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EDUCATIONAL CAMPAIGNS AS A TOOL TO SUPPORT CONSCIOUS CONSUMER PURCHASES TO MINIMIZE FOOD WASTE: AN INVESTIGATION AMONG A SELECTED SOCIAL GROUP IN POLAND

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ABSTRACT: The purpose of this study was to determine the causes of food waste at the lowest level, i.e. in the household, and to determine the most effective information channels for educational campaigns that provide consumers with ways to minimise this phenomenon. The study was based on a survey questionnaire developed by the authors and administered to a total of 1384 respondents. The statistical analysis, including descriptive statistics and the ANOVA test, was performed with the use of Statistica 13.3 PL. Also used were linear regression statistics. The study provided a basis for the conclusion that Generation Z consumers, who participated in the study, perceive the information contained on the label as relevant and important at the time of purchase. Specifically, consumers checked the product's ingredients, expiration date and price. As the main reason for food waste in households, consumers indicated that they do not track the expiration dates of purchased products when found again in the kitchen, and are already past their best-before date. The respondents identified as the key information and educational channels that contribute to raising consumer awareness: web pages run by institutions, bloggers/influencers, experts, social media, and, as the least important one, TV programs.

KEYWORDS: young consumer, purchasing decisions, food waste, education campaigns, information channels, labeling information

Introduction

Food waste problem

The growing volume of food waste has become a matter of increased concern. The problem is witnessed in all countries around the globe, both in those struggling with chronic malnutrition (famine) and in those experiencing excessive consumption (Pearson et al., 2013; Corrado & Sala, 2018; Rohini et al., 2020). The reasons behind food waste can be found in each link of the food chain, from production through to consumption (or, in fact, to non-consumption, which is why people dispose of food products). Food waste at the household level is a complex behaviour related to consumer decisions on what to do with food products, such as making shopping plans, storing, preparing, and consuming food (Stancu et al., 2016; Setti et al., 2018). In developed countries, households are the ones accountable for the largest amount of food waste (Oláh et al., 2022; Wojciechowska-Solis & Śmiglak-Krajewska, 2020). This phenomenon has negative environmental, social and economic impacts, and is caused by a number of factors, including household members being unaware of how much food they waste every day. This is especially true in developed countries where food supply exceeds demand, and the lifestyle of today's consumers mostly evolves towards consumerism and excessive accumulation of material goods (Wojciechowska-Solis & Śmiglak-Krajewska, 2023). As regards developing countries, the greatest losses occur at the initial stages of the production process (Caldeira et al., 2019; Principato et al., 2019; De Moraes et al., 2020; Dhir et al., 2020). This primarily results from a lack of sophisticated agricultural techniques, efficient systems or transport infrastructure, and from people being unable to store products in a way to ensure their shelf life.

So far, no definition of food waste has been agreed upon at the European Union level. Member States differ in the definitions they rely on, and the Food and Agriculture Organisation (FAO) of the United Nations use its own vocabulary. "Food waste refers to food appropriate for human consumption being discarded, whether or not after it is kept beyond its expiry date or left to spoil. Often this is because food has spoiled but it can be for other reasons such as oversupply due to markets, or individual consumer shopping/eating habits" (FAO, 2013). The European Parliament views food waste as "all the foodstuffs discarded from the food supply chain for economic or aesthetic reasons or owing to the nearness of the 'use by' date, but which are still perfectly edible and fit for human consumption and, in the absence of any alternative use, are ultimately eliminated and disposed of, generating negative externalities from an environmental point of view, economic costs and a loss of revenue for businesses". As found in the FUSIONS project (implemented in 2012-2016 under the European Commission's Seventh Framework Program), the current practice of using multiple definitions results in wastage is estimated across different kinds of resources, making it difficult to compare the results and monitor trends (Östergren et al., 2014).

