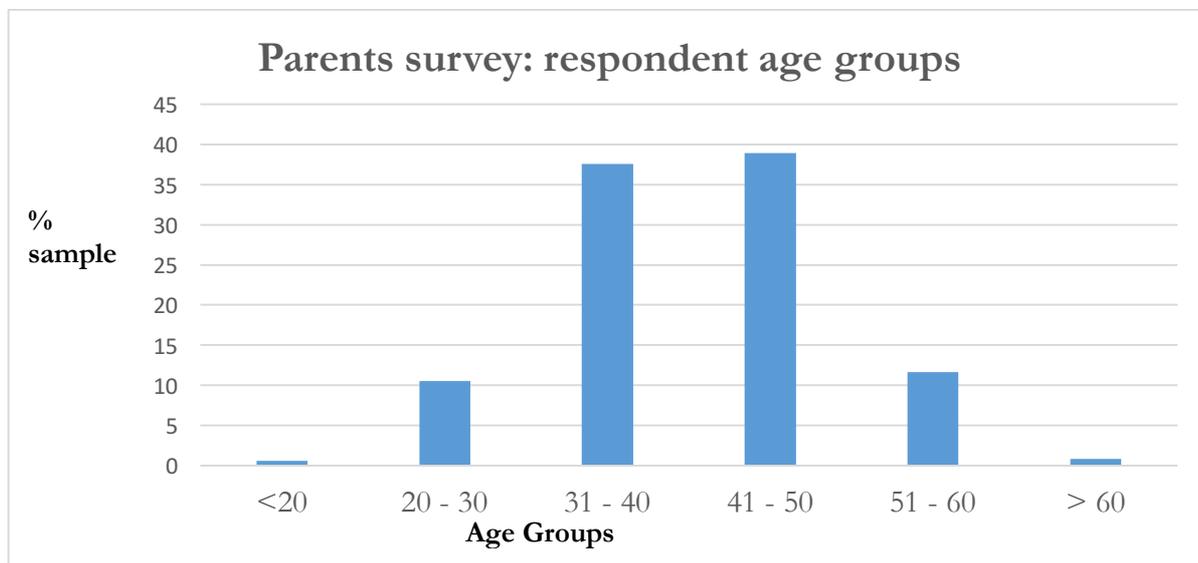
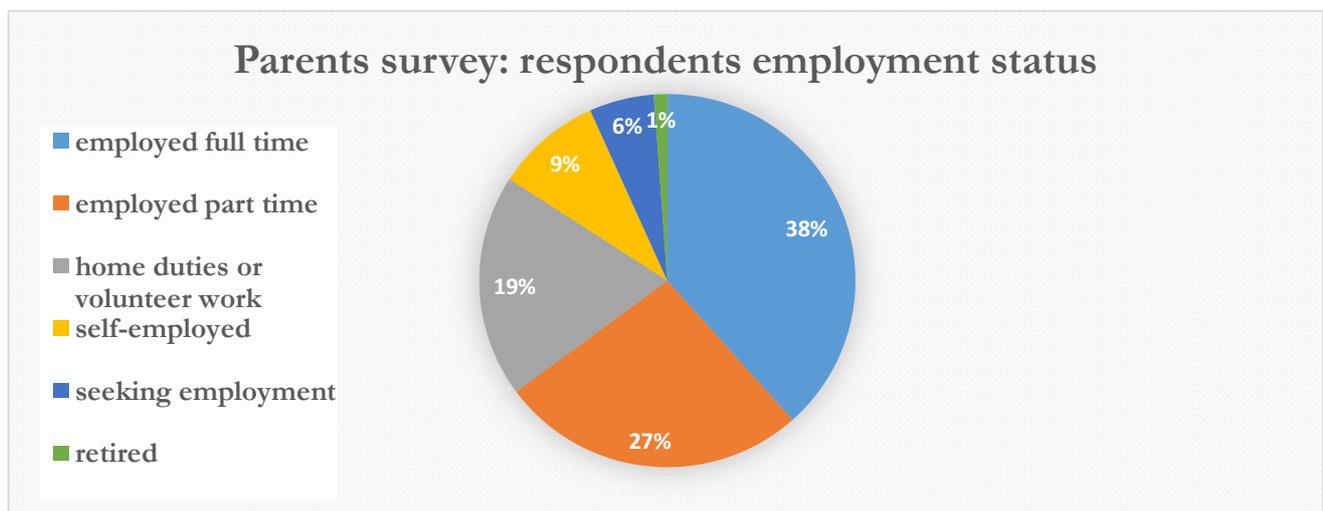


Fig 1: Percentage of different age groups represented in parent survey respondents

#### 3. Employment Status

Most respondents were either employed full or part-time (see Fig.2).



