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Household food waste in Belgrade - sin and unconcern

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Abstract. The aim of this study was to examine the actual procedures with food in households and consumer attitudes about food waste. The survey was conducted in 83 households in Belgrade, Serbia. All participants were interviewed using a standardized questionnaire. The results obtained show that awareness of food waste is at a satisfactory level, but the actual situation is that food is discarded in large quantities, even though people are aware of what a global problem this is. Large contradictions were observed among the respondents' answers in this study. Respondents who stated that they never discard food, in further responses, declared they throw away significant amounts of food for various reasons (too long storage, overconsumption, improper preparation, etc.). We conclude that people are either unaware of how much food they discard, or they do not want to admit it to themselves. However, participants largely have a sense of guilt about discarding food. This indicates consumer awareness of food waste, and is an encouraging sign that further education could be effective in consumers taking into account their food waste habits, starting from procurement planning, through storage and preparation.

1. Introduction

Food is precious and many resources are needed for its production. According to current estimates, globally, about one-third of food produced for human consumption is unnecessarily thrown away or lost, which brings with it an economic cost and cost associated with the environment [1,2]. Unnecessary food waste is a global problem that has grown in recent years and is now being raised in public and political programs. Its importance will continue to grow, especially taking into account the need to feed the ever-increasing population of the world [3,4].

Due to the increasing number of published papers on the topic of food waste in households [5], consumer awareness should be increased as well as their role in this global problem. Are consumers



truly aware of the problems caused by the large amounts of household food thrown away, and are they willing to do something in order to reduce this amount? Surveys are not adequate tools for measuring the amount of wasted food [6]. Due to growing interest in the world, and in Serbia, food waste has become a very popular topic in the media, but also in organizations that want to draw attention to the seriousness of this situation. Is the level of discarded food similar in all parts of the world, whether in emerging countries or not, and are consumers becoming more aware of food waste? The aim of this study was to examine respondents' attitudes about food waste, habits and procedures with surplus food in households and to consider how to increase consumer awareness of the actual quantities of food wasted.

2. Materials and Methods

2.1. Investigation and Data Collection

The study was conducted during a six-month period, from November to April 2018/2019, and included 83 households in Belgrade, Serbia. All respondents were over 18 years old. Households were chosen randomly, with the consent of the main person responsible for the purchase and preparation of food. Participants were briefly informed about the aim of this survey, and the answers and collected data were anonymous.

Experienced researchers prepared the questionnaire and survey structure. In total, the sample size for this survey was 100 households. Since 17 persons did not complete the questionnaire, the final sample consists of 83 households that answered the questions asked. The results obtained are based on self-reporting, and they providing a picture about respondents' habits in shopping, storage behaviours, their attitudes about food waste and actual procedures with surplus food.

2.2. Statistical analysis

Statistical analysis of the results was elaborated using IBM software, SPSS Statistics 24. Statistical analysis was performed using the Chi squared test to determine the significance of differences between means. Correlations between parameters were used to determined significance of their relationships. A level of 0.05 was considered significant.

To compare food waste in households, the sum of ranks were calculated. First, the data in compared groups were initially arranged and listed in order of increasing value, where the number 1 represents the food that is most often thrown away. Then, sums of ranks for some foods were compared [7].

3. Results and Discussion

3.1. Household demographics

Of 83 respondents, 25.30% were men, and 74.70% women, which is understandable, since women are mostly responsible for household chores in Belgrade. The age groups of respondents (26-35, 36-45, 46-55, 56-65 years) were evenly distributed (20.48%, 22.89%, 20.48%, 21.69%, respectively), with the exception of the youngest (18-25 years, 10.84%) and the oldest (>65 years, 3.61%). The majority of respondents were divided into two levels of education: faculty level (33.73%) and secondary school (36.14%). The majority of respondents (74.70%) were employed full-time. The numbers of household members varied, although most households contained between 2 and 4 members (31.33%, 21.69%, and 20.48%, respectively). The structure of the surveyed households is presented in Figure 1.

