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Brief Report

Industry versus Government Regulation of Food Date Labels: Observed Adherence to Industry-Endorsed Phrases

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Abstract: A leading factor in the creation of avoidable household food waste is confusion about food date labels. In the United States, date labels are largely unregulated, resulting in a plethora of date label phrases used in commerce. Federal regulation has been proposed but never passed, while both industry and government have provided voluntary guidance on preferred label phrases. We study food producer adherence to the label phrases endorsed by the Trading Partner Alliance (TPA, an industry group), which includes “Use By” for perishable products subject to a material degradation of critical performance or potential food safety concern and “Best If Used By” for all other packaged foods. Based on three studies conducted between the fall of 2018 and the summer of 2019 that use two distinct measurement methodologies, we find adherence to be less than 50% and to differ by product category, retailer, region, and brand type (store versus national brands). We find numerous dry goods and other foods that are better suited to the “Best If Used By” phrase instead feature the “Use By” phrase. This misapplication of phrases to products and the low TPA phrase adherence rate suggests that practices as of the summer of 2019 may still contribute to consumer confusion about date labels and to inadvertent food discard. We explore possible reasons why our estimated adherence rate is lower than industry reported figures and discuss tradeoffs between government regulation and industry self-regulation.

Keywords: food waste; food date labels; self-regulation; food packages; quality dates; safety dates

1. Introduction

The amount of avoidable food waste continues to attract policy attention among governments and organizations at the local, regional, national, and international levels because reducing avoidable food waste is hypothesized to forward sustainability goals including environmental, economic, and social objectives. A leading factor in the creation of avoidable household food waste is consumer confusion about food date labels (i.e., the dates and accompanying phrases found on food packages). We refer to any date that appears on a food package as the label date, while we use the terms date label or date labeling to refer to the approach to communicating the label date to consumers, including the phrase that accompanies any label date.

Quested and Murphy [1] estimate that as much as one-third of avoidable household food waste in the United Kingdom could be attributed to consumer confusion about date labels. Many consumers interpret these dates as a point in time after which the safety of the product declines while, for most

products, the date serves as the manufacturer's estimate of the point in time after which the quality of the product may begin to decline [2,3]. For example, Qi and Roe [4] found 70% of U.S. respondents agreed that throwing away food after its label date has passed will reduce the odds of foodborne illness, while Neff, Spiker, and Truant [5] found that 65% of U.S. respondents listed food poisoning as a motivation for discarding food in their homes.

The strategic roadmap created by Rethinking Food Waste through Economics and Data (ReFED), a nongovernmental organization in the United States, advises that reducing consumer confusion concerning date labels would be among the most impactful and cost-effective approaches to helping achieve substantial reductions in avoidable food waste [6]. Unlike the European Union, which standardizes date label phrases via regulation (EU Regulation 1169/2011), the United States does not mandate date label phrase standardization [2]. As a result, many different date label phrases co-exist in the U.S. market. To reduce consumer confusion concerning date labels, ReFED suggests adopting uniform date label phrases and providing consumer education based upon these unified phrases [6]. Uniform label phrases could occur in several ways, including through government-imposed regulation or through industry self-regulation [7].

In terms of U.S. government regulation, current federal law does not require the use of, nor prescribe definitions for food date labels, with the exception of infant formula (infant formula packages must display "use by", which is intended to communicate the date before which the infant formula will be of acceptable quality as to nutrients), but attempts have been made. Bills proposing date labeling standards were introduced to the U.S. Congress in 2015 (Food Recovery Act of 2015), 2016 (Food Date Labeling Act of 2016), and 2019 (Food Date Labeling Act of 2019); as of this writing, none have emerged from committee. There have also been several federal executive branch efforts to standardize date labels, including the National Institute of Standards and Technology's proposed standard food date labeling language [8] and the National Shellfish Sanitation Program's definitions for date label language on shellfish [9]. Both the U.S. Department of Agriculture's Food Safety and Inspection Service [10] and the U.S. Food and Drug Administration [11] have also recommended date label phrases. However, no government action mandates compliance other than for infant formula.

In the absence of federal mandates, some states have enacted state-level food date labeling laws, producing a patchwork of regulation across states and products [12]. States that have enacted food date label laws generally enact laws or regulations for a specific type of food (e.g., milk) rather than a comprehensive labeling system applicable to all food [12]. States that regulate date labels on certain foods fail to prohibit the use of that label on nonregulated food or in a manner inconsistent with the meaning of a regulated food date label, which can exacerbate consumer confusion.

