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Buying into waste: The role of consumer food purchasing behaviors, knowledge, attitudes, and opinions concerning food date labels

Jelili A. Adebiyi [a]*
Northern Michigan University and Michigan State University

Noleen R. Chikowore [b]
University of Leeds and Michigan State University

Angel S. Forde [c]
Florida Agricultural and Mechanical University and Michigan State University

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Abstract

Food waste is a growing global issue with significant consequences, including the intensification of food insecurity, the exacerbation of climate change, and environmental degradation. Efforts to address the problem, particularly at the consumer level, have not been effective. This is mainly because consumer food waste and reduction efforts are influenced by multiple interacting and highly contextual factors, including purchasing behaviors, and consumer opinions, attitudes, and understanding of food date labels, of which there are about 50 in the U.S. There is uncertainty and persistent misunderstanding abound regarding the meaning of food date labels. This requires investigating the causes of the misunderstandings to determine how they can be better addressed. We explored the food purchasing attitudes, knowledge, and opinions of U.S. consumers regarding food date labels using quota

[a] * *Corresponding author:* Jelili A. Adebiyi, PhD, Assistant Professor, Department of Earth, Environment, and Geographical Sciences, Northern Michigan University; Marquette, MI 49855 USA; and Department of Forestry, Michigan State University; Natural Resources Building; 480 Wilson Road, Room 131; East Lansing, MI 48824 USA; jadebiyi@nmu.edu; https://orcid.org/0000-0002-9518-8784

[b] Noleen R. Chikowore, PhD, Lecturer, School of Earth and Environment, University of Leeds, Leeds, LS2 9JT, UK; and Department of Community Sustainability, Michigan State University, East Lansing, MI 48824 USA; n.r.chikowore@leeds.ac.uk; https://orcid.org/0000-0002-0224-2260

[c] Angel S. Forde, PhD, Faculty Extension Agent, Cooperative Extension Programs, College of Agriculture and Food Science, Florida Agricultural and Mechanical University (FAMU), Tallahassee, Florida USA; Angel.Forde@famu.edu; and Department of Community Sustainability, Michigan State University, East Lansing, Michigan USA.

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sampling. Data was collected through a survey completed by 742 respondents. Many U.S. consumers still do not understand the difference between *best before* and *use by* dates, as well as the primary purpose of *best by, use by,* and *sell by* dates. The date labels were conflated with food safety, leading to food waste when a food item passes its *best by, sell by,* or *use by* date. The *sell by* date was misunderstood as implying food quality. The *use by* date was the most likely to be misunderstood and misrepresented by U.S. consumers. We identified how this confusion could be addressed and how U.S. food retailers can contribute to reducing consumer food waste by offering price discounts for individual food items, rather than promotions that encourage the bulk purchasing to receive discounts.

Keywords
food waste; food date labels; food purchasing; best by date; use by date; sell by date; consumer knowledge, attitudes, and opinions

Introduction

Food waste is a growing global problem with enormous consequences, including the intensification of hunger, food insecurity, and climate and environmental change. In its 2021 Food Waste Index Report, the United Nations Environment Program (UNEP) estimated that 931 million tons of food are wasted annually. Global food loss and waste are valued at $936 billion annually (World Economic Forum (WEF) and McKinsey & Company, 2020). The amount of food wasted globally equals 1 billion meals per day (World Food Program (WFP), 2024). The majority of wasted food comes from households (569 million tons, 61%), followed by food service (244 million tons, 26%), and then retail (188 million tons, 13%) (UNEP, 2021). Given these staggering figures, it is imperative to explore and develop a better understanding of the causes of consumer food wasting and how they can be addressed.

Despite increasing awareness and education about the problem, consumer food wasting seems to be worsening, especially in the United States (Shanker, 2023). This suggests that the issue requires further empirical scrutiny, which underpins the rationale for conducting this study to investigate consumer food waste in the U.S. Among 35 high-income countries, the U.S. has the highest consumer food waste (ReFED, 2021) and the highest food waste per capita (95.1 kg) (Economist Intelligence Unit, 2018).

In the U.S., about 35% to 40% of the food produced is wasted or lost annually (Environmental Protection Agency (EPA), 2019). This amounts to 130 billiono meals and an economic loss valued at $285 billion (ReFED, 2021). Most of the wasted food in the U.S. ends up in landfills (Environmental Protection Agency [EPA], 2019). Landfilled food waste accounts for 58% of U.S. methane emissions, the third-largest source in the country (EPA, 2024; Povich, 2021).

Furthermore, U.S. households and consumer-facing businesses, such as retailers and food service establishments, are responsible for the majority of the wasted food in the country. In 2019, 37% (30 million tons) of the wasted food in the U.S. was attributed to consumers and households, while consumer-facing businesses contributed 28% (23 million tons) (ReFED, 2021). Confusing food labels exacerbate the problem of food wasting among consumers in the United States (Povich, 2019).

