

# Exploration of individual factors influencing self-reported household food waste in Australia

Ana Gimenez<sup>1</sup> | Gastón Ares<sup>1</sup>  | Sara R. Jaeger<sup>2,3</sup> 

<sup>1</sup>Sensometrics & Consumer Science, Instituto Polo Tecnológico de Pando, Facultad de Química, Universidad de la República, Canelones, Uruguay

<sup>2</sup>Vescor Research, Copenhagen, Denmark

<sup>3</sup>The New Zealand Institute for Plant & Food Research Limited, Auckland, New Zealand

## Correspondence

Sara R. Jaeger, Vescor Research, 2900 Hellerup, Copenhagen, Denmark.  
Email: [sara.r.jaeger@gmail.com](mailto:sara.r.jaeger@gmail.com)

## Funding information

New Zealand Ministry for Business Innovation and Employment; New Zealand Institute for Plant and Food Research Limited

## Abstract

Food losses and waste (FLW) is a global problem. Because household FLW is one of the biggest contributors to total FLW, strategies are being implemented to reduce per capita FLW in many countries. The present research contributed to this goal by investigating individual factors influencing self-reported household food waste in Australia. Using a web survey, data were obtained from 847 consumers. The average per capita food waste corresponded to 339 g/week and the median to 180 g/week. The most frequently wasted food categories were fresh vegetables and salads, fresh fruit, and bread. The percentage of participants reporting having disposed of these categories ranged between 45.9% and 65.9%. Although socio-demographic characteristics have been identified as relevant influencers of household food waste, the evidence is still inconclusive about the strength of their effects. Results from the present work identified significant effects of age and household size. For the former, the amount of per capita household food wasted tended to reduce with participants' age. Regarding the effect of household size, per capita food waste decreased with the number of people in the household. The present research also explored the effect of a series of psychological factors on the amount of food waste and five hypotheses derived based on the postulates of theories of consumer behavior were supported.

## Practical applications

The association between the amount of food waste reported by participants and their intention to engage in food waste reduction behaviors and the positive effect of awareness on behavioral intention suggest the potential of communication campaigns to trigger behavioral change. Males and younger citizens should be targeted in such campaigns given their lower awareness compared with females and older citizens.

## 1 | INTRODUCTION

Food losses and waste (FLW) have been increasingly recognized as an urgent global problem due to their short- and long-term negative impacts on food and nutrition security and the sustainability of food systems (de Boni et al., 2022). Reducing FLW has the potential to

reduce pressure on natural resources and has been identified as one of the pathways to eradicate global hunger without depleting natural resources (Seppelt et al., 2022).

Food is lost and wasted along the whole food supply chain (UNEP, 2021), and its economic and environmental impacts cumulate along the path, from production, processing, distribution, and

This is an open access article under the terms of the [Creative Commons Attribution](https://creativecommons.org/licenses/by/4.0/) License, which permits use, distribution and reproduction in any medium, provided the original work is properly cited.

© 2023 The Authors. *Journal of Sensory Studies* published by Wiley Periodicals LLC.

commercialization to consumption (Muth et al., 2019; Scherhauser et al., 2018). Studies conducted in both developed and developing countries have identified the last steps of the food supply chain as the main contributors to FLW (Alexander et al., 2017; Dou & Toth, 2021; Schanes et al., 2018; UNEP, 2021). According to the most recent estimates, the amount of food wasted in private households and the retail and food service sectors has been estimated at 931 million tons per year, from which approximately 60% corresponds to household food waste (UNEP, 2021). This stresses the need to develop strategies to tackle consumer food waste in the context of private households. In this sense, Sustainable Development Goal 12, 'Responsible consumption and production', aims at halving global food waste at retail and consumer levels by 2030 (United Nations, 2022).

Household food waste is a complex phenomenon, determined by a diverse range of consumer behaviors along the food journey: planning, purchasing, storing, preparation, serving, consumption, and management of leftovers (Roodhuyzen et al., 2017). These behaviors are influenced by the interaction of individual, product-related, and contextual factors (dos Santos et al., 2022; Roodhuyzen et al., 2017; Schanes et al., 2018). An in-depth understanding of consumer behavior in relation to food waste is essential to inform the development of communication campaigns and public policies to reduce household food waste (Boulet et al., 2021). Although interest in the topic has largely increased in the last decade, research is still limited, particularly outside Europe and the United States (dos Santos et al., 2022; Schanes et al., 2018).

## 1.1 | Individual factors influencing household food waste

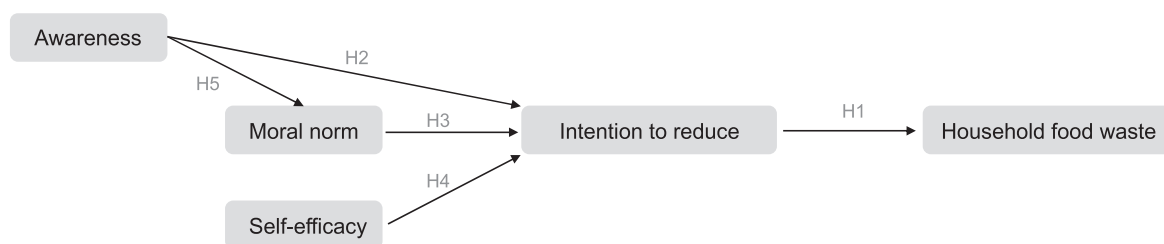
Individual characteristics shape consumer behavior in relation to food waste, which are expected to largely influence the amount and way in which food waste is generated in the household (Roodhuyzen et al., 2017). Socio-demographic characteristics have also been reported to predict the generation of household food waste. However, the evidence is still inconclusive (Schanes et al., 2018). No consensus has been found in the literature regarding the effect of gender and age on household food waste (Aschemann-Witzel et al., 2019; Cecere et al., 2014; Principato et al., 2015; Quedstedt et al., 2013; Stancu et al., 2016; Visschers et al., 2016), whereas smaller

households and those with children have been consistently been reported to generate a larger amount of food waste per capita (Parizeau et al., 2015; Principato, 2018; Quedstedt et al., 2013; Stancu et al., 2016; Visschers et al., 2016).

Psychological factors have been identified as key influencers of food waste behaviors (dos Santos et al., 2022; Principato, 2018; Schanes et al., 2018). Lack of awareness and knowledge about food waste have been reported to be positively associated with food waste (Aschemann-Witzel et al., 2015a; Principato et al., 2015; Quedstedt et al., 2013). Awareness of the negative consequences of food waste may create moral norms. The more people are aware of the negative consequences of food waste the more morally obligated they may feel to reduce food waste, as postulated by the Norm Activation Model for pro-environmental behaviors (De Groot & Steg, 2009; Schwartz, 1977). However, engaging in food waste reduction does not only require being aware of the problem but also capabilities related to food planning and preparation (Aschemann-Witzel et al., 2015a). In this sense, self-efficacy, conceptualized as the degree to which people believe they are capable of avoiding food waste (Bandura & Walters, 1977), is another individual factor that can influence household food waste. Self-efficacy is not based on the actual capability of individuals but on their subjective evaluation of their capability (Bandura, 1982). When people have higher self-efficacy, they believe they are more capable of reducing food waste and therefore they are expected to have a higher intention to engage in prevention behaviors and discard a lower quantity of food (Taberner & Hernández, 2011). Previous research has shown that self-efficacy is negatively related to the frequency of food waste incidents and intention to reduce food waste (Aschemann-Witzel et al., 2020; Wang et al., 2022).

## 1.2 | Aim of the study and hypotheses

The present study aimed at exploring the influence of individual factors on household food waste. The objectives were: (i) to explore the effect of socio-demographic characteristics on self-reported household food waste; (ii) to evaluate the effect of awareness, moral norms, and self-efficacy on intention to reduce food waste and self-reported household food waste. Based on previous research, a series of hypotheses were derived for the results related to the second objective, which are graphically presented in Figure 1.



**FIGURE 1** Graphical representation of the research hypotheses regarding food waste.

Drawing from the Theory of Planned Behavior, which postulates that behavioral intention is a strong predictor of actual behavior (Ajzen, 1991, 2015), the following hypothesis was derived:

**H1.** : Self-reported amount of food wasted by households is negatively correlated to behavioral intention to reduce food waste.

