

Introduction

Changing consumer demands and interests have led to innovations in food products, one of which is the plant-based food category. In 2020, there was an 27% overall growth in the plant-based food market, which put the total plant-based foods industry at an evaluation of \$7 billion in U.S. retail sales (Goldschmidt, 2021). The largest segment of the plant-based food market is plant-based milks, which had a 20% increase in sales in 2020 (Goldschmidt, 2021). Plant-based milk alternatives include soymilk and “peanut milk, rice milk, oat milk, sesame milk, coconut milk, almond milk, hemp milk, hazelnut milk, tiger nut, lupin milk and quinoa milk” (Sethi et al., 2016, p. 3409).

The increased demand for these products is not connected to lower prices because consumers will pay almost twice the amount for plant-based milk options compared to dairy milk (Settembre, 2019). McCarthy et al. (2017) found the reasons consumers in North Carolina chose plant-based milk alternatives over dairy milk included concerns about personal health, mistreatment of animals, and environmental impact. A study from the University of Oxford found that soy milk produced less greenhouse gases and used less land compared to dairy milk (Poore & Nemecek, 2018).

From the dairy industry’s perspective, labeling of plant-based milk with words commonly found in dairy products has created controversy. This is mainly due to the current Food and Drug Administration (FDA) regulation standards and dairy groups’ advocacy efforts to limit the use of common dairy words on plant-based milk (National Milk Producers Federation, 2019). The argument stems from this FDA definition of milk, yet non-milk containing items can be labeled as milk by the FDA (National Milk Producers Federation, 2019). The formal definition of milk is listed in section 131.110 in Title 21 of the Code of Regulations as “Milk means the lacteal secretion, practically free from colostrum, obtained by the complete milking of one or more healthy cows” (Code of Federal Regulations Title 21, n.d., para. 1).

The discussion about non-dairy product labeling has made its way to the U.S. Capitol. The DAIRY PRIDE Act originated in 2017 in the United States Senate as a bill that would ensure products made from non-dairy sources do not have a dairy associated word on the label (DAIRY PRIDE Act, 2017; National Milk Producers Federation, 2020), but the act was not successful at passing congressional vote. The National Milk Producer’s Federation (2019) stated the bill was needed to clarify that plant-based milks do not have the same nutritional value as dairy milk because the term “milk” implies similarity. However, the Plant Based Food Association has created standards that can be voluntarily followed regarding plant-based milk labeling (Simon, 2018). Some of these labeling standards include using the ingredient name with milk on the label, listing plant-based milk on the label, and using dairy-free or non-dairy on the label.

In addition to consumers and lawmakers, the topic of plant-based milk has gained attention from media outlets. Media sources have a role in influencing consumers by drawing attention to some topics and shaping how those topics are presented (Happer & Philo, 2013). This is done through the media’s role to share information and its ability to change behavior and impact policy issues. Methods of the media’s influence include repeating messages and leaving out certain sides of the issue (Happer & Philo, 2013). Therefore, examining news coverage of topics can indicate what information audience members are receiving and how that might influence subsequent opinions and behaviors. As the popularity of plant-based milk increases, it is necessary to explore media coverage to inform communication efforts for those in the

traditional dairy industry and those representing these alternative options. Knowing how plant-based milk is depicted in news coverage could be insightful to agricultural marketing and public relations efforts for the industries involved.

Theoretical Framework

Framing served as the theoretical framework for this study. Entman (1993) described framing as “the power of communicating text” (p. 51) because framing selects ideas and gives them more importance. This in turn gives attention to the frame through evaluation or interpretation. Hallahan (1999) described the impacts of framing as the ability to form worldly perspectives for people. Moreover, framing can occur through two mechanisms: contextual cues or priming. With contextual cues, heuristics influence a person’s decision making. In the priming effect, previous memories about a topic influence a person’s current opinion (Hallahan, 1999).

Frames can be used to describe and define a topic, which gives it more importance for interpretation or evaluation by the reader (Entman, 1993; Hallahan, 1999). In news framing, an issue is highlighted in a certain way in an article for the reader (Shen, 2004). Journalists can use frames to portray a perspective on a topic by including some frame while neglecting others (Brüggemann, 2014). In regard to media coverage about new food products and production techniques, Runge et al. (2018) posited media frames “likely play a role in shaping attitudes toward novel food technologies” (p. 243). The researchers said the lack of transparency in the food system leads many members of the public to rely on media coverage to determine the health and safety of food. Prior studies have explored what frames are used in media coverage about novel food technologies such as agricultural biotechnology and genetically modified organisms (Crawley, 2007; Lundy & Irani, 2004; Marks et al., 2007; Nisbet & Huges, 2006; Pjesivac et al., 2020). Additionally, quantitative content analysis studies have examined media coverage of agricultural issues such as how frames were used in media coverage about an animal disease outbreak (Cannon & Irani, 2011), agriculture safety (Lundy et al., 2018), a food recall (Calley et al., 2019), antibiotic use in livestock (Steede et al., 2019), and the rural opioid epidemic (Lawson & Meyers, 2020).