U.S. consumers are often confused about and tend to misunderstand multiple retail food date labels, such as *sell by, use by,* and *best by* (Neff et al., 2019; Patra et al., 2022a; Wilson et al., 2017, 2018). Most of these labels indicate peak food quality and freshness, not food safety (MITRE-Gallup, 2023). The *sell by* date specifies how long food items should be shelved for sale. As indicated by the U.S. Department of Agriculture (USDA, 2025), *sell by* has nothing to do with food safety. Meanwhile, the *use by* date is the last day manufacturers suggest consuming a food item, after which the quality begins to decline. Except for infant formula, the *use by* date is not connected to food safety (USDA, 2025). The *best by* date indicates when consumers should consume food for peak quality or flavor. These food date labels are neither federally regulated (USDA, 2025) nor science-based (Patra et al., 2022b).

Food date labels intertwine with and exacerbate consumer food wasting (Patra et al., 2020,

2022b). Despite growing scholarly attention to the topic (Kavanaugh & Quinlan, 2020), food labels remain a leading factor in U.S. consumers' food buying and waste decisions (MITRE-Gallup, 2023; Patra et al., 2022b). In their survey of 9,259 Americans, MITRE-Gallup (2023) found that 10% of food wasted in the U.S. was due to continued and increased consumer misunderstanding and confusion over food date labels. This underscores the need for more research on U.S. consumers' perceptions, knowledge, and understanding of food date labels to determine whether they still misunderstand and misinterpret their meaning. Moreover, there is a lack of nationally representative data on the subject matter (MITRE-Gallup, 2023), further justifying this study.

Against the above backdrop, this survey-based study was conducted to explore U.S. consumers' perceptions, knowledge, and understanding of *best by, best before*, *use by,* and *sell by* date labels, as well as the gaps in their understanding. We also explored how U.S. consumers use food date labels to determine whether a food is suitable for consumption or should be discarded. In doing so, this study aims to contribute to an improved understanding of how misconceptions about food date labels influence consumer food waste in the U.S. Another goal is to determine whether there has been an improvement in U.S. consumer understanding of food date labels.

Additionally, consumer food wasting is associated with overbuying driven by retail marketing strategies such as price discounts on individual food items, multibuy promotions, and whether food items are sold loose or prepackaged (Calvo-Porral et al., 2017; Quested et al., 2013; WRAP, 2022). The effect of selling food items either loose or prepackaged on consumer food waste also varies depending on the type of food items (WRAP, 2022). The intersection of these retail-related factors with consumer food waste is poorly understood (Tsalis et al., 2021; WRAP, 2022), and existing evidence is ambiguous and mixed (Calvo-Porral et al., 2017; Tsalis et al., 2021). For example, some studies reported positive and negative relationships between price discounts for food items and consumer food waste (Tsalis et al., 2021; Tsalis et al., 2024). Other studies, such as Katajajuuri et al. (2014) and Giordano et al. (2019), found no correlation between purchasing food at discounts and consumer food waste. This underscores why this study also examined how sales offers and the format in which food is sold—whether loose or prepackaged—influence U.S. consumer food purchasing behaviors. Additionally, we examined the relationship between the retail factors and the wasting of various types of food.

Food wasting and food waste reduction by consumers involve a high level of complexity due to multiple interacting and highly contextual factors (Quested et al., 2011, 2013). For example, a consumer's decision to throw away food may be motivated by insights derived from food date labels and personal judgment of whether the food appears expired or has a bad taste (Ahmed et al., 2021; Gong et al., 2022). Additionally, the reduction of food wasting by consumers can be influenced by habitual social factors, values, and motivations, such as a desire to manage their homes effectively, eagerness to save money, and concerns for environmental and climate health (Ahmed et al., 2021; Diaz-Ruiz et al., 2018; Lyndhurst and Waste and Resources Action Program (WRAP), 2011; Patra et al., 2020; Quested et al., 2013). Moreover, the impact of consumers' understanding of food date labels on food waste is best examined within the broader context of their food practices—attitudes, values, habits, and behaviors (Quested et al., 2011; Quested et al., 2013; Lyndhurst & WRAP, 2011). Therefore, we also examined how such consumer food practices affect food waste and U.S. consumers' waste reduction efforts. Our investigation also examined the perceived importance of including information on food labels, such as storage, freezing, defrosting, packaging, and the optimal time to consume opened canned food to help consumers reduce food wasting.

To achieve our underlying research objectives, we addressed the following questions: (1) How much food do American consumers waste at the household level, and how does this vary by food type? (2) How do sales promotions and the format in which food is sold—loose versus prepackaged—affect U.S. consumer purchasing habits, and what impact do these factors have on the waste of dif-

ferent types of food? (3) Do Americans still misunderstand food date labels, and do their perceptions, understanding, and use of these labels contribute to food waste? How does this vary by food type and socio-demographic factors? (4) Could including information on storage, freezing, and defrosting alongside food date labels help reduce consumer food waste in the U.S.? (5) What would motivate Americans to reduce food waste at home, and how do financial, emotional, practical, and environmental factors influence their behavior?

Methods

Data was collected in the Fall of 2019 using a virtually deployed Qualtrics survey collaboratively designed by researchers from different disciplines. The sustainability-focused survey was divided into various parts that aligned with gaps in scholarship and questions the participating researchers wanted to explore. These questions included topics such as food waste, climate change, ecological restoration, and sustainability knowledge, with each researcher responsible for populating their survey section with relevant questions. The food waste section of the survey, which informed this study, comprised questions on the following topics: household food preparation, estimated food thrown away, food shopping and wasting behaviors, reasons for food waste, feelings about wasted food, motivation to reduce food waste, and understanding of food date labels. To allow comparison with existing studies, some questions were adopted from previous food waste surveys (Aktas et al., 2018; Lyndhurst & WRAP, 2011; Neff et al., 2015). Respondents stated their agreement with certain measurement items on a five-point Likert scale (e.g., *strongly disagree*, *disagree*, *somewhat disagree*, *agree*, and *strongly agree*).

