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Research Paper

Predictors of food waste quantities and composition: A nationwide diary study of Swiss households

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ABSTRACT

In this study, we aimed to quantify the average amount of avoidable food wasted in Swiss households using a novel web-based diary method. We also aimed to identify under-explored predictors of food waste, including sociodemographic factors (e.g. linguistic region), psychological factors (e.g. plate-clearing tendencies and perceived health risk), and eating habits (e.g. dietary patterns and frequency of dinner preparation). We collected data from a random stratified sample of 515 households in Switzerland across three linguistic regions. Food waste data for 14 food groups were collected via a web application, whereas personal and household characteristics were gathered separately through online surveys. We identified food waste predictors using correlation and regression analyses. On average, the participants reported wasting 401.9 grams (standard deviation = 394.3) of food per capita per week. Overall, age, household size, linguistic region, and plate-clearing tendencies were key predictors of food waste. Households in Italian-speaking regions wasted less food than those in German-speaking regions. Additionally, participants with stronger plate-clearing tendencies wasted less food than those with weaker tendencies. This finding might thus highlight a relevant trade-off between reducing food waste on plates and increased overeating (metabolic food waste), which may result from a stronger tendency to clear one's plate. We also observed that 'non-meat eaters' generated more waste of starchy side dishes than 'meat eaters'. Our findings highlight the need for future interventions to address cultural, behavioural, and dietary factors to reduce avoidable food waste and offer insights for designing targeted strategies for specific populations and food categories.

1. Introduction

Around one billion meals are wasted daily by households worldwide (UNEP, 2024), making food waste a major economic, environmental, and social challenge. In Switzerland, about one third of all food is lost along the value chain, with households being the largest contributors (Beretta and Hellweg, 2019). European countries have committed to reducing food waste in line with Sustainable Development Goal 12.3, which aims to halve global food waste by 2030 (UNEP, 2024). Achieving this goal requires consistent monitoring of the quantity and composition of household food waste (United Nations, 2015). However, household food waste data often lack harmonisation and robustness, and comparable national-level data remain limited (UNEP, 2024). More direct quantification methods, such as weighing food waste, can improve data reliability (UNEP, 2024), especially when combined with information on personal and household characteristics to identify key predictors of food waste (Szymkowiak et al., 2022).

1.1. Household food waste quantification

There are various methods for quantifying household food waste. The most frequently used methods are waste composition analysis (WCA), bin cameras, kitchen caddies, diaries, and surveys (Hartikainen et al., 2025; Merian et al., 2024; van Herpen et al., 2019). WCA, bin

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cameras, and kitchen caddies are direct quantification methods (weighing by scale) used to quantify solid food waste. Although these direct methods are considered accurate methods for quantifying solid food waste, they do not account for beverages and other disposal routes besides the household bin. By contrast, surveys are an indirect quantification method based on recall; thus, food waste data based on surveys are considered less accurate than data from WCA, bin cameras, or kitchen caddies (Merian et al., 2024). Lastly, diaries are considered a direct food waste quantification method. In addition to reporting on solid food, diaries enable the quantification of waste from liquids and other disposal routes than waste bins.

As diaries rely on self-reported food waste data, this collection method can lead to underreporting and an underestimation of the actual amount of food waste (Aschemann-Witzel et al., 2021; Merian et al., 2024; van Herpen et al., 2019). However, diaries remain a valid and valuable method for identifying food waste predictors and understanding behavioural drivers, thereby enabling the development of targeted reduction measures (Hebrok and Boks, 2017).

Large-scale diary studies that are representative of a country are rare (Cicatiello and Giordano, 2018; Etim et al., 2025; Krah et al., 2024; Withanage et al., 2021). Most diary studies use non-probability sampling (selection based on non-random criteria) or do not specify their sampling methods. The sample sizes of diary studies typically range between 10 and 100 households, and only a few included 500 households or more (Ananda et al., 2021; Bilska et al., 2024; Herzberg et al., 2020; Krutprong and Pharino, 2025; Sigala et al., 2024). Households of larger samples often come from consumer panels, which may bias the results due to the participants' prior experience with the topic, and they might not be representative of a certain population. Women, students, and highly educated individuals are frequently overrepresented.

In Switzerland, three diary studies have been conducted in recent years (Ammann et al., 2021; Breitenmoser et al., 2024; Merian et al., 2024). These studies used non-probability sampling, with sample sizes ranging from 84 to 223 households. However, none of these covered all three main linguistic regions of Switzerland (German, French, and Italian). One study analysed potential food waste predictors (Ammann et al., 2021) with a focus on the overall food waste amount. To record food waste, Ammann et al. (2021) used a paper-based method in their diary study, while the other two studies used a web-based application (Breitenmoser et al., 2024; Merian et al., 2024). Using a web-based application to record food waste could enhance data management efficiency for researchers, reduce errors associated with handwritten data by participants, and offer a more sustainable alternative to paper.

1.2. Potential predictors of food waste

The identification of key predictors of food waste can help develop targeted reduction interventions for different household groups (Aschemann-Witzel et al., 2021; Delley and Brunner, 2018; Etim et al., 2025). Potential key predictors are sociodemographic characteristics, psychological factors, and eating habits. Sociodemographic characteristics, such as household size, the presence of children, age, and gender, can influence food waste (Ammann et al., 2021; Ananda et al., 2021; Visschers et al., 2016). However, the results of studies investigating the influence of sociodemographic factors on food waste are inconsistent. For example, Visschers et al. (2016) found that women tend to waste more food. However, no other studies have reported gender differences in food waste (Cantaragiu, 2019; Przezbórska-Skobiej and Wiza, 2021; Stoica et al., 2022). Whether households have children may also influence the amount of food waste (Parizeau et al., 2015; Stoica et al., 2022; Visschers et al., 2016). Further, Gulyas and Edmondson (2024) found that owning a garden can lead to less food waste. In addition, different linguistic regions and cultures can affect food-related behaviours (Elimelech et al., 2024; Langellier et al., 2015).

To date, there is limited knowledge on how linguistic regions affect food waste amounts (Ananda et al., 2021). Eating habits, such as cooking frequency and diet, can affect food waste. For example, more frequent home cooking has been linked to higher food waste (Laila et al., 2022), while vegetarian meals tend to produce less plate waste than meat-based meals (Berardy et al., 2022). Psychological factors, such as perceived health risk and plate-clearing tendencies, may further influence food waste behaviour. People who perceive certain foods as risky to their health tend to waste more food, possibly because they are more likely to discard visually imperfect foods (Ammann et al., 2021; de Hooge et al., 2017; Visschers et al., 2016). The plate-clearing tendency refers to the habit of finishing all food on one's plate, regardless of hunger (Robinson et al., 2015), and is linked to a stronger concern about food waste (Nill and Meule, 2022; Sheen et al., 2020).

1.3. Aim of the study

Our study aims (1) to quantify the average amount of food wasted in households for a representative sample in Switzerland. Further, we aim (2) to identify potential predictors—sociodemographic, psychological, and dietary—for overall and category-specific food waste. With this first national-level diary study in Switzerland, we contribute more reliable data on the amount of food wasted in Swiss households by using standardised methods and large samples, contributing to European efforts for better data comparability. Further, by analysing less-studied food waste predictors, such as linguistic regions, plate-clearing tendencies, and dietary patterns, we advance the development of more precise and effective food waste reduction strategies.

