

INCOME, ATTITUDES, AND FOOD WASTE: SEGMENTATION OF CZECH HOUSEHOLDS

Anna Martinková¹, Veronika Antošová¹, Lucie Veselá¹

¹Department of Marketing and Trade, Faculty of Business and Economics, Mendel University in Brno, Zemědělská 1, 613 00 Brno, Czech Republic

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ABSTRACT

Household food waste is a significant environmental and economic problem in the Czech Republic — it is estimated that households generate a significant portion of total food waste. The present article examines whether household income affects the level of food waste and attitudes towards it, and complements this survey on consumer segmentation based on purchasing and consumption behavior. The empirical basis is a questionnaire survey conducted in January and February 2025 among the population of the Czech Republic (n = 294), supplemented by semi-structured in-depth interviews (n = 6). The statistical dependence between the monitored variables was verified by Pearson's chi-square test of independence, and the strength of the dependence was verified by Cramer's coefficient; hierarchical cluster analysis using the Ward method was used to segment respondents. The results showed that the proportion of food thrown away per month was not statistically dependent on income, while attitudes towards waste did depend on income and age. A significant predictor of lower waste was the frequency of checking the refrigerator. Cluster analysis identified three household segments with different purchasing, waste and perception approaches. The findings suggest that quantitatively measured waste levels and attitudes towards the problem may diverge, which has implications for the development of targeted communication strategies.

Keywords: food waste, households, income, consumer behavior, segmentation, cluster analysis, attitudes, Czech Republic

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1 INTRODUCTION

Food waste is currently perceived as one of the most serious cross-cutting problems of the food system, combining environmental impacts, economic losses, and the ethical dimension of food inaccessibility for part of the population. The United Nations Sustainable Development Goal 12.3 aims to halve global food waste at the retail and consumer levels by 2030 (Eurostat, 2024). Within the European Union, food waste generation is continuously monitored in the context of this commitment both in the processing sector and at the levels of distribution and households, with households consistently representing the single largest source of waste (Eurostat, 2024).

The situation in the Czech Republic is comparable. Previous studies repeatedly document that the majority of food waste is generated at the final consumption stage (Kormaňáková, Remešová and Vančová, 2021; Nováková, Hák and Janoušková, 2021). Consequently, attention is logically focused on the purchasing and consumption behaviour of Czech households and on the socioeconomic factors shaping such behaviour.

The economic dimension of the issue is significant: the value of food ending up in municipal waste represents a portion of household expenditure that can be successfully reduced through relatively simple organisational adjustments. The environmental dimension—greenhouse gas emissions associated with the production, transportation, and disposal of unconsumed food—makes household food waste one of the measurable contributors to the carbon footprint of final consumption (Aloysius *et al.*, 2023). Alongside the economic and environmental dimensions, a social dimension also plays a role, as food waste contrasts with the growing number of households facing income insecurity (Czech Statistical Office, 2024).

Among the socioeconomic predictors of food waste, household income is frequently discussed. However, the literature does not provide a clear conclusion regarding the relationship between income and the level of food waste. Some studies demonstrate that higher income correlates with larger amounts of discarded food or with less cautious stock management (Schanes, Doberning and Gözet, 2018; Bravi *et al.*, 2020). Other studies, however, point out that the relationship is not straightforward: the influence of income overlaps with household size, life stage, demographic structure, and attitudes toward consumption (Aloysius *et al.*, 2023; González-Santana *et al.*, 2022). Furthermore, Qi, Roe and van Rijnsoever (2016) show that higher-income households may frame food waste as an acceptable side effect of quality eating habits, meaning that attitudes toward the issue may diverge from observable behaviour indicators.

Another recurring topic in the literature is the role of discount promotions and retail marketing campaigns. The classical thesis (Schanes, Doberning and Gözet, 2018) describes discounts as incentives for impulsive purchasing, leading to overconsumption and subsequent waste; however, more recent empirical studies (Tsalis, Boutrup Jensen and Aschemann-Witzel, 2024) question this straightforward mechanism. A third consistently documented factor is household organisation itself—particularly stock control, shopping planning, and the use of shopping lists (Kubíčková, Veselá and Kormaňáková, 2021; Kubíčková *et al.*, 2022).