When government regulation is not present, industry groups can self-regulate through standards of practice or publicized expectations that can permeate a particular sector, as a means to provide additional certainty to the sector and/or as a means to forestall or shape impending regulations [13]. The Trading Partner Alliance (TPA), a group led by the Grocery Manufacturers Association (GMA, renamed the Consumer Brands Alliance in January 2020), and the Food Marketing Institute (FMI) organized meetings to discuss how food date labels contribute to the problem of food waste and endorsed a system of food date labeling consisting of two phrases (hereafter, TPA label phrases): Best if Used By/Best if Used or Frozen By (BEST by, BEST, or BB for small and very small packages) and Use By/USE or Freeze By (USE for very small packages, [14]). The TPA passed a resolution in 2017 encouraging widespread adoption of these food date labels by summer of 2018. The U.S. Food and Drug Administration's 2019 recommendation voices "strong support" for following the TPA's "Best If Used By" phrase but does not extend this support to the "Use By" phrase because of uncertainty concerning the level of food safety implied by this phrase [11].

The working hypothesis of those interested in date label phrases is that widespread adoption of a single set of date label phrases will permit more effective educational programming and reduce consumer confusion in support of more informed decisions by consumers that will result in less wasted food. Widespread adoption of a single set of phrases could be feasible either through federal regulation or

industry self-regulation. Federal regulation requires considerable legislative and executive branch effort to pass legislation, promulgate rules, and provide enforcement. Alternatively, industry self-regulation may also generate significant adherence with greater flexibility and less costs, but efficacy depends upon voluntary participation. For example, according to an industry survey, GMA reports that 87% of survey respondents' consumer-packaged goods adopted the endorsed TPA label phrases as of December 2018 with a projected 98% adoption rate by the end of 2019 [15].

However, there is often a lag between adoption of a new label and its appearance on store shelves, as companies may only apply new labels to packages when existing inventories of previous label versions are exhausted. In addition, companies that have adopted new date phrases may not add these to their labels until other mandated label changes are also implemented [16]. For example, many food manufacturers supplying U.S. markets will be required to switch to a new version of the nutrition facts label by 1 January 2020 [17] and will wait to simultaneously implement the voluntary alteration of date label phrase with the mandatory change in nutrition information [15,16]. Furthermore, not all food manufacturers are members of GMA, and not all GMA members participated in the GMA survey, suggesting reported figures may only apply to a self-selected group of firms that may be more compliant with TPA suggestions. Together, this suggests that observed levels of TPA adherence on the market may be lower than reported levels.

The purpose of this article is to document adherence of commercially available food products to TPA label phrases and to analyze the factors that are associated with adherence. We accomplish this through analyses of data collected during the autumn of 2018 and the summer of 2019. Study 1 assesses TPA adherence on products from 30 distinct product categories found in stores representing 5 different retail chains in a single metropolitan area during the summer of 2019, while Study 2 assesses TPA adherence on products found in the refrigerators of respondents to a nationwide online survey conducted in the autumn of 2018. Study 3 traces changes in date label phrases between the autumn of 2018 and summer of 2019 for a smaller group of products appearing on store shelves in a single metropolitan area.

2. Materials and Methods

We conducted three distinct data collections detailed below.

2.1. Study 1: Store Shelf Study

In the summer of 2019, a researcher traveled to stores representing five distinct food retail chains in Columbus, Ohio, USA, and documented the date label phrase that appeared on 5235 distinct products. The researcher visited each store and completed data collection either on a single day or over several consecutive days. The data collection was designed to be broadly representative of contemporary grocery retailing in the United States. We selected items from 30 different product categories across dry goods (e.g., cereal, flour, rice, oil, chips), dairy and eggs, beverages, frozen foods, breads and bakery, fresh packaged produce (e.g., bagged salad, vegetable trays), fresh meats, and fresh and prepared meals. The categories were chosen to broadly represent different types of food that often feature date labels (all product categories are listed in Table S1). Within each category, we focused on popular sizes and documented every brand displayed on the shelf in the selected size. The stores were chosen because each belongs to a national or regional chain that is a member of the Food Marketing Institute, which is a signatory of the TPA. One store followed a traditional supermarket format, two followed a supercenter format (hybrid of supermarket and mass merchandising), one followed a fresh format (emphasizing perishables and distinct center-store brands), and one followed a wholesale club format. The Columbus metro area contains more than 2 million people and is situated within a 500 mile radius of 41% of the U.S. population [18].

2.2. Study 2: Home Refrigerator Study

We gathered data from 307 residents of 44 different states across the continental United States who responded to an online survey between 19 September and 4 October 2018. The aim of the survey was to measure consumer behavior regarding food purchasing, preparation, cold storage, and disposal. The survey was approved by the local Institutional Review Board. All respondents provided informed consent.

The survey targeted adults who identified as the primary grocery shopper for their household and had access to the household's refrigerator. Respondents participated in a baseline survey and were invited to participate in a follow-up survey approximately one week later. We used data only from the baseline survey, which prompted respondents to report the date phrase that appeared upon randomly selected products from several food categories stored in their home refrigerator (food stored in freezers or at room temperature were not considered). The baseline questionnaire is included in the supplemental materials (File S1).