Our contribution to the literature has four key aspects. Firstly, our nationwide study covers multiple linguistic regions in Switzerland. Therefore, we provide a comprehensive understanding of the predictors of food waste at a national level. Secondly, this is the first study to analyse the impact of plate-clearing tendencies on the amount of food waste. This provides new insights into the relationship between food waste and eating behaviour, in particular overeating (metabolic food waste). Thirdly, we used a novel, validated, tri-lingual, web-based food waste app to measure food waste. This app is a more intuitive and user-friendly tool for participants, and could be useful for further studies. Fourthly, besides analysing predictors for total food waste, we also provide category-specific food waste predictors. This facilitates the development of targeted interventions for specific food categories.

2. Methods

Following the open science policy, the data obtained herein, as well as the study documents (initial survey, final survey, invitation, and instruction letters, and content of the web application), are freely accessible on Zenodo (Liechti et al., 2025).

2.1. Study design

To quantify the amount of food waste for a representative sample of Swiss households, we used a web application based on a food waste diary. This method has been applied and validated in a previous Swiss study that quantified household food waste (Merian et al., 2024). To investigate potential predictors of household food waste, we collected data on personal and household characteristics via surveys. Therefore, we randomly selected a stratified sample of Swiss households from the German-, French-, and Italian-speaking regions of Switzerland. The study consisted of three phases: Phase 1: sampling and data collection of participants' personal and household characteristics via an initial survey (8 weeks); Phase 2: quantification of the household food waste by the participants (seven consecutive days within a six-week period); and Phase 3: data collection of participants' personal characteristics via a final survey (2 weeks). The total study duration was 12 weeks, from October to December 2024. Fig. 1 provides an overview of the study design, and Appendix 1 provides an overview of the study timeline.

The web application for recording food waste and the surveys for

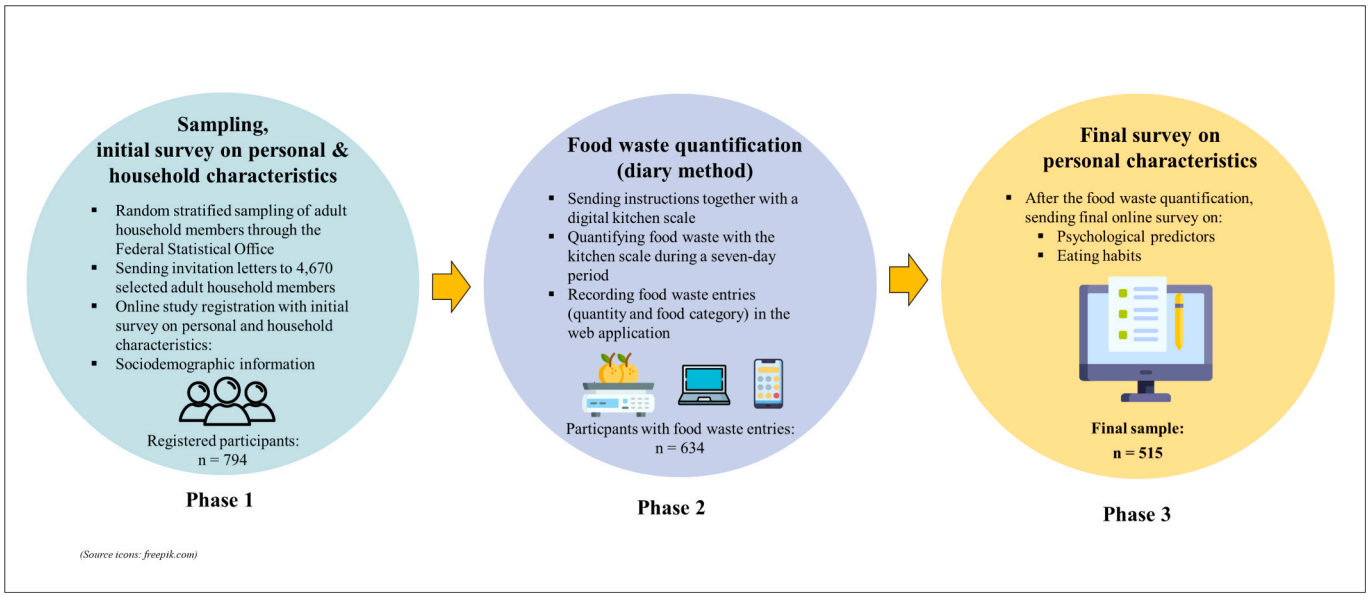

Fig. 1. An overview of the study design of the national food waste diary in Swiss households, with a final simple size of 515 households. The study consists of three phases. Phase 1: Sampling and initial survey on personal and household characteristics; Phase 2: Food waste quantification; and Phase 3: Final survey on personal characteristics.

collecting data on personal and household characteristics were first pre-tested with 11 adult volunteers. The volunteers came from German-, French-, and Italian-speaking regions. The pre-test focused particularly on the clarity of the web application and the survey, as well as on ensuring reliable online data transmission. In this study, all letters, correspondences, and a video were trilingual (from German translated to French and Italian by native speakers from our internal linguistic service) and were printed and sent by post.

2.2. Sampling and initial survey

A stratified random sample (n = 4,670) was drawn by the Swiss Federal Statistical Office from the national sampling frame for person and household surveys (Federal Statistical Office, 2024). This sampling method allows for representative insights. In each household, one randomly selected household member was responsible for measuring the amount of food waste and completing two surveys (initial and final survey) on personal and household characteristics on behalf of their entire household.

Participant sampling was conducted using the following 24 strata (3 × 2 × 4): (1) the three principal linguistic regions of Switzerland (German, French, Italian), (2) the gender (women, men), and (3) four age categories (18–34 years, 35–49 years, 50–64 years, 65 years and older) (Chatelan et al., 2017). A total of 4,670 adult household members were contacted at the beginning of October 2024 and invited by postal invitation letter to register and participate in our study (see Fig. 1, Phase 1). The distribution of contacted participants across the linguistic regions was as follows: 2,324 participants (49.8%) from the German-speaking region, 1,650 (35.3%) from the French-speaking region, and 696 (14.9%) from the Italian-speaking region (see Appendix 2). The participants were able to register for the study during an eight-week period, from October to November 2024. After registering for the study, we collected data on personal and household characteristics (i.e., sociodemographic information) via an initial survey. Applied quotas for the linguistic regions, gender, and age groups with sample sizes for the total sample, non-participants, and participants can be seen in Appendix 2.

2.2.1. Invitation letter

An informative invitation letter was sent to 4,670 households explaining the study design. The letter comprised three sections. First, it outlined the study's aim and the importance of participation, supported by a video featuring the researchers, accessible via QR code and link, to establish a personal connection and encourage registration. The video provided background on food waste, explained the study, and invited participation.