We used Qualtrics to deploy the survey. Quotas were used to ensure that the final sample matched U.S. census data for age, sex, race, education, and whether the participant self-identified as living in an urban or rural area. Pew Research Center data was used to identify national trends in political affiliation. Screening participants and data collection were conducted on a rolling basis until Qualtrics had collected enough individuals who met the quota requirements and were not excluded due to poor data quality. Respondents with more than 15% of their responses missing were not included in the data analysis. The threshold was determined through ex-post data collection. SPSS was used to analyze the 742 responses that met our inclusion criteria. Descriptive statistics (e.g., frequencies, percentages) were computed for socio-demographic variables such as age, gender, income, and ethnicity. Spearman's rank correlation was used to estimate bivariate relationships between variables, such as food waste and sales offers, perceived understanding of food date labels and educational status, and food waste and food date labels. A two-tailed p-value <0.05 or <0.01 was considered statistically significant.

Results

Most respondents identified as women (n = 477), white or Caucasian (n = 526), and married (n = 310). Approximately 28.8% (n = 214) indicated that they had completed high school, while another 41.7% (n = 185) reported having some college education or an associate's or other 2-year college degree (Table 1). Only 25.7% of respondents had a bachelor's or another 4-year college degree (n = 116) or a graduate degree (n = 75, 10.1%). More respondents identified as not employed (n = 325, 43.8%) than those working full-time (n = 321, 43.3%), with a significantly higher number than part-time workers (n = 96, 12.9%). At the 0.05 alpha level, a positive and statistically significant relationship (p = 0.079, p = 0.031) existed between respondents' employment status and household food preparation.

About 76% of respondents (n = 562) were responsible for purchasing perishable foods, such as meat, vegetables, fruits, dairy, and bread, for their household. Only 9.6% (n = 71) indicated that they shared the responsibility almost equally with their partners, roommates, or parents. Most respondents (n = 498) purchased their perishables from large retail stores, including Meijer, Walgreens, and Walmart. Only a small percentage shopped at organic grocery stores (n = 97, 13.1%) and non-chain local food stores or farmers markets (n = 20, 2.7%) for their perishables.

Responses to the question "Who is responsible for most of the food preparation in your house-

Table 1. Respondent Socioeconomic Demographics (%)

Variable	Survey (%)
Rural/urban residence	
Urban	72.0
Rural	28.0
Gender	
Women	64.3
Men	35.2
Other	0.5
Age	
19–24	10.5
25–34	24.5
35–44	22.5
45–54	13.5
55+	29.0
Annual Income (US$)	
Less than $20,000	22.8
$20,001–$40,000	27.5
$40,001–$60,000	18.5
$60,001–$80,000	12.8
$80,001–$100,000	8.2
More than $100,001	10.2
Ethnicity	
White/Caucasian	70.9
Black/African American	17.0
Hispanic	5.8
Asian	4.0
Other	2.3

hold?" indicated that approximately 72% (n = 533) of respondents handled most of the food preparation. Only 9.6% (n = 71) shared this responsibility with household members. Those who bought perishables (n = 562, 75.7%) also prepared them, with most of these individuals being women. The relationship between gender and food preparation was found to be negatively correlated (ϱ = -0.058), although the correlation was not statistically significant.

Sales and Prepackaged Food: Effects on Respondents' Waste and Purchasing Behaviors

Sales offers seem to influence respondents' food purchasing habits, with the majority reporting that they use them, while only a small portion stated they do not (Table 2). Furthermore, about half of the respondents (n = 451, 47.3%) indicated that sales offers led them to purchase more food than necessary, while 25.8% (n = 192) held the opposite view. This overbuying was linked to more food waste. Interestingly, those who utilized sales offers wasted less food overall, including baked items, fruits and vegetables, dairy products, meat, fish, and precooked or preprepared foods.

Prepackaging also influenced food-buying behavior. Almost half of the respondents (n = 323, 43.6%) said they bought more when foods were prepackaged, while about 25% (n = 185) disagreed. Those who bought more food because it was prepackaged also wasted more baked goods, fruits, vegetables, dairy products, meat, fish, and precooked or preprepared foods.

This study also examined preferences for purchasing unpacked fruits and vegetables, as well as discounts on individual items. Most respondents (n = 499, 67.3%) preferred buying unpacked fruits and vegetables to ensure they purchased the right quantity, with a few expressing disagreements. Likewise, the majority favored price discounts on individual food items over multibuy deals (n = 493, 66.4%), with only a small number disagreeing.

Knowledge of Food Date Labels

The majority of respondents said that they had a clear or moderate understanding of the difference between *best before* and *use by* dates (n = 622, 83.8%), while a smaller portion expressed confusion or a lack of understanding (n = 120, 16.2%) (Table 3). Respondents with higher education were slightly less likely to say they understood the difference between the date labels, but this weak relationship was not significant at the 0.01 alpha level (p = -0.005).