Awareness of food waste, moral norms, and self-efficacy were regarded as precursors of behavioral intention, based on the postulates of the Theory of Planned Behavior (Ajzen, 1991, 2015), the Norm Activation Model (De Groot & Steg, 2009; Schwartz, 1977) and Social Learning Theory (Bandura & Walters, 1977). Therefore, the following hypotheses were proposed:

**H2.** : Awareness of food waste and its negative consequences has a positive impact on behavioral intention to reduce food waste.

**H3.** : Moral norms about food waste and its negative consequences have a positive impact on behavioral intention to reduce food waste.

**H4.** : Self-efficacy to reduce food waste and its negative consequences has a positive impact on behavioral intention to reduce food waste.

The Norm Activation Model states that awareness of the negative environmental consequences can trigger moral norms around the behavior (De Groot & Steg, 2009; Schwartz, 1977). Thus, the following hypothesis was derived:

**H5.** : Awareness of food waste and its negative consequences has a positive impact on moral norms to reduce food waste.

The research was conducted in Australia which is a diverse and multicultural society with a population of around 26 million people (Australian Bureau of Statistics, 2022). It is known for its friendly and laid-back culture, and people of many different nationalities and backgrounds call Australia home (Australian Bureau of Statistics, 2021a). The country has a strong economy and a high standard of living and is often ranked highly in international indices of quality of life (OECD, 2020). Overall, Australia is a welcoming and inclusive society that values equality and social justice (OECD, 2020). In relation to food loss and waste the Australian Government has developed a strategy to halve Australia's food waste by 2030 which was acknowledged as requiring behavior changes as well as improved technology to make the food system more efficient (Australian Government, 2017). In 2016/17, Australia generated an estimated 7.3 million tons of food waste from across the entire supply and consumption chain, corresponding to a total food waste generation of 298 kilograms per capita (Arcadis, 2019). Households and

primary production were the largest waste-generating sectors, together accounting for 65% of national food waste. Significant volumes of waste were also generated in food manufacturing (24%). A national food waste strategy and a roadmap for achieving food waste reductions, primarily through prevention efforts, have been developed (FIAL, 2021).

## 2 | METHODOLOGY

### 2.1 | Participants

People from the Commonwealth of Australia took part in the research. Participants had self-registered on a database managed by a web panel provider with ISO 20252:2019 accreditation (ISO: International Organization for Standardization, 2019). High proficiency in English and regular participation in household grocery shopping and food preparation (more than once a week) were eligibility criteria.

A quota sampling strategy was imposed with the interlocking quota for men (50%) and women (50%) across three age groups (25–39 years old (33.3%), 40–54 years old (33.3%), and 55–69 years old (33.3%)). The sample (Table 1) was diverse across a range of characteristics such as place of living, educational attainment, marital status, household composition, and size.

#### 2.1.1 | Human ethics statement

The study was covered by an approval for sensory and consumer research from the Human Ethics Committee at the New Zealand Institute for Plant and Food Research Limited (674-2022). Participants gave voluntary consent and were assured that their responses would remain confidential. The study could be left at any time without justification. As compensation, participants received reward points which could be redeemed for online purchases.

### 2.2 | Experimental approach

#### 2.2.1 | Quantification of food and beverage disposal

Food and beverage disposal was quantified using the protocol from van Herpen, van Geffen, et al. (2019). This is a 4-part validated survey to measure household food waste: (i) general introduction, in which food waste is defined and explained, (ii) check-all-that-apply question with 24 food and beverage categories, where participants must select all those where products were disposed of in their household in the past week, (iii) explanation of food waste states, (iv) follow-up questions for those food categories that were selected in (ii) where participants quantify how much was disposed of and in which state was the majority of the disposed foods/beverages. The list of food and beverage categories can be found in the Results section.

**TABLE 1** Description of the characteristics of the study participants ( $n = 847$ )<sup>a</sup>.

Participant variable	Percentage of participants (%)
Gender	
Male	50
Female	50
Age group	
25–39 years old	33
40–54 years old	34
55–69 years old	34
Region	
Sydney	30
Melbourne	32
Brisbane	15
Adelaide	9
Perth	11
Hobart/Canberra/ACT Regional/Darwin	4
Annual household income, before tax (AU\$) <sup>b</sup>	
Less than \$50,000	6
\$50,000–\$79,999	11
\$80,000–\$99,999	11
\$100,000–\$119,999	11
\$120,000–\$149,999	14
\$150,000 or more	37
Prefer not to answer	9
Household size <sup>b</sup>	
1 person	20
2 people	42
3 people	17
4 people	16
5 or more people	5
Prefer not to answer	0
Household members <sup>c</sup>	
No-one, I live alone	20
Spouse/partner	67
Child/ren aged under 18	24
Child/ren aged over 18	12
Parents	5
Flatmate/s	3
Other	1
Prefer not to answer	1
Education	
Lower than secondary	1
Secondary	14
Diploma	11
Advanced Diploma, Associate Degree	7
Bachelor degree	42

(Continues)

**TABLE 1** (Continued)

Participant variable	Percentage of participants (%)
Masters and PhD	22
Other	2
Prefer not to answer	1
Employment	
Working full time	65
Working part time	13
Non-paid work/home duties	3
Student	1
Unemployed	3
Retired	14
Other	1
Prefer not to answer	1
Ethnicity <sup>c</sup>	
Australian	73
European	15
Chinese	6
Indian	2
Other	7
Prefer not to answer	2

<sup>a</sup>Some percentage values do not add up to 100 due to rounding.<sup>b</sup>For data analysis, income was merged into three categories: Less than \$99,999; \$100,000–\$149,999; \$150,000 or more. Household size was also merged into three categories: 1 person; 2 people; and 3 people or more.<sup>c</sup>Total responses are >100% as participants may select multiple options.

Participants were told that the questions relating to food waste would be about all edible food and drink products that were thrown away regardless of whether they were bought in a store or were home-grown, including those that were spoiled or past their expiration date, and that it did not matter whether the food was thrown away in the general trash can, food waste container, compost heap or given to an animal (pet, birds, etc.). Participants were further instructed to not consider: (i) bones, peels, seeds, or stumps or (ii) food and drink products that are thrown away when eating in a restaurant or canteen.

The first part of recording food waste was a check-all-that-apply question, where participants had to consider the past 7 days and indicate which products had been disposed in their household. Where complete meals had been disposed, the main ingredients had to be reported separately. For those categories where disposal was indicated as having occurred, the main state of the disposed products as well as quantity was to be specified. One of four categories had to be selected for the state of the disposed food: (1) Completely unused foods: food that is disposed of which has not been used at all. For instance, unopened packages, including unopened parts of multipacks, moldy apples, dried leek, and complete bread. (2) Partly used foods: food that is disposed of after it has been partly used. For instance, a

few bread slices, half a package of meat cuts, half an onion, or half a package of milk. (3) Meal leftovers: leftovers that are disposed of after these were left on the plate, pots, or pans. For instance, potato mash or rice that is left on the plate or in the pan, sandwiches that were not eaten during lunch. (4) Leftovers after storing: meal leftovers that are disposed of after these were stored in the fridge or freezer to be eaten at a later moment. For instance, a frozen pasta portion. The instruction was to select which category the majority of the disposed food/beverage belonged to. The quantities of disposed foods and beverages were given in units that were appropriate for the individual product categories (e.g., table or serving spoons, pieces of fruit, slices/loafs of bread, number of eggs, and number of glasses). Five answer options were always provided, recorded as 1–5 by increasing quantity. Full details can be found in van Herpen, van Geffen, et al. (2019).

### 2.2.2 | Attitudes to food waste and perceived food waste reduction

Drawing on Jang and Lee (2022) and Kim et al. (2022), different aspects of attitudes to food waste—awareness, moral norm, intention to reduce, and self-efficacy to reduce (Table 2)—were measured using 7-point Likert scales from 1 = ‘disagree strongly’ to 7 = ‘agree strongly.’ Participants were instructed to read the statements and indicate the extent to which they agreed/disagreed with each. The responses were obtained following the food disposal quantification task.

### 2.2.3 | Data collection

The survey language was English (UK spelling). Participants completed the task from a location of their own choosing, using a desktop or laptop computer. Survey completion via mobile phone was not permitted (automatic screen size detection by survey platform). Questions used for participant characterization were either asked at the start (and used to implement quota sampling) or at the end of the survey.

Baseline data were collected in June or July 2022, following revision of test links and evaluation of responses from ~10% of participants to rule out implementation errors. For data quality purposes, participant exclusion based on completion time was implemented in accordance with recommendations by Jaeger & Cardello (2022).