*Fig 2: Relative percentage in employment status amongst parent survey respondents*

#### 4. Highest Level of Education

Parent respondents were almost equally split between high school, TAFE qualification and Bachelor/Diploma as their highest level of education (see Table 1)

|                         | N   | %    |
|-------------------------|-----|------|
| <i>High School</i>      | 172 | 27.7 |
| <i>TAFE</i>             | 214 | 34.5 |
| <i>Bachelor/Diploma</i> | 179 | 28.8 |
| <i>Post grad</i>        | 54  | 8.7  |
| <i>Missing</i>          | 2   | 0.3  |

*Table 1: Highest level of education achieved by parent survey respondents (n=621)*

#### 5. Survey respondent's location in Western Australia

Parent respondents came from a range of locations across Western Australia (see Table 2)

|                        |                      |                       |
|------------------------|----------------------|-----------------------|
| Albany                 | Cottesloe            | Manjimup              |
| Armadale               | Dardanup             | Melville              |
| Ashburton              | Denmark              | Merredin              |
| Augusta-Margaret River | Derby-West Kimberley | Mundaring             |
| Bassendean             | Dumbleyung           | Murray                |
| Bayswater              | East Fremantle       | Narrogin              |
| Belmont                | East Pilbara         | Northam               |
| Beverley               | Esperance            | Perth                 |
| Boddington             | Exmouth              | Plantagenet           |
| Boyup Brook            | Fremantle            | Port Hedland          |
| Broome                 | Gingin               | Rockingham            |
| Bunbury                | Gosnells             | Roebourne             |
| Busselton              | Harvey               | Serpentine-Jarrahdale |
| Cambridge              | Joondalup            | South Perth           |
| Canning                | Kalamunda            | Stirling              |
| Capel                  | Kalgoorlie/Boulder   | Swan                  |
| Carnamah               | Kellerberrin         | Wanneroo              |
| Chapman Valley         | Kwinana              | Wyalkatchem           |
| Cockburn               | Mandurah             | Yilgarn               |

*Table 2: Locations in Western Australia of parent survey respondents (n=619)*

#### 6. Household make-up

The majority of households (84.3%) were couples with dependent children and 15.2% were single parents with dependent children. 0.5% lived in a multi-generational household (e.g. with grandparents).

#### 7. Number of children in household and relationship to respondent

The majority of parental respondents came from households with two children (see Table 3)

| # children in household | % of respondents |
|-------------------------|------------------|
| 1                       | 28               |
| 2                       | 46               |
| 3                       | 18               |

|             |   |
|-------------|---|
| 4 and above | 8 |
|-------------|---|

Table 3: Relative percentage of parent survey respondents from different sized households

94.8% of respondents were the biological parent of the children in their household, while 3.1% were step-parents, 0.8% were both biological and step-parents, 1.3% were adoptive parents.

### 8. School Grades of Children

430 (69.2%) of respondents had at least one child in primary school (PS). Fig 3 shows their percentage representation across the different PS grades.

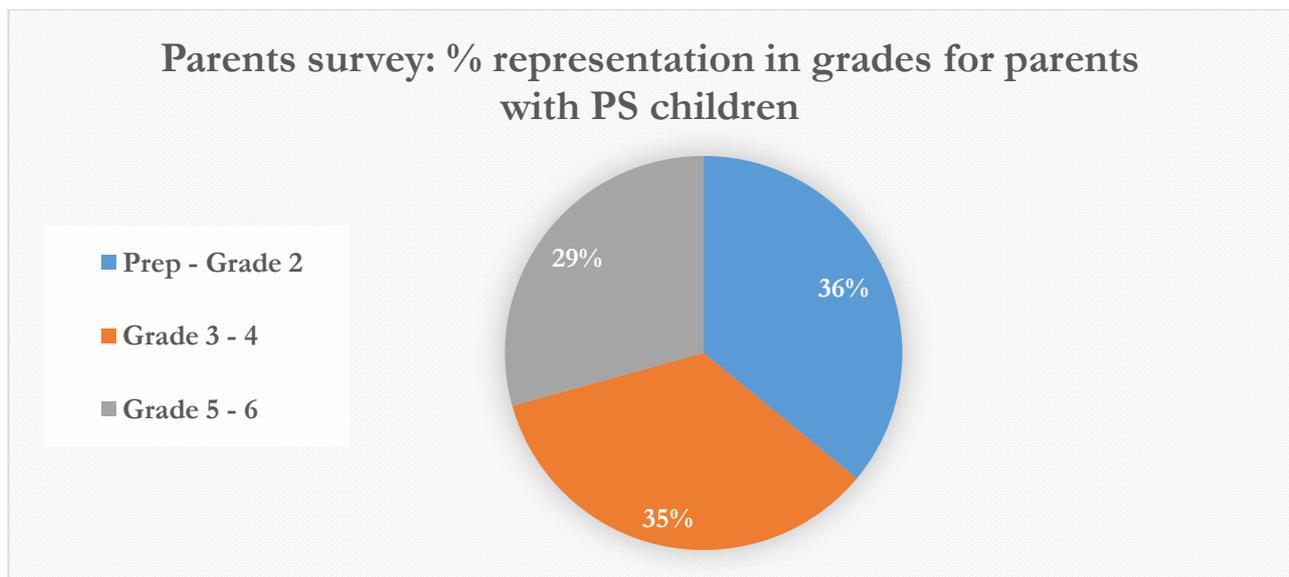


Fig 3: Relative percentage of PS grades represented amongst parent survey respondents with children in PS (n= 430)

Of parents with children in PS, 60.5% had one child in PS, 32.1% had two, 6.3% had three, 0.5% had four and 0.7% had five.

341 (55.3%) of respondents had at least one child in high school (HS). Fig 4 shows their percentage representation across the different HS grades.