The survey asked respondents questions about nine categories of food (vegetables; fruit; dairy and eggs; meat, poultry, and fish; beverages; prepared or leftover foods; condiments, sauces, and jarred foods; snacks and candy; other). For each category, respondents reported the number of food items in their refrigerator and gave details about one food item randomly assigned as part of the online survey, including the label date and any accompanying phrase. We note that not all selected products featured a label date, as some were not stored in their original packaging and others were sold in a manner that did not feature a label (e.g., random weight whole produce). Other products featured a label date but no accompanying phrase. Items in the leftover food category were presumed not to carry a date label and were omitted from analyses.

Respondents reported on 796 individual items that featured packaging with a label date, which served as the base for our calculations concerning TPA adherence. Three "attention" questions, indicating whether the respondent was paying attention to the content of survey questions, were included in the baseline survey as well. Only those who responded correctly to all three of these questions were included in the analysis.

2.3. Study 3: Changes in Label Phrases among Select Products

Prior to implementing the summer of 2019 store shelf data collection detailed in Study 1, we conducted a pilot study in the same metropolitan area during the autumn of 2018. Because the pilot featured several of the same retailers and products as the latter study, we can assess the pace of change in label phrases for a select set of products and retailers. Ninety products from three retailers were observed in both the autumn of 2018 and summer of 2019 in the following categories: milk, cereal, fresh chicken, packaged lettuce, bread, and eggs. We classified the type of change that occurred for each product (if any) between the two data collections.

2.4. Statistical Methods

Statistical analyses, which included summary statistics and chi-square tests of association, were performed using Stata (StataCorp, College Station, TX, USA, version 14.2). Statistical significance was set at the 5% level, with test results at the 10% level referred to as marginally significant.

3. Results

3.1. Study 1: Store Shelf Study

We found that 35.6% of the surveyed items in stores in 2019 featured a TPA-endorsed date label phrase (95% confidence interval, 34.3% to 36.9%) with 30.7% featuring the phrase "Best if Used By" and 4.9% featuring the phrase "Use By". Adherence to TPA date label phrases was statistically different across stores (see Figure 1) and product categories (Figure 2). Specifically, TPA label phrases were most prevalent among bread and bakery products and dry goods and least prevalent among dairy and

eggs. Retailer adherence varied significantly with rates ranging from more than half to less than one in six. Store brands that are controlled by the retailer adhered to the TPA phrases at a rate that was 63% higher (48.7% vs. 29.7%) than other national and regional brands stocked by these retailers (Figure 3).

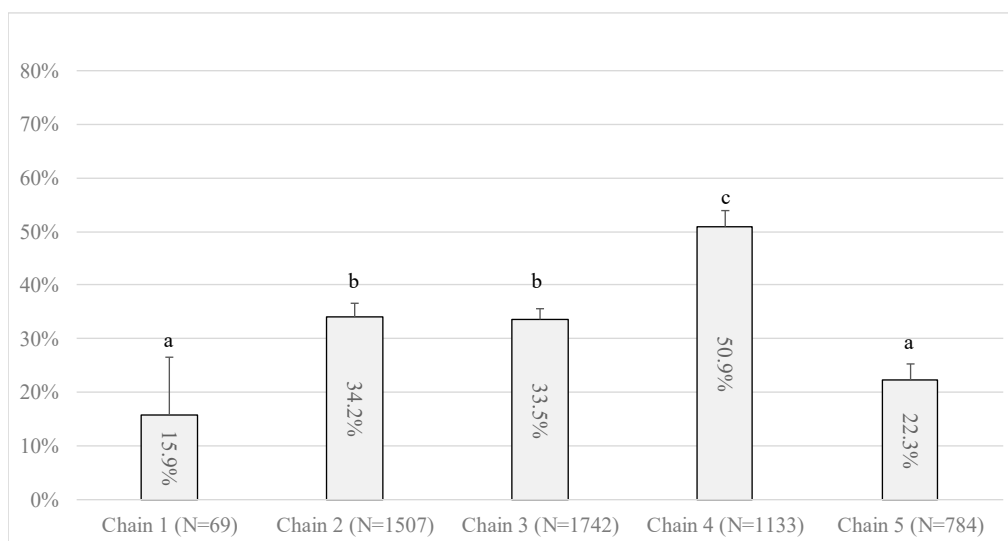


Figure 1. Store shelf study: Trading Partner Alliance (TPA) adherence by store, summer 2019. Error bars depict 95% confidence intervals. Adherence is significantly different across stores ($\chi^2(4) = 192.8, p < 0.001$). Chains sharing the same lowercase letter are not significantly different from one another via pairwise chi-square tests.