Second, the letter described the incentives for completing the study, including a digital kitchen scale, a CHF 20 shopping voucher, and a summary of the study results. Finally, the letter explained the online registration process via QR code or link, using personalised anonymous six-digit codes. Participants and non-participants could contact the researchers by email or phone, and reasons for refusal were documented when available.

2.2.2. Sampling procedure

Of the total randomly selected household sample (4,670), 137 were unreachable (see Fig. 2). Reasons included returned letters (n = 111), living abroad (n = 11), residing in care institutions (n = 2), illness (n = 6), relocation (n = 2), no internet access (n = 3), or death (n = 2). This left a sample of 4,533 reachable household members. Of these, 3,670 were non-responders, while 69 provided reasons for refusal via phone or e-mail. The reasons for refusal were lack of interest (n = 45), feeling too old (n = 8), lack of time (n = 8), and not generating food waste at home (n = 8). From the total sample of 4,670 household members, 794 registered to participate (17%). Among these, 634 persons (80%) quantified food waste on behalf of their entire household, but only 546 persons (69%) quantified food waste for the full seven-day period. Of these, 515 participants (94%) also completed the final survey on personal characteristics.

Only households that completed both the initial and final surveys and recorded food waste for all seven days were included. Observations with any missing data were excluded from the analysis. The final sample consisted of 515 participants (response rate: 11%), representing a total of 1,422 household members. Further, the response rates were comparable across linguistic regions: 11.6% in the German-speaking region, 9.7% in the French-speaking region, and 12.2% in the Italian-speaking region.

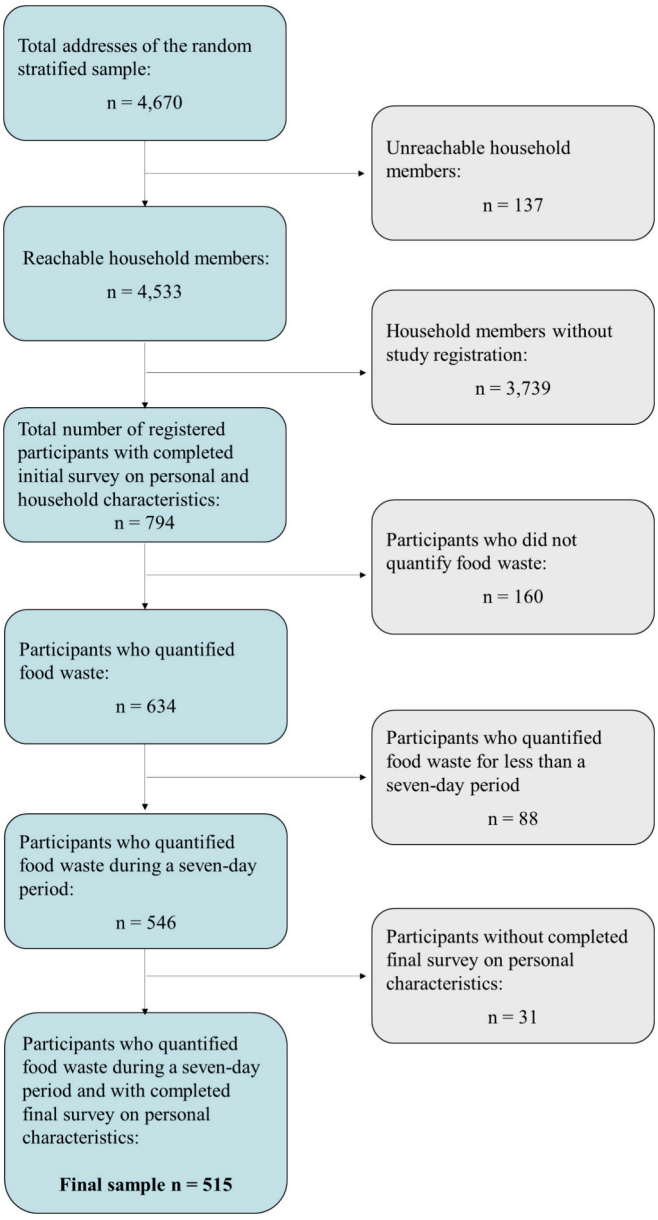

Fig. 2. Overview of the sampling procedure. A total of 4,670 household members were contacted. The final sample consisted of 515 participants who quantified food waste during a seven-day period and completed initial and final surveys on household characteristics.

2.3. Food waste quantification

Registered participants were informed that the study was approved by the ETH Zurich Ethics Commission (EK-2024-N-249-A) and provided written informed consent online. They received an instruction letter, a digital kitchen scale (PRIMOTECO KW 8350), and QR code stickers linking to the web-based food waste diary and serving as reminders. The two-page instruction sheets explained study preparation, food waste classification and quantification, and use of the web application, following a procedure similar to Merian et al. (2024).

We asked participants to measure and record their avoidable household food waste. Therefore, we provided an illustrated definition of avoidable food waste based on the FUSION framework, defined as all food fit for human consumption that is discarded or composted (Stenmark et al., 2016). Participants were therefore instructed to weigh and record all avoidable food and beverage waste intended for human consumption. To help participants better distinguish between avoidable food waste (i.e., included for the food waste measurement) and unavoidable food waste (not included for the food waste measurement), photo-based lists of avoidable food waste items (e.g., edible carrot or potato peel waste) and unavoidable food waste items (e.g., chicken bones, non-edible peels of fruits and vegetables such as for example avocado peel, banana peel, non-edible peel waste such as for example tomato stalk or pepper stalk and non-edible seeds, pits, and cores from fruits and vegetables or egg shells) were provided. Furthermore, food waste management practices after waste generation, such as using food waste for animal feed or composting, were not included in this study. Reminder emails were sent to all registered participants (n = 794) three days before the start of data collection, three weeks after the start, and ten days before the study closed on December 15, 2024.

We asked participants to select the corresponding food category (in total, 14 categories; see Appendix 3) and specific food products (in total, 61 food products; see Appendix 3) in the web application, followed by entering the measured amount in grams. If no suitable food category or product was found on the list, the participants could provide an entry under 'Other'. The food products and categories were adapted from previous research (Ammann et al., 2021; Merian et al., 2024; Visschers et al., 2016). Participants quantified all discarded food and beverages within their households for all members; food waste generated outside the home was excluded. Avoidable household food waste was measured over a self-selected seven-day period between November and mid-December 2024, consistent with previous studies (Visschers et al., 2016; Werkman et al., 2025). Quantification was conducted using a web application–based food waste diary, a commonly used and previously validated method (Merian et al., 2024). Participants weighed discarded food in grams each day using the provided digital kitchen scale and recorded the amounts in the web application. All questions and photos of the 14 food categories from the web application are available on Zenodo (Liechti et al., 2025).

We asked participants to make at least one entry per day, even if no food waste occurred (option: 'no food waste'). We further enhanced the web application by making it trilingual (German, French, and Italian) and improving its user-friendliness with illustrations of the 14 food categories. Responsible household members could make food waste entries throughout the day whenever food waste occurred. The participants could return the scale after the study if they no longer needed it.

