



February 2018

Food Waste: The Role of Date Labels, Package Size, and Product Category¹

Norbert L.W. Wilson^a, Bradley J. Rickard^b, Rachel Saputo^b, Shuay-Tsyh Ho^b

^aFriedman School of Nutrition Science and Policy, Tufts University

^bCharles H. Dyson School of Applied Economics and Management, Cornell University

Introduction

Food waste has become one of the top food policy issues in the United States and elsewhere. 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). Researchers have estimated that 31% of food is wasted; this is the total of food wasted by consumers (21%) and producers (10%) (Buzby et al. 2014).

Consumers may discard products based on the expiration date because of concerns of safety. The date labels and the expiration dates may also influence perceptions of quality. As a result, perceptions of quality and safety may inform consumers' expected consumption levels (and therefore their expected amount of food waste) at the point of purchase. That is, based on the date label and the expiration date, consumers may knowingly purchase a product with the idea that some portion of it will not be consumed, i.e., some of the value of the product will be discarded.

Our purpose was to better understand date labels, such as "Best by", "Fresh by", "Sell by", and "Use by" and the effects on anticipated food waste. We used four date labels that each used different language. One date label was more suggestive of a food safety concern ("Use by"), two were more suggestive of a food quality concern ("Fresh by" and "Best by"), and one was suggestive of retailer responsibilities rather than a label directed at the final consumer ("Sell by"). We included a range of products to understand how date labels influence anticipated waste for products of 1) increasing perishability, 2) various sizes, and 3) increasing expiration dates to evaluate the effects of these parameters on anticipated waste.

¹ This article has been taken from the journal article of the same name by the authors: "Food waste: The role of date labels, package size, and product category." Elsevier Ltd. *Food Quality and Preference* 55 (2017) 35–44. <http://dx.doi.org/10.1016/j.foodqual.2016.08.004>.

Method

Data were collected from 200 non-student subjects. In the experiment, subjects evaluated three products, yogurt, ready-to-eat breakfast cereal, and salad greens, each in two sizes, small and large. And for each size of product, subjects evaluated three different expiration dates, near, middle, and far.

For each food item, subjects were asked their willingness to pay (WTP) for the item and to indicate the percent of the item that they expect that their household will consume. The expected consumption was subtracted from 100% to calculate the expected waste or “predetermined waste” variable (PW). A measure of the cost of wasted food was calculated by multiplying the PW*WTP and called the “Willingness to Waste” (WTW).

Results

Our results clearly show that date labels do impact consumer behavior (Table 1). “Use by” yielded the greatest WTW, used to represent the cost of discarded food, under nearly every condition, therefore, “Use by” should be adopted in limited ways to express real threats to safety for perishable products and the two bills before the U.S. Congress. “Sell by” generated the lowest WTW; however, this date label may be best as a “closed” date label (not shown to consumers) as it conveys little information to consumers.

Beyond the effect of date labels on the value of PW, we find evidence of a tradeoff in the value versus the quantity of waste. The negative correlation between WTP and PW suggests that consumers are potentially less likely to waste if they value the product more.

Table 1. Date Label Effects on Mean Premeditated Waste (PW), Willingness to Pay (WTP), and Willingness to Waste (WTW)

	Premeditated Waste (PW) <i>% of product</i>	Willingness to Pay (WTP) \$	Willingness to Waste (WTW) ¹ \$
Use By	42.07	1.95	0.60
Fresh By	42.59	1.57	0.46
Best By	45.60	1.44	0.34
Sell By	44.74	1.52	0.30
Overall Date Labels	43.99	1.59	0.41

Our results also suggest that consumers may adjust their PW, WTP, and WTW by product features. Since the impact of expiration date and package size on food waste is a non-trivial concern, these impacts need to be examined more closely to understand more fully how the use of date labels affects food waste over time and across package sizing.

For example, states that make the sale of products beyond the expiration date illegal, e.g. milk in Montana (Leib et al. 2013), may encourage greater waste when the product may be fine for human consumption beyond that specific date. This result suggests that varying product size may be a possible market solution to food waste. Subjects anticipated wasting (PW and WTW) more when presented larger package sizes. While consumers may receive a quantity discount for

larger sizes, this saving may be lost through waste. The potential environmental cost of more packaging is an issue worth considering. Nevertheless, further exploration of expiration dates and package size may be a tool that industry can use to combat food waste.