## 2.3 | Data analysis

All data analyses were run in R software version 4.2.0 (R Core Team, 2022).

### 2.3.1 | Quantification of food waste

Across the food and beverage categories listed in Table 3, total values (g) of food waste were calculated for each participant.

**TABLE 2** Statements measuring attitudes to food waste, adapted from Jang and Lee (2022), and Kim et al. (2022).

#### Statement wording by attitude construct<sup>a</sup>

1. Awareness of food waste problem
  - (a) I am aware that the food waste problem is serious, and directly connected to our daily lives.
  - (b) I am well aware of the food waste problem these days.
  - (c) I am usually interested in the food waste issue.
  - (d) I am aware that the food waste disposal issue is crucial.
  - (e) Food waste contributes to pollution, climate change, and exhaustion of natural resources.
2. Moral norm for food waste reduction
  - (a) I feel guilty about poor people when I leave leftover food.
  - (b) Leaving leftovers give me a bad conscience.
  - (c) I have been raised to eat all food I have taken myself.
  - (d) It is contrary my principles when I have to discard food.
3. Self-efficacy to food waste reduction
  - (a) There are simple things I can do to reduce the negative consequences of food waste.
  - (b) I can change my daily routines to prevent the problem caused by food waste.
  - (c) My individual actions will contribute to a solution of the problem caused by food waste.
  - (d) Changes in my daily routines will contribute to reducing the negative consequences of food waste.
4. Intention to reduce food waste
  - (a) I am interested in trying to reduce my household food waste.
  - (b) I will try to reduce food waste.
  - (c) I am confident that I will join in reducing food waste.

Note: Responses obtained on 7-point Likert scales from 1 = ‘disagree strongly’ to 7 = ‘agree strongly.’

### 2.3.2 | Effect of sociodemographic variables on food waste

Analysis of variance (ANOVA) was used to estimate the effect of socio-demographic variables on the amount of food waste reported by participants. The logarithmic transformation of per capita household food waste was considered as a dependent variable, whereas gender, age, household size, presence of children under 18 years old in the household, and income were considered as factors. Household size and household income were recorded into three categories based on the distribution of the responses. For household size, the categories were 1 person, 2 people, and 3 people or more. For household income, data were recoded into the following three categories: Less than \$99,999; \$100,000–\$149,999; and \$150,000 or more. A significance level of 0.05 was considered. When effects were significant Fisher’s least significant differences (LSD) were calculated for post-hoc comparison of average values.

The same analysis was used to assess the effect of socio-demographic variables on awareness, moral norm, self-efficacy, and intention to reduce food waste. For this purpose, the average value of the items within each of the constructs was considered as dependent

variable. Cronbach alpha was used to verify the reliability of the scales.

### 2.3.3 | Structural equation modeling

A structural equation model (SEM) was used to assess the research hypothesis summarized in Figure 1. The latent variables awareness, moral norm, self-efficacy, and intention to reduce food waste were constructed based on the observable variables included in the questionnaire, as shown in Table 3. For household food waste, because the distribution was highly skewed, the logarithm of the per capita household food waste was considered. The analysis was run in R using package lavaan (Rosseel, 2012), and package semPlot (Epskamp et al., 2022) was used to obtain a graphical representation of the final model.

## 3 | RESULTS

### 3.1 | Self-reported amount of food waste

Based on self-reported food waste in the 7 days leading up to survey completion, the most frequently wasted food categories were fresh vegetables and salads, fresh fruit, and bread (Table 3). The percentage of participants reporting having disposed these categories ranged between 45.9% and 65.9%. Rice and remaining grains, yogurts and custards, non-alcoholic beverages, meat, cheese, sauce, and potatoes showed an intermediate disposal frequency, being discarded by 20.5%–27.0% of the participants. On the contrary, the categories least frequently discarded by participants corresponded to infrequently eaten or shelf-stable foods: meat substitutes (3.4%), candy/cookies/granola bars/chocolate bars (8.1%), beans, lentils and chickpeas (8.7%), fish (9.7%) and cereals (9.9%).

The quantity of food wasted per capita in the 7 days before the survey showed a left-skewed distribution, ranging between 6 g and 4675 g (Figure 2a). The average per capita food waste corresponded to 339 g/week and the median to 180 g/week. After a logarithmic transformation, the data had an approximately normal distribution according to Shapiro–Wilk test ( $W = 0.996$ ,  $p = 0.06$ ) (Figure 2b).

### 3.2 | Effect of sociodemographic variables on self-reported household food waste

An ANOVA was used to explore the effect of socio-demographic variables on per capita household food waste. As shown in Table 4, gender, the presence of children under 18 years old in the household, and household income did not have a significant effect. However, the self-reported amount of food wasted in the household in the 7 days prior to the survey was significantly affected by participants' age and household size.

Per capita household food waste decreased with age: 55–69 years old participants reported discarding significantly less food than 25–39 years old participants (149.5 vs. 201.0 g/per capita),

whereas 40–54 years old participants reported an intermediate quantity that did not significantly differ from the other groups (176.7 g/per capita). Regarding the effect of household size, per capita food waste decreased with the number of people in the household. Participants living in single-person households reported discarding the highest quantity of food (299.5 g/per capita), followed by those living in 2-person households (168.0 g/per capita) and finally those living in households composed of 3 or more people (134.9 g/per capita).

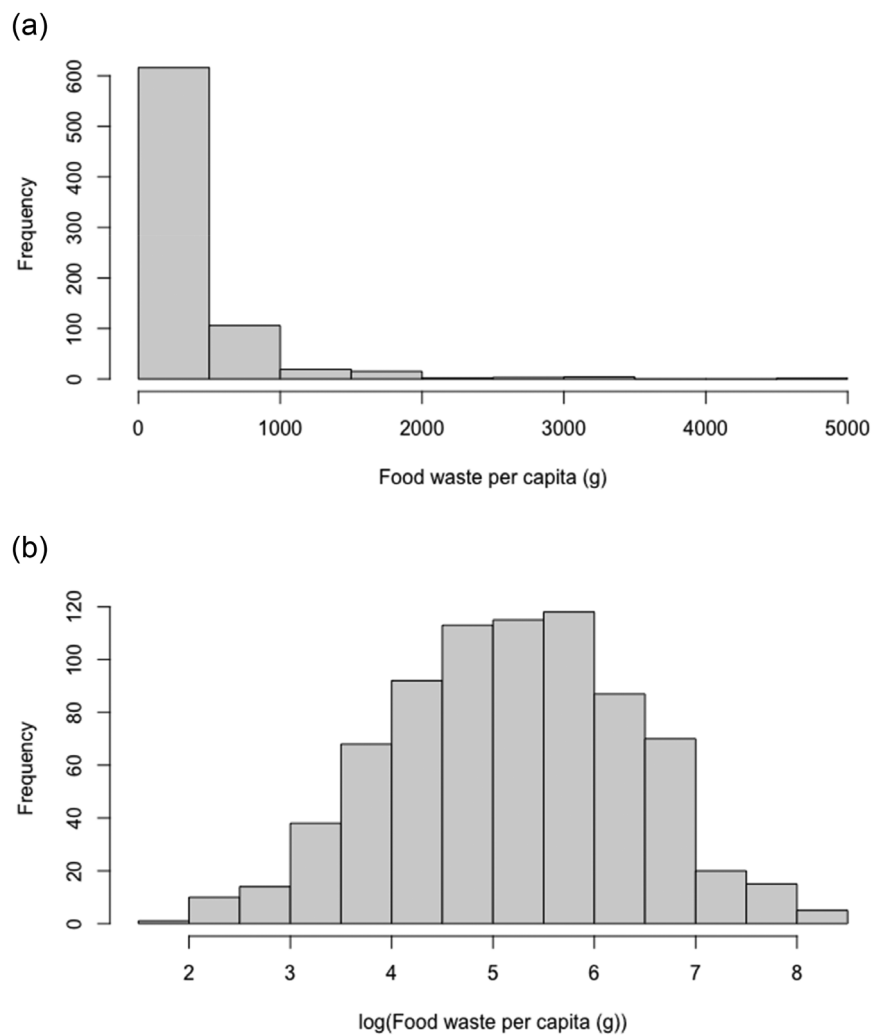
### 3.3 | Awareness, moral norm, self-efficacy, and intention to reduce food waste

Table 5 shows summary statistics for items measuring the four constructs measured using Likert scales: awareness, moral norm, self-efficacy, and intention to reduce food waste. The scores provided by participants were distributed along the whole scale. Average values

**TABLE 3** Percentage of participants ( $n = 847$ ) reporting disposing each of the 24 categories in the week before the survey.