2.4. Surveys on personal and household characteristics

We used Tivian software (Tivian Experience Management Platform, 2024) to design and administer the two online surveys. The participants registered with their anonymous and personalised six-digit number, which we provided in the invitation letter. The sociodemographic characteristics of the participants and households were initially collected in Phase 1 via the initial survey (see Fig. 1). After completing the seven-day food waste quantification period, the participants received a link to the final online survey by e-mail in mid-December 2024. In the final survey, we initially asked the participants questions on perceived health risks and plate-clearing tendencies about psychological predictors before asking about their eating habits. The participants had two weeks to complete the final survey. We merged the food waste data with the data on personal and household characteristics using anonymous and personalised six-digit identification numbers.

Sociodemographic data were collected from the survey participants and their household members. This included participants' age in years (including four pre-defined age groups), gender, educational level, employment status, and household size. In addition, we asked the participants whether they had a garden. Further sociodemographic characteristics, such as linguistic region, marital status, mean age of adult household members, number of children under 18 years old living in the household, and the proportion of adult women, were derived from the database of the Federal Statistical Office.

Perceived health risks of food were assessed using four items from Visschers et al. (2016). These items evaluated whether the participants considered certain food products potentially dangerous or harmful. The participants rated their level of agreement with each statement on a 7-point Likert scale response format, with higher values corresponding to stronger agreement. According to Cronbach's α value, the scale had good internal reliability (see Table 1), with values comparable to those reported in previous studies (Ammann et al., 2021; Visschers et al., 2016). The mean scores were calculated and used in further analyses. To measure plate-clearing tendencies, we used five items from Robinson et al. (2015). The participants rated their level of agreement with each statement on a 5-point Likert scale response format, with higher values corresponding to stronger agreement (see Table 1). According to Cronbach's α value, the scale had good internal reliability (see Table 1), with values comparable to those reported in previous studies (Robinson et al., 2015; Sheen et al., 2018). Scores were summed and used in further analysis. Lastly, the participants' eating habits were assessed based on how often they prepared dinner at home and their dietary patterns.

2.5. Data processing and statistical analysis

To calculate the amount of overall and category-specific food waste, we summed the total amount of food waste per household over the seven days of recording. To determine the amount of food waste per capita, we divided the overall amount of food waste per household by the number of household members. For Spearman's rank correlation, we used IBM SPSS Statistics (Version 28). Spearman's rank correlation coefficients were calculated between the psychological constructs, sociodemographic characteristics, eating habits, and the overall amount of food waste. This was done to evaluate the bivariate relations for the overall amount of food waste per capita and to check for multicollinearity.

For the regression analysis, we used Stata/SE (Version 17.0). As the data were positively skewed and zero inflated (records of no food waste), we added 1 to all food waste reports and log-transformed the amount of overall food waste and the amount of category-specific food waste for 14 food categories. This approach has been applied in previous studies (Ammann et al., 2021; Visschers et al., 2016). Although the log-transformation improved the normal distribution, a zero-inflated distribution persisted, particularly for the food categories. Thus, we employed a Tobit regression model rather than a linear regression to examine the relationship between the predictors and the amount of food waste.

Table 1
Scales and items used as predictors for the amount of food waste produced. All items were translated into German, French, and Italian.

Scales	Items	Source
Perceived health risk (Cronbach's α = 0.68)	1. I believe that the risk of becoming ill as a result of eating food past its use-by date is high. 2. I am not worried that eating leftovers results in health damage. (R) 3. I think that consuming leftovers is harmless. (R) 4. I think that one can perfectly safely eat food products whose use-by dates expired a few days ago. (R)	Visschers et al., 2016
Plate-clearing tendencies (Cronbach's α = 0.83)	1. I always tend to clear my plate when eating. 2. I normally finish eating when my plate is empty. 3. Before I start eating, I normally plan to finish the serving I am about to eat. 4. I rarely leave food on my plate. 5. It is normal for me to have very little food left or an empty plate at the end of a meal.	Robinson et al., 2015

Note: (R) = reverse coded items.

Tobit models, which are a hybrid of probit and multiple regression analysis, are appropriate when the dependent variable is censored (in our case, left-censored at 0) and predict the probability of the censored versus the non-censored value and the extent to which the non-censored values as the dependent variable explained the predictors entered into the multiple regression (Tobin, 1958). We used Tobit analysis with the log-transformed amount of overall and category-specific (only for four food categories with the highest food waste amounts) food waste as dependent variables, as previously demonstrated (Ananda et al., 2022; Visschers et al., 2016; Werkman et al., 2025). For the total food waste amount and for each food category, we ran a separate Tobit regression. In addition to testing for multicollinearity using correlations, we examined multicollinearity within the regression model.

3. Results

3.1. Descriptives

3.1.1. Sociodemographic characteristics and eating habits

Table 2 provides an overview of the participants' sociodemographic characteristics of our sample (n = 515). There were slightly more women (57.1%) than men (42.9%). The majority of the participants

Table 2
Sample characteristics of participants in the national food waste diary study in Switzerland (n = 515).

Sample characteristics of participants	Number of participants	%
Age groups in years		
18–34	98	19.0
35–49	155	30.1
50–64	168	32.6
65 and older	94	18.3
Age (year, mean ± SD)	49.2 (± 15.1)	
Gender		
Women	294	57.1
Men	221	42.9
Marital status*		
Single	142	27.6
Married/Registered partnership	325	63.1
Widowed/Divorced	48	9.3
Employment		
Yes, 80% or more	255	49.5
Yes, part-time, less than 80%	116	22.5
I am searching for job	9	1.8
I am currently not employed (housewife, househusband, students, retired)	135	26.2
Education		
No qualification, in education	4	0.8
Compulsory school	12	2.3
Vocational apprenticeship/vocational college/ commercial school	156	30.3
(Vocational) baccalaureate	42	8.2
Higher technical or vocational education	75	14.6
University of applied sciences or university of education	86	16.7
University/Federal Institute of Technology	140	27.1
Weekly frequency of cooking dinner at home		
Never	11	2.1
1×	7	1.4
2×	18	3.5
3×	24	4.7
4×	46	8.9
5×	72	14.0
6×	82	15.9
Every day	255	49.5
Dietary pattern		
Omnivore (I eat all animal products)	287	55.7
Flexitarian (I try to eat little meat)	186	36.1
No meat (vegetarian, pescatarian and vegan)	36	7.0
Other	6	1.2

Notes: *According to the Federal Statistical Office.

were aged 50–64 years (32.6%) or 35–49 years (30.1%) and were from the German-speaking region (52.4%). The overall mean age of the participants was 49.2 years (± 15.1), with minimum and maximum ages of 18 and 86 years, respectively. Most of the participants were married or in a registered partnership (62.9%) and completed either a vocational apprenticeship/vocational college/commercial school (30.3%) or a university degree (27.2%). Further, the majority had an employment of at least 80% or more (49.5%) and were omnivores (54%). As mentioned in Table 2, 'Other' dietary patterns included responses such as 'healthy' or 'balanced' diets or vague, non-specific descriptions of eating habits. Additionally, most of the participants answered that they prepared dinner every day (49.5%) and did not own a garden (64.7%).