We also tested respondents' understanding of the primary purpose of the *best by*, *sell by*, and *use by* dates. Just over half correctly understood the *best by* date (n = 388, 52.3%) as indicating food quality. Many people mistook it for a food safety warning, and others interpreted it as signaling a discard date or when to remove food from store shelves. Similarly, most respondents (n = 385, 51.9%) correctly understood the *sell by* date as indicating when stores

Table 2. Respondent Food Purchasing Behaviors Related to Sales and Packaging, and their Correlation with Food Waste by Product Category

Statements about food purchasing	Strongly disagree (%)	Disagree (%)	Neither disagree nor agree (%)	Agree (%)	Strongly agree (%)
I take advantage of sales offers	3.2	3.9	15.1	38.4	39.4
Sale offers lead me to buy more than I need	7.5	18.3	26.8	30.3	17.0
I buy more quantity of prepackaged items than if I were to buy the same items individually	9.2	15.8	31.5	27.8	15.8
I would prefer to buy my fruit and vegetables individually (rather than prepackaged) so I can decide how much to buy	3.4	6.6	22.8	39.9	27.4
I would prefer if shops offered price discounts on single items instead of having to purchase more than one item together (e.g., buy one, get one free)	3.1	7.4	23.0	38.4	28.0

Spearman correlation coefficient values between how much food was thrown away the week before taking the survey and different forms of sales promotional

		Baked items	Dairy products	Fruits and vegetables	Meat and fish	Precooked/ preprepared food
I take advantage of sales offers	correlation coefficient	-0.177**	-0.176**	-0.168**	-0.228**	-0.186**
	Sig. (2-tailed)	<0.001	<0.001	<0.001	<0.001	<0.001
Bought more food than needed due to sale offers	correlation coefficient	0.274**	0.307**	0.219**	0.226**	0.195**
	Sig. (2-tailed)	<0.001	<0.001	<0.001	<0.001	<0.001
I bought more prepacked food items than I could have purchased individually	correlation coefficient	0.140**	0.212**	0.158**	0.146**	0.108**
	Sig. (2-tailed)	<0.001	<0.001	<0.001	<0.001	<0.003

** Correlation is significant (Sig) at $p < 0.01$ (2-tailed)

should remove food from their shelves, while others mistook it as indicating food quality or safety. Furthermore, only 15.5% ($n = 115$) correctly recognized the *use by* date as a marker of food quality. The rest misunderstood it as signaling that the food is becoming unsafe and should be discarded or removed from store shelves.

Understanding of *best by* showed almost no association with education level. For the *sell by* date, those with more education tended to understand slightly better, but the relationship was not statistically significant. Interestingly, individuals with more education were somewhat less likely to interpret the *use by* date correctly; however, this relationship was not statistically significant.

Food Date Labels: Usage, Attitudes, and Opinions

Most respondents ($n = 473$, 63.7%) stated that food label dates help them determine when food is no longer suitable for consumption, although 21.8% ($n = 162$) were unsure (Figure 1). Additionally, most respondents believed that checking if food is bad before throwing it away is important, even if it has passed its labeled date, while some were uncertain about this. The findings also revealed mixed attitudes toward discarding food past its labeled date, even when the food is still good. Most respondents were uncertain or unconvinced, whereas some believed it was important to throw away such food, though only a small portion felt strongly about it. Moreover,

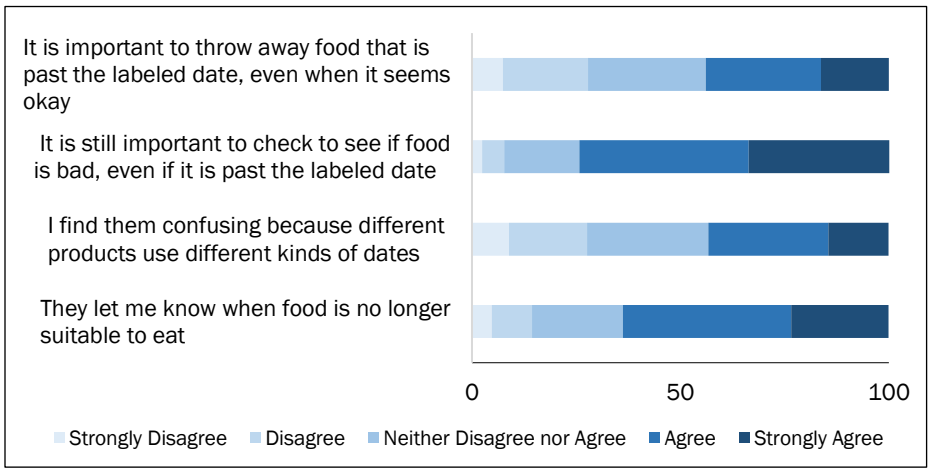
Table 3. Respondents' Knowledge of the Primary Purpose of Food Date Labels and Correlation with Their Education Status