Product category	Percentage of participants (%)
Fresh vegetables and salads	65.9
Fresh fruit	50.8
Bread	45.9
Rice and remaining grains (including wraps, couscous, etc.)	27.0
Yoghurt, custard, etc.	23.3
Non-alcoholic beverages (milk, juice, soda. Excluded: water, tea, coffee, and diluted syrup)	23.3
Meat (please report cold meat slices at 'bread toppings')	23.1
Cheese (cheese cubes, French cheese, and sprinkle cheese. Excluded: cheese as bread topping)	22.7
Sauce (ketchup, mayonnaise, cocktail sauce, etc.)	20.8
Potatoes	20.5
Pasta	18.5
Bread toppings (cold meat slices, cheese slices, sweet topping, etc.)	18.5
Eggs	16.6
Potato products (fries, chips, baby or precooked potatoes, etc.)	15.2
Soups/curry	13.9
Non-fresh vegetables (jar/canned/frozen)	13.5
Crisps/nuts	10.3
Non-fresh fruit (jar/canned/dried/frozen)	10.2
Alcoholic beverages	10.0
Cereals (muesli, granola, oat, brinta, etc.)	9.9
Fish	9.7
Beans, lentils, chickpeas, etc.	8.7
Candy/cookies/granola bars/chocolate bars	8.1
Meat substitute	3.4

**FIGURE 2** Distribution of per capita household food waste in the 7 days before the survey, expressed as grams (a) and as its logarithmic transformation (b).



**TABLE 4** Results of the analysis of variance ( $F$  values and  $p$  values) exploring the effect of socio-demographic variables on self-reported household food waste. The logarithmic transformation of per capita food waste was considered as dependent variable.

Effect	$F$ value	$p$ value
Gender	0.71	0.400
Age	8.50	0.004 <sup>a</sup>
Household size	27.64	<0.001 <sup>a</sup>
Children under 18 years old living in the household	0.56	0.456
Household income	0.051	0.950

Note: Participants not reporting household income and the number of members in the household ( $n = 81$ ) were excluded from the analysis, giving as a result a dataset with 766 participants. The degrees of freedom are Gender (1), Age (2), Household size (2), Children living in household (1), and Household income (2).

<sup>a</sup>Significant effects at 0.05.

ranged between 5.1 and 6.0, suggesting overall agreement with the items. The Cronbach alpha coefficients for the four constructs were equal to or higher than 0.80, suggesting good reliability.

ANOVA was used to explore the effect of socio-demographic variables on the average values of each of the four constructs measured using Likert scales. As shown in Table 6, gender had a significant effect on the average scores of the four constructs. Females showed a significantly higher awareness, moral norm, self-efficacy, and intention to reduce household food waste than males (5.9 vs. 5.5, 5.6 vs. 5.3, 5.7 vs. 5.4, and 6.1 vs. 5.8, respectively). Participants' age had a significant effect on awareness and intention to reduce food waste. The oldest participants showed the highest awareness (5.9 vs. 5.6 for the other two groups) and intention to reduce food waste (6.1 vs. 5.9 for the other two groups). Meanwhile, household size, children living in the household, and income did not have a significant effect on the average value of any of the four constructs.

### 3.4 | Effect of awareness, moral norms, and self-efficacy on intention to reduce food waste, and self-reported household food waste

The SEM showed a good fit to the experimental data. The Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI) were higher than 0.9

**TABLE 5** Descriptive statistics for the items measuring awareness, moral norms, self-efficacy, and intention to reduce food waste. Responses were obtained on 7-point Likert scales from 1 = 'disagree strongly' to 7 = 'agree strongly.'

	Effect	Mean	Standard deviation
Awareness about food waste (Cronbach alpha = 0.92)	I am aware that the food waste problem is serious, directly connected to our daily lives.	5.8	1.2
	I am well aware of the food waste problem these days.	5.9	1.2
	I am usually interested in the food waste issue.	5.4	1.4
	I am aware that the food waste disposal issue is crucial.		1.3
	Food waste contributes to pollution, climate change, and exhaustion.	5.7	1.4
Moral norms about food waste (Cronbach alpha = 0.80)	I feel guilty about poor people when I leave leftover food.	5.1	1.6
	Leaving leftovers give me a bad conscience.	5.1	1.6
	I have been raised to eat all food I have taken myself.	5.8	1.3
	It is contrary my principles when I have to discard food.	5.6	1.4
Self-efficacy to reduce food waste (Cronbach alpha = 0.91)	There are simple things I can do to reduce the negative consequences of food waste.	5.7	1.2
	I can change my daily routines to prevent the problem caused by food waste.	5.4	1.3
	My individual actions will contribute to a solution of the problem caused by food waste.	5.5	1.4
	Changes in my daily routines will contribute to reducing the negative consequences of food waste.	5.4	1,3
Intention to reduce food waste (Cronbach alpha = 0.92)	I am interested in trying to reduce my household food waste.	5.9	1.2
	I will try to reduce food waste.	6.0	1.1
	I am confident that I will join in reducing food waste.	6.0	1.2

Note: Statements were adapted from Jang and Lee (2022) and Kim et al. (2022).

(0.958 and 0.950), which is a standard criterion to assess goodness of fit of structural equation models (Fornell & Larcker, 1981). In addition, the Root Mean Square Error of Approximation (RMSEA) and the Standardized Root Mean Square Residual (SRMR) were 0.067 and 0.047, respectively, providing additional evidence of the goodness of fit (RMSEA lower than 0.07 and SRMR lower than 0.08 are regarded as acceptable thresholds [Hu & Bentler, 1999; Tabachnick & Fidell, 2007]). This suggests that the experimental data supported the proposed model.

Figure 3 shows the results of the structural equation model and standardized path coefficients. All the path coefficients were significant, suggesting that the five hypotheses were accepted: awareness of food waste had a positive effect on moral norm (H5); awareness, moral norm, and self-efficacy had a positive effect on the intention to reduce household food waste (H2, H3 and H4, respectively); and intention to reduce household food waste had a negative effect on the self-reported amount of per capita household food waste (H1).

Standardized path coefficients were largely different. The larger the path coefficient, the stronger the association between variables. Thus, the strongest association was found between awareness of food waste and moral norm to reduce food waste, whereas the weakest association was found for intention to reduce food waste on the

self-reported amount of household food waste, expressed per capita (Table 7).

## 4 | DISCUSSION AND CONCLUSIONS

The present research intended to contribute to the food waste literature by exploring the influence of individual factors on household food waste in Australia, a country in a region of the world underrepresented in the literature (dos Santos et al., 2022; Schanes et al., 2018). Both socio-demographic and psychological factors were considered to maximize the contribution of the research.

### 4.1 | Amount of food wasted by the households

The amount of food wasted by the households was estimated at a median of 180 g/week, which corresponds to 9.4 kg per person per year. This is markedly lower than the 99.8 kg per person per year of food waste generated by consumers in their private households, reported in the National Food Waste Strategy Feasibility Study published in 2021 (FIAL, 2021). The difference was expected considering