Table 3 provides an overview of the household sociodemographic characteristics of our sample (n = 515). Most of the households were two-person households without children below the age of 18 years (62.7%). The mean age of adult household members was 47.7 years (±13.4), with minimum and maximum mean ages of 22.5 and 85 years, respectively. Furthermore, most of the households showed an equal proportion of adult women and men living in the households (61.9%).

3.1.2. Food waste quantification

On average, the participants reported wasting 401.9 grams (g) (SD = 394.3) of food per capita per week. Nineteen households (3.7%) reported no food waste over the one-week period. The four food categories contributing the most to the overall amount of food waste were vegetables and fruits (mean [M] = 215.7 g, standard deviation [SD] = 267.3), starchy side dishes (M = 34 g, SD = 85.4), leftovers from dishes (M = 32.2 g, SD = 96.9), and bread and bakery products (M = 31.6 g, SD = 64.3) **(**Fig. 3**)**. In addition to solid food, beverages also made a notable contribution to the overall amount of food waste (M = 22.3 g, SD = 86.7). The food categories with the lowest reported waste were chocolate/confectionary/sweet spread (M = 3.2 g, SD = 50.6), nuts/seeds/kernels (M = 2.2 g, SD = 13.3), fish and seafood (M = 1.9 g, SD = 17.2), and savoury snacks (M = 0.5 g, SD = 5.1) **(**Fig. 3**).**

Table 3
Sample characteristics of households in the national food waste diary study in Switzerland (n = 515).

Sample characteristics of households	Number of participants	%
Linguistic region*		
German	270	52.4
French	160	31.1
Italian	85	16.5
Owning a garden		
No	333	64.7
Yes	182	35.3
Number of household members in households		
1	71	13.8
2	196	38.1
3	92	17.89
4	110	21.4
5	35	6.8
6	9	1.7
7	2	0.4
Average age of adult household members (year, mean ± SD)*	47.70 (±13.4)	
Number of children below 18 years*		
None	323	62.7
1	80	15.5
2	86	16.7
3	20	3.9
4	6	1.2
Proportion of adult women in household*		
Less women (0–49%)	89	17.3
Equal (50%)	319	61.9
More women (51–100%)	107	20.8

Notes: *According to the Federal Statistical Office.

3.1.3. Relationships between household food waste, individual, and household characteristics

The participants' perceived health risk was low (M = 2.59, SD = 1.26, on a 7-point Likert scale) while showing a tendency to clear their plates (M = 4.55, SD = 0.64, on a 5-point Likert scale). The results of the bivariate Spearman rank correlations **(see** Appendix 4**)** showed significant positive associations between the amount of food waste per capita, the participants' age ($r = 0.11$, $p < 0.05$), and employment status ($r = 0.12$, $p < 0.01$). Specifically, older participants and those with lower levels of employment were associated with higher amounts of food waste per capita. Conversely, significant negative correlations were found between the amount of food waste per capita, household size ($r = -0.15$, $p < 0.01$), and participants' plate-clearing tendencies ($r = -0.12$, $p < 0.01$). In particular, households with more household members and participants who more frequently cleared their plates were associated with lower amounts of food waste per capita.

3.2. Predictors of food waste

Next, the data were analysed using a Tobit regression model to investigate the impact of different predictors on the amount of food waste produced. Five separate Tobit regression models were estimated: one model for the amount of overall food waste per capita (see Table 4) and four models for the amount of category-specific food waste using categories with the highest amount per capita—that is, vegetables and fruits, starchy side dishes, leftovers from dishes, and bread and bakery products (see Fig. 3 and Table 5).

3.2.1. Overall food waste

The Tobit analysis of the overall amount of food waste showed a significant model (see Table 4**,** model statistics). Of the 19 included predictors, seven were statistically significant ($p < 0.05$), most of which were sociodemographic. Specifically, being a woman ($p < 0.05$), older age ($p < 0.001$), and smaller household size ($p < 0.01$) were all associated with higher food waste per capita. In addition to the participants' ages, we considered the average age of adult household members. Households with younger adults were associated, however, with significantly higher food waste per capita ($p < 0.001$). Linguistic region and marital status were also significant predictors. The participants from Italian-speaking regions generated significantly less food waste per capita ($p < 0.01$) compared to those in German-speaking regions. Moreover, the participants who were divorced or widowed produced significantly less food waste per capita ($p < 0.05$) than those who were married or in a registered partnership. Beyond sociodemographic factors, stronger plate-clearing tendencies—indicating less food left uneaten on the plate—were associated with lower food waste per capita ($p < 0.05$).

3.2.2. Category-specific food waste

All four Tobit models on the amount of waste by food categories with the highest food waste amounts (vegetables and fruits, starchy side dishes, leftovers from dishes, and bread and bakery) showed significant models. The results, along with the model statistics for all four regressions, are summarised in Table 5. The findings varied notably across the four food categories. Overall, plate-clearing tendencies were an important predictor of food waste per capita for nearly all categories, including starchy side dishes ($p < 0.01$), leftovers from dishes ($p < 0.05$), and bread and bakery ($p < 0.01$). In each of these categories, stronger plate-clearing tendencies were associated with reduced food waste per capita. Additionally, the mean age of adult household members and household size significantly influenced the amount of food waste per capita in several categories. Households with younger adults were associated with increased waste of vegetables and fruits ($p < 0.05$) and leftovers from dishes ($p < 0.05$), while larger household sizes were linked to more waste of starchy side dishes ($p < 0.05$) and bread and bakery products ($p < 0.05$).

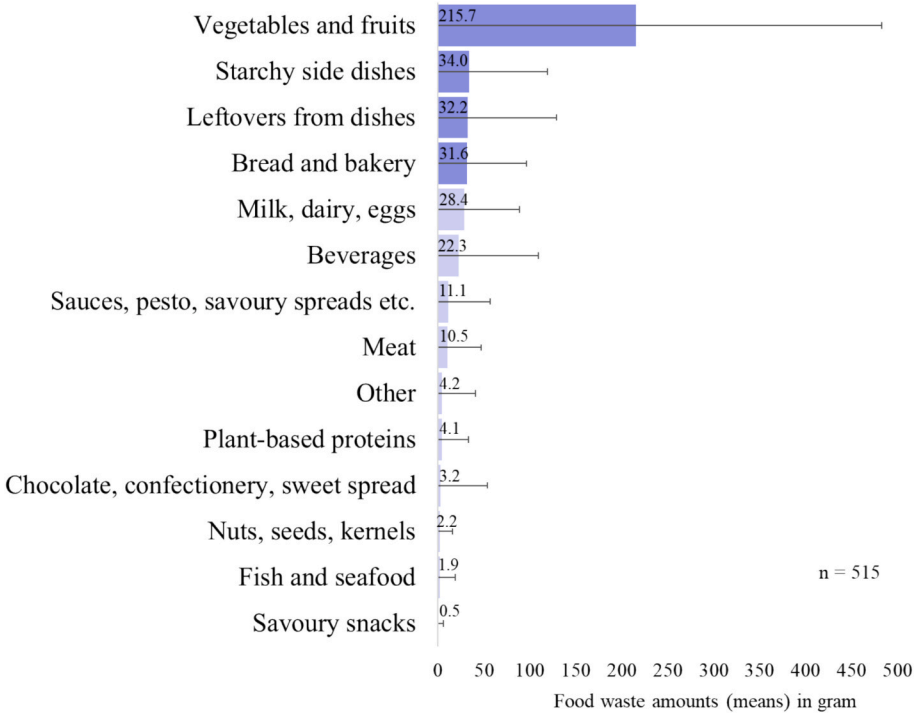

Fig. 3. Self-reported food waste amounts, expressed as mean per capita (in grams), across all 14 food categories over a seven-day period. The coloured bars represent the mean values, which are also indicated numerically within the boxes. The total sample size is n = 515. Error bars indicate standard deviations. "Other" includes mixed waste, flour, scraps, yeast, baby food, sugar, and unspecified items.