In 2022, approximately 132 kilograms (kg) of food per inhabitant were wasted in the EU. Among all economic groups, household waste accounted for the largest share: 54% of the total amount of food waste, the equivalent of 72 kg per inhabitant. The remaining 46% was waste generated upwards in the food supply chain: 19% by the manufacture of food products and beverages group (25 kg), 11% by restaurants and food services (15 kg), 8% in the primary production (10 kg) and 8% in the retail group (11 kg) (Eurostat, 2023). Food waste costs EU businesses and households an estimated €143 billion a year and causes at least 6% of the EU's total greenhouse gas emissions (Feedback EU, 2022). Halving EU food waste by 2030 could save 4.7 million hectares of agricultural land (EEB). Poland is also affected by this problem: nearly 5 million tons of food are disposed of each year, translating into an average rate of 150 kg per second (FAO, 2013). This has a number of adverse social, economic, energy and environmental impacts – from the consumption of natural resources, soil, water and energy, through to pollution, greenhouse gas emissions, and generation of waste packaging and waste food (Niedek & Krajewski, 2021).

Ways of reducing food waste

Over the recent years, the food waste issue has clearly captured increased interest from international organisations, NGOs, politicians and scientists of different fields (Aydin et al., 2021; Schanes et al., 2018). Efforts made to combat food waste and loss are the key to sustainable food systems; they can be justified not only by the savings made by consumers and economic operators but also by the

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reduced consumption of natural resources and smaller damage to ecosystems. Recovering and redistributing surplus food provides an opportunity in a number of areas, such as the recycling of nutrients and secondary raw materials, production of feeding stuffs, food safety, biodiversity, bio-economy, waste management, and renewable energies (Pink & Wojnarowska, 2020). Measures taken to prevent and reduce food waste are consistent with the concept of sustainable development. In 2015, the General Assembly of the United Nations adopted the Sustainable Development Goals (SDGs) as part of the 2030 Agenda for Sustainable Development (ONZ, 2015). The program includes 17 SDGs and 169 targets. SDG 12.3 is worded as follows: "By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses" (ONZ, 2015). The European Union, too, defined their goals for reducing food waste. Directive 2008/98/EC amending certain waste management regulations is the key legal act in that area. In 2018, the European Commission adopted the amended Waste Framework Directive (WFD), which binds EU member states to begin measuring and reporting their food waste from 2020 onwards. The Commission is currently developing proposals for legally binding food waste targets for EU member states, including critical decisions about their ambition (with options ranging from 20% to 50% by 2030) and their scope (retail and consumer level only, or from farm to fork). Also worth noting is another Union document, namely the European Parliament resolution of January 19, 2012, "How to avoid food wastage: strategies for a more efficient food chain in the EU" (European Parliament, 2013). In their resolution, the European Parliament calls on the European Commission, inter alia, to assess and encourage measures to reduce food waste, such as dual-date labeling ("sell by" and "use by"), and the discounted sale of foods close to their expiry date and of damaged goods (Nicastro & Carillo, 2021). It is extremely important that consumers understand the difference between these two terms. The first one is related to the product's safety, while the second refers to its quality. In Poland, pursuant to the act on preventing food waste, which has been in force since 2019, stores shall deliver unsold food products to a selected NGO with which they signed an agreement. If the sellers discard food anyway, they are charged with fines to be paid to that NGO. If they did not enter into such an agreement, the fines shall be paid to the Environmental Protection and Water Management Fund, which has competence over their registered seat. Reducing the quantity of food waste under an environmentally-friendly food system is part of the European Green Deal, and of action plans and strategies presented in the European Union, such as "from field to fork" or the new Circular Economy Action Plan for a cleaner and more competitive Europe (European Commission, 2020a, 2020b).

As a major actor in reducing food waste and loss, social organisations become an important partner for food producers and retail networks, which – for the sake of social responsibility – accept the challenge of reducing food waste and loss at each stage of their activity. A number of campaigns and initiatives are taken with a view to reducing the amount of food wasted by humans, while also providing practical solutions for education initiatives and awareness campaigns intended for households and retailers at the local and national level. As regards international projects, emphasis should be placed on the FAO Save Food Initiative, which is focused on avoiding food loss and reducing waste. Its fundamental goals include: launching public-private partnerships; running information campaigns; developing policies; providing consistent and coordinated assessments; and analysing data on food waste and loss (Hegnsholt et al., 2018). In many countries (e.g. Austria, Denmark, Spain, the UK, Italy, France, the United States, Poland, Germany, Slovakia), there are food bank programs in which surplus food is transported from retailers or other sales points to those in need. The Federation of Polish Food Banks develops a number of initiatives that contribute to reducing food waste (e.g. exempting food donations from VAT, offering tax allowances) and runs multiple education projects, including: "Do not waste food," "Be environmentally-minded," "Food Recovery and Waste Reduction," and the "Model for Reducing Food Waste and Loss for Social Benefit" (Hegnsholt et al., 2018).