In the Czech context, empirical evidence regarding the relationship between these factors and actually measured (or at least self-reported) household behaviour remains limited. Existing studies either rely on aggregated statistics (Czech Statistical Office, 2024) or focus on specific subpopulations and regions (Nováková, Hák and Janoušková, 2021; Kormaňáková, Remešová and Vančová, 2021). Less attention has been paid to the contemporary verification of quantitative hypotheses concerning the effects of income and accompanying factors, as well as to qualitative insight into the mechanisms underlying observed behavioural patterns.

Therefore, the aim of this article is to:

- (1) (verify whether the income level of Czech households is statistically associated with the self-reported proportion of discarded food and attitudes toward food waste;
- (2) examine complementary hypotheses concerning the effects of age, education, stock control, and the use of discounts; and
- (3) identify household segments differing in the level of food waste and attitudes toward it based on purchasing and consumption variables.

The conclusions of the article are discussed with regard to the possibilities of targeted communication aimed at reducing household food waste and build upon the general framework of consumer decision-making (Kotler and Keller, 2013), although the primary focus remains empirical and quantitative.

2 METHODOLOGY AND DATA

To fulfil the research objectives, a combination of quantitative and qualitative research methods was employed in a sequential design.

The quantitative survey was conducted in the form of an online questionnaire using Google Forms, distributed primarily through social media and targeted email communication during the period from 20 January to 28 February 2025. The questionnaire was structured into three sections: sociodemographic data, purchasing habits (shopping frequency, influence of discounts, stock control, planning), and food waste behaviour itself (types of discarded food, reasons for disposal, attitudes). Prior to the main data collection, pilot testing was carried out on a sample of 22 respondents, and the feedback obtained was incorporated into the final version of the questionnaire. The minimum respondent age was set at 15 years.

A total of 303 responses were collected; after excluding irrelevant and incomplete responses, the final sample consisted of 294 units. Gender and the number of dependent children in the household were used as quota characteristics; the sample distribution corresponded to the 2021 Population Census data with a maximum deviation of 4.3 percentage points (Czech Statistical Office, 2024). Women represented 51.5% of the sample and men 48.5%. Regarding age structure, the most represented groups were 15–25 years (34.0%) and 26–35 years (29.6%), whereas the groups aged 56–65 years and 66 years and above together accounted for only 7.5% of the sample. This uneven age distribution resulted from the exclusively online distribution of the questionnaire and is discussed as a limitation in the Discussion section. Monthly household income most frequently fell within the range of CZK 50,001–70,000 (29.3%), while households with income below CZK 25,000 represented 10.6% of the sample.

Statistical processing relied on basic descriptive statistics and Pearson's chi-square test of independence. The significance level was set at $\alpha = 0.05$; the null hypothesis of independence between two categorical variables was rejected when the p-value was lower than this threshold. The strength of association was quantified using Cramér's V coefficient. In accordance with the objectives of the article, the following hypotheses were tested (formulated as null hypotheses):

- **H01: Household expenditure on food is not dependent on the number of household members.**
- **H02: The frequency of using discount promotions is not dependent on household income.**
- **H03: The percentage of discarded food is not dependent on household income.**

- **H04: The percentage of discarded food is not dependent on the frequency of checking food stocks in the refrigerator.**
- **H05: The percentage of discarded food is not dependent on the use of discount promotions.**
- **H06: Attitudes toward the problem of food waste are not dependent on household income level.**
- **H07: Attitudes toward the problem of food waste are not dependent on age.**
- **H08: Attitudes toward the problem of food waste are not dependent on the highest level of education attained.**

The formulation of the hypotheses was based on previous literature—H02 follows Gupta (2016), H04 follows the methodology of Kubičková *et al.* (2022), H05 follows Schanes, Doberning and Gözet (2018), H06 follows Qi, Roe and van Rijnsoever (2016), and H07 and H08 again follow Kubičková *et al.* (2022). H01 and H03 test general assumptions regarding the relationship between household size, household income, and consumer behaviour.

Hierarchical cluster analysis was employed among the multivariate methods for respondent segmentation. Input variables—including shopping frequency and types of purchases, use of discounts and loyalty programmes, stock control, frequency of discarding different food categories, reasons for disposal, and attitudes toward the issue—were transformed onto a unified 0–1 scale. Clustering was performed using Ward's method with Euclidean distance.