Do you understand the difference between **best before** *dates and* **use by** *dates?*			%
Not at all			3.0
I am a little confused			13.2
More or less			40.0
Absolutely			43.8
What is the primary purpose of each of the following date labels?	**Best by (%)**	**Sell by (%)**	**Use by (%)**
To inform people when food becomes unsafe	32.2	12.8	55.0
To inform people when food quality is guaranteed	52.3	32.2	15.5
To inform stores when to take food off the shelves	10.2	51.9	19.9
To inform me when I should discard the food	5.3	3.1	9.6
Spearman's correlation between perceived understanding of some date labels and educational status			**Education**
Understand the difference between ***best before*** dates and *use by* dates	correlation coefficient		-0.005
	sig. (2-tailed)		0.896
Understand the primary purpose of *best by* date label	correlation coefficient		0.008
	sig. (2-tailed)		0.823
Understand the primary purpose of *sell by* date label	correlation coefficient		0.049
	sig. (2-tailed)		0.183
Understand the primary purpose of *use by* date label	correlation coefficient		-0.049
	sig. (2-tailed)		0.180

Correlation is significant at $p < 0.01$ (two-tailed)

43.2% of the respondents (n = 321) agreed that the use of different types of dates on products confuses them, while a smaller number disagreed, and some remained neutral.

Figure 1. Respondent Use and Opinions about Food Date Labels



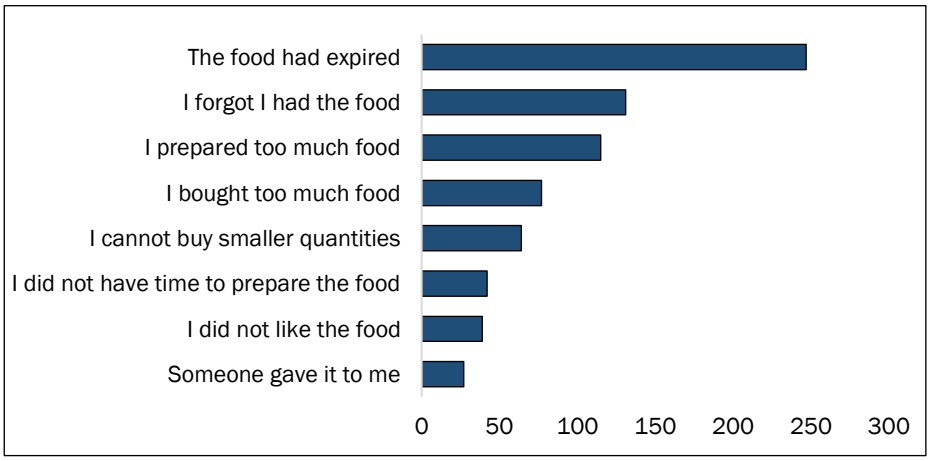
Throwing Away Foods, Foods Thrown Away

Respondents self-reported their household food waste for the previous week, with most indicating they threw away a small portion of their food, and a smaller number reporting that they wasted larger amounts of their food (30% to 40%). A few reported wasting nothing (Table 4). Furthermore, most respondents reported throwing away very little of the following: baked goods, dairy products, precooked or preprepared foods, meat and fish, and fruits and vegetables. However, baked goods were the least wasted, with 49.5% (n = 367) saying they threw away "hardly any." Fruits and vegetables had the highest number of respondents reporting larger amounts of waste. Across all categories, a smaller number of respondents indicated throwing away "a lot," and only a few reported not consuming certain food types at all.

Respondents were asked why they threw away food the last time before the survey. Most (n = 247, 33%) said the food had expired, 17.7% (n = 131) said they had forgotten about it, and 15.5% (n = 115) cited preparing too much food (Figure 2). We examined how food date labels influence the decisions to discard food. Most respondents would almost certainly discard

food if it looked expired (*n* = 546, 73.6%) or tasted bad (*n* = 598, 79.9%). Opinions were more divided about discarding food past *sell by* and *best before* dates, with many respondents unsure or neutral. However, respondents were generally more inclined to discard food past the *use by* date compared to the *best before* date. Equally, a greater number (*n* = 255, 25.1%) reported being less likely to discard foods past the *best before* date than those past the *use by* date (*n* = 139, 18.7%) (Figure 3).

Figure 2. Reasons for Throwing Away Food by Respondents



Respondents who reported higher food waste in the week before the survey were more likely to discard food past the *best before* and *sell by* dates (Table 5). In contrast, respondents were less likely to discard food solely based on whether it appeared expired or tasted bad. While there was a positive association between higher food waste and discarding food past the *use by* date, the relationship was not statistically significant.

Table 4. Self-Reported Food Waste by Respondents the Week Before the Survey

Percentage of food wasted by respondents

Percentage of food wasted	Number of respondents	Percentage of respondents
0	69	9.3
10	339	45.7
20	145	19.5
30	90	12.1
40	45	6.1
50	54	7.3
Total	742	100.0

Importance of Information on Food Labels

We asked respondents to rate the importance of specific information on food date labels to help reduce food waste. This included information on how to ensure food lasts, freezing, defrosting, consumption after opening, and packaging food for freshness. Most respondents considered this information important (Figure 4). The highest importance was placed on how soon to consume a product after opening (*n* = 528, 71.2%), followed by information on packaging for freshness (*n* = 507, 68.3%). Fewer respondents found guidance on freezing and defrosting (*n* = 31, 4.2%) or whether a product is suitable for home freezing (*n* = 28, 3.8%) to be important.