Companies can design new (or revamp existing) products, packaging, and promotions and help change consumers' behaviour. Price promotions on products that are slightly damaged or close to their expiration date can also help reduce food waste. French supermarket chain Intermarché in 2014 launched its Inglorious Fruits and Vegetables campaign, which offers imperfect fruits and vegetables at a 30% discount. Furthermore, Tesco has experimented with a Buy One Get One Free-Later program that allows customers to pick up their free product when they actually need it, cutting down on the temptation to stock up on discounted products that will go bad (Hegnsholt et al., 2018). State-of-the-art applications, such as "No Food Wasted" in the Netherlands, "Food Loop" in Germany, "Foodsi" in

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Poland, "Too Good to Go" in the UK or "FoodCloud" in Ireland and the UK, put the customers in contact with supermarkets and restaurants to notify them of bargains or available surplus food (EUFIC, 2017).

Food waste is also increasingly often addressed in media coverage so as to make consumers aware of a growing social and economic problem. Institutions in charge of education and information campaigns rely on marketing communications. Media, including social media and web celebrities, clearly have a great impact, especially on young people. When bloggers, influencers and YouTubers get involved in campaigns, they become a kind of role model, and it is therefore easier to convey the message to their followers. As Kurzydem (2019) indicate, a huge amount of available information may become overwhelming and confuse people as to what is true and what is superfluous. This is what makes education and information measures so important in arranging the available information and structuring the knowledge derived from it. Hence, education and information activities that contribute to consumer awareness should be promoted at many levels of everyday life: in families, schools and at workplaces. Implementing these measures has an important impact on marketing behaviors (Szczepańska, 2024): it triggers changes related to improving food quality; provides knowledge on rational nutrition; promotes the ability to properly cook and choose meals and store foodstuffs; shapes consumer behavior (by developing a practice to check foodstuff labels, look at the products' qualitative characteristics, and enhance knowledge of habits covered by the healthy eating pyramid); promotes health education practices; raises awareness of the consequences of wasting food; and makes people realize the adverse impacts of choosing unhealthy products.

Undoubtedly, the problem of food waste is recognised within the scientific community, as evidenced by a significant number of publications (Schanes et al., 2018; Abdelradi, 2018; Principato et al., 2021; Boulet, 2022; Przezbórska-Skobiej & Wiza, 2021). Reynolds et al. (2019) noted that there is no reviewed research on the efficiency of intervention measures aimed at preventing food waste at the consumption level of food systems. This is a significant gap which, when bridged, may support people working on reducing food waste in developed countries by indicating which intervention measures are particularly efficient in that respect. The authors of this paper propose to carry out a study which can be viewed as a preliminary step and focuses on consumer education and consumer awareness of the importance of information contained on labels.

Materials and Methods of research

The study was carried out between October 2023 and March 2024. This study was preceded by a pilot study. A pilot study was conducted to assess the questionnaire's clarity, relevance, and overall effectiveness. The insights gained from the pilot informed potential adjustments to improve question wording, structure, or content. Before participation, all respondents provided informed consent, acknowledging the study's objectives and data handling policies. The questionnaire was completed anonymously. The survey questionnaire was administered to 2000 respondents aged 18-30. The criterion for sending the survey form to the respondent was the consent to participate in the study and the declaration of observation of the phenomenon of food waste in their household. The age range for Generation Z (Gen Z) varies depending on different sources and definitions. Generally, Gen Z is considered to include individuals born roughly between the late 1990s and the early 2010s. Because there is no universally agreed-upon cutoff, the specific ages can differ slightly depending on the organisation or context. This variability reflects ongoing discussions about generational boundaries based on cultural, technological, and social factors. Commonly cited age ranges are: born 1990 or later (Wiktorowicz & Warwas, 2016), between 1991 and 2009 (Tulgan, 2009), between 1993 and 2005 (Turner, 2013), after 1995 (Ensari, 2017). Finally, 1384 valid survey questionnaires were retained for analysis. The exclusion criteria for the survey included factors such as incomplete responses, inconsistent or invalid answers, or responses that did not meet eligibility criteria (e.g., age outside the 19-30 range). Because of these criteria, approximately 616 questionnaires (about 30.8%) were discarded, leaving 1,384 valid responses for analysis. This process ensures the reliability and validity of the data, even though it results in the loss of some responses. The main centres where the survey was conducted were the University of Life Sciences in Lublin and the Poznan University of Life Sciences. The sample is representative only of the populations within the University of Life Sciences

