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# Food Quality and Preference

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## Food waste: The role of date labels, package size, and product category

Norbert L.W. Wilson<sup>a</sup>, Bradley J. Rickard<sup>b,\*</sup>, Rachel Saputo<sup>b</sup>, Shuay-Tsyh Ho<sup>b</sup><sup>a</sup> Department of Agricultural Economics and Rural Sociology, Auburn University, Auburn, AL 36849, United States<sup>b</sup> Charles H. Dyson School of Applied Economics and Management, Cornell University, Ithaca, NY 14853, United States

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### ABSTRACT

The presence of food waste, and ways to reduce it, has generated significant debate among industry stakeholders, policy makers, and consumer groups around the world. Many have argued that the variety of date labels used by food manufacturers leads to confusion about food quality and food safety among consumers. Here, we develop a between-subject, laboratory experiment with different date labels (Best by, Fresh by, Sell by, and Use by) for products (ready-to-eat cereal, salad greens, and yogurt) of different sizes and dates to evaluate how date labels influence the value of premeditated food waste of subjects, or their willingness to waste (WTW). Subjects have different WTW over products, sizes, and dates; we expect that ambiguity avoidance may prompt differences in the WTW. The WTW is greatest in the “Use by” treatment, the date label which may be the least ambiguous and suggestive of food safety. The WTW is the lowest for the “Sell by” treatment, which may be the most ambiguous date label about safety or quality for the consumer. Results from the mixed-design, repeated measures ANOVA provide evidence that subjects have different WTW by date labels over products.

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### 1. Introduction

The presence of food waste, and ways to reduce food waste, has generated significant debate among industry stakeholders, policy makers, and consumer groups. Arguably, food waste has become one of the top issues for individuals and organizations involved in food marketing and food policy in the United States and elsewhere. The U.N. Conference on Sustainable Development acknowledges food waste and food loss as important components of food insecurity in their Zero Hunger Challenge (Halloran, Clement, Kornum, Bucatariu, & Magid, 2014). In June 2013, the U.S. Department of Agriculture (USDA) and the U.S. Environmental Protection Agency (EPA) partnered to launch the U.S. Food Waste Challenge, an initiative to reduce food waste throughout the food supply chain.<sup>1</sup> Some have estimated that annual food waste costs in the United States are approximately \$160 billion, representing resources that went into the production, distribution, and marketing of food products (Buzby, Wells, & Hyman, 2014; Newsome et al., 2014; Pierson, Allen, McLaughlin, & Halloran, 1982). Food waste is also a food security concern as it symbolizes a lost opportunity to feed

the 17.4 million food insecure U.S. households (Coleman-Jensen, Rabbitt, Gregory, & Singh, 2015).

Buzby et al. (2014) estimate that 31% of food is wasted; this is the total of food wasted by consumers (21%) and producers (10%). Given the consumer share of food waste in the United States and several efforts to address food waste in production, distribution, and storage, we work to understand better date labels, such as “Best by”, “Fresh by”, “Sell by”, and “Use by” as a possible avenue to mediate food waste. Specifically, we focus on the effects of different date labels, on anticipated food waste, which may reflect the actual level of food waste. In this analysis we create a new measure of food waste, the willingness to waste (WTW), which is based on the value ascribed to the product by subjects and their anticipated waste.<sup>2</sup> This analysis suggests that date labels may influence consumer willingness to pay (WTP) for food products, the anticipated waste, and the WTW.

A burgeoning literature explores the role of date labels on food waste. Critics argue that date labels are confusing for consumers, and that this confusion encourages unnecessary levels of food waste (Newsome et al., 2014; Wansink & Wright, 2006; WRAP,

\* Corresponding author.

E-mail address: [bjr83@cornell.edu](mailto:bjr83@cornell.edu) (B.J. Rickard).<sup>1</sup> A summary of the USDA report can be found at ([http://www.usda.gov/oce/food-waste/usda\\_commitments.html](http://www.usda.gov/oce/food-waste/usda_commitments.html)).<sup>2</sup> We thank Will Masters for noting previous use of “willingness to waste”. Notably Hurlley and Shogren (1997, 1998a, 1998b) use the term to mean the value of a prize that a player in a game theoretic model would be willing to dissipate in order to win the prize. Other researchers have made passing reference to willingness to waste, which was not measured or empirically derived. However, to our knowledge we know of not other use of the phrase to mean the value of anticipated food waste.

2011). Evidence suggests that consumers waste food products as they near the date posted on the date label (open date label) for perceived food safety reasons (Kantor, Lipton, Manchester, & Oliveira, 1997; Miles & Frewer, 2001; Newsome et al., 2014; Woodburn & Van Garde, 1987). In addition to food being discarded for reasons related to perceived food safety, others have shown that consumers waste food for reasons related to food quality (Theotokis et al., 2012; Tsiros & Heilman, 2005). Wansink and Wright (2006) find that as consumers observe an approaching “Best if Used By” date label, they decrease their acceptance, as well as the perceived healthfulness and freshness of the product.