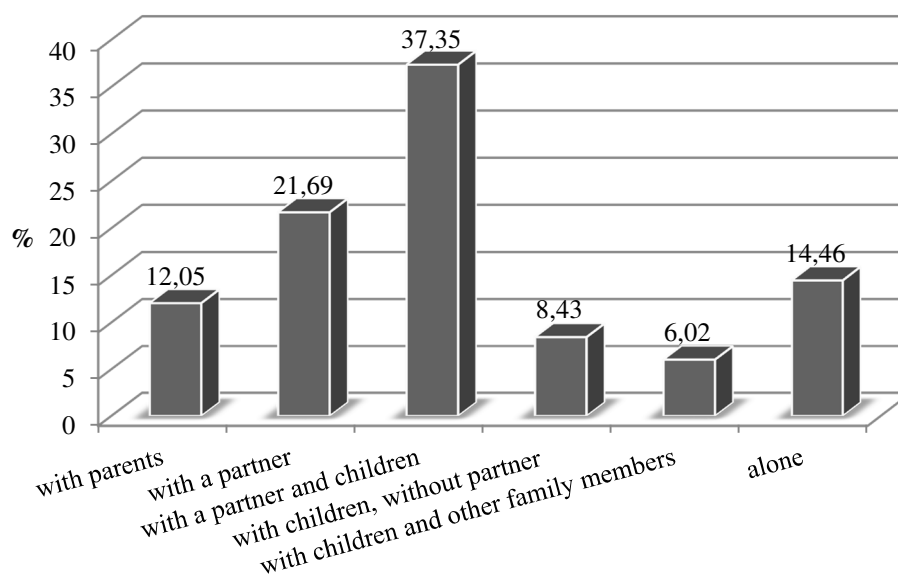


Figure 1. Household structure in the examined households

3.2. Food supply habits

Altogether, 75.90% of the participants claimed they buy food in super/hypermarket, which was significantly more ($P > 0.05$) than those who buy food at a minimarket or local store (16.87%) or at a green market (7.23%). Few participants shopped once or twice a month. Food supply habits are shown in Table 1.

Table 1. Food supply habits in households

Question	Answer (%)	
How often do you go to a retail outlet to purchase food (three or more products)?	Every day	27.71
	Every other day	22.89
	Three times a week	20.48
	Once a week	26.51
	Twice a month	0.00
	Once a month	2.41
	Up to 10,000 RSD	13.25
How much money per month do you spend on food?	10,000-20,000 RSD	21.69
	20,000-30,000 RSD	24.10
	30,000-40,000 RSD	30.12
	More than 40,000 RSD	10.84
	Do you prepare a list of those food items you intend to purchase?	Yes
	No	49.40
Are you attracted to special offers (promotions, discounts) of foods that you did not plan to buy?	Yes	73.49
	No	26.51
Do you pay attention to the expiration date on the label?	Yes	80.72
	No	19.28
Do you buy food that has passed its expiration date (at a discount)?	Yes	36.14
	No	63.86

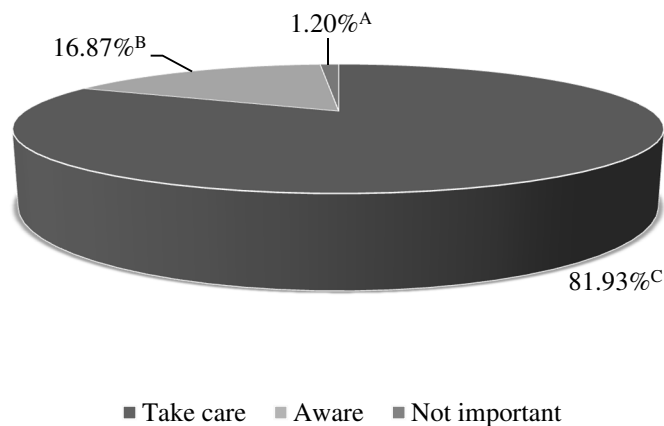
In Table 2, procedures with surplus food in households are given. Reported procedures with surplus foods indicate consumers care about the amount of food wasted, but survey questions did not previously prove to be a valid method for determining people's general food waste habits [8,4,6,9]. Many researchers suggest that the amount of wasted food can best be calculated by combining different methods [4,10,11].