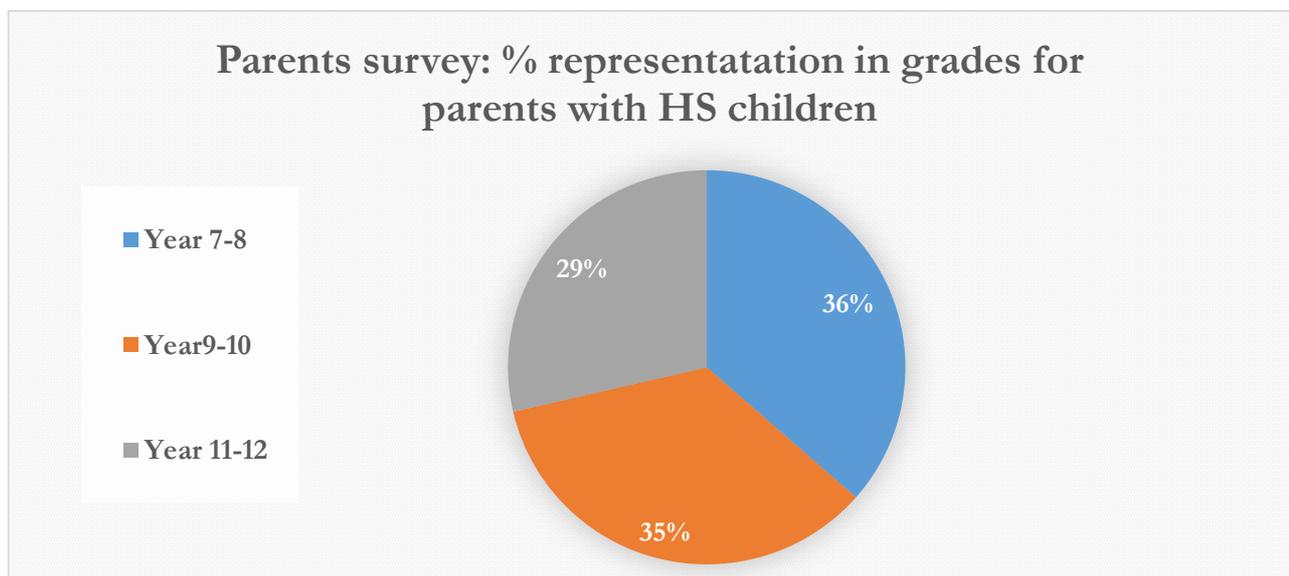


Fig 4: Relative percentage of HS grades represented amongst parent survey respondents with children in HS (n= 341)

Of parents with children in HS, 71.0% had one child in HS, 23.2% had two, 4.1% had three, and one had seven.

## WA school STUDENTS

### 1. Gender

There were more female respondents overall (n = 409 ) than male respondents (n = 160). Fig 5. shows the gender mix of respondents from PS and HS.

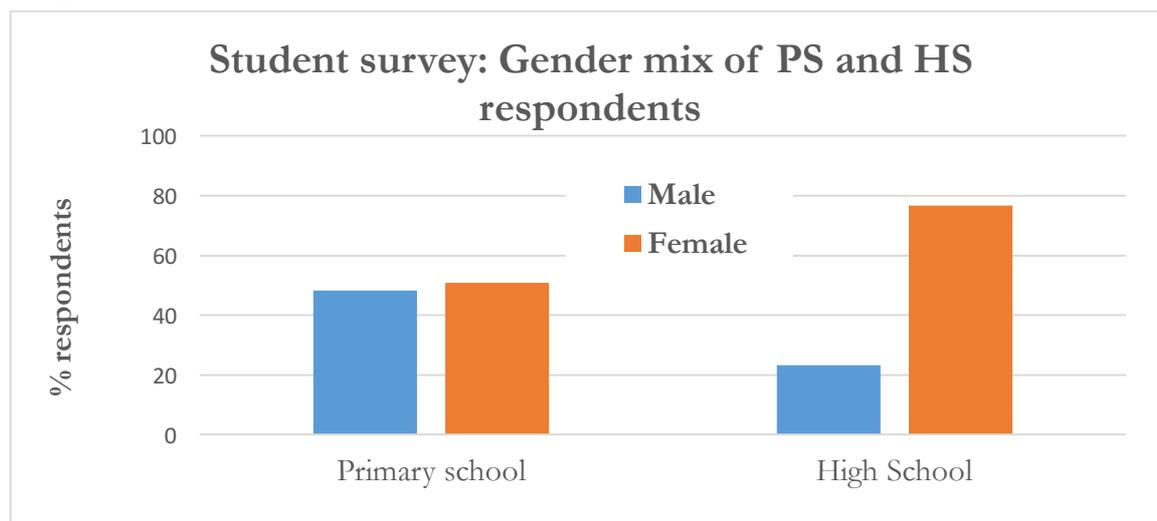


Fig 5: Relative percentage of males and females in PS respondents (n= 109) and HS respondents (n = 460)

### 2. Grades represented across PS and HS

There were more respondents from HS (n = 460) than PS (n = 109). All grades across HS were represented in the survey respondents sample, with year 7 and 8 students having the lowest representation (see Fig 6). Due to ethics restrictions as well as concerns about ability to complete an online survey, PS grades were restricted to Grades 4 – 6 (see Fig. 7).

