RESEARCH ARTICLE

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Plate waste in food service: Nudging intervention

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Abstract
Food waste is a threat to global sustainability. The study aim is to determine the effect of nudge interventions to reduce food waste at lunch. In this experimental study, which was planned in this cross-sectional type, survey data on food waste attitudes were collected from the participants. Volunteers who benefited from the cafeteria service were assigned to the survey (n=157), excluding those who did not use the cafeteria regularly, had a history of food allergy, and declared a diagnosis of chewing-swallowing disorder or celiac disease (n=3). The sociodemographic data and subjective waste amounts of the participants based on the survey, the waste was measured rationally in the pre-nudging and nudging period. The primary outcome is that nudge interventions applied to reduce food waste at lunch can contribute to the total amount of food waste and in which foods to reduce waste. Despite the nudging intervention, the total amount of waste increased, only vegetarian food and bread waste decreased. These changes are not statistically significant. According to the subjective evaluation data, vegetarian food and bread group foods are wasted more. Subjective and rational evaluation results are inconsistent. Short-term nudging intervention is not effective and different strategies are needed to reduce the amount of food waste.
Keywords: Food waste, Plate waste, Nudging, Food Service

INTRODUCTION

Food waste; It covers all losses caused by agricultural production of food components, losses in processing, transportation, and storage processes of edible foods, and inability to consume foods offered for consumption in some way (purchase more than necessary, improper storage conditions, expired products, etc.) (Heller & Keoleian, 2015). Food losses and waste, along with hunger and malnutrition, rank first among global nutrition problems. Food losses and waste damage the economies of countries as well as all other components in the food chain. In addition, food waste directly threatens environmental, social, and economic sustainability. For this reason, food waste has recently become one of the important issues that come to the fore all over the world (Godfray et al. 2010). The Food and Agriculture Organization (FAO) reported that approximately 30% of the food produced for human consumption in the world is lost or thrown away every year (Parfitt et al. 2010). Approximately 1.3 billion tons, in other words, 190 kg of food per person is thrown away every year (Wu et al. 2019). Under the United Nations Sustainable Development Goal 12.3, it calls for a 50% reduction in global food waste per capita at retail and consumer levels by 2030 (Hanson et al. 2015). Reducing food waste is one of the key points identified in the future nutrition strategy of 9 billion people. (Richardson et al. 2021; Ravandi et al. 2019)

It remains unclear how much food is wasted in mass nutrition systems and what factors are affected by wasting behavior (Wu et al. 2019). Studies in the field of waste emphasize the need for more studies that reflect both subjective and objective data on this issue (Hanson et al. 2015; Richardson et al. 2021; Ravandi et al. 2019; Thongplew et al. 2021; Lorenz et al. 2017; Aires et al. 2021; Leverenz et al. 2021; Ellison et al. 2019). Studies on mass feeding focus on school canteens and often describe the wasteful behavior of adolescents and young adults (Wu et al. 2019; Richardson et al. 2021; Lorenz et al. 2017; Ellison et al. 2019; Whitehair et al. 2013). There is a need for constructive and consistent methods to reduce waste (Whitehair et al. 2013).

Nudging is one of the strategies to reduce food waste. 'Nudging' are adjustments in the electoral environment that can change behavior without eliminating individuals' choices or without economic incentives (Thaler et al. 2009). Lin et al. evaluated the concept of nudges in two categories (Lin et al. 2017). Although Type 1 nudges aim to change the behavior of the consumer at the point of decision-making, it is not intended for the decision-maker to realize it (For example, placing healthy drinks on the upper shelves and unhealthy drinks on the lower shelves on refrigerators). Type 2 nudges, on the other hand, aim to encourage long-term reassessment of how the individual made a certain decision (For example, to encourage walking or to train to abstain from alcohol) (Lin et al. 2017). In many studies, it is seen that nudges interventions are applied to reduce food waste (Ellison et al. 2019; Whitehair et al. 2013; Pinto et al. 2018; Ahmed et al. 2018). In addition, although educational campaigns are popular due to their ease of implementation and low cost, the effectiveness of these interventions remains unclear. However, a systematic review stated that most studies do not evaluate the level of food waste (Metcalfe et al. 2020).

In this research, the primary outcome aims to determine the effect of nudging interventions applied to reduce food waste at lunch on the level of waste. In this context, we conducted a field experiment in the cafeteria of a university that receives catering services. Our study aims to reduce food waste by increasing awareness of food waste among university staff through informative and educational posters, brochures, and flyers placed in the cafeteria where food is served. Secondly, by using individual surveys before nudging, it is aimed to subjectively and rationally determine consumer food wastes for food waste and to define the factors affecting the amount of waste.