For vegetables and fruits, the participants' age and linguistic region were significant predictors of food waste per capita. Older participants were associated with higher waste for vegetables and fruits ($p < 0.05$), while participants from the Italian-speaking region generated less vegetable and fruit waste compared to those in the German-speaking region ($p < 0.01$). Additionally, the participants' eating habits influenced waste of starchy side dishes; those who do not eat meat produced more waste compared to omnivores (eating all animal products) ($p < 0.01$). Finally, having more children under 18 years old ($p < 0.01$) and preparing dinner at home more frequently ($p < 0.05$) were linked to increased waste of leftovers from dishes.

Across all five models, we found no significant associations between the overall amount of food waste per capita—or the amount by food category—and predictors, such as education, employment status, proportion of adult women in the household, garden ownership, or perceived health risks.

4. Discussion

We quantified the amount of food waste in Swiss households using a nationwide sample of Switzerland. We also identified potential predictors (sociodemographic characteristics, psychological factors, and eating habits) of the amount of food waste. Our sample of 515 participants broadly reflected the Swiss population aged 18 and older (7,094,571) in terms of gender, age, linguistic region, marital status, and household size (see Appendix 5). Similar to the general population, our sample included slightly more women, mainly from the German-speaking region, followed by the French- and Italian-speaking regions. Most participants were married or in registered partnerships and lived in two-person households.

The participants wasted, on average, 401.9 g of food per capita per week, slightly higher than the 348 g reported by Ammann et al. (2021) for Switzerland. Furthermore, a recently conducted food waste composition analysis (unaware participants) of Swiss households showed an average of 790 g of avoidable food waste per capita per week (Winzeler et al., 2023). This is almost double the amount of food waste (401.9 g) quantified in this study. This might highlight the effect of under-reporting when quantifying food waste with food waste diaries with aware participants.

When comparing avoidable food waste amounts using one-week diaries across European countries, we observed substantial differences. In an Italian study (n = 385) (Giordano et al., 2019), participants reported wasting 530 g per capita per week, whereas reported quantities were 805.2 g per capita per week in a French study (n = 19) (Pelt et al., 2020) and 1.8 kg per capita per week in a Greek study (n = 1,133) (Sigala et al., 2024). Overall, reported food waste amounts were higher compared to this study with 401.9 g per capita and per week. Furthermore, results from a German study (n = 6,853) (Herzberg et al., 2020) showed that 5% of participants reported no food waste during the two-week study period. In our study, the proportion of households reporting no food waste was slightly lower, at 3.7% during the one-week study period.

These differences in avoidable food waste amounts using the diary method were observed elsewhere (Eičaitė & Baležentis, 2024). Further, comparing food waste amounts across different studies is challenging, as different methods could be applied (e.g., duration of the quantification period, expression of food waste per household, per capita, per day or for the whole study duration, season of measurement, definition of food waste such as for example avoidable food waste and unavoidable food waste, method of measurement or the included food categories, for example with or without liquids). As the selection of the method impacts the results, a direct comparison of food waste quantities from different studies and countries is thus problematic (Merian et al., 2024; Withanage et al., 2021).

Further, our results showed that fruits and vegetables were the most wasted food categories. When comparing wasted food categories assessed using one-week diaries across European countries, considerable variability was observed. For example, vegetables and milk and cheese were the most frequently wasted food categories in Italy (Giordano et al., 2019), whereas fruits and vegetables, and bread and baked

Table 4
Results of the Tobit regression analysis on the overall amount of self-reported food waste per capita.

		B	*SE*	*t*
Sociodemographic	Participants			
	Age	0.03	0.01	3.90***
	Education	0.02	0.04	0.54
	Employment	0.04	0.06	0.64
	Gender	−0.28	0.14	−2.01*
	Marital status: Single	0.05	0.18	0.3
	Marital status: Divorced/ Widowed	−0.59	0.23	−2.53*
	Households:			
	Number of children below 18 years	0.19	0.10	1.82
	Linguistic region: French	0.08	0.15	0.57
	Linguistic region: Italian	−0.60	0.18	−3.27**
	Average age of adults in households	−0.04	0.01	−3.77***
	Proportion of adult women in households	0.03	0.11	0.26
	Household size	−0.23	0.08	−2.68**
	Owning a garden	0.02	0.14	0.16
Eating habits	Participants			
	Frequency of dinner preparation	−0.00	0.04	−0.01
	Dietary pattern: Little meat	−0.10	0.14	−0.73
	Dietary pattern: No meat	−0.10	0.25	−0.39
	Dietary pattern: Other	0.09	0.59	0.15
Psychological	Participants			
	Plate-clearing tendencies	−0.04	0.02	−2.07*
	Perceived health risks	0.06	0.05	1.12
	Constant	6.78	0.70	9.62***
	Model statistics			
	Log Likelihood	−904.16		
	LR chi^2 (19)	55.31		
	p-value	<0.001		
	Number of observations	515		
	Left-censored	19		
	Uncensored	496		

Notes: ***$p < 0.001$; **$p < 0.01$; *$p < 0.05$. Reference group marital status: Married/registered partnership. Reference group linguistic region: German. Reference group dietary pattern: omnivores (I eat all animal products). Gender, 0 = women, 1 = men, 'Other' dietary patterns included responses such as 'healthy' or 'balanced' diets, or vague, non-specific descriptions of eating habits.

goods were most frequently wasted in Germany (Herzberg et al., 2020). In Lithuania, the most wasted categories were home-prepared or catered food and milk and dairy products (Eičaitė & Baležentis, 2024), while in Finland vegetables and potatoes, as well as home-cooked food, were the most frequently wasted categories (Katajajuuri et al., 2014).

Overall, vegetables appear to be a consistently wasted food category across countries, whereas fruits were not among the most frequently wasted categories in all studies. This and further differences in the most frequently wasted food categories across countries may be explained by variations in dietary patterns, cultural food practices, climatic conditions, seasonal availability of foods, and food purchasing and storage behaviours. In addition, differences in food preparation habits, portion sizes, retail systems, and methods used to assess food waste may also contribute to the observed variability between studies.