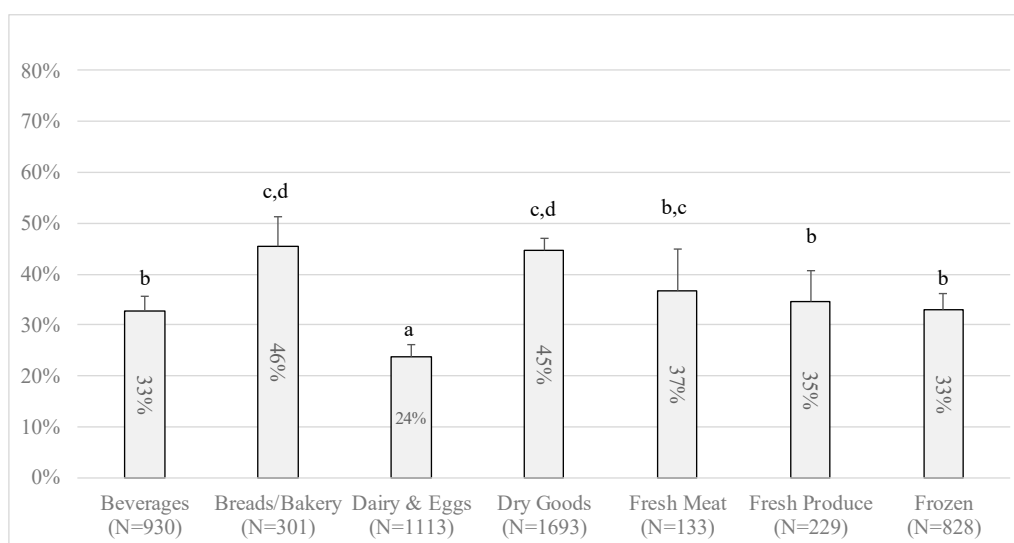


Figure 2. Store shelf study: TPA adherence by food category. Error bars depict 95% confidence intervals. Adherence is significantly different across categories ($\chi^2(6) = 148.1, p < 0.001$). Categories sharing the same lowercase letter are not significantly different from one another via pairwise chi-square tests.

TPA guidelines reserve the use of the phrase “Use By” for foods that are perishable and subject to a material degradation of critical performance or potential food safety concern. We explore more closely how this phrase is applied across the products in this study because consistent application of the “Use By” phrase across products is desirable. In this sample, nearly half of the products featuring the “Use By” phrase were in the dairy and egg category (Figure 4), though this phrase also appeared on items in all other categories except beverages. The appearance of the “Use By” phrase across all categories, including dry goods, is concerning, as such items are unlikely to meet the criteria reserved

for the application of this phrase (the food is perishable and subject to a material degradation of critical performance or potential food safety concern).

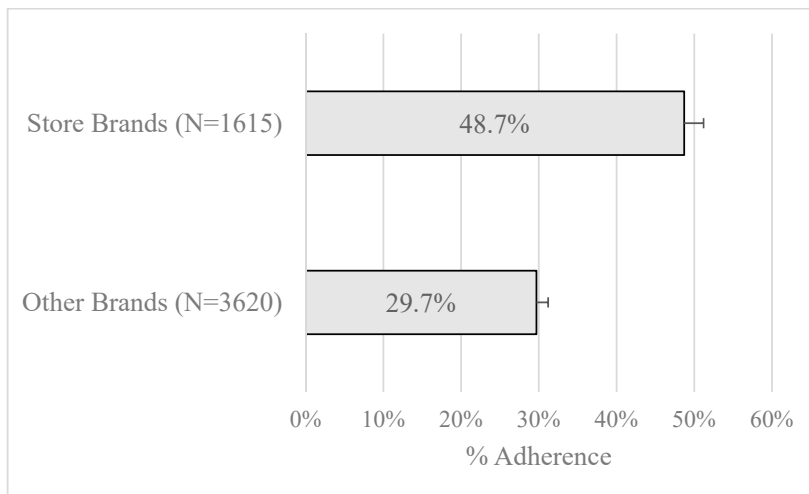


Figure 3. Label adherence: store brands vs. other brands. Error bars depict 95% confidence intervals. Adherence is significantly different between brand types ($\chi^2(1) = 176.6, p < 0.001$).

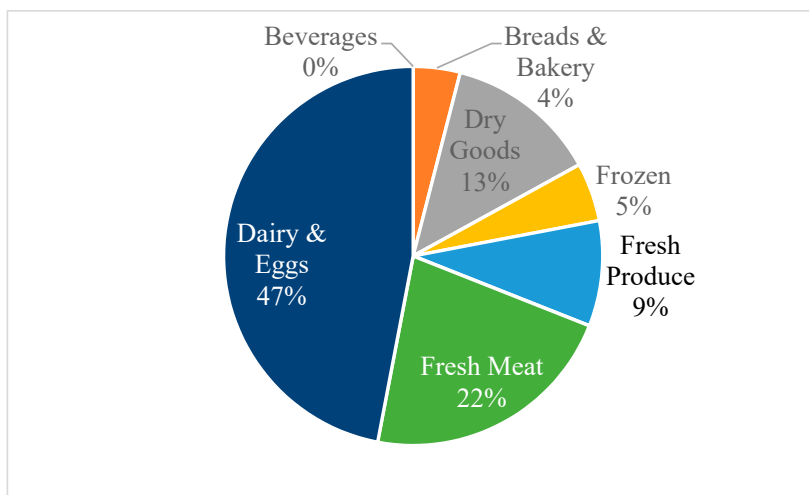


Figure 4. Distribution of appearances of “Use By” by food category.