We asked respondents how they decide to store their food. Most relied on information from food labels or packaging (always: *n* = 324, 43.7%; sometimes: *n* = 258, 34.8%). Only 21.6% (*n* = 160) relied on their own knowledge.

Opinions on Food Waste Reduction Decision-Making

Many respondents reported that thinking about the possibility of saving money was a strong motivator

Amount of different food types thrown away by respondents

	Hardly any	Some	A fair amount	A lot	We do not eat this food	Mean	Standard deviation
Bakery items	367	139	109	90	37	2.24	1.88
Vegetables and fruits	289	194	132	114	13	2.22	1.41
Dairy products	336	142	137	108	19	2.20	1.56
Meat and fish	331	139	140	105	27	2.28	1.71
Precooked or preprepared foods	332	155	116	98	41	2.36	1.93

Figure 3. Survey Response to the Statement on the Likelihood of Throwing Away Food Because It Looks Expired or Is Past Specific Food Date Labels

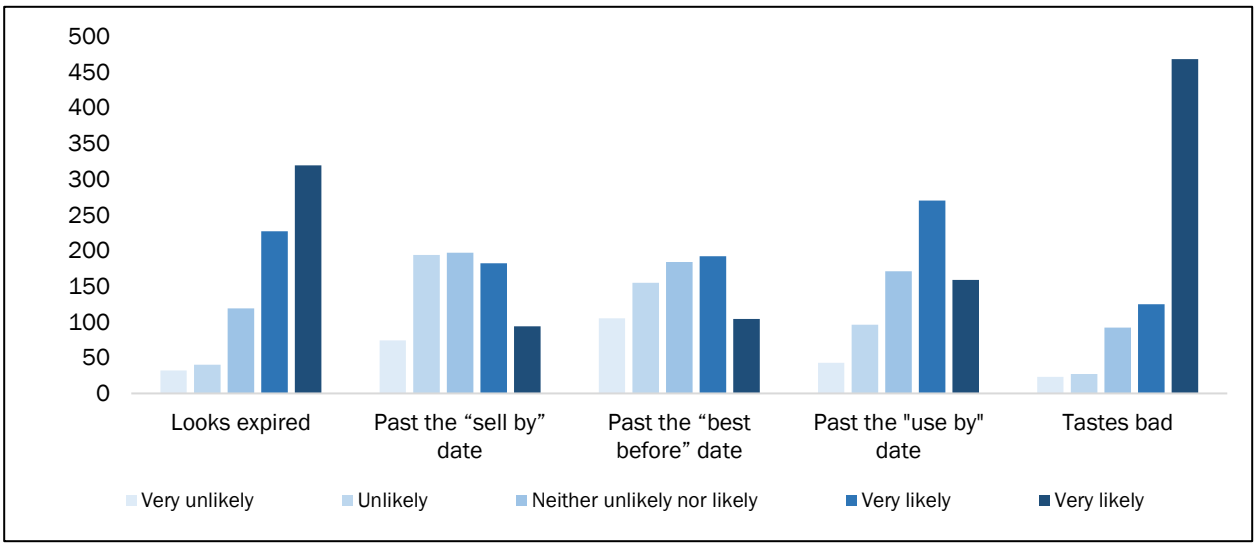


Table 5. Correlation Between Food Waste and Date Labels

		Spearman's **Rank Correlation Coefficient**				
		Past “best before” date	**Past “use by” date**	**Past “sell by” date**	**Tastes bad**	**Looks expired**
Estimated amount of food wasted	correlation coefficient	0.185**	0.064	0.163**	-0.264**	-0.106**
	sig. (2-tailed)	<0.001	0.084	<0.001	<0.001	0.004

** Correlation is significant (Sig) at $p < 0.01$ (2-tailed)

Figure 4. Survey Response to the Importance of Information on Food Storage, Packaging, Freezing, Defrosting, and Consumption Timing of Opened Products