Conclusion

Researchers, policy makers, and consumers are questioning the efficacy of various mechanisms and policies that might be used to reduce food waste, but little economic research exists that examines the alternatives carefully. Our research finds that the value of consumer food waste does respond to date labels, although the effects vary across food categories.

Our findings show that a date label that is most suggestive of a food safety concern leads to the greatest value of food wasted. Consumers in our experiment anticipated wasting a higher value of food when they were presented with the “Use by” date label. The date labels that are more suggestive of a food quality concern lead to less value of food wasted by subjects in our experiment.

Results from our experiment provide additional support for policy proposals that seek to regulate date labels on food and beverage products. Policies that look to re-evaluate how food and beverage products are labeled may be useful as part of a larger regulatory effort to reduce food waste. As part of this discussion, regulators should consider the full economic and food waste implications of policies that might lead to the harmonization of date label language across all food and beverage products.

Acknowledgements

The project was supported by the Agricultural and Food Research Initiative Competitive Program of the USDA National Institute of Food and Agriculture (NIFA), grant number 2014-67024-21849 and through Hatch project NYC-121864. Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the authors and do not necessarily reflect the view of the National Institute of Food and Agriculture (NIFA) or the United States Department of Agriculture (USDA). Additional support is provided by the Alabama Agricultural Experiment Station at Auburn University.

References

- Buzby, J. C., Wells, H., F., & Hyman, J. (2014). The Estimated Amount, Value, and Calories of Postharvest Food Losses at the Retail and Consumer Levels in the United States. In E. R. Service. Washington, D.C.: U.S. Department of Agriculture, Economic Research Service.
- Codex Alimentarius Commission. (2014). Report of the Forty-Second Session of the Codex Committee on Food Labeling. In Rome, Italy: Food and Agriculture Organization of the United Nations and World Health Organization.
- Coleman-Jensen, A., Rabbitt, M. P., Gregory, C., & Singh, A. (2015). Household Food Security in the United States in 2014. In E. R. S. U.S. Department of Agriculture. Washington, DC.
- Farr-Wharton, G., Foth, M., & Choi, J. H.-J. (2014). Identifying Factors that Promote Consumer Behaviours Causing Expired Domestic Food Waste. *Journal of Consumer Behaviour*, 13(6), 393-402.
- Hurley, T. M., & Shogren, J. F. (1997). Environmental conflicts and the SLAPP. *Journal of Environmental Economics and Management*, 33(3), 253–273.

- Halloran, A., Clement, J., Kornum, N., Bucatariu, C., & Magid, J. (2014). Addressing Food Waste Reduction in Denmark. *Food Policy*, 49, 294-301.
- Kantor, L. S., & Lipton, K. (1997). Estimating and Addressing America's Food Losses. *FoodReview*, 20(1), 2.
- Leib, E. B., Gunders, D., Ferro, J., Nielsen, A., Nosek, G., & Qu, J. (2013). The Dating Game: How Confusing Food Date Labels Lead to Food Waste in America. In, *NRDC Report: Natural Resource Defense Council*.
- Miles, S., & Frewer, L. J. (2001). Investigating Specific Concerns about Different Food Hazards. *Food Quality and Preference*, 12(1), 47-61.
- Newsome, R., Balestrini, C. G., Baum, M. D., Corby, J., Fisher, W., Goodburn, K., et al. (2014). Applications and Perceptions of Date Labeling of Food. *Comprehensive Reviews in Food Science and Food Safety*, 13(4), 745-769.
- Pierson, T. R., Allen, J. W., McLaughlin, E. W., & Halloran, J. M. (1982). Food Losses: Overview and Summary. Agricultural Economics Report 421 and Michigan Agricultural Experiment Station Journal Article 10876: Michigan Agricultural Experiment Station.
- Tsiros, M., & Heilman, C. M. (2005). The Effect of Expiration Dates and Perceived Risk on Purchasing Behavior in Grocery Store Perishable Categories. *Journal of Marketing*, 69(2), 114-129.

“Smart Marketing” is a marketing newsletter for extension publication in local newsletters and for placement in local media. It reviews elements critical to successful marketing in the food and agricultural industry. *Please cite or acknowledge when using this material.* Past articles are available at <http://dyson.cornell.edu/outreach/smart-marketing-newsletter>.