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in Lublin and Poznan University of Life Sciences. To claim broader generalizability, additional sampling from other institutions or regions would be necessary. The survey used a quantitative method (CAWI). The survey was implemented using the 1KA service, and calculations were performed using Statistica 13.3 PL. The survey consisted of 15 research questions and additional questions to identify the socio-demographic characteristics of respondents. At the sampling stage, random sampling was applied using stratified sampling. The population to be analysed was divided by gender. The recruitment criterion for the survey was the consumer's age of majority. The replies were assessed using an ordering scale and a 5-point scale (1: not important at all, ..., 5: extremely important). The reliability of the scales was examined by calculating the Cronbach's alpha and setting the acceptable level at $\alpha > 0.7$. Under these assumptions, the scales used in the study were found to be reliable (Henson, 2001). The results were analysed with Statistica 13.3PL (including descriptive statistics, the ANOVA test and linear regression statistics) in order to answer these research questions.

Linear regression statistics were also used to find the equation that best predicts the dependent variable as a linear function of independent variables – this was the reason for using multiple linear regression.

$$Y = b0 + \beta1 \times 1 + \beta2 \times 2 + \ldots + \beta k \times k + \varepsilon, \quad (1)$$

b0 – constant,
βi – model parameter (of regression factors) describing the effect of i-th variable,
β1, ⋯, βk – partial regression factors,
x1, ..., xk – variable examined,
ε – random component (Se).

The purpose of this study was to determine the causes of food waste at the lowest level, i.e. in the household, and to determine the most effective information channels for educational campaigns that provide consumers with ways to minimise this phenomenon.

The following questions were asked to explore this issue:

- RQ1: What are the reasons behind wasting food, i.e. what are the areas the education campaigns should focus on to prevent it from happening?
- RQ2: How do consumers perceive the importance of labelling information?
- RQ3: What information channels should be used in order for consumers to make informed purchasing decisions and avoid food waste?

The study was carried out as part of a government project: VEGA project no. 1/0398/22 "The current status and perspectives of the development of the market of healthy, environmentally friendly and carbon-neutral products in Slovakia and the European Union".

Results of the research

The sample was distributed such that 64.1% of respondents were female and 35.9% were male (Table 1). The youngest age group (referred to as Generation Z in the research typology), which has only recently entered the labour market, was presented in this study. Generally, consumption decisions and behaviours of Generation Z are the key drivers of future trends in food markets and beyond. It was important for the authors to explore that group's opinions because their state of knowledge should be the basis for building future information strategies and messages. A vast majority of interviewees are residents of small and larger cities. Rural dwellers accounted for barely 7.3%. Almost 50% of respondents had a tertiary education. More than half of the respondents had two or more dependent minors. Over 60% of respondents found themselves to be in an average financial situation, and only 1/3 of the sample believed they have a good financial standing.

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Table 1. Socioeconomic characteristics of consumers

Variable	Category	Frequency (N)	Percentage (%)
Gender	Male (M)	497	35.9
	Female (F)	887	64.1
Age	18-21	548	39.6
	22–25	576	41.6
	26–30	260	18.8
Place of residence	Rural areas (rural communes) (type 1)	101	7.3
	Towns of up to 50,000 inhabitants (urban–rural communes) (type 2)	840	60.7
	Towns more than 50,000 inhabitants (towns) (type 3)	443	32.0
Level of formal education	Primary	202	14.6
	Secondary	537	38.8
	University	645	46.6
Household Size	1-3	530	38.3
	4-6	829	59.9
	≥7	25	1.8
Self-assessment of the respondent's financial situation	Bad (enough for my basic needs)	14	1.0
	Average (I am able to buy most of the things I would like to have)	919	66.4
	Good (I can afford to buy what I want)	451	32.6