Despite discussions about the quantity and value of food waste in the United States, little empirical work exists that provides primary data to quantify food waste and describes how food waste may vary across different populations and across different products. Understanding consumer behavior is a key factor in developing a better understanding of the causes of food waste and the consequences of changes that might be employed to mitigate food waste. As part of this discussion, we have witnessed a range of public policy recommendations that have proposed to change the language used on food as it relates to date labels (Newsome et al., 2014). One example is the bill titled “The Food Date Labeling Act” that was introduced in May 2016 in the U.S. House of Representatives and Senate (H.R. 5298 and S. 2947).<sup>3</sup>

For the purpose of this research, we developed an experiment to study the factors that influence food waste. We include a range of products to understand how date labels influence anticipated waste for products of increasing perishability. As suggested in the literature, product size and expiration dates may influence waste, so we include products of different sizes and dates to evaluate the effects of these parameters on anticipated waste.

### 1.1. Contextual background

In the United States, rules about open date labels differ by state, but overall they are widely unregulated. With the exception of infant formula, which is regulated under the 1980 Infant Formula Act, the U.S. Food and Drug Administration (FDA) does not require food products to display specific open (visible) date labels. However, some poultry, meat, and egg products under USDA jurisdiction necessitate date documentation, but phrases including “Sell by” and “Use before” can be used interchangeably (Leib et al., 2013; Newsome et al., 2014). The USDA does not set out strict guidelines for terminology commonly used on food products. The use of the following date label phrases have been summarized by Tsiros and Heilman (2005):

- “Sell By” conveys to the retailer the last date the product can be displayed for sale. It is not an indication of a product’s safety or quality.
- “Best if Use By,” “Best Before,” or “Best By” are used to suggest the date after which the food’s quality or flavor may deteriorate.
- “Use By” recommends the last date by which the product should be consumed, but does not necessarily convey safety information.

The power to enact additional food date labeling laws rests with sub-national (state and local) authorities, which can include the departments of agriculture, commerce, and health, among other agencies. Additionally, other qualifying phrases such as “Fresh By” or “Enjoy By” can be used by food manufacturers. Though neither are officially indicators of a product quality or product

safety, they suggest quality. The date labels do have the potential to send signals to consumers and influence preferences (Leib et al., 2013). Labels such as “Best Before” are sometimes perceived to indicate microbial safety rather than freshness, while “Use By” may be interpreted to imply quality, depending on accompanying information. Overall, this lack of jurisdiction by a single agency coupled with manufacturer discretion over the application of date labels has the capacity to foster inconsistencies in terminology and confusion about product safety and quality among consumers (Leib et al., 2013).

This confusion is thought to contribute to the disposal of safe and edible food (Codex Alimentarius Commission., 2014; Newsome et al., 2014; WRAP, 2011). In response to the ambiguity of date labels (date markings), Codex Alimentarius has a recommendation to consolidate date labels to two: one to indicate safety and one to indicate quality, which is similar to the bills in the U.S. Congress. Evidence also suggests some consumers believe a product past the open expiration date is no longer safe for consumption (Newsome et al., 2014). Woodburn and Van Garde (1987) found that consumers often disposed of food products that were past the open expiration date without additional sensory evaluation. Results from Kantor et al. (1997) support this claim; consumers reported not trusting their senses as an accurate judge of a food’s edibility, thus preferring to discard food when the quality or safety was questioned. Such evidence implies people place heavier reliance on expiration dates than temperature control, the latter of which is much more important in determining food safety because date labels do not guarantee microbiological food safety (Newsome et al., 2014; Woodburn & Van Garde, 1987).

Antecedents such as risk perception and experience with food-borne illness may shape perception of and engagement with date labels. Past experiences and the risk a consumer associates with a food product also influence how often a person examines the open date label (Tsiros & Heilman, 2005). Specifically, Kantor et al. (1997) found that negative experiences with a food product made consumers more inclined to discard prematurely that product. This increased tendency to waste food because of the expiration date despite lack of apparent safety concerns may be partially attributable to increased consumer awareness and fear of food safety issues (Miles & Frewer, 2001).

In addition to food products being discarded for perceived safety reasons, a food’s quality as signaled by date labels also contributes to food waste. Tsiros and Heilman (2005) found that depending on the product category, between 69% and 84% of consumers believe perishable products deteriorate in quality over time. This result is supported by Theotokis et al. (2012), who provided evidence that products priced lower as they near the expiration date prompts consumers to have negative perceptions of brand quality. While the psychological effects of expiration date-based pricing vary among consumers depending on associated risk and brand loyalty, Theotokis et al. (2012) suggested expiration dates influence how consumers perceive the product, and expiration date-based price changes signal inferior quality and ultimately affect consumer purchasing decisions.

Kantor et al. (1997) also found that bulk purchases contribute to food waste. Marketing tactics, such as “buy one get one free,” may also facilitate impulse purchases, which coupled with poor meal planning, thwarts households from consuming food products before the open date nears (Farr-Wharton, Foth, & Choi, 2014). Inadequate storage facilities and practices further contribute to avoidable food waste, as consumers are prone to forgetting or miscalculating what food they currently have in stock (Kantor et al., 1997). This culture of abundance and reliance on date labels may induce consumers to dispose of food products past the open date label (Godfray et al., 2010). Through the use of an economic experiment that assesses responses to different date labels across prod-

<sup>3</sup> Additional details for this bill can be found at: <https://pingree.house.gov/media-center/press-releases/introducing-commonsense-bill-standardize-food-date-labeling>

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