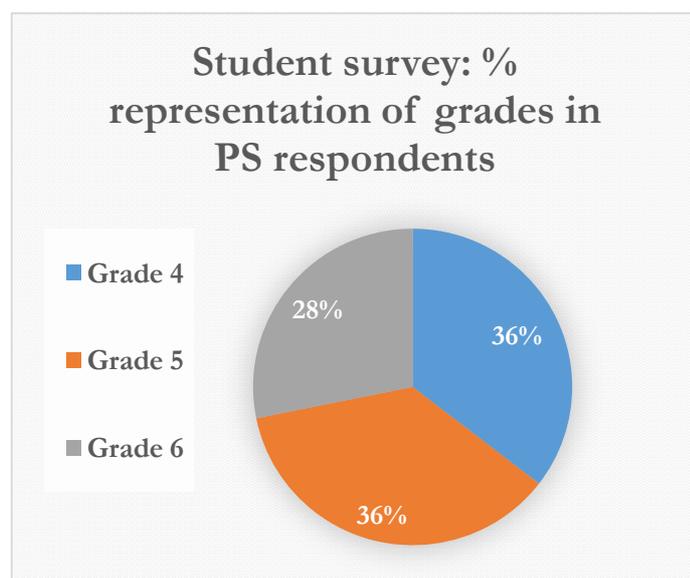
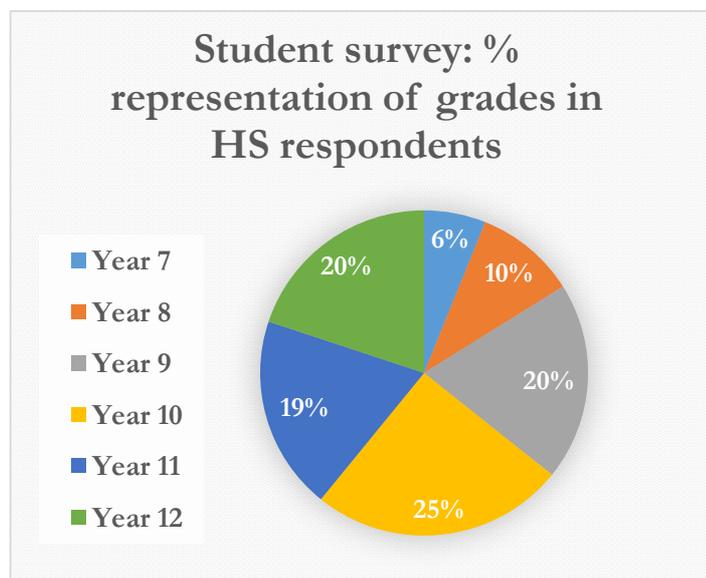


Fig 6: Relative percentage of grades in HS respondents (n= 460)

Fig 7: Relative percentage of grades in PS respondents (n=109)

### 3. Survey respondent's location in Western Australia

Student respondents came from a range of locations across Western Australia (see Table 4)

|                        |                      |                       |
|------------------------|----------------------|-----------------------|
| Albany                 | Denmark              | Mosman Park           |
| Armadale               | Derby-West Kimberley | Mundaring             |
| Augusta-Margaret River | East Fremantle       | Murray                |
| Bassendean             | Esperance            | Nedlands              |
| Bayswater              | Exmouth              | Perenjori             |
| Belmont                | Fremantle            | Perth                 |
| Boyup Brook            | Gingin               | Pingelly              |
| Broome                 | Goomalling           | Port Hedland          |
| Bunbury                | Gosnells             | Rockingham            |
| Busselton              | Harvey               | Roebourne             |
| Cambridge              | Joondalup            | Serpentine-Jarrahdale |
| Canning                | Kalamunda            | South Perth           |
| Capel                  | Kalgoorlie/Boulder   | Stirling              |
| Chapman Valley         | Kwinana              | Swan                  |
| Chittering             | Mandurah             | Vincent               |
| Cockburn               | Manjimup             | Wanneroo              |
| Cottesloe              | Melville             |                       |
| Dardanup               | Merredin             |                       |

Table 4: Locations in Western Australia of student survey respondents

### 4. Household make-up

Most student respondents (whether in PS or HS) came from households which had two children going to PS or HS (see Fig. 8).