DATA AND METHODS

Study type and sample

This research was carried out as an experimental field study, which was planned in this cross-sectional type, in a state university staff cafeteria located in the Marmara Region of Turkey and receiving catering services. This study consists of 3 stages. All processes involved in this study are shown in Suppl 1. In the first stage, there is a survey application regarding the sociodemographic characteristics and subjective waste disposal status of the participants. In the second stage, the pre-nudge period, plate wastes were collected without any intervention, in the third stage, nudging was made and the collection of waste continued. The wastes collected in the second and third stages are defined as the rational waste amount. The study was conducted in accordance with the ethical principles of the Declaration of Helsinki and approval was obtained from the Bandirma Onyedi Eylül University Health Sciences Non-Interventional Research Ethics Committee (Date: 07.02.2022 and Approval number 2022-10).

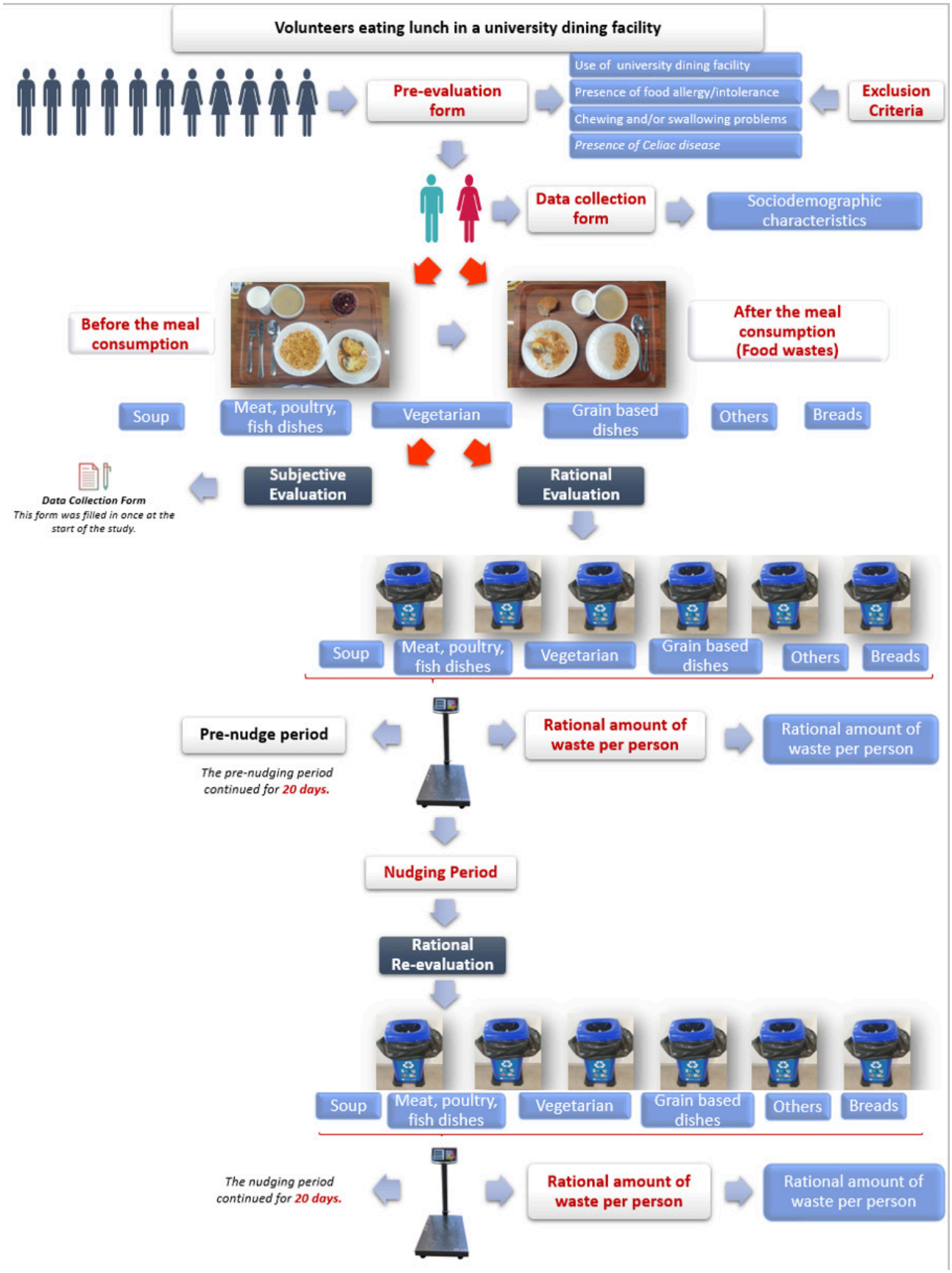
A questionnaire was applied to the participants to determine the subjective waste amounts, and some cases were excluded. Volunteering was essential to participate in the research (n=157). Those who did not use the cafeteria regularly had a history of food allergy and declared that they had a chewing-swallowing disorder or celiac diagnosis by the physician were excluded from the survey part of the study (n=3). In the evaluation of rational waste, it is aimed to reach all individuals who consume their lunch. No evaluation was made for days with Public Holidays. Since it was not known which plate belonged to which participant during the waste collection period, no exclusion was made.