The qualitative research followed the quantitative phase and took the form of semi-structured in-depth interviews. Six interviews were conducted—two representatives from each identified cluster—with the aim of deepening the understanding of attitudes and motivations typical for individual segments. The interviews were thematically structured around food evaluation, sensitivity to discounts, barriers to sustainable purchasing, and information needs. The characteristics of the sample and the limitations of the research design are systematically discussed in the Discussion and Conclusions section.

3 RESULTS

The purchasing and consumption behaviour of respondents corresponds to patterns typical of Czech urban and mixed environments. Most respondents purchase food once or twice a week, with supermarkets representing the dominant shopping location, followed by small retail stores. Among the factors influencing purchasing decisions, quality and price were evaluated as the most important, followed by discounts and shelf life, while brand emerged as the least significant factor. A shopping list is always prepared by 17% of respondents, and another 40% prepare one for more than half of their shopping trips; however, only one quarter of those who create shopping lists follow them strictly. The remaining three quarters admitted being tempted by discounts or purchasing additional items during shopping. Discount promotions are used during every shopping trip by 26% of respondents, and during more than half of shopping trips by another 26%; only 2% reported never using discounts. Food waste is considered a serious problem by 78% of respondents, while 16% perceive it as not very serious and 6% do not consider it a problem at all.

The results of hypothesis testing concerning the relationships among the examined variables are summarised in Table 1. Of the eight tested hypotheses, four were rejected (H01, H04, H06, H07).

Tab. 1 Summary results of hypothesis testing (Pearson's chi-square test, Cramer's coefficient V; N = 294)

Hypothesis (H0)	p-value	Cramer's coefficient
H01: Spending × Number of Household Members	0,0001	0,212
H02: Frequency of Discounts × Income	0,9694	0,104
H03: % Food Waste × Income	0,6366	0,132
H04: % Food Waste × Inventory Control	0,0224	0,190
H05: % Food Waste × Discount Usage	0,3242	0,124
H06: Attitude towards Waste × Income	0,0093	0,212
H07: Attitude towards Waste × Age	0,0248	0,187
H08: Attitude towards Waste × Education	0,3589	0,122

The key finding is that the direct relationship between household income level and the self-reported proportion of discarded food (H03) was not confirmed—the p-value substantially exceeds the significance threshold, and the value of Cramér's coefficient indicates only a very weak potential association. In contrast, attitudes toward the problem of food waste (H06) were found to depend on income level—the relationship is statistically significant and of moderate strength according to Cramér's coefficient. Attitudes are also related to age (H07), but not to the highest level of educational attainment (H08).

Among the variables associated with household organisation, the frequency of checking food stocks in the refrigerator (H04) was confirmed as a significant predictor: the more frequently households check their food supplies, the lower the proportion of monthly purchased food they ultimately discard. Neither the effect of discount usage itself on the level of food waste (H05) nor the relationship between the frequency of using discounts and income level (H02) was statistically confirmed.

Cluster analysis identified three respondent segments with $n = 68$ (Cluster 1), $n = 113$ (Cluster 2), and $n = 113$ (Cluster 3). The segments differ markedly both in shopping habits and in the level and perception of food waste (see Figure 1).

Segment A (Cluster 1) consists predominantly of younger respondents (most strongly represented by the 26–35 age group) living in two- to three-member urban households; it contains the highest proportion of households with incomes exceeding CZK 100,000. These respondents shop more frequently for smaller purchases, make substantial use of online food delivery services, and are relatively more influenced by brand in their purchasing decisions. They exhibit the highest level of food waste among all segments—the average self-reported proportion of food discarded monthly reaches 0.29 (on a 0–1 scale). At the same time, this segment demonstrates the most indifferent attitude toward the issue: a smaller proportion of respondents consider food waste a serious problem compared to the other segments. They also make the least use of loyalty and discount programmes and prefer smaller food package sizes as a suitable measure for reducing waste.