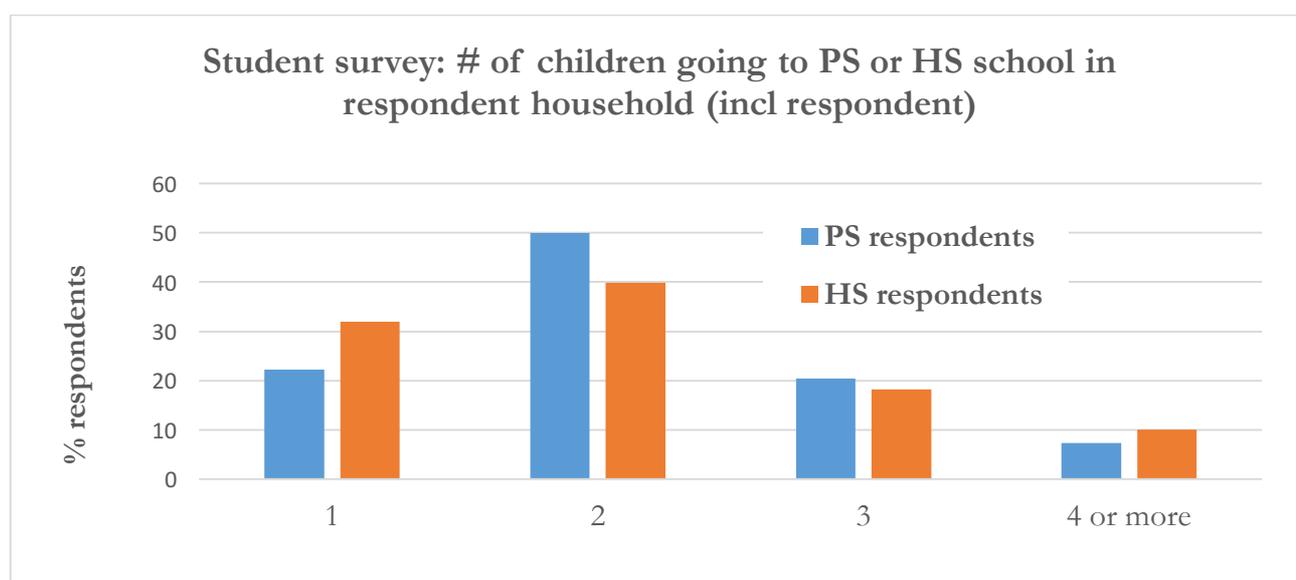


Fig 8: Relative percentage of PS (n = 108) and HS respondents (n= 457) that are part of households with different numbers of children going to PS or HS

For those respondents from PS (n = 108), 29.1% were the youngest child in the house, 3.3% were the middle child and 47.7% were the oldest. For those respondents from HS (n = 457), 19.6% were the youngest child in the house, 24.8% were the middle child and 52.7% were the oldest.

## Appendix 8: Predictors for parents involving children in choosing, making and packing food for school

### Predicting how often children are involved in choosing the food they take to school

Regression analysis of parent reported frequencies of PS and HS children being involved in choosing food for school were conducted against the following variables: Parental age, Parental gender, Parental levels of education, Parental employment status, the number of children in household, Children's grade tier, and Parental beliefs about whether children/family/teachers think it's a good/bad idea.

Based on this, Table 7 shows that PS children are more likely to be involved in choosing food for school if:

- I. parents have higher levels of education,
- II. if there are more children in the house,
- III. if the children are in upper PS and;
- IV. if parents believe that children think it's a good idea.

Table 8 shows that HS children are more likely to be involved in choosing food for school if:

- I. parents have higher levels of education,
- II. if parents believe that children think it's a good idea.

|   | Odds Ratio | CI low | CI high | Wald x | Significance |
|---|------------|--------|---------|--------|--------------|
| • <i>Parental levels of education</i>       | 1.298      | 1.068  | 1.578   | 6.872  | .009         |
| • <i>Number of children in household</i>    | 1.285      | 1.068  | 1.629   | 4.320  | .038         |
| • <i>PS grade tier</i>                      | 1.601      | 1.004  | 2.553   | 3.907  | .048         |
| • <i>Children thinking it's a good idea</i> | 1.720      | 1.162  | 2.546   | 7.345  | .007         |

*Table 7: Significant variables found to predict likelihood of PS children being involved in choosing their food for school*

|   | Odds Ratio | CI low | CI high | Wald x | Significance |
|---|------------|--------|---------|--------|--------------|
| • <i>Parental levels of education</i>       | 1.739      | 1.194  | 1.919   | 9.896  | .009         |
| • <i>Children thinking it's a good idea</i> | 1.584      | 1.162  | 2.011   | 7.330  | .007         |

*Table 8: Significant variables found to predict likelihood of HS children being involved in choosing their food for school*

### Predicting how often children are involved in making and packing the food they take to school

Regression analysis of parent reported frequencies of PS and HS children being involved in making and packing food for school were conducted against the following variables: Parental age, Parental gender, Parental levels of education, Parental employment status, the number of children in household, Children's grade tier, and Parental beliefs about whether children/family/teachers think it's a good/bad idea.

Based on this, Table 9 shows that PS children are more likely to be involved in making and packing food for school if:

- I. parents are younger in age; and
- II. if the children are in higher PS

Table 10 shows that HS children are more likely to be involved in making and packing food for school if:

- I. parents are younger in age;
- II. parents believe that children think it's a good idea
- III. parents believe that the family think it's a good idea
- IV. parents believe that their children don't think it is a bad idea

|                             | <b>Odds Ratio</b> | <b>CI low</b> | <b>CI high</b> | <b>Wald x</b> | <b>Significance</b> |
|-----------------------------|-------------------|---------------|----------------|---------------|---------------------|
| • <i>Parental age group</i> | 0.637             | 0.504         | 0.805          | 14.218        | <.001               |
| • <i>PS grade tier</i>      | 1.944             | 1.232         | 3.068          | 8.153         | .004                |

*Table 9: Significant variables found to predict likelihood of PS children being involved in making and packing their food for school*

|   | <b>Odds Ratio</b> | <b>CI low</b> | <b>CI high</b> | <b>Wald x</b> | <b>Significance</b> |
|---|-------------------|---------------|----------------|---------------|---------------------|
| • <i>Parental age group</i>                 | 0.739             | .566          | .966           | 4.907         | .027                |
| • <i>Children thinking it's a good idea</i> | 1.426             | 1.276         | 3.659          | 14.719        | <.001               |
| • <i>Family think it's a good idea</i>      | 1.576             | 1.368         | 2.903          | 5.800         | .016                |
| • <i>Children think it's a bad idea</i>     | 0.736             | 0.548         | 0.952          | 4.318         | .038                |

*Table 10: Significant variables found to predict likelihood of HS children being involved in making and packing their food for school*

## Appendix 9: Predictors for children bringing home leftovers

Regression analysis of parent reported frequencies of PS and HS children bringing leftovers back from school were conducted against the following variables: Parental age, Parental gender, Parental levels of education, Parental employment status, the number of children in household, Children's grade tier, and Parental beliefs about whether children/family/teachers think it's a good/bad idea

Based on this, Table 12 shows that PS children are more likely bring home leftovers if:

- I. if they are in upper PS; and
- II. if parents believe that teachers think it's a good idea.