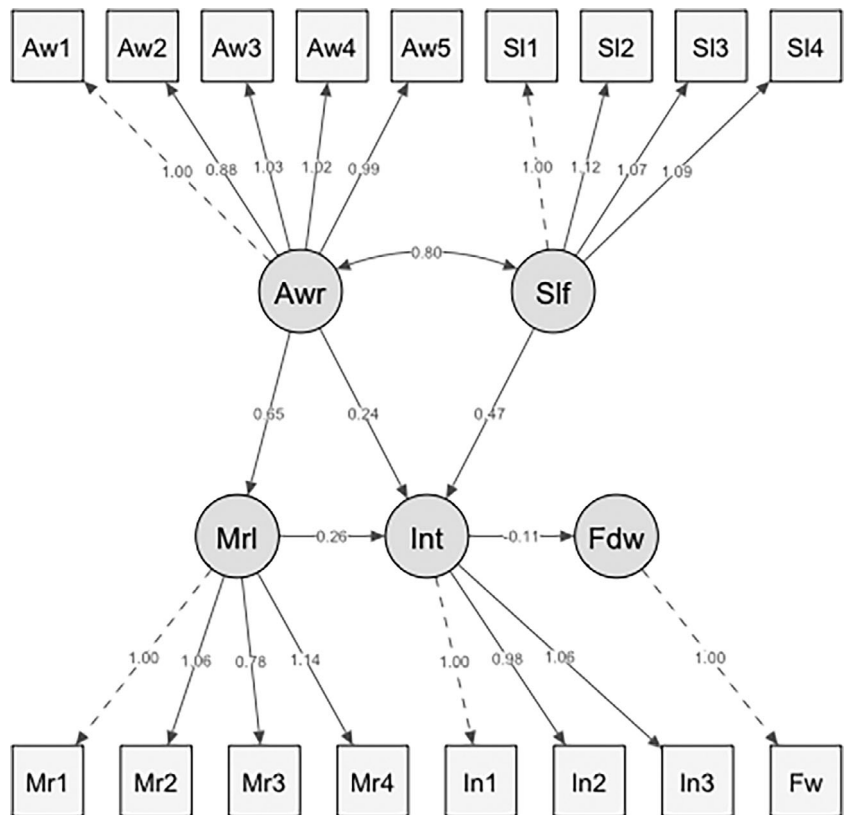
**TABLE 6** Results of the analysis of variance exploring the effect of socio-demographic variables on awareness, moral norms, self-efficacy, and intention to reduce food waste.

	Effect	F value	p value
Awareness about food waste	Gender	38.84	<0.001 <sup>a</sup>
	Age	9.42	0.002 <sup>a</sup>
	Household size	1.20	0.275
	Children living in the household	1.47	0.226
	Household income	0.00	0.993
Moral norm about food waste	Gender	13.53	<0.001 <sup>a</sup>
	Age	3.19	0.078
	Household size	0.10	0.755
	Children living in the household	1.15	0.285
	Household income	0.41	0.521
Self-efficacy to reduce food waste	Gender	18.46	<0.001 <sup>a</sup>
	Age	0.17	0.677
	Household size	1.27	0.261
	Children living in the household	0.17	0.684
	Household income	0.07	0.785
Intention to reduce food waste	Gender	21.20	<0.001 <sup>a</sup>
	Age	5.41	0.020 <sup>a</sup>
	Household size	1.42	0.232
	Children living in the household	0.10	0.756
	Household income	0.45	0.503

Note: Participants not reporting household income and the number of members in the household ( $n = 18$ ) were excluded from the analysis, giving as a result a dataset with 766 participants. The degrees of freedom are Gender (1), Age (2), Household size (2), Children living in household (1), and Household income (2).

<sup>a</sup>Significant effects at 0.05.

**FIGURE 3** Structural equation model and standardized path coefficients. Awr, Awareness of food waste; Mr1, Moral norms about food waste; S1f, Self-efficacy to reduce food waste; Int, Intention to reduce household food waste; Fdw, Self-reported household food waste. The numbers on the line represent the standardized path coefficients. Dashed lines represent the path coefficients regarded as reference in the model.



**TABLE 7** Results of the structural equation model testing the five postulated hypotheses regarding food waste.

Hypothesis	Regression	Coefficient	Standard error	p value	Outcome
H1	Intention to reduce—Food wasted	−0.110	0.041	0.008	Supported
H2	Awareness—Intention to reduce food waste	0.262	0.035	<0.001	Supported
H3	Moral norm—Intention to reduce food waste	0.471	0.036	<0.001	Supported
H4	Self-efficacy—Intention to reduce food waste	0.241	0.040	<0.001	Supported
H5	Awareness—Moral norm	0.652	0.041	<0.001	Supported

that questionnaires have been extensively reported to underestimate household food waste compared with diaries or waste composition analysis (Hoehn et al., 2023). Despite this drawback, questionnaire-based surveys have been reported to obtain large-scale data that can differentiate households according to the amount of food wasted (van Herpen, van der Lans, et al., 2019). Thus, questionnaires are a valid methodological approach to explore the effect of household characteristics on food waste-related behaviors. This is further supported by Ammann et al. (2021) who report a strong positive correlation between actual and self-reported measures of food waste.

Fresh fruits and vegetables were the most frequently wasted categories, followed by bread. These categories have been identified as the most wasted in studies conducted in Australia and several other developed and developing countries around the globe (Aschemann-Witzel et al., 2019; De Laurentiis et al., 2018; FIAL, 2021; Giménez et al., 2022; Giordano et al., 2019; Hanssen et al., 2016; Herzberg et al., 2020; van Dooren et al., 2019; von Massow et al., 2019). The large contribution of fruit and vegetables to household food waste represents a value loss of key nutrients and stresses the need to develop targeted waste reduction strategies (Augustin et al., 2020).

## 4.2 | Effect of socio-demographic variables on the amount of food wasted by households

Although socio-demographic characteristics have been identified as relevant influencers of household food waste, the evidence is still inconclusive about the strength and direction of their effect (Schanes et al., 2018). Results from the present work identified significant effects of age and household size.

The amount of per capita household food wasted tended to reduce with participants' age, in agreement with previous studies reporting a negative correlation between the amount of food wasted and age (Quested et al., 2013; Stancu et al., 2016; Visschers et al., 2016). In this work, the difference in the amount of food wasted between age groups can be explained considering the higher awareness of the food waste problem of the oldest participants (55–69 years old). Older citizens have been previously reported to have greater knowledge about the negative impacts of food waste than younger citizens (Qi & Roe, 2016). Visschers et al. (2016) hypothesized that older people's previous experiences with food shortages could also contribute to their smaller quantity of food wasted.

Regarding household size, the amount of food wasted per capita decreased with household size, as reported by several studies conducted in different countries worldwide (Giménez et al., 2022; Parizeau et al., 2015; Quested et al., 2013; Stancu et al., 2016; Visschers et al., 2016). The larger per capita food waste of smaller households can be explained considering that they may have more difficulties for portioning, and finding packaged products with adequate size in the marketplace (Ferro et al., 2022; Quested et al., 2013; Roodhuyzen et al., 2017).

Gender did not have a significant effect on the amount of food wasted, in agreement with Principato et al. (2015). On the contrary, Visschers et al. (2016) reported that females tend to waste more food than males. Despite the lack of significant effect on household food waste, females showed a higher awareness of the food waste problem, moral norm for food waste reduction, self-efficacy, and intention to reduce food waste. These differences in attitudinal responses to food waste match the higher food involvement of females compared with males (Bell & Marshall, 2003; Marshall & Bell, 2004).

Households with children have been reported to produce more food waste due to time constraints and children's changing preferences (Principato, 2018; Schanes et al., 2018). However, in this study, no significant differences were found in the per capita amount of food wasted by households with and without children younger than 18 years old. This result agrees with Parizeau et al. (2015), who reported that although households with children produced more total waste, their waste per capita was lower than households without children due to the smaller amount of food waste generation by children compared with adults.

Evidence on the effect of household income on food waste is not conclusive yet (Principato, 2018; Schanes et al., 2018). Results from the present work showed no significant effect of household income in the per capita amount of food wasted. Similar results have been reported by Stancu et al. (2016) in Denmark and Giménez et al. (2022) in Uruguay.

## 4.3 | Effect of awareness, moral norms, and self-efficacy on intention to reduce food waste and self-reported amount of food wasted by households

The present research explored the effect of a series of psychological factors on the amount of food wasted reported by participants in their



households. Results supported the five hypotheses derived based on the postulates of theories of consumer behavior. First, the results showed that the intention to reduce household food waste was negatively correlated to the self-reported per capita amount of food wasted by the households during the week prior to the survey. This validates behavioral intention as a predictor of consumer behavior in the context of household food waste, as established by the Theory of Planned Behavior (Ajzen, 1991, 2015). However, the standardized path coefficient of the relationship between the intention to reduce and actual food waste was the smallest in the model, suggesting a weak association. This suggests that intention to reduce food waste does not necessarily translate into engaging into food avoidance behaviors. The gap between intention and actual behavior can be explained by considering that food waste-related behaviors tend to be habitual and therefore occur without much cognitive deliberation (Schanes et al., 2018). In this sense, previous studies have shown that consumers usually regard their household food waste as negligible and find it difficult to recall food waste incidents (Elimelech et al., 2019; Ferro et al., 2022; Gaiani et al., 2018). Lack of ability to translate behavioral intentions into actual food waste reduction can also be attributed to individual characteristics, household composition (e.g., the attitudes and behaviors of other members of the household), as well as product-related and contextual factors (Roodhuyzen et al., 2017).