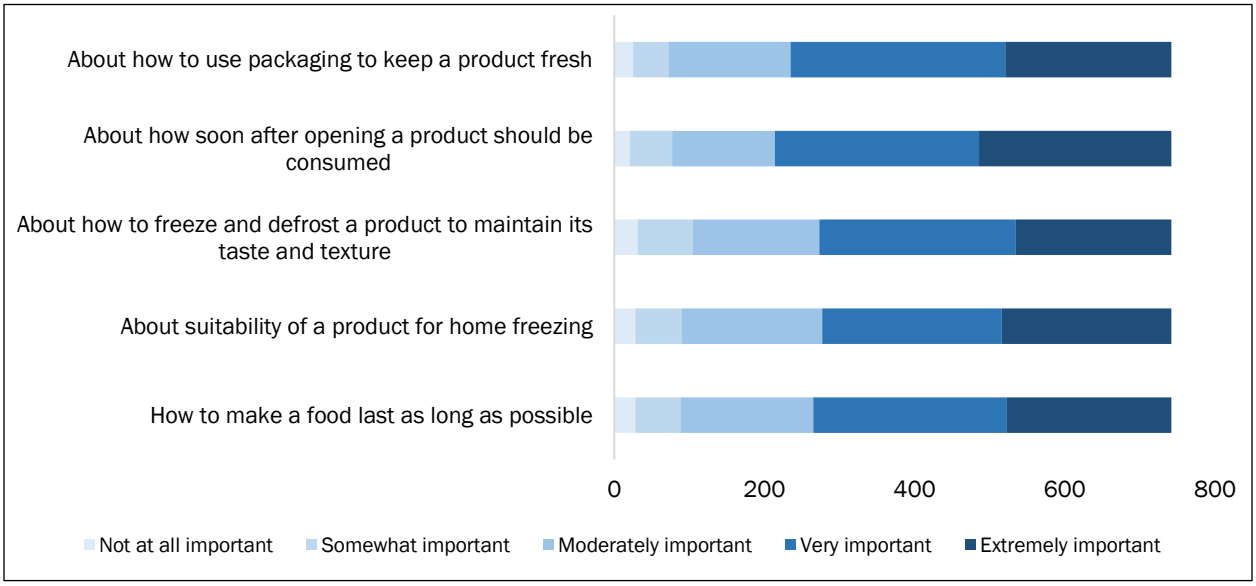


Table 6. Motivation to Reduce Food Waste (% of Response)

Motivation	Slightly Important	Moderately Important	Extremely Important
The possibility of saving money	14.7	25.1	60.1
The feeling of guilt about the time spent shopping, storing, or preparing food not eaten	24.1	31.1	44.8
Wanting to manage my home efficiently	16.8	29.2	60.0
Wanting to make a difference	18.7	27.8	53.5
Thinking about the greenhouse gases, energy, and water resources it took to get the food to my plate	25.1	53.2	46. 7

for reducing food waste, with 60.3% (n = 447) rating it as either extremely or very important (Table 6). Guilt about wasting the time spent purchasing, storing, or preparing food that was not consumed also played a significant role, although to a somewhat lesser extent. Most respondents indicated that managing their households effectively and believing their actions could have an impact were important motivations for reducing food waste. Similar attitudes were reflected in responses to the statement linking the reduction of wasted food to concerns about greenhouse gases, energy, and water resources used in the production and distribution of food from farm to plate—though the views here were more mixed, with fewer rating these concerns as extremely important (n = 145, 19.5%).

To reduce food waste, 52.3% (n = 488) of respondents wanted supermarkets to help consumers avoid overbuying, while 29.2% (n = 217) neither agreed nor disagreed. Approximately 19% either strongly disagreed (n = 49, 6.6%) or disagreed (n = 88, 11.9%).

Discussion

This study revealed that many U.S. consumers still do not understand the difference between *best before* and *use by* dates on food labels, as well as the primary purpose of *best by, use by,* and *sell by* dates (Neff et al., 2019; Wilson et al., 2018). The findings demonstrate how misinterpretation of these dates can lead to food waste and impact consumer purchasing behaviors. For example, 32.2% of respondents misinterpreted *best by* dates as specifying when food items are unsafe for consumption, which could lead to the unnecessary discarding of food. Mistaking *sell by* dates as a guarantee of food quality and safety, and misidentifying *use by* dates as indicating when food becomes unsafe, could lead to consumer food waste (Kavanaugh & Quinlan, 2020). The misrepresentations may also result in consumers avoiding or buying less food near its *best by*, *sell by*, or *use by* dates, leading retailers to discard unsold items (Yu & Jaenicke, 2021).

This confusion and misrepresentation suggest a need for more consumer education and clarification about food date labels from government agencies and nongovernmental organizations, such as the USDA, ReFED, Food Marketplace Inc., and large food retailers. The nature of the confusion suggests that the clarification could entail describing the date labels in terms of what they imply and what they do not. For example, the *best by* date can be accompanied by a statement indicating that it does not signify food safety or when the food should be discarded. The statement could also clarify that a food item that has passed its *best by* date does not necessarily mean it is unsafe to eat. It could also encourage consumers to use their sensory judgment to determine whether the food is still suitable for consumption. Similarly, the *sell by* date can be accompanied by a caveat that it does not indicate either food quality or food safety. Furthermore, the finding that over 50% of the respondents mistakenly believed the *use by* date indicated when food becomes unsafe illustrates the need for targeted consumer education. Additionally, the confusion among respondents regarding different food date labels highlights the need to streamline and standardize these labels to reduce food waste, as recommended by the FDA and USDA (EPA, 2019; U.S. Government Accounta-

bility Office [GAO], 2019). Considering existing consumer perceptions is crucial when standardizing these dates (Wilson et al., 2018).

Consistent with Kavanaugh and Quinlan (2020) and Newsome et al. (2014), our findings suggest that among *sell by*, *use by*, and *best by* dates, the *use by* date is the most likely to be misconceived and misrepresented by U.S. consumers. This may be due to the different definitions and varied applications associated with the *use by* date (Newsome et al., 2014). For example, the USDA states that the *use by* date is related to food safety only for infant formula: "A 'use-by' date is the last date recommended for using the product while at peak quality. It is not a safety date except when used on infant formula" (USDA, 2025, para. 12). The fact that over 50% of respondents mistook the *use by* date as indicating when food becomes unsafe may be connected to its use on infant formula. In the European Union, the *use by* date signifies food safety, meaning foods should not be eaten after this date (Hall-Phillips & Shah, 2017; Toma et al., 2017). Similarly, members of the United States Food Industry Association, the Food Marketing Institute, and the Grocery Manufacturers Association use the *use by* date as a marker of food safety (Roberts, 2022). The varying meanings and contexts of the *use by* date confuse consumers (Broad Leib et al., 2016). This highlights the need to streamline the meanings and applications of the *use by* and other food label dates, both nationally and globally. This could be achieved through an integrated, multi-stakeholder-engaged approach, as proposed by Patra et al. (2022a). The government could work with stakeholders like Food Marketplace Inc. to streamline and standardize the food date labels. Passing the Food Date Labeling Act of 2023 before the U.S. Congress is also imperative for regulating and unifying the dates (H.R.3159, 118th Congress, 2023).