The most popular phrases not endorsed by TPA included “Best By” (20.6%), no verbiage (just a label date, 12.9%), and “Sell By” (8.7%). Other phrases each appeared on less than 3% of the recorded items.

3.2. Study 2: Home Refrigerator Study

Table 1 summarizes the demographic characteristics of the baseline respondents to this survey. We note the sample was older and more racially diverse than the U.S. population and reports more formal education, lower incomes, and smaller household sizes than the national average. Additional analyses of these data are available in [19].

We found that 43.2% of the 796 products with a label date featured a TPA-endorsed phrase (95% confidence interval, 39.7% to 46.7%). The most popular phrases not endorsed by TPA included “Best By”, a label date appearing without a phrase, “Sell By”, and “Best Before.”

The frequency of adherence to TPA phrases differed significantly by the product category (Figure 5) with the lowest adherence among fruit, beverages, and candy. Given the national scope of the data

collection, we also assessed if TPA adherence differed by region. We found a marginally significant difference in adherence across the four regions ($\chi^2(3) = 6.63, p = 0.085$). Adherence was lowest in the West (38.1%), while the other regions' adherence ranged from 42.3% in the South to 43.3% in the Midwest to 52.9% in the Northeast. No information was collected regarding the retailer that sold each item nor the brand of the item; hence, we are unable to speak to differences across retailers or brand types.

Table 1. Respondent demographics from survey of U.S. consumers in Study 2.

Variable	Survey n = 307	U.S. (2018)
Race		
White	65.1%	76.6%
Black/African American	14.3%	13.2%
Other	20.5%	10.2%
Age		
Under 35	22.8%	45.9%
35 to 64	48.9%	38.3%
65 and older	28.3%	15.8%
Gender		
Male	28.0%	49.0%
Female	72.0%	51.0%
Highest education level		
High school diploma or less	20.5%	53.3%
Some college or Associate's degree	41.0%	21.8%
Bachelor's degree	25.7%	15.9%
Graduate or professional degree	12.7%	9.0%
Annual household income^a		
Less than \$50,000	60.9%	33.7% ^a
\$50,000 to \$99,999	29.6%	30.5% ^a
\$100,000 or more	9.4%	35.8% ^a
Average household size (std dev)	2.1 (1.4)	2.53
Average number of children <18 years old per household (std dev)	0.4 (0.9)	0.58

Note: a—U.S. income figures are for 2017 rather than 2018.

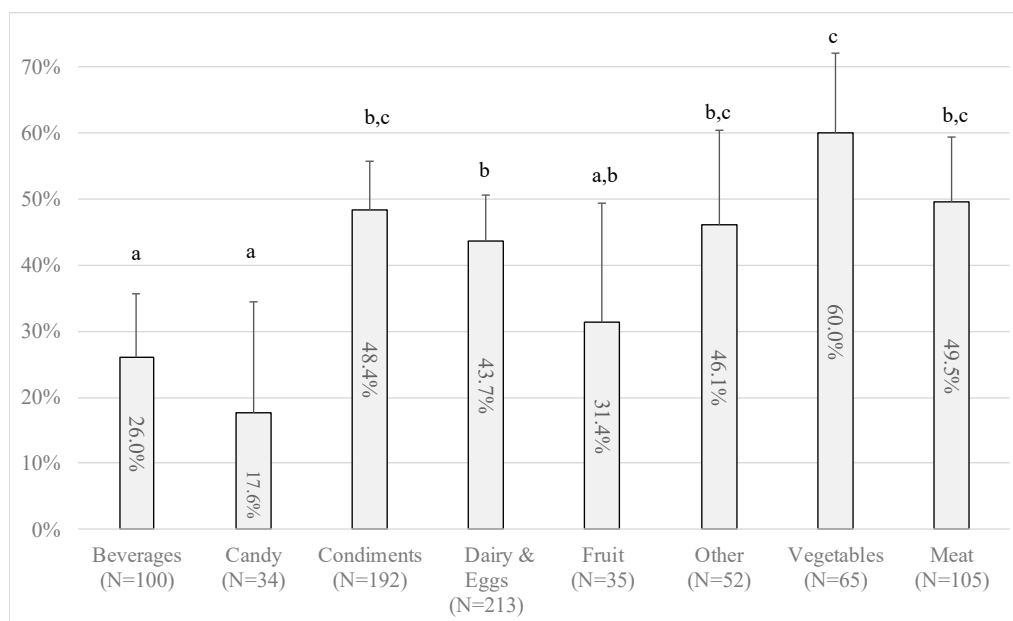


Figure 5. Home refrigerator study: adherence to TPA phrases by category. Error bars depict 95% confidence intervals. Adherence significantly different across categories ($\chi^2(7) = 34.62, p < 0.001$). Categories sharing the same lowercase letter are not significantly different from one another via pairwise chi-square tests.