4.1. Predictors of overall food waste

We identified several sociodemographic factors that predict the amount of food waste. For example, older participants tend to waste more food, which matches findings from Ammann et al. (2021). However, the results from a recent review showed that there is no consensus about the effect of age on the amount of food waste (Stoica et al., 2022). Our results on gender differences are in line with Visschers et al. (2016), who also found that women waste more. However, no other studies have reported gender differences in food waste (Cantaragiu, 2019; Przezbórska-Skobiej and Wiza, 2021). One possible explanation for food waste differences across genders might be distinct eating behaviours and preferences. Indeed, recent research indicates that women tend to consume more fruits, vegetables, and salads than men (Baur et al., 2022; Federal Office of Public Health, 2017). In our study, fruits and vegetablesaccounted for the highest amount of food waste. Moreover, data from the Federal Office of Public Health (2017) show that men spend less time on cooking and meal preparation than women. Although our study did not confirm that women produce more vegetable and fruit waste, the fact that women cook at home more frequently—which generates additional organic waste—may help explain why they tend to generate more food waste overall.

We also found that divorced or widowed people waste less food than married people or those in partnerships. Other studies, however, have found no effect of marital status on food waste (Grasso et al., 2019). We found that numerous household characteristics affect food waste. For example, the linguistic region was a key predictor: German-speaking households wasted more food than Italian-speaking households. In particular, German-speaking households wasted more fruits and vegetables than Italian-speaking households. Our results support those of other studies showing that linguistic region and location influence food habits and waste (Elimelech et al., 2024; Langellier et al., 2015; Ananda et al., 2021). Indeed, a recent Swiss study showed lower vegetable consumption in the German-speaking region compared to the Italian-speaking region (Chatelan et al., 2017). Thus, the reasons for linguistic and cultural differences might be partly explained by distinct eating patterns, which are also influenced by culture.

Previous studies have shown that larger households produce more food waste but less waste per capita (Ammann et al., 2021; Heng and House, 2022; Schanes et al., 2018). Our study confirmed this outcome, finding that food waste per capita decreases with a larger household size. While older participants tended to waste more food than younger ones, we found that households with younger adults wasted more per capita than those with older adults. This discrepancy between the participants' ages and the average age of adult household members may be because individual characteristics often serve only as a proxy for household traits. This underscores the need to consider both individual and household factors in food waste research. Several studies also report that food waste decreases with age, possibly due to better food management skills, past experiences with scarcity, and more conservative habits (Heng and House, 2022; Schanes et al., 2018; Stoica et al., 2022).

Our findings showed that participants with a stronger tendency to clear their plates generated significantly less overall food waste. Previous studies have also revealed that food waste concerns drive plate-clearing habits (Nill and Meule, 2022; Robinson and Hardman, 2016). These findings highlight a trade-off between waste reduction and overeating. The participants in our study scored high on the plate-clearing tendency (M = 4.5/5), often finishing food even when not hungry—known as metabolic food waste (Serafini and Toti, 2016). This behaviour can be associated with higher body weight, obesity (Krah et al., 2025; Robinson et al., 2015), and negative environmental impact (Franco et al., 2022). Interestingly, plate-clearing seems driven more by food waste concerns than by eating behaviour, as a recent study demonstrated (Nill and Meule, 2022).

Some potential predictors had no impact on food waste in our study. Although increased perceived health risks have been identified as a relevant food waste predictor (Ammann et al., 2021; Visschers et al., 2016), we did not find perceived health concerns to be a significant predictor. Similarly, previous research has shown that higher educational level (Visschers et al., 2016) and full-time employment (Grasso et al., 2019; Stoica et al., 2022) are associated with higher food waste amounts. However, our findings did not confirm these relationships. Lastly, owning a garden had no significant effect on food waste in our study, despite Gulyas and Edmondson (2024) reporting that garden owners tend to generate less food waste.

Table 5
Results of the Tobit regression analysis of self-reported food waste per capita across the four food categories with the highest overall food waste amounts.

		Vegetables and fruits			Starchy side dishes			Leftovers from dishes			Bread and bakery		
		B	*SE*	*t*	*B*	*SE*	*t*	*B*	*SE*	*t*	*B*	*SE*	*t*
Sociodemographics	Participants												
	Age	0.03	0.01	2.45*	0.04	0.03	1.30	0.04	0.04	0.92	0.15	0.03	0.60
	Education	0.08	0.06	1.50	0.02	0.13	0.19	−0.16	0.17	−0.93	0.01	0.11	0.08
	Employment	0.03	0.09	0.30	0.32	0.19	1.66	0.40	0.27	1.48	0.18	0.17	1.05
	Gender	−0.39	0.20	−1.92	−0.02	0.45	−0.04	−0.12	0.61	−0.19	−0.31	0.39	−0.8
	Marital status: Single	0.15	0.27	0.56	−0.22	0.61	−0.35	0.01	0.83	0.01	−0.77	0.53	−1.44
	Marital status: Divorced/Widowed	−0.38	0.34	−1.11	−0.01	0.80	−0.01	1.22	1.05	1.16	0.09	0.67	0.14
	Households:												
	Number of children below 18 years	0.10	0.15	0.66	0.49	0.33	1.46	1.41	0.45	3.12**	0.05	0.28	0.20
	Average age of adults in households	−0.03	0.01	−2.35*	−0.05	0.03	−1.67	−0.1	0.04	−2.24*	−0.03	0.03	−1.01
	Linguistic region: French	0.02	0.22	0.10	0.65	0.49	1.32	−0.16	0.65	−0.25	0.45	0.41	1.10
	Linguistic region: Italian	−0.92	0.27	−3.41**	0.55	0.60	0.91	−0.75	0.84	−0.90	−0.48	0.53	−0.92
	Proportion of adult women in households	0.11	0.16	0.67	−0.56	0.36	−1.53	0.84	0.50	1.68	−0.48	0.31	−1.56
	Household size	−0.19	0.12	−1.51	0.56	0.28	1.99*	0.10	0.37	0.27	0.51	0.24	2.17*
	Owning a garden	0.00	0.20	0.00	0.03	0.45	0.07	0.40	0.61	0.66	−0.35	0.39	−0.89
Eating habits	Participants												
	Frequency dinner preparation	0.01	0.06	0.17	0.10	0.13	0.78	0.38	0.19	2.05*	−0.05	0.11	−0.5
	Dietary pattern: Little meat	−0.12	0.20	−0.60	0.03	0.45	0.07	0.33	0.61	0.54	0.29	0.38	0.74
	Dietary pattern: No meat	−0.3	0.37	−0.79	2.05	0.79	2.58*	−0.79	1.18	−0.67	0.50	0.72	0.71
	Dietary pattern: Other	0.01	0.86	0.01	−1.78	2.10	−0.84	1.72	2.30	0.74	−3.80	2.20	−1.73
Psychological	Participants												
	Plate-clearing tendencies	0.01	0.03	0.46	−0.17	0.06	−2.68**	−0.20	0.09	−2.38*	−0.13	0.06	−2.38*
	Perceived health risks	0.06	0.08	0.75	0.10	0.18	0.57	0.30	0.23	1.30	0.26	0.15	1.77
	Constant	4.06	1.02	3.96***	0.60	2.34	0.26	−0.75	3.06	−0.25	2.40	2	1.2
	Model statistics												
	Log Likelihood	−1053.79			−772.09			−617.26			−838.99		
	LR chi^2 (19)	33.29			57.05			60.02			43.56		
	p-value	<0.05			<0.05			<0.001			<0.01		
	Number of observations	515			515			515			515		
	Left-censored	57			304			365			271		
	Uncensored	458			211			150			244		

Notes: ***$p < 0.001$; **$p < 0.01$; *$p < 0.05$. Reference group marital status: married/registered partnership. Reference group linguistic region: German. Reference group dietary pattern: omnivores (I eat all animal products). Gender, 0 = women, 1 = men, 'Other' dietary patterns included responses such as 'healthy' or 'balanced' diets or vague, non-specific descriptions of eating habits.