Intervention procedures

Design

Firstly, a data collection form was distributed to the participants in 20-25-minute face-to-face interviews. This form consisted of 25 questions and collected information about preliminary evaluation, general characteristics, subjective evaluation, and factors affecting the amount of waste. The data form was filled in for once on the first step of the study. In the data collection form, questions were asked about the pre-evaluation questions regarding the inclusion criteria, general characteristics, subjective evaluation of waste disposal, and influencing factors. The data collection form was prepared by making use of similar studies in the literature (Lorenz et al. 2017; Aires et al. 2021).

Secondly, the process steps are listed for the rational evaluation, the wastes from the lunch were meticulously collected during the study period, in accordance with the Covid-19 precautions, with each type of food in a separate container. The wastes were collected from the dinner plates of the individuals participating in the study by the researcher. The waste collection time is a process that takes about 2 minutes at the end of the food consumption of individuals. The amount and types of waste were recorded on a daily form by the reserachers. While preparing the form, similar studies in the literature

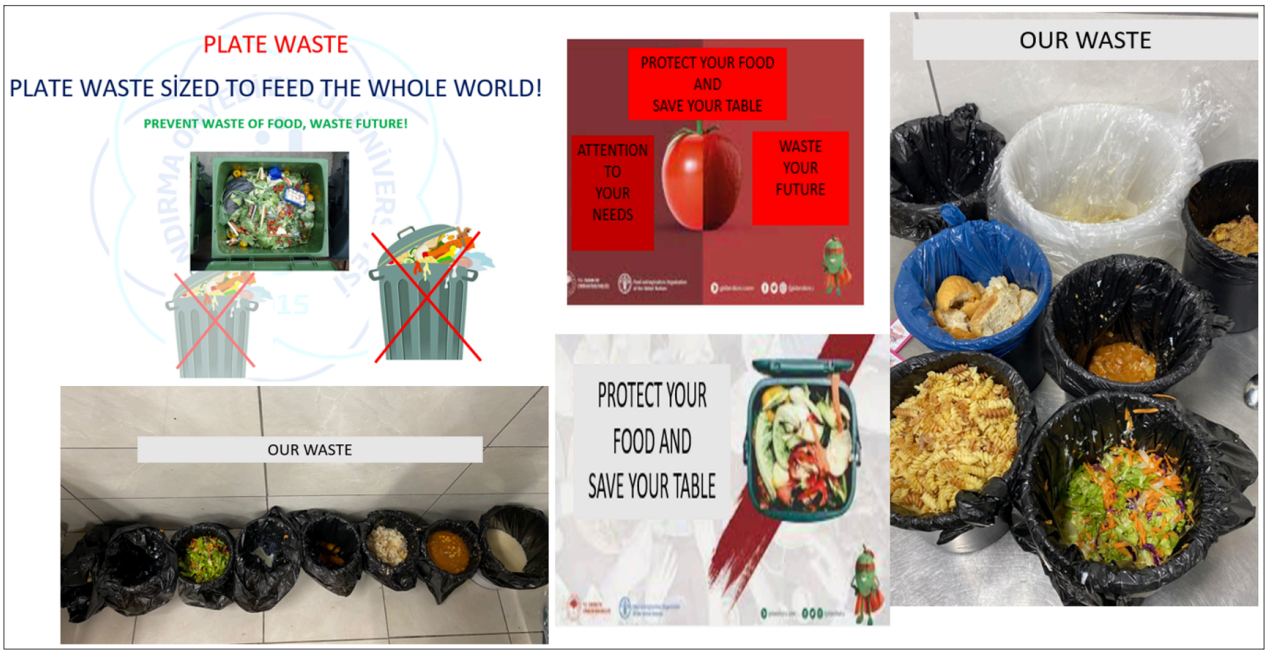

Volunteers eating lunch in a university dining facility
Pre-evaluation form
Use of university dining facility
Presence of food allergy/intolerance
Chewing and/or swallowing problems
Presence of Celiac disease
Exclusion Criteria
Data collection form
Sociodemographic characteristics
Before the meal consumption
After the meal consumption (Food wastes)
Soup
Meat, poultry, fish dishes
Vegetarian
Grain based dishes
Others
Breads
Subjective Evaluation
Rational Evaluation
Data Collection Form
This form was filled in once at the start of the study.
Soup
Meat, poultry, fish dishes
Vegetarian
Grain based dishes
Others
Breads
Pre-nudge period
The pre-nudging period continued for 20 days.
Rational amount of waste per person
Rational amount of waste per person
Nudging Period
Rational Re-evaluation
Soup
Meat, poultry, fish dishes
Vegetarian
Grain based dishes
Others
Breads
The nudging period continued for 20 days.
Rational amount of waste per person
Rational amount of waste per person

Suppl 1

were used (Lorenz et al. 2017; Elhatusaru 2018).