As with Study 1, the “Use By” phrase was observed on an array of products. “Use By” appeared in all eight categories with the most frequent use of this phrase among meats (26.1% share of all phrases used), dairy and eggs (25.0%), condiments (17.1%), beverages (10.2%), vegetables (9.1%), fruit (4.5%), and candy (1.1%).

3.3. Study 3: Changes in Label Phrases among Select Products

The changes in date label phrases among the 90 products observed in both autumn of 2018 and summer of 2019 are summarized in Figure 6. Most products retained the same label phrase between the two observation periods (88.9%) with 52.2% keeping the same non-TPA-endorsed phrase and 36.7% keeping the same TPA-endorsed phrase. A small number of products switched to a TPA-endorsed phrase from another phrase (5.6%), while 2.2% reverted from a TPA-endorsed phrase to a non-TPA-endorsed phrase for a net improvement in TPA adherence of 3.4% among these 90 products between the autumn of 2018 and the summer of 2019. About 3% switched among non-TPA endorsed phrases.

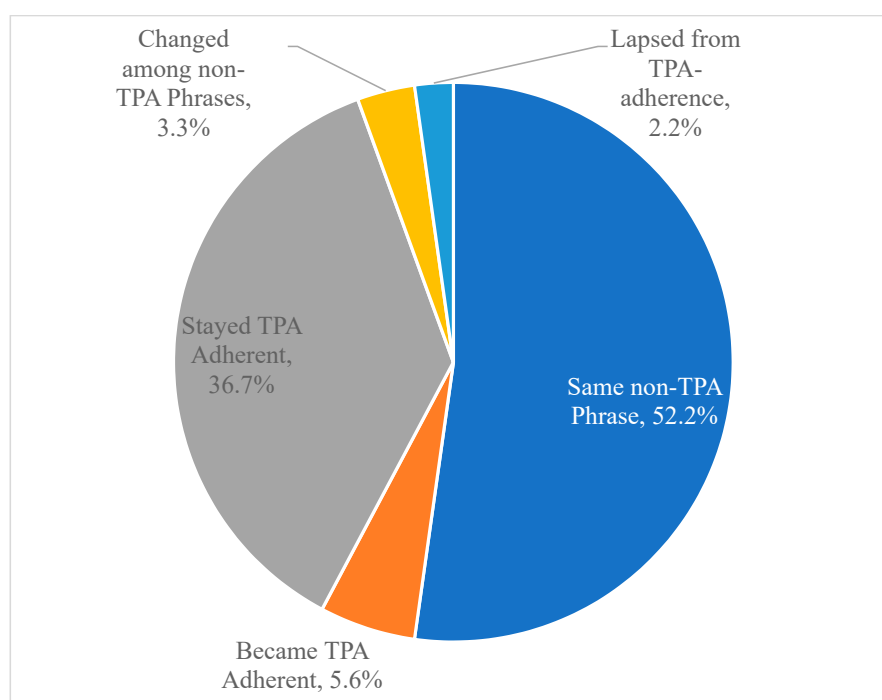


Figure 6. Label phrase comparison: autumn 2018 vs. summer 2019. For 90 products observed in Columbus, Ohio, in both autumn 2018 and summer 2019.

4. Discussion and Conclusions

We used two distinct data collection methodologies to provide data on the share of food products that adhere to the date label phrases endorsed in 2017 by the TPA, an organization of food industry partners that produce or sell packaged food. To the best of our knowledge, our work constitutes the only study documenting industry use of different date label phrases across markets in the United States.

The TPA’s goal was to have nearly universal adherence to their endorsed date label phrases by the end of 2019, and the organization reported that, as of December 2018, adherence was 87% with projected adherence to reach 97% by the end of 2019 [15]. Our studies focused on food packages that were for sale or sold several months before and several months after the GMA’s December 2018 assessment. We found adherence to TPA-endorsed date label phrases to be 35.6% and 43.2% in Studies 1 and 2, respectively, with neither confidence interval spanning the 50% mark. In Study 3, we observed a small net increase (3.4%) in adherence among a small group of select products and retailers over the

approximately nine months between the pilot study and Study 1. Hence, the weight of these sources of evidence suggests that industry self-regulation has not resulted in near-universal conversion of food date label phrases to those endorsed by TPA as of the summer of 2019 across the sample of products we observed.