Table 2. Procedures with surplus food in households

Question	Answer (%)	
Which foods do you discard more often (in greater quantities on a weekly basis)	Cooked food (prepared in household)	63.86
	Uncooked food	36.14
	Discard into a container	14.46
	Leave in a prominent place (next to a container, etc.)	22.89
What do you usually do with surplus food?	Give to a pet (dog, cat)	31.33
	Feed animals (wild birds, animals kept for breeding, etc.)	6.02
	Rarely have food surpluses	25.30
	Never	19.28
How often do you waste food?	Once a week	56.63
	Twice a week	15.66
	More than twice a week	8.43
When preparing larger amounts of food than usual for your household, do you discard large amounts of food?	Yes	32.53
	No	67.47
	Expiry date has passed	18.07
What is the most common reason for discarded food in your household?	Altered smell and taste typical of the food	55.42
	The appearance of the mould	16.87
	Poorly prepared food	3.61
	Incorrectly stored food	6.02
	Expiry date on the food is unclear	14.46
	Food was stored too long	30.12
What is the most common reason for the expiry date causing you to discard food?	Food was purchased/cooked in excessive amounts	34.94
	Food packaging size is too large	20.48

There were large discrepancies between reported and actual practice procedures. Participant awareness of the food waste problem is one thing, but their actions are quite another (Figures 2 and 3). As we can see, significantly ($P < 0.05$) fewer respondents believe that food waste is unimportant (1.20%) than those who are aware of the problems caused by food waste, but will not change their attitude

towards food surpluses in household (16.87%) and respondents who claim to care about food surpluses and avoid food waste (81.93%). However, the same groups of respondents reported they discard significant amounts of food, regardless of their reports about their attitude towards food waste (Figure 3). Porpino et al. [12] also noted that consumers believe food waste is an improper behaviour and generally claim to not waste a lot of food [13]. Most researchers agree that consumers' concerns are the main prerequisite for food waste reduction in households [14-17].



Legend: Different letter ^{A,B,C}-P<0.05.

Figure 2. Consumer awareness of food waste in households

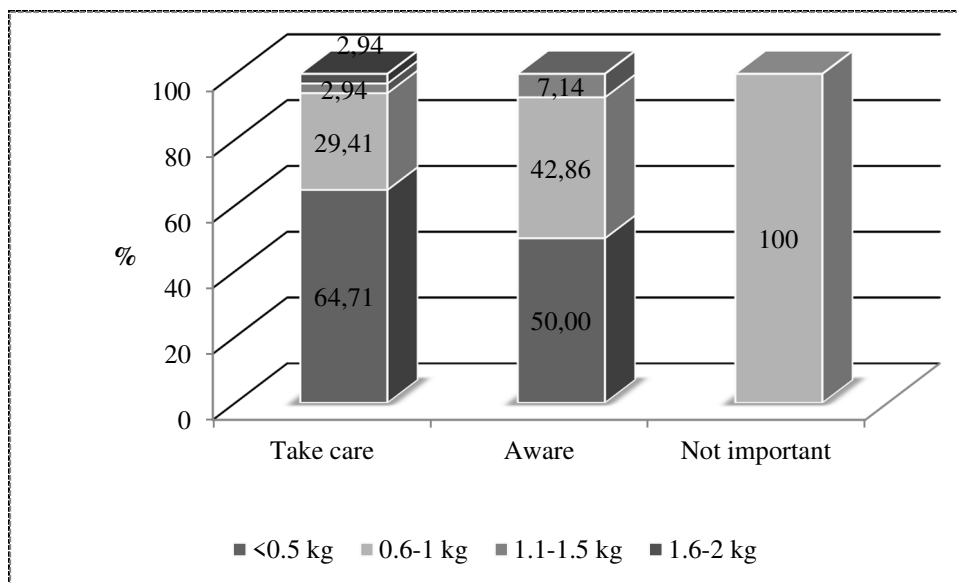


Figure 3. Reported quantity of food wasted weekly in accordance with participants' attitudes towards food waste