There is a need for educating consumers on how to store food properly and how to plan food purchase and consumption, and for promoting the right ways of doing so. In high-income countries, food is mostly wasted and lost in households. Hence, in order to prevent it, there is a need for improving communications across food chains and for raising consumer awareness. The latter must be provided with knowledge on expiry dates, shopping planning, and consumption. In the era of consumerism, where food is easily available and people seek high levels of consumption, preventing and combating food waste has become a real problem facing highly developed societies. Units in charge of consumer education and education campaigns/actions related to preventing losses in the food chain are headed by NGOs. Their activity represents the essential social marketing effort.

Table 2 presents the analysis of data used in explaining why food is wasted in households. Note that this study was carried out during the pandemic, which also translated into how consumers behaved. Each country introduced travel restrictions for the population at different stages of the pandemic. Hence, some people purchased more than they actually needed and prepared food stocks. Not all products were stored in appropriate conditions, and some of them had a short best-before date that the consumers did not notice. Ultimately, this situation resulted in food waste. Only during the pandemic, consumers started to adopt a conscious approach to preventing food waste and developed a habit of reading the labels. As one of the 3 main reasons for food waste in their households, the respondents said that they failed to keep track of some of the purchased products, which, when found again in the kitchen, were already past their best-before date. Purchasing more than needed was another reason. Furthermore, short shelf-life foodstuffs (which, by definition, are the healthiest ones as they contain negligible amounts of preservatives) were the ones most often disposed of by the respondents.

The data shown above (Table 2) clearly shows that despite the overwhelming amount of information, the consumers lack education. Neglecting this information quite often causes food waste due to improper storage or to the consumer's failure to look at the ingredients or the best-before date. In order to improve this situation, there is a need for education campaigns targeted at society.

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Table 2. Reasons for wasting food indicated by respondents

Variable Name	Ranking	Average	SD	Sum of indications in%
Non-compliance with the use-by date	1	4.78	0.99	62.6
Excessive amount of purchased – over-shopping	2	4.25	0.92	47.8
Short expiry date	3	4.18	1.05	35.2
Inadequate storage conditions	4	3.82	0.97	24.6
Losses at the table – distasteful – inadequate quality	5	3.73	0.94	22.1
Mismanagement	6	3.24	1.02	19.4

Note: the respondents could select at least 3 reasons, the sum is not equal to 100%.

Table 3 presents the respondents' opinions on the importance of information that can be found on product labels. Every piece of product labelling information is relevant to consumers (a weighted average above 4). First, the consumers check the product's ingredients, expiry date and price. The price is ranked only third. Next, the respondents focus on the manufacturer. In this study, the consumers who decide to purchase certain products (e.g. ones with an enhanced health value or higher-quality ingredients) are aware that the price of that food segment is higher. This proves the existence of other factors that are of greater importance to them. Price is less important to those living in large metropolitan areas, while residents of rural areas and small towns (type 1 and type 2), see it as an important factor they pay attention to when shopping. "Certificates of product origin" was considered least important among respondents coming from large cities (type 3). The results show that type 1 and type 2 members rated all information on the label highly. Thus, they confirmed that they pay attention to the information that ultimately influences their purchasing decisions. The younger generation that does not live in large metropolitan areas (Type 1 and Type 2) attaches greater importance to foodstuff labelling and believes this information to be true.

Table 3. Importance of information displayed on the labels of products (by place of residence)

Factor	Mean	(type 1)	(type 2)	(type 3)	p-Value
Price	4.44	4.72a	4.58b	4.26c	<0.000*
Product ingredients	4.64	4.67a	4.78a	4.64a	<0.000*
Expiration date	4.48	4.82a	4.56b	4.30c	<0.000*
Certifications confirming the origin of the product (certified labels)	4.09	4.58a	4.26b	3.68d	<0.000*
Manufacturer	4.43	4.68a	4.38b	4.28b	<0.000*

Note: * level of significance difference at $p < 0.050$. Different superscripts indicate significantly different means following the ANOVA post hoc Dunn test.