Our findings suggest that including specific information on food labels could help reduce food spoilage, quality loss, and waste. This information should cover how to store and handle food to achieve a longer shelf life, whether a food item is suitable for home freezing, and the proper methods for freezing and defrosting to maintain optimal flavor, texture, and taste. As suggested by Newsome et al. (2014), combining *best by* dates with freeze-by statements on food labels could provide guidelines on whether and how to freeze food and the optimal time frame for consumption after removing it from the freezer. Combining *freeze by* instructions with *use by* dates could help guide consumers in preventing the wasting of food items frozen past their *use by* dates. The findings also highlight the need for consumer education on best practices for safely storing, home-freezing, refrigerating, and defrosting food to reduce spoilage and waste.

The motivation for reducing food waste that is linked to greenhouse gas emissions and the resources used in food production and supply chains aligns with Stangherlin and de Barcello (2018) but differs from Neff et al. (2015). The finding suggests that educating the U.S. public through awareness campaigns about the climate and environmental impact of food waste could reduce consumer food waste. Illustrating how reducing food waste improves climate and environmental health may be particularly effective for eco-conscious consumers (Pellegrini et al., 2019). The finding highlights the need to integrate policies and programs aimed at reducing greenhouse gas emissions, mitigating climate change, and promoting environmentally friendly behaviors with efforts to prevent and minimize consumer food waste. This integration could increase awareness of the link between environmental health and food waste prevention. Additionally, promoting money-saving and smart shopping strategies, such as purchasing only the necessary quantities and using a shopping list, can help reduce food waste among consumers (Young et al., 2017). These strategies should be incorporated into broader consumer food waste prevention education to prevent impulse and excess buying due to sales and discounts, which can lead to food waste (Porpino et al., 2015).

This study revealed that most respondents were highly responsive to food sales promotional offers. However, the implications of the findings for consumer food purchasing behaviors and food waste are nuanced. On the one hand, the findings showed that sales promotions encouraging consumers to make excessive purchases for discounts can lead to increased food waste. While this aligns

with Gravert and Mormann (2025), it contrasts with Tsalis et al. (2024), who reported that buying discounted food resulted in less waste. Interestingly, this study also found that taking advantage of sales offers does not necessarily lead to more food waste, a finding consistent with Tsalis et al. (2024). This may be because buying food items on sale does not always equate to overbuying.

Consistent with Stangherlin and de Barcellos (2018), this study shows that food retailers could play a crucial role in helping consumers reduce food waste. U.S. food retailers could do this by replacing promotional sales offers that lead to overbuying and increased food waste with price discounts on individual food items. They could also prioritize selling food items, especially fruits and vegetables, loose rather than prepackaged. This is because, as both this study and WRAP (2021) have revealed, purchasing prepackaged food items could lead to increased food waste. This is particularly important, given that most respondents prefer to buy their fruits and vegetables loose to ensure they purchase the correct quantity.

Conclusions

The study examined U.S. consumers' understanding and use of *best by, best before*, *use by,* and *sell by* food date labels, focusing on how these labels influence decisions about food consumption, discarding, and waste reduction. We also explored how sales offers and whether food items are sold loose or prepackaged affect food purchasing behaviors and food waste. The findings revealed that many U.S. consumers still do not comprehend the differences between *best before* and *use by* dates, nor the primary purposes of *best by, use by,* and *sell by* dates. Specifically, the *use by* date is the most likely to be misunderstood and misrepresented. Misunderstanding and confusion about the food date labels contribute to consumer food waste. This study also showed that promotional offers influence food purchasing behaviors, which could lead to overbuying, but not necessarily to increased food waste. In contrast, this study revealed that purchasing prepackaged food items can lead to increased food waste.

To reduce consumer food waste, this study concludes that sustained, targeted education is necessary to clarify the meanings of food date labels. It also highlights the need to streamline and standardize the many food date labels currently in use. The study emphasizes the importance of including information on food labels about proper storage and handling, suitability for home freezing, and guidelines for freezing and defrosting to maintain optimal quality. Additionally, promoting money-saving and smart shopping strategies, such as purchasing only the quantities needed, could help consumers reduce food waste. Retail stores could also contribute to reducing consumer food waste by replacing multibuy promotions with individual food item discounts and by selling food, especially fruits and vegetables, loose rather than prepackaged.

The findings of this study suggest the need for further exploration, including how best to incorporate additional information on food date labels that clarifies their meaning and what they do not mean. Further studies could also explore the most effective ways to educate consumers from diverse backgrounds about the meanings of food date labels. Additionally, studying how food date labels influence purchasing and consumption behaviors would help deepen the understanding of their role in consumer food waste.

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