The waste collection period was planned to be five days a week for 8 consecutive weeks from the beginning of the study. The first 20 days period is the pre-nudge period, the second 20 days is the nudging period. For lunch, participants receive a choice of soup, cereal-based meal, vegetarian or meat-poultry-fish, and two other food types. Other foods are in the form of pairs such as yogurt and salad or salad and compote or pickles and ayran or dessert and fruit. In our research, these pairs are specified as other 1 and other 2. The bowl containing the leftovers of soup, main course (meat-poultry-fish), vegetarian meal, grain-based meals (rice/pasta/pastry), bread, and other foods (such as yoghurt, ayran, desserts, salad) was weighed with a calibrated scale in a tared manner. The calibration of the scales used was checked before the research. The container containing the wastes was weighed with a calibrated electronic scale with a precision of 0.1 g. Only complex dishes, such as dishes that cannot be mixed and the amount of waste that cannot be determined separately, are not included in the counting and total waste amounts. While determining the rational waste amounts, the samples in which the type and amount of waste could not be distinguished were not included in the total number of meals.

The Daily Record Form of Waste Amount and Types, which includes the rational evaluation of waste, was filled in by the researchers. The number of meals



Supp 2

has also been revised in cases where it is likely to be encountered (such as accidentally spilling the food). The average amount of waste per person was calculated by proportioning the collected waste and the number of people who consumed lunch that day. Afterward, nudging interventions were made to all participants on reducing waste and preventing waste, with stimuli such as posters, brochures, flyers, e-mails, and messages. The aim was to nudge in individuals with the size of waste by revealing the factors leading to food waste and capturing the attention of the participants with rhetorical questions and cultural statements and idioms about food waste. After the nudging, individuals will not be evaluated subjectively (no data collection form will be applied), and rational evaluation has been made by collecting waste only.

Nudging

In recent years, research on waste reduction by nudging intervention has become popular. Consumer behavior is the main subject of nudging research, which is preferred as an alternative, low-cost, and simple technique to reduce the amount of food waste at home or outside the home (Von Kamake & Fischer, 2018; Vidal et al. 2022; Qi et al. 2022). Some sample stimuli (brochure, mini handout, poster, email content, message content, etc.) prepared regarding the awareness intervention are presented in Suppl-2. While preparing the sample stimuli, the visuals on the publicly accessible www.SofranaSahipCik.com website prepared by the Ministry of Agriculture and Forestry for the prevention and reduction of food losses and waste were taken as a basis. Awareness-raising intervention and rational evaluation of waste continued for 20 days.

Variables

Independent variables: Individual characteristics such as age, gender, marital status, income level, household type, body mass index, type of food, and days of the week were determined.

The definitions of some variables are given as follows.

Type of food: The meals served at lunch will be evaluated as soups, main courses by evaluating the general menus of the establishment, vegetarian food, rice-pastas, and other (dessert with milk/sorbet, salad, fruit, yoghurt, ayran). Such a grouping is also present in similar study models related to the field (Lorenz et al. 2017; Aires et al. 2021).

Subjective waste rate: By using the subjective waste evaluation questionnaire, it will be questioned how much waste individuals leave at lunch from the food groups given as examples in the photographs. According to the plate size, it is scaled as whole, half, one-quarter, and three-quarter. While creating the related questions and scale, the methodology of a similar study in the literature was used (McCray et al. 2018).

Rational amount of waste per person: Each type of food will be collected in a container and the total amount will be weighed. The value obtained by proportioning the result of weighing to the number of plates used in that dish is the rational amount per person.

Rational amount of waste per person (g) = Total amount of waste (g) (according to the type of food) / Number of plates used

For example, if the total amount of waste for soup is 9 kg, the number of plates used is 110 bowls; 9.000g/110 bowl=81.8g soup is the rational waste amount per person.

Percentage of the rational waste amount per capita (%): It is found by dividing the rational per capita waste amount by the meal portion size.

Percentage rational waste amount per capita = (Rational waste amount per capita/Meal portion size) x100

Data analysis

Statistical evaluation of the data was made with the IBM SPSS (Statistical Package for Social Sciences-Chicago, IL, USA) 23.0 statistical package program. The normal distribution of data for numerical variables was evaluated with the Shapiro-Wilk test. Paired Samples t-test or Wilcoxon test according to the distribution of the data in case of repetition of two variables to compare the results obtained in the nudging period. In all statistical analyzes, the level of significance was taken as $p<0.05$.

RESULTS

Data on the general characteristics of the research population are presented in Table 1. The mean age and body mass index of the research group were found to be 35.27±8.88 and 24.63±4.53, respectively. It is seen that the research group varies in terms of social variables such as education, income, occupation, and household type. Individuals with different characteristics were included in the study in terms of the presence of disease and the status of applying a special diet. The statements of the participants regarding the subjective waste assessments are shown in Table 2. When the subjective evaluations of each food group/plate were questioned separately, it was found that about 80% of the participants did not leave any waste for the soup group. The number of people who leave all of them as waste for soups is quite low. When evaluated for meat-poultry-fish dishes, the rate of those who leave more than half of their plate as waste is around 15%. There is a similar trend for Vegetarian and Grain-based meals. The rate of leaving more than half of the portion size of other foods served on plates and glasses as waste was determined as 12%. The bread group was determined as the food left as waste the most. One out of every three participants left some of their bread as waste, and the rate of those who left all of their bread as waste was found to be relatively high compared to other food groups.