Segment B (Cluster 2) comprises the youngest respondents (predominantly aged 15–25 years), with a higher proportion of university-educated individuals and a balanced income distribution. This group demonstrates the most active use of discounts, loyalty programmes, and mobile applications, most frequently checks food supplies before shopping, and reports consistent planning

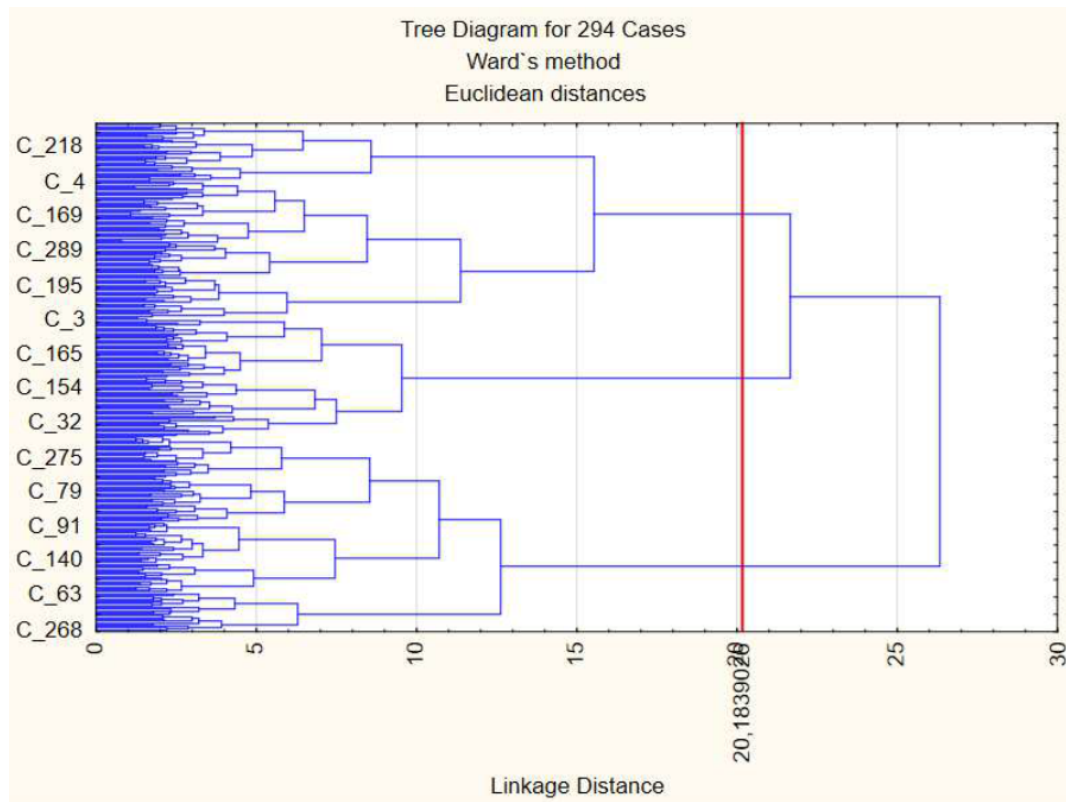


Fig. 1: Hierarchical cluster analysis dendrogram

behaviour. The average proportion of discarded food (0.19) is lower than in Segment A. In terms of attitudes, this segment perceives food waste as the most serious problem and considers better shopping planning to be the most effective preventive measure.

Segment C (Cluster 3) represents the oldest age group, with a higher representation of individuals aged 56 years and above, the highest proportion of households with monthly incomes below CZK 35,000, and more frequent residence in rural areas. This segment is characterised by careful shopping planning, consistent monitoring of expiration dates, and the use of discounted food products nearing the end of their shelf life. It demonstrates the lowest level of food waste (0.08). Food waste is perceived as a problem; however, the motivation to reduce it stems primarily from financial caution and practical experience rather than environmental convictions.

Across all segments, the most common reasons for discarding food include failure to consume food in time, exceeding the use-by date, and reaching the minimum durability date. The most frequently discarded categories are bakery products, fruit, vegetables, and dairy products. The qualitative interviews confirmed these quantitative patterns and supplemented them with motivational differences: whereas respondents from Segment A typically do not perceive their behaviour as wasteful, respondents from Segment B intentionally prevent waste through various organisational practices, and respondents from Segment C prefer traditional approaches such as freezing, composting, and feeding leftovers to animals.