Table 13 shows that HS children are more likely to bring home leftovers:

- if parents believe that children think it's a good idea.

|   | <b>Odds Ratio</b> | <b>CI low</b> | <b>CI high</b> | <b>Wald x</b> | <b>Significance</b> |
|---|-------------------|---------------|----------------|---------------|---------------------|
| • <i>PS grade tier</i>                      | 1.934             | 1.185         | 3.156          | 6.959         | .008                |
| • <i>Teachers thinking it's a good idea</i> | 1.681             | 1.029         | 2.748          | 4.299         | .038                |

*Table 12: Significant variables found to predict likelihood of PS children being involved in choosing their food for school*

|   | <b>Odds Ratio</b> | <b>CI low</b> | <b>CI high</b> | <b>Wald x</b> | <b>Significance</b> |
|---|-------------------|---------------|----------------|---------------|---------------------|
| • <i>Children thinking it's a good idea</i> | 1.643             | 1.003         | 2.692          | 3.893         | 0.048               |

*Table 13: Significant variables found to predict likelihood of HS children being involved in choosing their food for school*

# Appendix 10 - Design workshop outline

## \* This workshop aims to:

1. Engage participants in the design of draft interventions that aim to reduce avoidable food waste in WA schools (**WHAT NEXT**)
2. Present the results and analysis from student and parent surveys (**WHAT**)
3. Provide participants the opportunity to dissect findings, and consider what these may mean for changing behaviours to do with avoidable food waste (**SO WHAT**)

## \* Outline:

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### Activity

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- Welcome, acknowledgement of country (Noongar people) and housekeeping
- 
- Group introductions
  - Workshop aims, outline and format
- 

### **WHAT** (do we now know?)

- Presentation and discussion that includes:
    - Project background and story to date
    - Quick intro to BWA method as background
    - Survey findings and initial analysis
- 

### **SO WHAT** (discuss and digest)

- Discussion in pairs – key learnings and questions
  - Discussion as whole group
- 

### **WHAT NEXT** (design)

- Present spectrum of intervention types
    - Discussion: which of these intervention types on the spectrum is completely impossible to consider/address?
  - Break into pairs for rapid brainstorming of intervention ideas
    - Post-it ideas (as many as possible)
    - Initial editing; what are your favourites?
    - Develop ideas map on wall
  - Group votes on ideas (2 red stickers for each)
  - Form teams (2-3) to prototype top 3-5 ideas
-

---

· Teams build intervention prototype based on the following:

|                              |   |  |
|------------------------------|---|--|
| · What (is the intervention) | · Who (does it target or need to involve) | · Why (do it this way)?                        |
| · How (will it be done)?     | · When (will different things happen)?    | · Success? (what does it look like, outcomes)? |
| · Measurement?               | · \$ and resources                        | · Next steps (to make the project happen)?     |

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**Group check in** – how is it going, what is working, what it not, what questions are emerging?

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**Second draft** for interventions (alternatively, based on progress, participants draft another intervention)

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**Gallery wall** to present the different designs and **discussion:**

- What is similar
- What is different
- What is missing?
- How do we progress some of these ideas?

---

Next steps from BWA and WWS

Thanks and wrap-up

Evaluation

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# Appendix 11 - Design workshop outcomes

## 1) 'Headline' ideas generated and themes to group them

| Theme  | Specific ideas  |
|--|---|
| School policy to take home leftover/food waste   | <ul style="list-style-type: none"> <li>• Policies and rules to support</li> </ul>   |
| Resources to help parents involve children in choosing, making and packing food from home for school               | • References to websites, apps with ideas for lunch-boxes   |
|  | • Visual lunch box card   |
|  | • Meal plan – weekly (package)  |
|  | • Make lunches in school – home economics classes   |
|  | • Module of learning on food waste (ASDAN – TT)   |
|  | • Newsletter articles, cross curricular, take home rubbish  |
|  | • Posters   |
|  | • App for parents<br>• Parent DVD   |
| Excursion/incursions   | • Excursion to waste facilities   |
|  | • Olympic athlete – presenting food catering  |
|  | • Vendors/chefs – tour of schools and parent workshops on cooking with leftovers  |
| Workshop to help parents involve children in choosing, making and packing food from home for school                | • Lunchbox recipes/ideas, recommended portion sizes   |
|  | • Kids learn how to read and produce recipes  |
|  | • Parent workshop on communication and nutrition/health   |
|  | • Design of weekly lunch planner  |
|  | • Communicate to parents that kids helping is an investment of time to teach them – then they have it.<br>• H.S. kids make their own beeswax sandwich wraps |
| Student focussed communication about greater involvement in choosing, making and packing food from home for school | • Kids digital news   |
|  | • H.S students could photograph their lunchbox rather than take it home physically  |
|  | • 'My ideal lunch' student activity   |
|  | • Children could report/tell news about their lunch box if they packed it themselves  |
| School based initiatives/events  | • Waste Free Wednesday to include different food groups   |
|  | • Schools encourage waste free lunches  |
|  | • Super hero foods program  |
|  | • Incentives/rewards for lunchboxes   |
|  | • Primary/Secondary – Head of year/principal intro to 'new concept' at the start of the new year – take lunch home  |
|  | • Twice yearly parent night presentations before parent-teacher meetings  |
| Big WWS campaign   | • M.K.R for families  |
| Art installation   | • A display of uneaten food coming from schools – digital copy, use on internet for provocation   |

|   |   |
|---|---|
|   |   |
| <b>General principles for initiatives</b> | <ul style="list-style-type: none"> <li>• Inter-school resource sharing</li> <li>• Involve/partner with other programs and department/agencies/groups in cross-delivery</li> </ul> |