There may be several explanations for the difference between our findings and the 87% figure reported by GMA. First, the GMA survey asked firms which products carry TPA-endorsed phrases, where “carry” refers to the current label design. New label designs are typically applied to products after existing stocks of labels are exhausted, which may take up to a year after new label designs are created [16]. Furthermore, in the case of the United States, most food companies are required to change the nutrition facts label format beginning in 2020, and voluntary changes to date label phrases may be coordinated with mandatory changes to nutrition facts labels to avoid inefficient label production runs. Our study dates were the autumn of 2018 and the summer of 2019, which are both less than a year after the GMA survey was completed and several months prior to the deadline for new nutrition facts labels.

Second, the GMA only surveyed its members; not all food manufacturers are GMA members, and not all GMA members responded to the survey [16]. If nonresponse was large, and if nonresponding members and nonmembers were less adherent to TPA phrase adoption than respondents, then we would expect our estimates of adherence to be lower than the GMA figure. While we do not know which firms responded to the GMA survey, we are aware of newly announced initiatives by major TPA affiliated firms to transition to TPA-endorsed phrases. For example, in October of 2019, the Kroger Corporation, which is one of the largest food retailers in the United States and a member of FMI (but not GMA), announced an initiative to transition all date labels to adhere to TPA-endorsed phrases by the end of 2020 [20], suggesting more products may soon feature TPA-endorsed phrases.

Third, each of our studies features their own limitations. The first study directly observes packages on retail shelves. However, it considers only five retailers in a single city, though all five retailers are FMI members, and the chosen stores were from a region (Midwest) identified in Study 2 to have the second highest rate of TPA adherence. Furthermore, Study 1 explores only thirty food categories. While these categories include both shelf-stable items and items offered in refrigerated and frozen sections, they miss many items offered in any store and fall well below the number of categories representing the 32,000 individual products enumerated in the GMA survey [15]. It is possible that categories not included in Study 1 have adherence levels higher than those that were included.

The limitations of Study 2 include that we only assessed items that had been opened and resided in responding consumers’ refrigerators. While it is a national study and features items from a broad array of product categories, it will not feature shelf-stable items like cereal, canned goods, and bread, categories that constitute the majority of GMA members’ products [16]. In Study 1, shelf-stable items including cereal and bread had significantly higher levels of adherence to TPA phrases than items that required refrigeration like milk, meat, and eggs.

While our evidence suggests adherence to TPA-endorsed phrases as of the summer of 2019 was significantly below 50%, the data reveal another concern that could frustrate efforts at consumer education. We found that the “Use By” phrase is sometimes used in a manner that contradicts TPA guidance. “Use By” is endorsed for items subject to a material degradation of critical performance or potential food safety concern; however, “Use By” appeared on a broad array of food items across many food categories including dry goods, suggesting inconsistent implementation of this phrase. Given that this phrase is critical in guiding consumers to discard products in order to potentially protect safety, it is important to ensure consistent application of “Use By”.

While there was little change in labeling choices between the autumn of 2018 and the summer of 2019 for the 90 products tracked during that time frame, we have noted that label changes often take time to be implemented. Furthermore, we note that while the TPA phrases are endorsed by this industry umbrella group and align with existing federal agency suggestions, not all food manufacturers are members of this umbrella group, and firms who are members are not required to comply. Hence, adoption may not emerge as a priority among firms or, alternatively, firms may be

slower to implement new practices than if regulations emerged from governmental authorities. Finally, our data documenting greater TPA adherence among store brands than national and regional brands suggest that retailer-driven promises to change date labels will result in the most rapid change among store brands products that are produced specifically for stores that are members of FMI, while changes to other products may take longer.

In conclusion, continued monitoring of adherence to TPA-endorsed phrases over time will reveal whether an industry self-regulation approach, with its commensurate advantages of lower costs and greater responsiveness to market dynamics, can deliver a near-universal and consistent labeling environment that promotes food waste reduction. The level of adherence under industry self-regulation will help illuminate the trade-offs between voluntary compliance and more expensive and rigid federal regulation that has been introduced into the U.S. Congress. Further research that links how the TPA-endorsed phrases and education campaigns enabled by consistent date label phrasing alter consumer food use and discard decisions will help further assess the role of date labeling in accomplishing food waste reduction goals.

Supplementary Materials: The following are available online at <http://www.mdpi.com/2071-1050/11/24/7183/s1>, Table S1—Study 1 Items by Product Category, and File S1—Study 2 Survey Questionnaire.