4 DISCUSSION AND CONCLUSIONS

The empirical findings of this study offer a useful counter to the hypothesis that higher household income directly leads to higher food waste. The statistical dependence between income and the declared proportion of monthly food waste (H03) was not confirmed in the Czech sample, not even as a weak tendency. This result is in line with the conclusions of some foreign literature (Schanes, Doberning and Gözet, 2018; Aloysius *et al.*, 2023), which emphasizes that income should be interpreted together with the life stage, size and structure of the household and with subjective attitudes. At the same time, it is necessary to point out a possible methodological explanation: subjective self-estimates of the proportion of food waste tend to be systematically lower than objectively measured values (Kubičková, Veselá and Kormaňáková, 2021), and the underestimation may be different in different income groups. Moreover, the influence of income may be better reflected in the absolute quantity or value of food thrown away than in its share in monthly purchases — which the survey on which the article is based did not follow.

In contrast, the dependence of the attitude towards the problem of waste on income (H06) was statistically confirmed. This finding corresponds to the work of Qi, Roe and van Rijnsoever (2016), according to which households with higher incomes more often frame waste as a side effect of quality food and therefore as more acceptable. Qualitative interviews support this interpretation: respondents in Segment A typically do not perceive waste as waste, attribute the problem to retail chains and perceive their own behavior as neutral. There is therefore a tension between quantitatively measured behavior and its subjective framing, which in itself represents a challenge for communication in the field of waste reduction.

Among other results, it is worth highlighting the confirmed connection between the frequency of checking the stock in the refrigerator and the share of food thrown away (H04). This finding is consistent with the conclusions of Kubičková *et al.* (2022) and the broader literature on the role of household organization in reducing waste. The practical implication is available: a simple routine of checking inventory before shopping is among the least expensive measures that can be addressed through a communication campaign.

The data did not confirm the effect of the use of discount events on the level of waste (H05) or the relationship between the frequency of discounts and income (H02). This is in line with more recent evidence (Tsalis, Boutrup Jensen and Aschemann-Witzel, 2024), which questions the simple thesis of “discounts = excessive purchases = waste”. Qualitative interviews in this study demonstrate that discounts affect different segments in different ways: respondents with lower incomes actively seek out discounts and integrate them into planning (Segment C), while for respondents with higher incomes, discounts tend to modify specific purchasing decisions in an unplanned manner (Segment A). The insignificant aggregate result may thus conceal conflicting mechanisms within the population.

Segmentation based on cluster analysis yielded a structured description of three distinct types of households that systematically differ from each other in terms of both waste rates (0.29 / 0.19 / 0.08), attitudes towards the problem and preferred solutions. This distinction has practical implications: measures that one segment perceives as relevant (better shopping planning — Segment B) are not necessarily effective for the other (Segment A prefers smaller packaging; Segment C actively seeks discounted food before the end of its shelf life). For retail chains and public campaigns, this suggests that communication should be differentiated by segment — in particular, increasing the visibility and availability of discounted food before the end of its shelf life, expanding the range of smaller packages of perishable food, and supplementing communication with information on proper storage (Huang *et al.*, 2021; Corsini *et al.*, 2023; Eičaitė *et al.*, 2022).

The study findings should be interpreted with a few limitations in mind. The sample of 294 respondents does not have a representative age distribution — a consequence of the questionnaire being distributed exclusively online — and the proportion of seniors is significantly lower than in the population. The subjective estimate of the proportion of food wasted in monthly purchases, although methodologically economical, does not capture the absolute quantity or value of food wasted. The six in-depth interviews provide only illustrative insight into the mechanisms identified in the cluster analysis, not their saturated description. Further research should focus on (i) replication on a larger and more age-representative sample, (ii) addition of objective measurement of waste (diary or weight methods), and (iii) longitudinal verification of the relationship between attitude and behavior within individual segments.

In terms of the objectives of this study, it can be stated that empirical evidence has been obtained that the relationship between income and food waste is not linear in the Czech context: the level of income is not primarily reflected in the declared share of food thrown away, but rather in the household's attitude towards the problem of waste and — through this attitude and related purchasing habits — in segment-specific behavioral patterns. This finding is the basis for a differentiated communication strategy aimed at reducing food waste in the Czech Republic.

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Contact information

Veronika Antošová: e-mail: veronika.antosova@mendelu.cz