Table 1. Sociodemographic characteristics of the participants

Variables	Range	n	Valid percentage (%)
Gender	Male	102	65.0
	Female	55	35.0
Marital status	Married	82	52.2
	Single	74	47.1
	Not specified	1	0.6
Age	18-29	44	28.0
	30--40	60	38.2
	41 and above	44	28.0
	Not specified	9	5.7
Using the cafeteria	Everyday	56	35.7
	1-2 times a week	34	21.7
	3-4 times a week	57	36.3
	Every fifteen days	5	3.2
	1 time per month	5	3.2
Education	Primary education	5	3.2
	High school	10	6.4
	Associate-bachelor	58	36.9
	Graduate	83	52.9
	Not specified	1	0.6
Income status	Not declared	13	8.3
	Minimum wage and below	10	6.4
	Above the minimum wage and twice	45	28.7
	More than twice the minimum wage	89	56.7
Employment	Not declared	48	30.6
	Administrative	78	49.7
	Academician	17	10.8
	Employee	10	6.4
Household Type	Alone	58	36.9
	Living with family-friend	99	63.1
A special diet situation	Yes	10	6.4
	No	147	93.6
Presence of disease	No	126	80.3
	Yes	31	19.7
Constantly variable	**Mean±SD**	**Min-Max**	
Age (n=148)	35,27±8,88	18-62	
BKI (n=155)	24,63±4,53	15.47-42.93	

The proportional values of the answers given by the participants regarding the reasons for leaving waste are summarized in Figure 1. For all reasons, participants had the opportunity to give more than one answer. There are different reasons for taste. Tasteless, hot, smell, and salty were among the most common causes. In terms of structure, sticky and tough have been the most stated reasons. In terms of cooking methods, cooking with the boiling method and raw food are stated as the reason for leaving waste. Large portion sizes, incompatible menus, not being hungry enough, and not being hot enough are among the frequently mentioned reasons. Apart from these, being on a diet and concerns about hygiene were also stated as reasons for leaving waste.

Total waste amounts according to food groups related to pre-nudge and nudging periods are presented in Table 3. The changes in the amount of waste in both periods were not statistically significant ($p>0.05$). Considering the average values, it was seen that the average decreased only in bread and vegetarian meals, but this change was not statistically significant. It is seen that the average of the total waste amount value is higher than the pre-nudge in the nudging period, but this change is not statistically different.

The rates of subjective waste assessments according to sociodemographic characteristics are shown in Figure 2. Considering the gender variable, it was determined

Table 2. Waste rates based on the visual statement

Meals	Waste rates based on visual statement n (%)				
Soups 	 **No Waste**[a]	 **¼ waste**	 ½ waste	 ¾ waste	 **All waste**
	125 (79.6%)	15(9.6%)	10 (6.4%)	7(4.5%)	1(0.6%)
Meat-poultry-fish dishes 	 **No Waste**	 **¼ waste**	 ½ waste	 ¾ waste	**All waste**
	91(57.9%)	43(27.4%)	12(7.6%)	8(5.1%)	3(1.9%)
Vegeterian[b] 	 **No Waste**	 **¼ waste**	 ½ waste	 ¾ waste	**All waste**
	99(63%)	34(21.7%)	9(5.7%)	6(3.8%)	9(5.7%)
Grain based dishes 	 **No Waste**	 **¼ waste**	 ½ waste	 ¾ waste	**All waste**
	102(64.9%)	31(19.7%)	18(11.5%)	5(3.2%)	1(0.6%)
Others 	  **No Waste**	  **¼ waste**	  ½ waste	  ¾ waste	 **All waste**
	117(73.3%)	24(15.3%)	7(4.5%)	6(3.8%)	5(3.2%)
Breads 	**No Waste**	 **¼ waste**	 ½ waste	 ¾ waste	 **All waste**
	102(65%)	14(8.9%)	10(6.4%)	5(3.2%)	26(16.6%)

[a] In all food groups, 1-3 people responded as "I never choose that food in order not to generate waste". These participants were evaluated as No Waste.

[b] In the catering service, vegetarian meals are offered not only to individuals who are vegetarian, but also to all individuals as an alternative to meat meal. All individuals have the opportunity to receive every meal under equal conditions.