The relationship between the number of household members and the type of food wasted is shown in Figure 4. There was no significant correlation between these two parameters (P=0.216), but the data reveal peak quantities of cooked and uncooked food waste in households with two members. We can only speculate on the reason for this, and perhaps this household size is linked to family structure (age and sex), which could affect food waste. In households with more members (5 and more), we speculate the variety of food preferences also increases, and therefore, less food is wasted because leftovers are

more likely to be consumed (someone always likes something). Other researchers explained the discarding of larger quantities of cooked food [18,19] as due to overly large quantities being prepared or served.

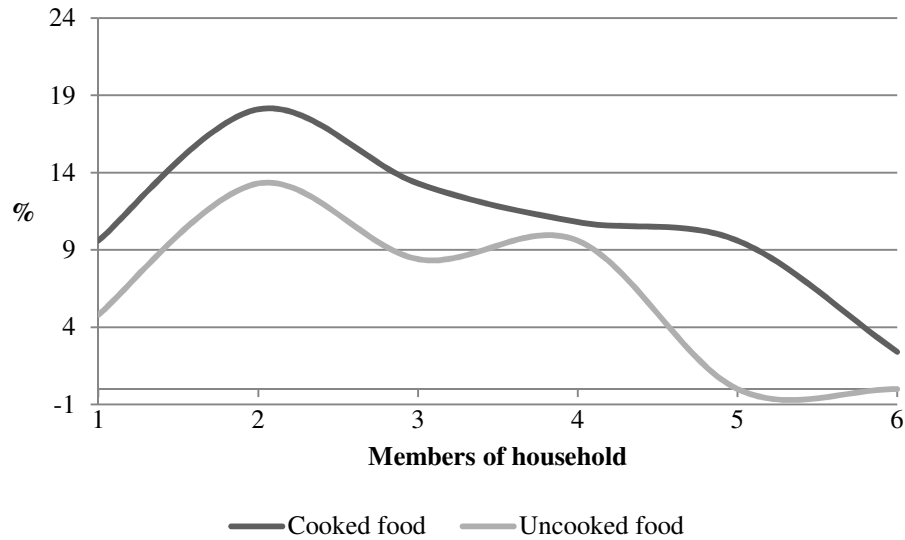


Figure 4. The relationship between the number of household members and quantity of food wasted

There were no significant relationships between the examined parameters, which could indicate participant dishonesty in responding, or respondents really being unaware of how much food they wasted. Further processing of the data obtained showed there were differences between the individual tested parameters, but the relationships between them were not determined because of the non-conformity of the response (for example, those who declared they did not discard food at all replied later in the survey that they discarded more than 0.5 kg of food per week). We can conclude that participants were unaware of the amount of food they waste, and that most of the respondents regard food waste as a sin (Figure 5). The reasons participants would consider reducing their food waste in households are given in Figure 5. This result is contradicted by one study [20], but that study produced quite different results from other studies [21-23]. However, there are similarities in other surveys to ours (Figure 5), where endangering the environment ranked behind other food waste problems [20,21,24]. The results obtained show the need for education about the negative environmental impact of wasted food.