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References

1. Quested, T.; Murphy, L. Household Food and Drink Waste: A Product Focus. WRAP: Banbury, UK, 2014. Available online: http://www.wrap.org.uk/sites/files/wrap/Product-focused%20report%20v5_3.pdf (accessed on 12 June 2019).
2. Leib, E.B.; Rice, C.; Neff, R.A.; Spiker, M.L.; Schklair, A.; Greenberg, S. Consumer Perceptions of Date Labels: National Survey. 2016. Available online: https://www.chlpi.org/wp-content/uploads/2013/12/Consumer-Perceptions-on-Date-Labels_May-2016.pdf (accessed on 11 November 2019).
3. Newsome, R.; Balestrini, C.G.; Baum, M.D.; Corby, J.; Fisher, W.; Goodburn, K.; Labuza, T.P.; Prince, G.; Thesmar, H.S.; Yiannas, F. Applications and perceptions of date labeling of food. *Compr. Rev. Food Sci. Food Saf.* **2014**, *13*, 745–769. [[CrossRef](#)]
4. Qi, D.; Roe, B.E. Household food waste: Multivariate regression and principal components analyses of awareness and attitudes among U.S. consumers. *PLoS ONE* **2016**, *11*, e0159250. [[CrossRef](#)] [[PubMed](#)]
5. Neff, R.A.; Spiker, M.L.; Truant, P.L. Wasted food: U.S. consumers' reported awareness, attitudes, and behaviors. *PLoS ONE* **2015**, *10*, e0127881. [[CrossRef](#)] [[PubMed](#)]
6. Rethink Food Waste Through Economics and Data (ReFED). A roadmap to reduce U.S. food waste by 20 percent (p. 96). 2016. Available online: www.refed.com/downloads/ReFED_Report_2016.pdf (accessed on 11 November 2019).
7. Gunningham, N.; Rees, J. Industry self-regulation: An institutional perspective. *Law Policy* **1997**, *19*, 363–414. [[CrossRef](#)]
8. National Institute of Standards and Technology. Uniform Laws and Regulations in the Areas of Legal Metrology and Engine Fuel Quality. 2018. Available online: <https://doi.org/10.6028/NIST.HB.130-2018> (accessed on 3 November 2019).

9. U.S. Food and Drug Administration. Guide for the Control of Molluscan Shellfish. 2015. Revision, 2. National Shellfish Sanitation Program. Available online: <https://www.fda.gov/food/guidanceregulation/federalstatefoodprograms/ucm2006754.htm> (accessed on 3 November 2019).
10. US Department of Agriculture. USDA Revises Guidance on Date Labeling to Reduce Food Waste. Press Release; 14 December 2016. Available online: <https://www.fsis.usda.gov/wps/portal/fsis/newsroom/news-releases-statements-and-transcripts/news-release-archives-by-year/archive/2016/nr-121416-01> (accessed on 2 November 2019).
11. US Food and Drug Administration. Dear Food Industry Letter on Date labeling. 23 May 2019. Available online: <https://www.fda.gov/media/125114/download> (accessed on 2 November 2019).
12. Rethink Food Waste Through Economics and Data. Date Labeling Policy Issues. 2019. Available online: <https://www.refed.com/tools/food-waste-policy-finder/spotlight-on-date-labeling/carousel> (accessed on 15 June 2019).
13. King, A.A.; Lenox, M.J. Industry self-regulation without sanctions: The chemical industry's responsible care program. *Acad. Manag. J.* **2000**, *43*, 698–716.
14. Trading Partner Alliance. Product Code Date Labeling: Crucial Initiative to Reduce Consumer Confusion. 2017. Available online: https://www.gmaonline.org/file-manager/2017%20Product%20Labeling%20White%20PaperV1_3.pdf (accessed on 8 June 2019).
15. Grocers Manufacturers Association. Best if Clearly Labeled: How the Consumer Packaged Goods Industry is Reducing Confusion and Food Waste. 2019. Available online: <https://www.gmaonline.org/file-manager/Best%20if%20Clearly%20Labeled%20FINAL%20Small%20File.pdf> (accessed on 8 June 2019).
16. Stasz, M.; Grocers Manufacturing Association, Washington, DC USA. Personal communication, 2019.
17. US Food and Drug Administration. Changes to the Nutrition Facts Label. Available online: <https://www.fda.gov/food/food-labeling-nutrition/changes-nutrition-facts-label> (accessed on 5 December 2019).
18. Columbus Economic Development Agency. Economic Development: Facts & Figures. Available online: <https://www.columbus.gov/development/economic-development/Proximity/> (accessed on 11 November 2019).
19. Davenport, M.L.; Qi, D.; Roe, B.E. Food-related routines, product characteristics, and household food waste in the United States: A refrigerator-based pilot study. *Resour. Conserv. Recycl.* **2019**, *150*, 104440. [CrossRef]
20. Kroger Corporation. Kroger to Standardize Our Brands Date Labels to Reduce Household Food Waste. 2019. Press Release. Available online: <https://www.prnewswire.com/news-releases/kroger-to-standardize-our-brands-date-labels-to-reduce-household-food-waste-300939642.html> (accessed on 11 November 2019).



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