Table 3. Rational amount of waste per person (g) before and during intervention

Variables	Mean ± SE		p-value
	Pre-nudge	Nudging	
Soup	13.61±5.95	13.85±5.48	0.897
Meat	25.82±11.91	37.79±18.78	0.021
Veg	39.62±29.42	36.40±21.47	0.695
Grain	14.24±4.45	15.83±6.20	0.359
Other 1	8.07±4.41	9.00±7.91	0.647
Other 2	9.79±7.47	12.20±7.48	0.316
Bread	4.73±1.58	4.59±2.45	0.833
Total	115.88±8.69	129.66±8.19	0.256

that female participants left more waste than male participants in all food groups. Subjective waste rates according to being married or single are close to each other (±1-7%). According to age groups, the participants who did not want to indicate their age left to waste in the soup, meat products, and bread groups compared to other individuals. When the age groups are evaluated according to each other, it can be said that there is no standard tendency for all food groups. Considering their income, it is seen that the participants who do not want to indicate their income leave waste above the average in the soup, meat, vegetable, cereal, other 2, and bread groups. In addition, low-income individuals also reported that they left more waste than the average in the soup, meat-poultry-fish, vegetable, and grain-based foods group. Considering the body mass index, it was determined that underweight individuals left waste above the average in all food groups except the other 2.

Charts containing the evaluation of rational waste amounts based on day-to-day and food groups before and during the intervention are presented in Figure 3. Considering the soup waste, it is observed that the changes vary on a day-to-day basis during the intervention, and there is no linear change. In terms of control and intervention days, it was seen that the highest amount of waste was on the 10th, 16th, and 19th days of the intervention. When looking at meat-poultry-fish dishes, a similar linear trend was not observed, and there were changes on a day-to-day basis. When the control days and the intervention days are compared, it is seen that there is no linear trend on the days with the lowest waste, and the lowest wastes are on the control days. It was observed that the control and intervention days in vegetarian wastes progressed in parallel with each other, but the highest amount of waste was observed on the 17th day of the intervention. The lowest waste values in the other 1 and other 2 meal groups were similar on control days. In the bread group, there was a linear decrease in the first 3 days of the intervention, but the waste values increased and decreased in the following days. Although the days with less waste for the bread group were in the intervention period, these decreases are not linear.

DISCUSSION

In this study, which was conducted to determine subjectively and rationally the food waste generated at lunch in a food service establishment and to examine the effects of nudging interventions on food waste, it was determined that significant levels of food waste were formed and nudging intervention did not have a positive effect on food waste.

Nutrient loss and waste create nutritional, economic, social, and environmental impacts in both developed and developing countries (Aires et al. 2021). Reducing nutrient loss and waste; It is thought that it will make positive contributions to reducing production costs, increasing the efficiency of mass nutrition systems, improving food safety, and improving environmental sustainability (FAO, 2019). Prevention of food waste the Sustainable Development Goals is a matter of international concern to reduce it by half at the global level by 2030 (Sustainable Development Goals). In a study in which strategies to reduce food waste were developed, it was shown that by changing the shape and size of the plate and reducing the portion size, the waste was reduced statistically significantly. However, it was also emphasized that such a strategy is costlier than an educational intervention (Richardson et al. 2021). In this study, it is aimed to reduce the amount of waste by making a nudging intervention with posters, brochures, and informative notes at the least cost.

Plate waste in food services occurs due to different stages of food production. The first of these is the residues arising from the storage and preparation stages. The second is food that is not prepared and served, resulting from inadequate planning of the quantity to be produced. Another is considered as food (plate leftovers) that is served but not consumed (Aires et al. 2021). One of the largest sources of food waste in Europe is the food service industry, which includes the hospitality and healthcare sectors (Beratta et al. 2013, Service 2013). The accommodation sector includes staff and non-profit and non-profit catering establishments such as school canteens and cafeterias (Pirani & Arafat 2016). In this study, which was carried out in the university cafeteria, it was determined that food

waste before and after the nudging intervention had a high daily average of 115.88±8.69 g and 129.66±8.19 g, respectively. Factors such as menu planning, preferences of consumers, inadequate personnel training, excessive portion amount, and use of poor-quality products are effective in the formation of food waste (Ferreira et al. 2013, Tekiner ve ark. 2021). In this study, many topics that can contribute to the literature on the subjective reasons for leaving waste came to the fore. According to our data, taste, structure, and cooking methods were found to be the main topics that often affect waste. The participants had different comments about the taste, bitter taste and salty were the most common answers. Odor is also one of the most important reasons for leaving waste. Being sticky and tough often affects the amount of waste. The fact that the food remains raw and that the method of boiling is used while cooking is also among the reasons stated by the participants. Large portion sizes, incompatible menus, not being hungry enough, and not being hot enough are among the frequently mentioned reasons. Apart from these, being on a diet and concerns about hygiene were also stated as reasons for leaving waste.