Awareness of the food waste problem, moral norm, and self-efficacy to reduce food waste were confirmed as precursors of behavioral intention, as predicted by the Theory of Planned Behavior (Ajzen, 1991, 2015), the Norm Activation Model (De Groot & Steg, 2009; Schwartz, 1977), and Social Learning Theory (Bandura & Walters, 1977). The importance of these constructs in the context of food waste reduction has also been previously reported in the context of household food waste (Aschemann-Witzel et al., 2015a, 2020; Jang & Lee, 2022; Kim et al., 2022; Principato et al., 2015; Qusted et al., 2013; Wang et al., 2022). In addition, awareness was positively correlated to moral norms. This suggests that awareness of the negative consequences of food waste activates moral norms to engage in food waste prevention behaviors, as previously reported by other authors for food waste and other pro-social behaviors (De Groot & Steg, 2009; Wang et al., 2022; Watson & Meah, 2012).

#### 4.4 | Implications for the development of strategies to reduce household food waste

Taken together, results from the present work provide insights for the development of strategies to reduce household food waste. The association between the amount of food waste reported by participants and their intention to engage in food waste reduction behaviors and the positive effect of awareness on behavioral intention suggest the potential of communication campaigns to trigger behavioral changes. Males and younger citizens should be specific targets of such campaigns given their lower awareness compared with females and older citizens.

Campaigns stressing the negative consequences of food waste are expected to encourage food waste prevention behaviors. Dissonance-based campaigns aimed at making consumers aware of the gap between their beliefs and their current behavior deserve special consideration (Pelt et al., 2020; Piras et al., 2022). Such campaigns have been reported to be effective across different behavioral domains, including environmental behaviors (Freijy & Kothe, 2013).

Higher awareness of the negative consequences of food waste is expected to activate moral norms, which could further contribute to encourage prevention behaviors. Piras et al. (2022) have recently shown recommended communication campaigns depicting food waste prevention as the social norm. However, it should be stressed that these messages may not work for all consumers. Cecere et al. (2014) reported that people actively engaged in food waste reduction tend to exhibit altruistic motivation, which makes them not largely influenced by social norms. For these consumers, the development of interventions providing planning and food preparation skills may be more effective. This approach could contribute to effectively address the most relevant behavioral drivers of household food waste (Ferro et al., 2022; Principato, 2018; Schanes et al., 2018), increasing self-efficacy. Communication campaigns providing practical recommendations have been reported to be effective in achieving household food waste reductions of up to 28% (EPA, 2016; FAO, 2019).

In closing, it should be acknowledged that communication campaigns to encourage changes in consumer behavior in relation to food waste are only one of several multifaceted strategies to reduce food waste and encourage more sustainable habits (Aschemann-Witzel et al., 2015b; Tsalis et al., 2021).

#### 4.5 | Strengths and limitations of the research

The use of questionnaires is a limitation of the present work, as previously discussed. Although they have been shown to underestimate the amount of food wasted by households, they are a valid methodological approach to evaluate the effect of individual characteristics on this phenomenon (van Herpen, van der Lans, et al., 2019). Another limitation of the research pertains to the sample. Although it was diverse in regard to participants' demographic and socio-economic characteristics, it was not nationally representative. Specifically, only people living in Australia's five major urban regions—Sydney, Melbourne, Brisbane, Perth and Adelaide—took part. While these city regions represent ~70% of the Australian population (Australian Bureau of Statistics, 2021b) and are geographically apart, rural Australia was not represented. This could skew the results compared with a national survey, since food waste may differ between rural and urban households and be higher in the latter (e.g., Lebersorger & Schneider, 2011; Li et al., 2021) although this is not always found (Thyberg et al., 2015). Self-selection bias could also have skewed the sample, both in relation to those people in society who choose to take part in internet surveys (Buchanan, 2018; Daikeler et al., 2020) but also in relation to topic interest. To mitigate the latter, the survey invitation did contain references to eating/drinking, foods/beverages, or

food likes/dislikes. This precaution was taken to ensure that people with low food interest and involvement would opt out, which could lead to bias since psychographic heterogeneity in the sample would be influenced. In populations, people with differing degrees of food involvement are known to exist (Pickering & Pickering, 2022). The use of an online survey was unlikely to have majorly skewed the participant profile. Australia-wide in 2016, nearly 80% of all households had internet access, and the question about household internet access was excluded from the most recent census in 2021 (Australia Community Profile, 2023).

#### AUTHOR CONTRIBUTIONS

**Gastón Ares:** Conceptualization, methodology, formal analysis, writing—original draft, writing—review & editing. **Ana Gimenez:** Conceptualization, methodology, formal analysis, writing—original draft, writing—review & editing. **Sara R. Jaeger:** Conceptualization, methodology, writing—original draft, writing—review & editing.

#### ACKNOWLEDGMENTS

Sok L. Chheang (Plant & Food Research, New Zealand) is thanked for their help in data collection and curation. Open access publishing facilitated by New Zealand Institute for Plant and Food Research Ltd, as part of the Wiley - New Zealand Institute for Plant and Food Research Ltd agreement via the Council of Australian University Librarians.

#### FUNDING INFORMATION

Financial support was received from two sources: (1) The New Zealand Institute for Plant and Food Research Limited and (2) The New Zealand Ministry for Business, Innovation & Employment.

#### CONFLICT OF INTEREST STATEMENT

All authors declare no conflicts of interest.

#### DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

#### ORCID

Gastón Ares  <https://orcid.org/0000-0002-0565-8835>

Sara R. Jaeger  <https://orcid.org/0000-0002-4960-5233>

#### REFERENCES

- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179–211. [https://doi.org/10.1016/0749-5978\(91\)90020-T](https://doi.org/10.1016/0749-5978(91)90020-T)
- Ajzen, I. (2015). Consumer attitudes and behavior: The theory of planned behavior applied to food consumption decisions. *Rivista di Economia Agraria*, LXX(2), 121–138. <https://doi.org/10.13128/REA-18003>
- Alexander, P., Brown, C., Arneith, A., Finnigan, J., Moran, D., & Rounsevell, M. D. A. (2017). Losses, inefficiencies and waste in the global food system. *Agricultural Systems*, 153, 190–200. <https://doi.org/10.1016/j.agsy.2017.01.014>
- Ammann, J., Osterwalder, O., Siegrist, M., Hartmann, C., & Egolf, A. (2021). Comparison of two measures for assessing the volume of food waste in Swiss households. *Resources, Conservation and Recycling*, 166, 105295. <https://doi.org/10.1016/j.resconrec.2020.105295>
- Arcadis. (2019). National Food Waste Baseline. <https://www.dccew.gov.au/sites/default/files/env/pages/25e36a8c-3a9c-487c-a9cb-66ec15ba61d0/files/national-food-waste-baseline-final-assessment.pdf>
- Aschemann-Witzel, J., de Hooge, I., Amani, P., Bech-Larsen, T., & Oostindjer, M. (2015a). Consumer-related food waste: Causes and potential for action. *Sustainability (Switzerland)*, 7(6), 6457–6477. <https://doi.org/10.3390/su7066457>
- Aschemann-Witzel, J., de Hooge, I., Amani, P., Bech-Larsen, T., & Oostindjer, M. (2015b). Consumer-related food waste: Causes and potential for action. *Sustainability*, 7(6), 6457–6477. <https://doi.org/10.3390/su7066457>
- Aschemann-Witzel, J., Giménez, A., & Ares, G. (2019). Household food waste in an emerging country and the reasons why: Consumer's own accounts and how it differs for target groups. *Resources, Conservation and Recycling*, 145, 332–338. <https://doi.org/10.1016/j.resconrec.2019.03.001>
- Aschemann-Witzel, J., Giménez, A., Grønhoj, A., & Ares, G. (2020). Avoiding household food waste, one step at a time: The role of self-efficacy, convenience orientation, and the good provider identity in distinct situational contexts. *Journal of Consumer Affairs*, 54(2), 581–606. <https://doi.org/10.1111/joca.12291>
- Augustin, M. A., Sanguansri, L., Fox, E. M., Cobiac, L., & Cole, M. B. (2020). Recovery of wasted fruit and vegetables for improving sustainable diets. *Trends in Food Science & Technology*, 95, 75–85. <https://doi.org/10.1016/j.tifs.2019.11.010>
- Australia Community Profile. (2023). Internet connection. <https://profile.id.com.au/australia/internet-connection?WebID=270>
- Australian Bureau of Statistics. (2021a). *Australia's Population by Country of Birth*. Accessed on 2nd June 2023 from: <https://www.abs.gov.au/statistics/people/population/australias-population-country-birth/latest-release>
- Australian Bureau of Statistics. (2021b). Location: Census. Australian Bureau of Statistics.
- Australian Bureau of Statistics. (2022). National, state and territory population. Statistics about the population and components of change (births, deaths, migration) for Australia and its states and territories. Accessed on 2nd June 2023 from: <https://www.abs.gov.au/statistics/people/population/national-state-and-territory-population/sep-2022>
- Australian Government. (2017). *National Food Waste Strategy: Halving Australia's food waste by 2030*. Commonwealth of Australia.
- Bandura, A. (1982). Self-efficacy mechanism in human agency. *American Psychologist*, 37(2), 122–147. <https://doi.org/10.1037/0003-066X.37.2.122>
- Bandura, A., & Walters, R. H. (1977). *Social learning theory* (Vol. 1). Prentice Hall.
- Bell, R., & Marshall, D. W. (2003). The construct of food involvement in behavioral research: Scale development and validation. *Appetite*, 40(3), 235–244. [https://doi.org/10.1016/S0195-6663\(03\)00009-6](https://doi.org/10.1016/S0195-6663(03)00009-6)
- Boulet, M., Hoek, A. C., & Raven, R. (2021). Towards a multi-level framework of household food waste and consumer behaviour: Untangling spaghetti soup. *Appetite*, 156, 104856. <https://doi.org/10.1016/j.appet.2020.104856>
- Buchanan, T. (2018). Personality biases in different types of “internet samples” can influence research outcomes. *Computers in Human Behavior*, 86, 235–244. <https://doi.org/10.1016/j.chb.2018.05.002>
- Cecere, G., Mancinelli, S., & Mazzanti, M. (2014). Waste prevention and social preferences: The role of intrinsic and extrinsic motivations. *Ecological Economics*, 107, 163–176. <https://doi.org/10.1016/j.ecolecon.2014.07.007>
- Daikeler, J., Bošnjak, M., & Lozar Manfreda, K. (2020). Web versus other survey modes: An updated and extended meta-analysis comparing response rates. *Journal of Survey Statistics and Methodology*, 8(3), 513–539. <https://doi.org/10.1093/jssam/sz008>