## 2) Draft initiatives developed from ideas

### Project 1: No food waste disposal at schools

*A competition/initiative approach that engages schools in banning food disposal and having all leftovers go home engaging parents in the reuse of leftovers.*

1. Questionnaire and letter of explanation/overview of project including parent involvement/competition.
  - Questionnaire has basic y/n questions including:
    - i. Do you use leftovers in packed lunches?
    - ii. Do you use leftovers in your evening meals?
    - iii. Please give examples...
2. For a set period (i.e. 1 or 2 weeks) everything goes home (no bins available in school)
3. Students working in pairs at the end of the day – white/smart board, basic costing of items (pre lesson – average food costs, research):
  - Mark up cards with costs to go home
  - Raise of hands – standard leftovers – common waste types, underpin recipe request
4. Invitation to parents to create recipe entry for competition
  - Parents given submissions to trial at home afterwards
5. Schools submit favourite/most popular voted recipes to WWS
6. WWS select either:
  - Top 2 for overall recipe book AND/Or provide recipe of month
7. Back to same survey – compare results
  - No admin constraints
  - Ownership of students for filling in
  - Individual student comparisons demonstrating behaviour change/perceptions

Slogans:

- Savour your scraps
- From waste to wanted
- Recipes from rubbish/recycling
- Recycled recipes
- Luscious lunch leftovers

### Project 2: Policy to prevent disposal of avoidable food waste in schools

**What:** Children are encouraged to take home avoidable food waste

**How:**

- Set eating times, supervised area and bins (primary schools)
- Trial through designated events – information/planning/education/engagement
- Waste audits – prior/monitor
- Newsletters, staff meetings, posters, assembly

- Policy is promoted
- Student involvement/monitoring
- Incentives – students want to do it!

#### Why:

- Parents to have conversation with children
  - Minimise school food waste
  - Encourage reuse, reduce, recycle
  - Understand quantity of food needed
  - Understand food likes/dislikes
- Minimise financial waste

#### Who:

- |                                  |             |
|----------------------------------|-------------|
| • Board (authority)              | • P & F     |
| • Principal                      | • Students  |
| • Staff – teaching and ancillary | • Community |
| • Parents                        |             |

### Project 3: Workshop/incursions and app to support parents in involving children in choosing, making and packing food for school

Why: Inform schools/community, reduce waste

Who: Parents/community, staff, students

What: (1) Practical community workshops:

- Healthy food options
- Portion sizes
- Recipe ideas
- Packing a lunchbox – beeswax wraps/ keeping items cools/warm
- Food prep/cooking classes for lunchbox ideas
- Storage of food
- Reusing leftovers-strategies
- Ideas to make kids eat their lunch (i.e. cut fruit, slinky, dehydration)