In this study, which aimed to determine subjectively and rationally the food waste formed at lunch in the food service and to determine the effect of nudging interventions applied to reduce food waste on the level of waste, according to subjective evaluations, the least amount of waste was left in the soup group, the most in the bread group, and the waste level of the intervention

Figure 1. The causes of waste

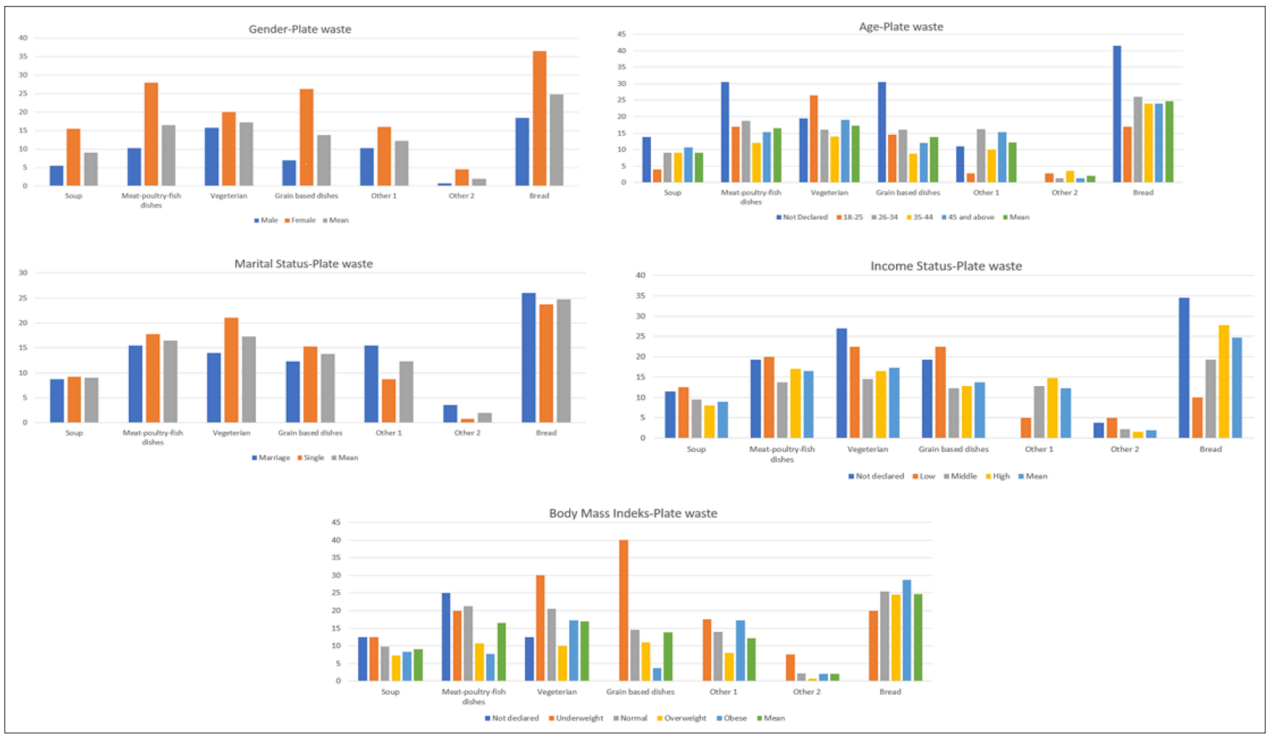


Figure 2. Variation of subjective waste rates (%) according to sociodemographic characteristics

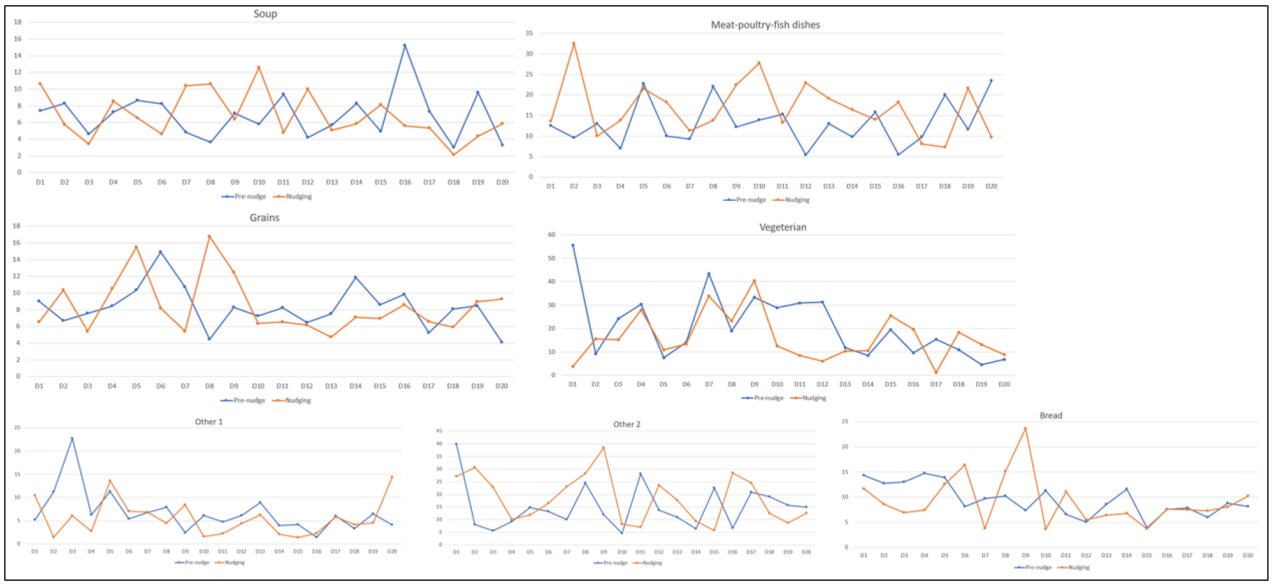


Figure 3. Day-to-day change of percentage (%) rational waste amount per capita according to meal types pre-nudge and nudging