- de Boni, A., Ottomano Palmisano, G., De Angelis, M., & Minervini, F. (2022). Challenges for a sustainable food supply chain: A review on food losses and waste. *Sustainability*, 14(24), 16764. <https://doi.org/10.3390/su142416764>
- De Groot, J. I. M., & Steg, L. (2009). Morality and prosocial behavior: The role of awareness, responsibility, and norms in the norm activation model. *The Journal of Social Psychology*, 149(4), 425–449. <https://doi.org/10.3200/SOCP.149.4.425-449>
- De Laurentiis, V., Corrado, S., & Sala, S. (2018). Quantifying household waste of fresh fruit and vegetables in the EU. *Waste Management*, 77, 238–251. <https://doi.org/10.1016/j.wasman.2018.04.001>
- dos Santos, J. I. A. S., da Silveira, D. S., da Costa, M. F., & Duarte, R. B. (2022). Consumer behaviour in relation to food waste: A systematic literature review. *British Food Journal*, 124(12), 4420–4439. <https://doi.org/10.1108/BFJ-09-2021-1075>
- Dou, Z., & Toth, J. D. (2021). Global primary data on consumer food waste: Rate and characteristics—A review. *Resources, Conservation and Recycling*, 168, 105332. <https://doi.org/10.1016/j.resconrec.2020.105332>
- Elimelech, E., Ert, E., & Ayalon, O. (2019). Bridging the gap between self-assessments and measured household food waste: A hybrid valuation approach. *Waste Management*, 95, 259–270. <https://doi.org/10.1016/j.wasman.2019.06.015>
- EPA. (2016). Food: Too good to waste. *Implementation guide and toolkit*.
- Epskamp, S., Stuber, S., Nak, J., Veenman, M., & Jorgensen, T. D. (2022). Package “semPlot.” CRAN.
- FAO. (2019). The state of food and agriculture. *Moving forward on food loss and waste reduction*.
- Ferro, C., Ares, G., Aschemann-Witzel, J., Curutchet, M. R., & Giménez, A. (2022). “I don’t throw away food, unless I see that it’s not fit for consumption”: An in-depth exploration of household food waste in Uruguay. *Food Research International*, 151, 110861. <https://doi.org/10.1016/j.foodres.2021.110861>
- FIAL. (2021). The National Food Waste Strategy Feasibility Study—Final report.
- Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 18(1), 39. <https://doi.org/10.2307/3151312>
- Freijy, T., & Kothe, E. J. (2013). Dissonance-based interventions for health behaviour change: A systematic review. *British Journal of Health Psychology*, 18(2), 310–337. <https://doi.org/10.1111/bjhp.12035>
- Gaiani, S., Caldeira, S., Adorno, V., Segrè, A., & Vittuari, M. (2018). Food wasters: Profiling consumers’ attitude to waste food in Italy. *Waste Management*, 72, 17–24. <https://doi.org/10.1016/j.wasman.2017.11.012>
- Giménez, A., Alcaire, F., Vítola, A., Curutchet, M. R., & Ares, G. (2022). Exploring the economic and environmental effects of food waste in Uruguayan households. *Enterprise Development & Microfinance*, 33, 1–23. <https://doi.org/10.3362/1755-1986.22-00061>
- Giordano, C., Alboni, F., & Falasconi, L. (2019). Quantities, determinants, and awareness of Households’ food waste in Italy: A comparison between diary and questionnaires quantities’. *Sustainability*, 11(12), 3381. <https://doi.org/10.3390/su11123381>
- Hanssen, O. J., Syversen, F., & Stø, E. (2016). Edible food waste from Norwegian households—Detailed food waste composition analysis among households in two different regions in Norway. *Resources, Conservation and Recycling*, 109, 146–154. <https://doi.org/10.1016/j.resconrec.2016.03.010>
- Herzberg, R., Schmidt, T. G., & Schneider, F. (2020). Characteristics and determinants of domestic food waste: A representative diary study across Germany. *Sustainability*, 12(11), 4702. <https://doi.org/10.3390/su12114702>
- Hoehn, D., Vázquez-Rowe, I., Kahhat, R., Margallo, M., Laso, J., Fernández-Ríos, A., Ruiz-Salmón, I., & Aldaco, R. (2023). A critical review on food loss and waste quantification approaches: Is there a need to develop alternatives beyond the currently widespread pathways? *Resources, Conservation and Recycling*, 188, 106671. <https://doi.org/10.1016/j.resconrec.2022.106671>
- Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, 6(1), 1–55. <https://doi.org/10.1080/10705519909540118>
- Jaeger, S. R., & Cardello, A. V. (2022). Factors affecting data quality of online questionnaires: Issues and metrics for sensory and consumer research. *Food Quality and Preference*, 102, 104676.
- Jang, H.-W., & Lee, S.-B. (2022). Protection motivation and food waste reduction strategies. *Sustainability*, 14(3), 1861. <https://doi.org/10.3390/su14031861>
- Kim, W., Che, C., & Jeong, C. (2022). Food waste reduction from customers’ plates: Applying the norm activation model in south Korean context. *Land*, 11(1), 109. <https://doi.org/10.3390/land11010109>
- Lebersorger, S., & Schneider, F. (2011). Discussion on the methodology for determining food waste in household waste composition studies. *Waste Management*, 31(9–10), 1924–1933. <https://doi.org/10.1016/j.wasman.2011.05.023>
- Li, Y., Wang, L., Liu, G., & Cheng, S. (2021). Rural household food waste characteristics and driving factors in China. *Resources, Conservation and Recycling*, 164, 105209. <https://doi.org/10.1016/j.resconrec.2020.105209>
- Marshall, D., & Bell, R. (2004). Relating the food involvement scale to demographic variables, food choice and other constructs. *Food Quality and Preference*, 15(7–8 SPEC.ISS), 871–879. <https://doi.org/10.1016/j.foodqual.2004.06.003>
- Muth, M. K., Birney, C., Cuéllar, A., Finn, S. M., Freeman, M., Galloway, J. N., Gee, I., Gephart, J., Jones, K., Low, L., Meyer, E., Read, Q., Smith, T., Weitz, K., & Zoubek, S. (2019). A systems approach to assessing environmental and economic effects of food loss and waste interventions in the United States. *Science of the Total Environment*, 685, 1240–1254. <https://doi.org/10.1016/j.scitotenv.2019.06.230>
- OECD. (2020). Better life index. Accessed on 2nd June 2023 from: <https://www.oecdbetterlifeindex.org/countries/australia/>
- Parizeau, K., von Massow, M., & Martin, R. (2015). Household-level dynamics of food waste production and related beliefs, attitudes, and behaviours in Guelph, Ontario. *Waste Management*, 35, 207–217. <https://doi.org/10.1016/j.wasman.2014.09.019>
- Pelt, A., Saint-Bauzel, R., Barbier, L., & Fointiat, V. (2020). Food waste: Disapproving, but still doing. An evidence-based intervention to reduce waste at household. *Resources, Conservation and Recycling*, 162, 105059. <https://doi.org/10.1016/j.resconrec.2020.105059>
- Pickering, G. J., & Pickering, H. M. G. (2022). On being a foodie: Development of the foodie index and association with personality and taste phenotype. *Food Quality and Preference*, 96, 104451. <https://doi.org/10.1016/j.foodqual.2021.104451>
- Piras, S., Righi, S., Setti, M., Koseoglu, N., Grainger, M. J., Stewart, G. B., & Vittuari, M. (2022). From social interactions to private environmental behaviours: The case of consumer food waste. *Resources, Conservation and Recycling*, 176, 105952. <https://doi.org/10.1016/j.resconrec.2021.105952>
- Principato, L. (2018). Food waste at consumer level: A comprehensive literature review. [https://books.google.co.uk/books?hl=en&lr=&id=6qFTDwAAQBAJ&oi=fnd&pg=PP8&dq=Food+waste+platform+consumer+&ots=q3AoYS1F3v&sig=ROVbt\\_9mssWSXqvtmxIHRYxOuy&redir\\_esc=y#v=onepage&q&f=false](https://books.google.co.uk/books?hl=en&lr=&id=6qFTDwAAQBAJ&oi=fnd&pg=PP8&dq=Food+waste+platform+consumer+&ots=q3AoYS1F3v&sig=ROVbt_9mssWSXqvtmxIHRYxOuy&redir_esc=y#v=onepage&q&f=false)
- Principato, L., Secondi, L., & Pratesi, C. A. (2015). Reducing food waste: An investigation on the behaviour of Italian youths. *British Food Journal*, 117(2), 731–748. <https://doi.org/10.1108/BFJ-10-2013-0314>
- Qi, D., & Roe, B. E. (2016). Household food waste: Multivariate regression and principal components analyses of awareness and attitudes among U.S. consumers. *PLOS ONE*, 11(7), e0159250. <https://doi.org/10.1371/journal.pone.0159250>
- Quested, T. E., Marsh, E., Stunell, D., & Parry, A. D. (2013). Spaghetti soup: The complex world of food waste behaviours. *Resources, Conservation*