Linear regression presented in Table 4 shows the role of channels used in delivering education content, i.e. education campaigns. The respondents assessed the efficiency of information channels used in education campaigns on food waste, e.g. "have a healthy diet" (a campaign promoting the consumption of organic food and a change in eating habits). In order to determine which information channels are effective in conveying the message of education campaigns, the respondents were asked to provide feedback about the following statement: "Education campaigns (the content of the message) are effective when carried out through the following information channels" (the suggested replies were provided on a five-point scale used as a dependent variable in the regression analysis (Table 4). The data was analysed with linear regression; the set of coefficients (obtained from the factor analysis for each group of samples) were used as predictors. The authors carried out the linear regression procedure in an effort to discover and explain the relationship between independent and dependent variables. It can be assumed that the proposed model composed of five variables, provides

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quite a good description of the phenomenon under consideration, i.e. the relationship between the content of an education campaign and the channel used in conveying it to the population. The coefficient of determination (R2) is 0.38, which means the model explains 38% of the relationships between the variables. The variables retained in the model are statistically significant at $p < 0.050$.

Table 4. Information channels through which, according to respondents, educational campaigns should be conducted

Factor	Estimate β	Standard Error	p-Value
Experts, e.g. nutritionist, doctor (A)	0.18	0.03	<0.000*
TV programs (e.g. advertising blocks) (B)	0.14	0.02	0.004*
Web pages ran by institutions (C)	0.22	0.04	<0.000*
Social media, e.g. Facebook, Instagram, Tweeter (D)	0.16	0.03	<0.000*
Bloggers/influencers (E)	0.19	0.04	0.017*
F–statistic of the model	F(10.257) = 1.95		
Constant	4.53		
Random component (SE)	3.63		
Coefficient of determination (R2)	0.38		

Note: * level of significant difference at $p < 0.050$.

The combination of variables presented in Table 4 shows the foreseen contribution of selected information channels to an effective education campaign. Note that all five variables have a significant impact on the foreseen patterns of consumer behaviour. The β values are as follows: the highest coefficients (indicating which of the independent variables has the greatest impact on the dependent variables) were recorded for "Web pages ran by institutions" (C), followed by "Bloggers/influencers" (E), "Experts, e.g. nutritionists, doctors" (A), „Social media, e.g. Facebook, Instagram, Tweeter" (D), and "TV programs (e.g. advertising blocks)" (B). The presence of these variables in the consumer education model is dictated by the aftermath of changes in primary education (changing educational programs), in which parents have begun to pay more attention to the health of children and adolescents, actively seeking ways to improve it. Also important is the social and environmental education related to the current global crisis and hunger issue. This is why the respondents also indicated the significance of education campaigns related to food waste. Numerous advertising campaigns are in place to educate Polish consumers and explain the concepts related to informed purchasing choices, which allow them to compose their baskets so as to include products which maximise health benefits, are not harmful to the environment, and minimise subsequent product waste. The education campaigns also refer to egocentric aspects of individuals: "When choosing high-quality products for better health, you also care for the environment, and minimising product waste is a way to save money." The regression equation proposed in this study is as follows:

$$Y = 4.53 + 0.18A + 0.14B + 0.22C + 0.16D + 0.19E \pm 3.63. \quad (2)$$

Discussion and Conclusions

The study identified the causes of food waste at the lowest level, i.e. at the household level, and identified the most effective information channels for educational campaigns that provide consumers with ways to minimise this phenomenon. Informed consumer behaviour plays a significant role in ensuring the sustainable development of the world's scarce resources (Koyuncu et al., 2014). A study conducted by Łaba et al. (2019) under the PROM project spanning across all links of the food chain found that households are accountable for 64% of food waste. This confirms the validity of the