4.2. Predictors of category-specific food waste

We observed similar age-related patterns for the different food categories as for food waste overall: households with younger adults wasted more vegetables, fruits, and leftovers, consistent with previous studies (Ananda et al., 2022; Visschers et al., 2016). Household size also influenced the amount of food wasted in some food categories. While smaller households produced more overall waste per capita, larger households wasted more starchy side dishes, bread, and bakery products per capita. This aligns with findings showing that larger households generate more waste per capita across various food groups, including dairy, meat, and frozen foods (Ananda et al., 2022).

Our findings show that having children did not affect food waste overall compared to households without children, but households with more children under 18 wasted more leftovers compared to households with fewer children under 18. Similar studies have reported that households with children generate higher waste of fruits, vegetables, protein, starches, and meat (Ananda et al., 2022; Visschers et al., 2016). This suggests that both the presence and number of children influence food waste. The reasons for the increased waste amount might be due to families caring more about the quality of the food they feed their children and children's eating behaviours being less predictable and largely influenced by their preferences (Stoica et al., 2022).

Although cooking dinner more frequently did not affect food waste overall, our results show an association with increased leftover waste, consistent with other findings (Laila et al., 2022). Interestingly, omnivores wasted fewer starchy side dishes than did non-meat eaters. An assumption is that substituting meat with plant-based alternatives may lead to larger portion sizes of starchy side dishes. This may lead to increased food waste, particularly when leftovers are no longer used.

4.3. Implications for future food waste interventions

Our study identified differences in predictors for overall food waste as well as for category-specific food waste. These findings underline the importance of analysing not only the overall amount of food waste but also the patterns of waste across different food groups. Future interventions should also consider how often waste occurs. Moreover, food waste reduction strategies may be more effective if tailored to specific personal and household characteristics (Ananda et al., 2022). The results of our study showed that households with more children under the age of 18 tend to generate higher amounts of leftovers from dishes per capita. Therefore, targeting families with children with interventions aimed at reducing and managing leftovers could be effective for reducing household food waste. For example, portion sizes for children could be more precisely adapted based on children's hunger levels and preferences. Further interventions might include cooking classes, video tutorials, recipes that use leftovers, or reducing the preparation of meals that typically generate leftovers (Aschemann-Witzel et al., 2018; Karunasena et al., 2020; Liechti et al., 2024). The latter may be especially relevant for households that frequently cook dinner at home. Involving all household members, if possible, as well as children, might be particularly effective in reducing food waste.

Plate-clearing tendencies were high in our study (M = 4.55 on a 5-point Likert scale) and significantly predicted overall and category-specific food waste across most food groups. This suggests that people often finish food despite no longer being hungry. Consequently, food waste reduction interventions should address both food waste and overeating, or metabolic food waste (Serafini and Toti, 2016). Improving food management skills, encouraging behavioural change, and promoting appropriate portion sizes are therefore essential. Combined approaches, such as smaller plates or serving utensils paired with food waste information, appear particularly effective (Liechti et al., 2024). Simple reminders to consider actual hunger before serving food may further reduce plate and metabolic food waste. Finally, linguistic and dietary differences should be considered when designing interventions.

5. Outlook and limitations

Our study identified differences between individual and household characteristics regarding food waste amounts. To improve the generalisability of these findings, future research should be designed according to the level of focus—whether on individuals or households. Furthermore, when investigating household food waste, data should ideally be collected from all household members. There is a need for more national and representative studies to improve data quality and generate more consistent findings regarding the sociodemographic predictors of food waste. Additionally, future research should explore unexplored predictors, such as dietary patterns, cultural differences, such as linguistic regions, and plate-clearing tendencies, as identified in our study.

Our study has some limitations. First, since data collection took place between October and December, the results may not fully capture food waste associated with food items that are predominantly available in other seasons, as reported elsewhere (Adelodun et al., 2021). However, our study provides valuable data from a cross-sectional design rather than longitudinal tracking when comparing food waste quantities and food categories across seasons. Further,the response rate for our diary study was relatively low, at 11%. Based on previous research experience, we anticipated this and included various incentives—such as a video, a free kitchen scale, a summary of the results, shopping vouchers, and multiple reminders—to recruit as many participants as possible. Our results highlight the importance of offering rewards not only during recruitment but also throughout the study by providing regular motivation. Furthermore, our study quantified food waste using a self-reporting approach. Thus, the participants were aware of the quantification, which could lead to social desirability and underreporting biases. We anticipated this and pointed out to participants several times that it was important to behave normally during the quantification so that it would reflect household food waste as accurately as possible. To overcome this issue in future studies, food waste quantifications should explore less intrusive (unaware) food waste quantification methods. Based on our study results, we assume that some food waste predictors might be explained by different eating behaviours. Thus, future studies should assess both consumption and waste to allow for controlling for distinct eating behaviours.

6. Conclusions

In our national diary study, we identified several predictors of food waste—including sociodemographic characteristics, eating habits, and psychological factors—for both overall and category-specific food waste. Overall, this study provides valuable insights into developing targeted interventions to reduce food waste. We also found that the habit of clearing one's plate—which the literature identifies as linked to metabolic food waste—was the strongest key predictor for generating overall and category-specific food waste. Further key predictors for overall food waste included linguistic region, age, gender, and household size. Meanwhile, dietary patterns, frequency of dinner preparation, and the number of children under 18 in the household primarily influenced waste within specific food categories. Our results also highlight the importance of considering both individual and household characteristics, as individual data alone may serve only as a proxy for household behaviour. Additionally, analysing waste by food category—beyond just overall amounts—helps identify categories that contribute most to waste, based on quantity, frequency, and environmental impact. These findings can help improve the consistency and reliability of food waste data and support the development of more effective targeted food waste reduction strategies.

CRediT authorship contribution statement

Carole Liechti: Writing – review & editing, Writing – original draft, Visualization, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Gabriele Mack:** Writing – review & editing, Validation, Supervision, Methodology, Investigation, Conceptualization. **Kevin O'Sullivan:** Writing – review & editing, Methodology. **Sabrina Stöckli:** Writing – review & editing. **Claudio Beretta:** Writing – review & editing, Methodology. **Verena Tiefenbeck:** Writing – review & editing. **Jeanine Ammann:** Writing – review & editing, Validation, Supervision, Resources, Project administration, Methodology, Investigation, Funding acquisition, Data curation, Conceptualization.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.wasman.2026.115717.

Data availability

Data is available on Zenodo: 10.5281/zenodo.16918887

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