- and Recycling, 79, 43–51. <https://doi.org/10.1016/j.resconrec.2013.04.011>
- R Core Team. (2022). R: A language and environment for statistical computing. R Foundation for Statistical Computing.
- Roodhuyzen, D. M. A., Luning, P. A., Fogliano, V., & Steenbekkers, L. P. A. (2017). Putting together the puzzle of consumer food waste: Towards an integral perspective. *Trends in Food Science and Technology*, 68, 37–50. <https://doi.org/10.1016/j.tifs.2017.07.009>
- Rosseel, Y. (2012). lavaan: an R package for structural equation modeling and more Version 0.5-12 (BETA). 12, 1–32.
- Schanes, K., Dobernic, K., & Gözet, B. (2018). Food waste matters—a systematic review of household food waste practices and their policy implications. *Journal of Cleaner Production*, 182, 978–991. <https://doi.org/10.1016/j.jclepro.2018.02.030>
- Scherhauser, S., Moates, G., Hartikainen, H., Waldron, K., & Obersteiner, G. (2018). Environmental impacts of food waste in Europe. *Waste Management*, 77, 98–113. <https://doi.org/10.1016/j.wasman.2018.04.038>
- Schwartz, S. H. (1977). Normative influences on altruism. *Advances in Experimental Social Psychology*, 10, 221–279.
- Seppelt, R., Klotz, S., Peiter, E., & Volk, M. (2022). Agriculture and food security under a changing climate: An underestimated challenge. *IScience*, 25(12), 105551. <https://doi.org/10.1016/j.isci.2022.105551>
- Stancu, V., Haugaard, P., & Lähteenmäki, L. (2016). Determinants of consumer food waste behaviour: Two routes to food waste. *Appetite*, 96, 7–17. <https://doi.org/10.1016/j.appet.2015.08.025>
- Tabachnick, B. G., & Fidell, L. S. (2007). *Using multivariate statistics* (5th ed.). Allyn and Bacon.
- Taberner, C., & Hernández, B. (2011). Self-efficacy and intrinsic motivation guiding environmental behavior. *Environment and Behavior*, 43(5), 658–675. <https://doi.org/10.1177/0013916510379759>
- Thyberg, K. L., Tonjes, D. J., & Gurevitch, J. (2015). Quantification of food waste disposal in the United States: A meta-analysis. *Environmental Science & Technology*, 49(24), 13946–13953. <https://doi.org/10.1021/acs.est.5b03880>
- Tsalis, G., Jensen, B. B., Wakeman, S. W., & Aschemann-Witzel, J. (2021). Promoting food for the trash bin? A review of the literature on retail price promotions and household-level food waste. *Sustainability*, 13(7), 4018. <https://doi.org/10.3390/su13074018>
- UNEP. (2021). UNEP food waste index report 2021. <https://www.unep.org/resources/report/unep-food-waste-index-report-2021>
- United Nations. (2022). Ensure sustainable consumption and production patterns. <https://sdgs.un.org/goals/goal12>
- van Dooren, C., Janmaat, O., Snoek, J., & Schrijnen, M. (2019). Measuring food waste in Dutch households: A synthesis of three studies. *Waste Management*, 94, 153–164. <https://doi.org/10.1016/j.wasman.2019.05.025>
- van Herpen, E., van der Lans, I. A., Holthuysen, N., Nijenhuis-de Vries, M., & Quedsted, T. E. (2019). Comparing wasted apples and oranges: An assessment of methods to measure household food waste. *Waste Management*, 88, 71–84. <https://doi.org/10.1016/j.wasman.2019.03.013>
- van Herpen, E., van Geffen, L., Nijenhuis-de Vries, M., Holthuysen, N., van der Lans, I., & Quedsted, T. (2019). A validated survey to measure household food waste. *MethodsX*, 6, 2767–2775. <https://doi.org/10.1016/j.mex.2019.10.029>
- Visschers, V. H. M., Wickli, N., & Siegrist, M. (2016). Sorting out food waste behaviour: A survey on the motivators and barriers of self-reported amounts of food waste in households. *Journal of Environmental Psychology*, 45, 66–78. <https://doi.org/10.1016/j.jenvp.2015.11.007>
- von Massow, M., Parizeau, K., Gallant, M., Wickson, M., Haines, J., Ma, D. W. L., Wallace, A., Carroll, N., & Duncan, A. M. (2019). Valuing the multiple impacts of household food waste. *Frontiers in Nutrition*, 6, 143. <https://doi.org/10.3389/fnut.2019.00143>
- Wang, J., Li, M., Li, S., & Chen, K. (2022). Understanding consumers' food waste reduction behavior—A study based on extended norm activation theory. *International Journal of Environmental Research and Public Health*, 19(7), 4187. <https://doi.org/10.3390/ijerph19074187>
- Watson, M., & Meah, A. (2012). Food, waste and safety: Negotiating conflicting social anxieties into the practices of domestic provisioning. *The Sociological Review*, 60(2\_suppl), 102–120. <https://doi.org/10.1111/1467-954X.12040>

**How to cite this article:** Gimenez, A., Ares, G., & Jaeger, S. R. (2023). Exploration of individual factors influencing self-reported household food waste in Australia. *Journal of Sensory Studies*, e12881. <https://doi.org/10.1111/joss.12881>