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selected research segment by the authors – that link in the food chain that makes purchasing decisions. Review of actions taken to reduce food waste at the consumer level, performed by Kim et al. (2020), and Stöckli et al. (2018), reveals that most of these actions were based on informing and educating consumers. In the United States, emphasis is placed on customer education with a view to reducing food waste caused by ordering and consuming excessive amounts of products (Okumus, 2020). Other countries mostly rely on private initiatives that promote preventing food waste (Papargyropoulou et al., 2019). A study by Neff et al. (2019) carried out with American consumers came to conclusions similar to what was found in this paper, namely that consumers realise the importance of labelling information (including the best-before date and storage conditions), but it is difficult for them to read and acknowledge it. According to Aschmann-Witzel et al. (2019), education campaigns on how to manage food at the end-consumer level may effectively contribute to reducing food waste, provided that they are targeted at key consumer segments and address topics related to the main reasons why people discard food. Generally, countries around the world put forth policies and social initiatives targeted at the last link of the food chain (consumers), which directly relate to how food waste is perceived and what the behaviours and attitudes towards it are (Karwowska et al., 2021). A recent study by Martin-Rios et al. (2021) presents some initiatives related to different approaches to food waste based on management practices and on consumer knowledge and awareness. In turn, a study by Russel et al. (2017) carried out in the UK suggests that the British waste food because of wrong shopping habits, i.e. stockpiling foodstuffs and not keeping track of labelling information (which may vary depending on current standards and regulations for the scope of information presented). In their new research projects, Barkemeyer et al. (2023) compared the purchasing awareness between economies at different levels of development and found that organically labelled products are more sought after in more developed countries and are not wasted to the same extent as goods without organic labels.

The studies of the indicated researchers from different countries confirm common problems related to the phenomenon of food waste.

Just like the authors of this paper, Lee and Kotler (2015) refer to social marketing, i.e. appropriate education campaigns on how to properly plan shopping and create shopping lists with healthy eating principles in mind. Although such learning processes are slower and more difficult to assess in a short-term perspective, they still can be effective and may carry long-lasting impacts. The success of education campaigns in reducing food waste was also addressed in studies carried out by scientists such as Martins et al. (2016), Devaney and Davies (2017), Kallbekken and Sælen (2013), Young et al. (2017), and Schmidt (2016).

Our study showed that three pieces of information found on product labels had the greatest importance for most respondents – the product's ingredients, the expiry date and the price, which was also stated by Bryła (2021), Zhao et al. (2021) and Aschemann-Witzel et al. (2017).

As the main reason for food waste in their households, the respondents said that in the most frequent scenario, they do not keep track of some of the purchased products, which, when found again in the kitchen, are already past their best-before date. Another reason is that they buy excessive amounts of food that they do not actually need. Usually, they discarded short shelf-life products. In a study from the UK, it was found that about 40% of the food waste occurred because the households cooked, prepared and served more food than could be consumed. Somewhat more than half of the food waste occurs because the food was not used in time (Anderson & Reid, 2019). In a study by Cox and Downing (2007), several reasons for food losses were given, e.g., "lack of plan" or "change of plans", "buying too much", "do not want to eat leftovers" and "do not know what to do with them" or "high sensitivity to food hygiene". Several studies also suggest that the main cause of food waste is shopping without proper planning, which causes consumers to buy too many food products that are not consumed by the expiry date (Aydin & Yildirim, 2021; Schanes et al., 2018; Teng et al., 2021).

The respondents identified the following as the key information and educational channels that contribute to raising consumer awareness: web pages run by institutions, bloggers/influencers; experts (e.g. nutritionists, doctors); social media; and, as the least important one, TV programs. Not only the author's own research but also the research of other authors (Chinie et al., 2021; Schanes et al., 2018) shows that in recent years, online social networks have gained increased attention as a medium for awareness campaigns aimed at reducing food waste. Goldsmith and Goldsmith (2011) have stated that online social networks can have a similar effect as real interactions with opinion

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leaders. This study provides information for both social organisations, food businesses and policy makers. The results of this study can be used to inform strategic communication campaigns, which can aid in educating consumers regarding the issue of food waste. The authorities should also continuously inform consumers about the selective collection of waste and the involvement of organisations whose main objective of activity is the different methods of reusing food waste. This could result in a range of benefits such as reducing waste costs, protecting our environment and creating a more sustainable food system. Social media and celebrities can also be used to promote and shape the cultural fashion for food conservation, especially among young people (Teng et al., 2021).

Food waste is a problem that affects us all. We must act at both the individual and societal levels to reduce this alarming loss and counteract the negative consequences for our environment. Actions such as reducing food waste, donating excess food to those in need, and shopping and storing food sustainably are key to achieving this goal. To achieve these goals, we need to educate society about what can be done to waste as little as possible.