was at the expected level. It was determined that there was no linear change. When evaluated with sociodemographic data, it was observed that subjective waste amounts may cause proportional changes according to being female, income status, and being weak. Gender is known to influence food choices and waste. It has been suggested that women waste more than men on average, which may be related to their tendency to organize food more than men. Similarly, women's subjective waste disposal rates were found to be higher than the average in this study (Richardson et al. 2021, Beardsworth et al. 2002, Painter et al. 2016). According to the subjective evaluations, although the food group the group leaves most frequently, it is seen that the least amount and ratio of bread waste is left in the rational evaluation. Regardless of the study, it was observed that the participants took their bread waste with them when leaving the cafeteria or took them with them to feed the animals. While planning the methodology of the research be done, the situation of the participants taking some foods with them should also be taken into consideration.

In a review on food waste, it was reported that information campaigns can be effective in reducing waste by up to 28%. It has been reported that applications such as changing plate sizes, cooking lessons, refrigerator cameras, advertising, and information sharing are costly and studies are still needed to make evidence-based decisions (Reynolds et al. 2019). Recent studies have focused on the concept of nudging to improve food waste behaviors (Whitehair et al. 2013, Pinto et al. 2018, Vidal et al. 2022). Whitehair et al. (2013) reported that simple to-the-point prompt-type messages in a university cafeteria resulted in a 15% reduction in food waste, while the addition of more personalized feedback-based messages did not result in a further reduction in the amount of food waste. According to Pinto et al. (Pinto et al. 2018) in a university canteen, it was found that after the education campaign, plate waste per capita decreased from 76.50 g to 64.67 g, and the waste consumption index decreased by about 15%. In another study (Vidal et al. 2022), it was reported that the total daily food residue decreased by 19.29 g after nudging strategies were applied in school canteens. On the other hand, nudging strategies are not always effective in reducing food waste. Shaw et al. (Shaw et al. 2018) found that there was no significant change in the amount of avoidable food waste in both low-income and high-income households after they forwarded brochures on the environmental impacts and economic impacts of avoidable food waste. A systematic review study revealed that nudge interventions caused undesirable increases in food waste in secondary school students. Also, most of the studies reviewed did not measure the amount of food waste (Metcalfe et al. 2020). In our study, measuring the amount of food waste after nudge intervention is an important finding. Interestingly, after nudging, a significant increase was detected in the residue of meat dishes, while no significant change occurred in other food wastes. When the literature is examined, it is unclear which intervention is effective on food waste behavior. Accordingly, it is not known whether restricting consumer choice or having choices is more effective in reducing food waste. Although it is concluded in this study that nudging is not effective in reducing food waste, more studies are needed to shed light on the subject.

While making rational waste evaluations in our research, Richardson et al. (Richardson et al. 2021) similar to his study, we removed the inedible parts of the food (such as bones, bones, shells, and fruit seeds) in waste measurements such as. We also presented the percentage values of the edible waste of the leaf-only edible foods, and the gross and net calculation of the portion values were presented in the same way. This is the strength of our study. In our study, due to the non-standard number of groups and the low number of answers given to the options in subjective evaluations, a statistical comparison test was not performed between subjective wastes and demographic variables, and the rates were compared. In the prospective studies to be planned on the subject, inferences can be made about the extent to which demographic variables can affect the subjective waste amounts by having a higher sample size, ensuring the homogeneity of the groups, and randomization. In this study, the effects of a low-cost, short-term nudge intervention were revealed. In other studies, to be planned on the subject, the effects of nudging interventions can be investigated in populations with a larger and stratified sample duration longer than 4 weeks.

CONCLUSION

In this study, some data were presented regarding the amount of waste that adults left subjectively at lunch, the reasons for leaving waste, and the amount of rational waste they left before and during the nudging intervention. It also presents the evidence in the context of its sample during the nudging period and that the four-week intervention alone will not be sufficient in the strategy of reducing food waste. Future studies should focus on adding different strategies in addition to nudging.

COMPLIANCE WITH ETHICAL STANDARDS

Conflict of interest

The authors declared that for this research article, they have no actual, potential or perceived conflict of interest.

Author contribution

The contribution of the authors to the present study is equal. All the authors read and approved the final manuscript.

All the authors verify that the Text, Figures, and Tables are original and that they have not been published before.

Ethical approval

Ethics committee approval was obtained from the Bandirma Onyedi Eylül University Health Sciences Non Interventional Research Ethics Committee (Date: 07.02.2022 and Approval number 2022-10)

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Data availability

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