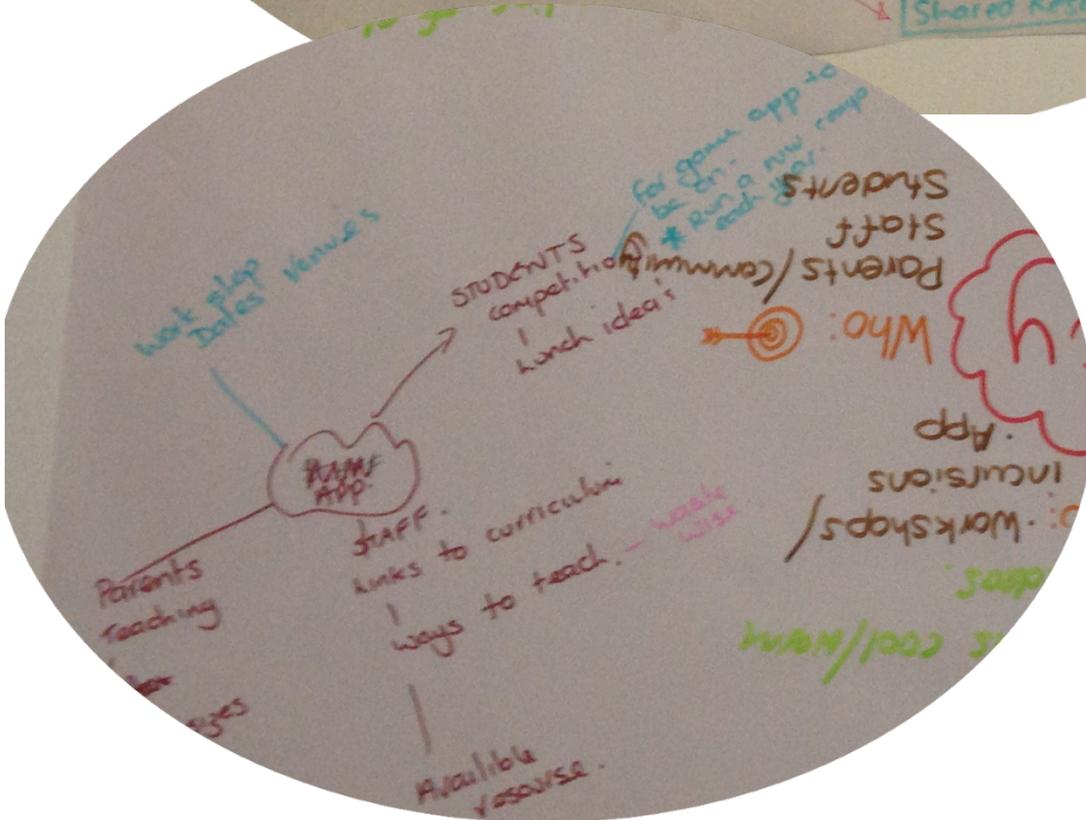
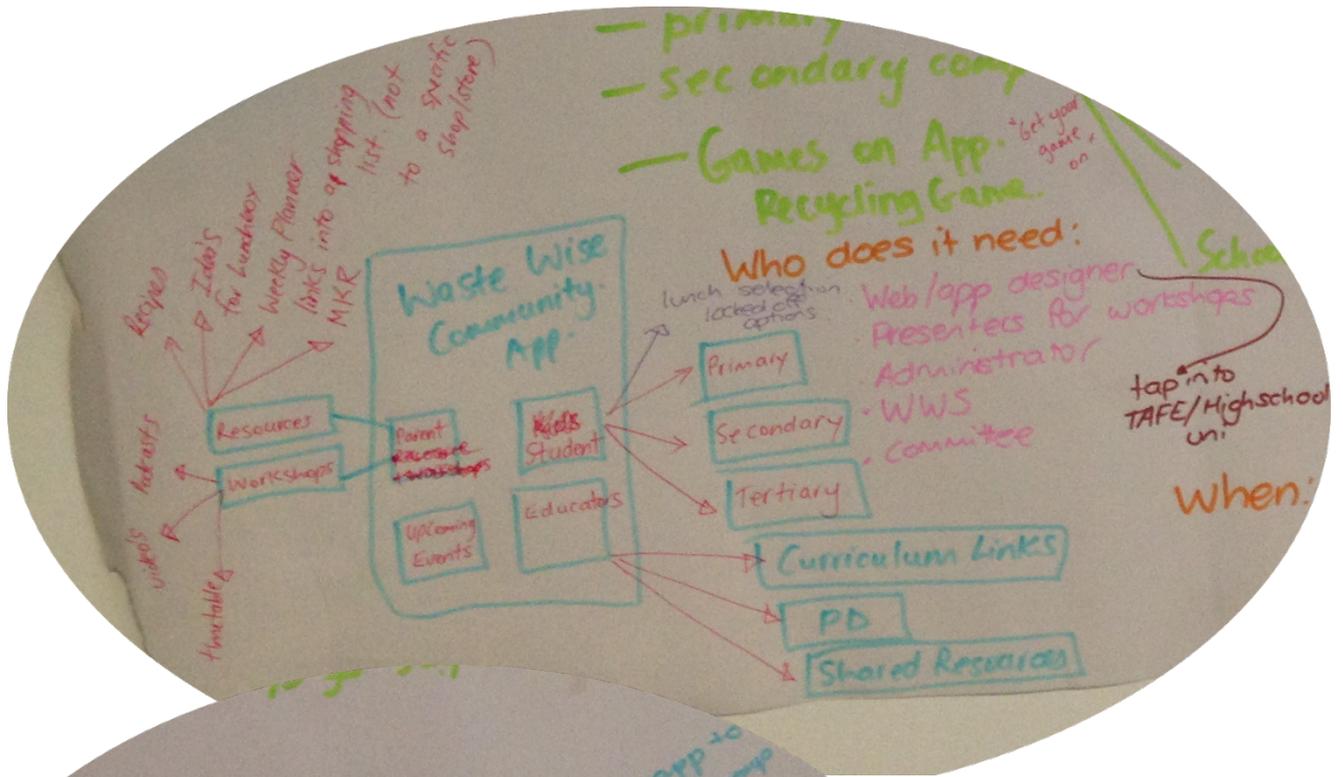
(2) App (see flow-chart pics to get better sense of different elements suggested)

- Kids post their ‘lunchbox of the week’
- Primary and secondary competitions – posting ideas for great lunches in high school. Kids recipes/photos/movies or clips of students giving demos and suggestions. Schools feature waste wise initiatives by students – waste wise movies/campaigns/slogans made by students
- Games on App – recycling game

Who does it need? (App)

- Web/app designer
- Presenters for workshops
- Administrator
- WWS

- Committee



#### Project 4: Art instillation

An installation/display within schools that reveals/raises awareness of the total amount of avoidable food waste disposed of within a school over a specific period of time. Team for this idea produced high-level flowcharts which did not provide much detail about the different elements of this project. There was considerable thinking evident of:

- Student involvement
- Involving high-profile champions to promote and support program
- The need for an online presence

- The opportunity to make the display provocative

### **Project 5: School based garden to reduce waste**

Detailed idea from participant about school gardens as way of encouraging behaviours – this is already an established practice by WWS. If there is interest in this from WWS, opportunity to monitor existing initiatives in schools and attempt to track outcomes from this (rather than re-invent the wheel?).