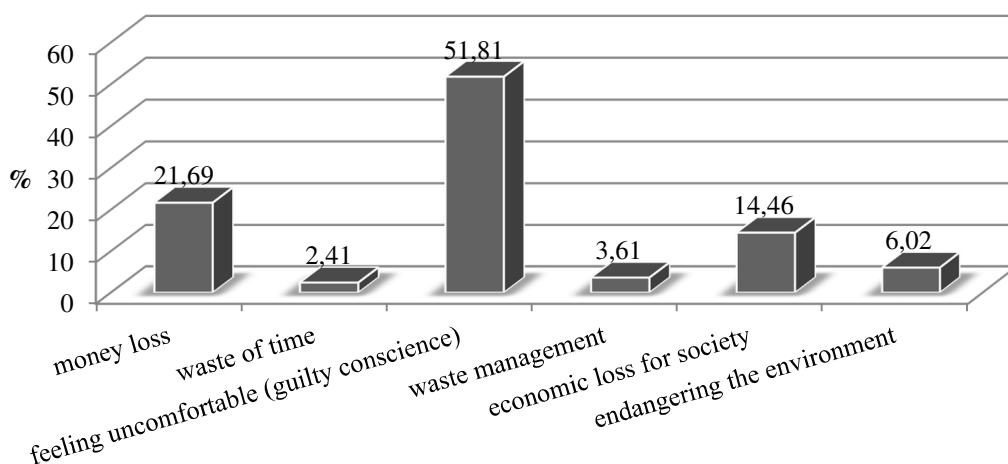
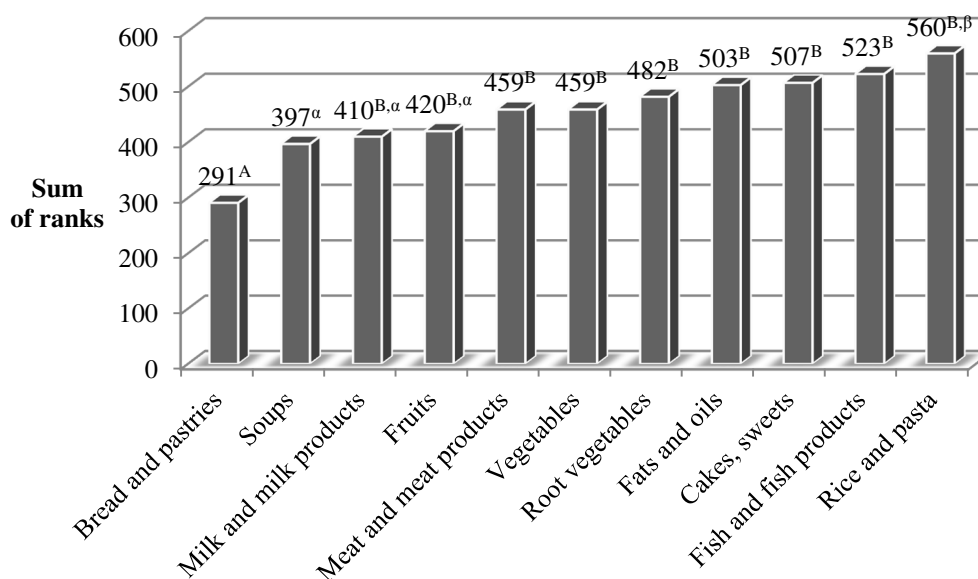


Figure 5. The reasons participants would consider reducing food waste in households

The respondents reported how much and which foods they threw away. As we can see in Figure 6, significantly more ($P < 0.05$) bread is thrown away than other foods (except soups), and significantly more ($P < 0.05$) soups, milk and milk products, and fruits are wasted than rice and pasta. Results of another study [19] do not coincide with our research, as respondents in that study declared they mostly discarded vegetables, dairy products, and then bread, milk, and meat. Aschemann-Witzel et al. [25] listed the frequency of categories of wasted food, and their results are also quite different to ours. Some (10.4%) respondents in [25] reported they did not discard food at all, whereas in our study, 8.43% of participants stated they did not discard food.



Legend: Different letter A, B or α, β – $P < 0.05$.

Figure 6. Sum of ranks for food types wasted by Belgrade households (n=76)

4. Conclusion

This pilot study was to obtain information on how suitable this method of survey is, and whether the results relate to the actual state of food waste or to the opinion of the respondents about their own food waste. Further studies will include a larger number of participants and modify the questionnaire according to our experiences. We determined that food waste is largely considered a sin, and believe this could contribute to the real amount of food wasted not being reported. There is insufficient awareness among participants of the amount of food they throw away and the consequences this causes. In any case, it is necessary to increase the level of consumer awareness about the importance of reducing food waste in households.

Acknowledgment

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