The consumption link is responsible for the generation of the greatest amounts of waste in most groups of food (cereals, potatoes, eggs, dairy, and meat). Excessive consumerism and the unrestricted use of available resources are the reasons why society cannot cope. The energy, climate, health crisis has made it necessary for consumers to "grow up" in a fairly short period of time and start analyzing their consumption habits so that they don't waste what they buy (wastefulness translates into financial losses), while continuing to buy quality products (which have health benefits). Achieving this goal is facilitated by launching educational campaigns/actions that convey a message with valuable tips. This will result in creating an informed consumer who makes thoughtful purchasing decisions while minimising food waste.

Limitations and future research

One of the limitations of this study is the target group of young consumers from Generation Z (the study cannot be generalised to the entire population of the country). The second restriction is the structure of the questionnaire; it was based on the results of a pilot study in which the participants chose some replies from many statements and thus co-decided of what was ultimately used as variables covered by the final study questionnaire. The most effective mechanism for measuring food waste-related behaviours would be to carry out observations. However, considering the nature of this study and some pragmatic aspects of a research project, it was impossible to proceed this way. Hence, further research should consist in repeating this study with a sample that better reflects the country's population, and making observations a part of the final analysis.

Data Availability Statement

Data are available from the correspondent author upon request.

Conflicts of Interest

The authors affirm no conflict of interest. The funders had no involvement in the study's design, data collection, analysis, manuscript writing, or the decision to publish the results.

Ethical statement

Due to the nature of the research, no approvals, permits or opinions of competent authorities/committees are required. The research did not require the collection of any samples of living organisms but the answering of the research questionnaire. All research participants were adults. Respondents gave informed consent to take part in the survey, which is anonymous. The only data characterising the research participant are: gender, place of residence, and age.

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The contribution of the authors

Conceptualization, J.W.-S., M.Ś.-K. and M.A.J.; literature review, J.W.-S., M.Ś.-K. and M.A.J.; methodology, J.W.-S. and M.Ś.-K.; formal analysis, J.W.-S. and M.Ś.-K.; writing, J.W.-S., M.Ś.-K. and M.A.J.; conclusions and discussion, J.W.-S. and M.Ś.-K.

The authors have read and agreed to the published version of the manuscript.

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KAMPANIE EDUKACYJNE JAKO NARZĘDZIE WSPIERAJĄCE ŚWIADOME ZAKUPY KONSUMENTÓW W CELU ZMINIMALIZOWANIA MARNOWANIA ŻYWNOŚCI: BADANIE W WYBRANEJ GRUPIE SPOŁECZNEJ W POLSCE

STRESZCZENIE: Głównym celem niniejszej pracy była identyfikacja zachowań konsumentów w zakresie marnowania żywności oraz identyfikacja najbardziej skutecznych kanałów informacyjnych dla kampanii edukacyjnych, które dostarczają konsumentom metod minimalizacji tego zjawiska. Badanie przeprowadzono z wykorzystaniem autorskiego kwestionariusza ankietowego. W badaniu wzięło udział 1384 respondentów. Analiza statystyczna, obejmująca statystyki opisowe oraz test ANOVA, została wykonana przy użyciu programu Statistica 13.3 PL. Wykorzystano także metody regresji liniowej. Badanie pozwoliło na sformułowanie wniosku, iż konsumenci z pokolenia Z, którzy wzięli udział w badaniu, postrzegają informacje zawarte na etykietach jako istotne i ważne podczas dokonywania zakupów. W szczególności sprawdzają oni skład produktu, datę ważności oraz cenę. Jako główną przyczynę marnowania żywności w gospodarstwach domowych respondenci wskazali fakt, że nie śledzą dat przydatności do spożycia zakupionych produktów, które następnie znajdują się w kuchni i często są już po terminie ważności. Respondenci wskazali kluczowe kanały informacyjne i edukacyjne, które przyczyniają się do zwiększania świadomości konsumentów: strony internetowe prowadzone przez instytucje, blogerzy i influencerzy, eksperci, media społecznościowe oraz – jako najmniej istotny – programy telewizyjne.

SŁOWA KLUCZOWE: młody konsument, decyzje zakupowe, marnowanie żywności, kampanie edukacyjne, kanały informacyjne, informacje na etykietach

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