How messages are framed can influence food purchasing attitudes and behaviors. In a United Kingdom study about sustainable foods, Bellotti and Panzone (2016) explored the relationship between the number of published articles about this topic to consumers’ food expenditures in a UK supermarket chain. Although the regression analysis did not indicate the number of articles had an influence on food expenditures, the researchers did conclude providing information about policy and environmental benefits may influence public opinion. To further explore the sample, Bellotti and Panzone (2016) completed a content analysis of articles about organic food and said that “differences in response might be attributed to the way food-related environmental messages are framed” (p. 198). In the United States, Bryant and Dillard (2019) examined the influence of message frames on acceptance of cultured meat. Through an experiment, the researchers found that participants who were exposed to the “high tech” frame had significantly more negative attitudes toward this food technology compared to those who received messages framed as “societal benefits” or “same meat.” This demonstrated that how the information was being presented did have an influence on subsequent attitudes.

In regard to what frames are present in media coverage of food topics, Meyer (2017) conducted a content analysis of gluten-free diet coverage in three major U.S. newspapers. The content analysis found that articles with the advice and medical frames were used more

frequently than the other frames identified in the articles. In addition, most newspaper articles were categorized as feature or opinion articles, which could influence how people interpret the information in the article. Meyer (2017) stated this could present biases when information is communicated to the reader.

Although it is not a media content analysis, Mete et al. (2019) reviewed blogs about healthy eating in Australia. The authors examined authors' professions, message purpose, whether the blog adhered to the Australian Dietary Guidelines, and communication methods. Mete et al. (2019) found that most common communication methods about nutrition included recipes followed by practical tips and then recommendations from the author. Recipes were characterized as providing alternatives for an item, using a certain food in a recipe, or healthier replacements for a recipe (Mete et al., 2019).

Prior research has indicated that media coverage and message framing can influence attitudes and public awareness regarding food products (Bellott & Panzone, 2016; Bryant & Dillard, 2019; Runge et al., 2018). After reviewing the literature, no research has been completed specifically examining framing of plant-based milk in media coverage. Therefore, the current study extends the previous work of these researchers by utilizing content analysis methods and framing theory to explore a new agricultural topic.

Purpose and Objectives

The purpose of this study was to explore how U.S. news coverage presented information about plant-based milk from 2011-2020. In this study, news coverage referred to newspapers, web-based publications, magazines, and journals. The following research questions were answered:

RQ1: What was the frequency of articles in news coverage about plant-based milk?

RQ2: What types of articles appeared in news coverage about plant-based milk?

RQ3: What frames were present in news coverage about plant-based milk?

RQ4: What was the pattern between frame and article type and frame and year published?

Methods

This study was a quantitative content analysis, which is a research technique used to draw inferences from content that will answer research questions (Krippendorff, 2018). The general approach to a content analysis study is to decide on the phenomenon that will be studied then to design the study by selecting a sample of content. Finally, coders collect and analyze the data to answer the research questions (Riffe et al., 2014).

The Nexis Uni academic database was used to obtain the sample of articles to achieve the study's purpose. Nexis Uni was selected because it has more than 17,000 news, business, and legal sources available. The database results are also available in a downloadable format for further analysis. The keywords used in the search were: plant-based milk or plant based milk. Using the "or" function in Nexis Uni resulted in the greatest number of articles. Parentheses were also put around the whole search term to prevent the database from returning articles that only contained one of the words in the search term. We did not search for mentions of the individual types of plant-based milk (e.g., almond milk, oak milk, etc.) because a review of search results indicated the overarching keywords (plant-based milk or plant based milk) returned more relevant articles than when the more specific terms were included. We acknowledge this is a

potential limitation and recommend future studies explore media coverage of the specific types of plant-based milk.

An initial keyword search of plant-based milk and plant based milk resulted in 3,752 total articles identified from 2011-2020. However, this included many types of news irrelevant to the study’s purpose because they were not focused on the topic of plant-based milk or were from international news outlets. International news outlets were not included in the study because the plant-based milk topic varies between countries in terms of access and popularity. We chose to include articles from U.S. newspapers available in the Nexis Uni database (LexisNexis, 2022) to provide a more focused examination of this topic’s media coverage. Articles without a specified location of publication, or non-jurisdiction, were also removed from the sample.

To address the study’s purpose, only content published in newspapers, web-based publications, magazines, and journals were kept in the sample. Using an additional filter in Nexis Uni allows for specific articles that have similar content to be eliminated from the search. This created the sample size of 256 articles with 141 newspaper articles, 68 web-based publication articles, and 47 articles in magazines and journals. We reviewed these articles and removed six duplicates. This resulted in a final sample size of 250 articles.

Article Type & Frame Variables

Table 1 provides the description of article types, which were adapted from a previous content analysis study (Meyer, 2017).

Table 1

Description of Article Types Used in the Study

Article Type	Description
General News	General News articles provide breaking and new information. They are written in the standard inverted pyramid style and are typically shorter articles.
Feature	Feature articles do not include breaking news. These are written using longer leads and typically focus on human interest to provide more details and perspectives on a topic.
Opinion	Opinion pieces are written by the editorial staff or others. These articles are written in first person. These may have the word “opinion, editorial or letter to the editor” in the title.
Recipe	If the article is a recipe, then it focused mainly on giving instructions for how to make the food/drink item.

The frames for this study (Table 2) were established *a priori*. Identifying the frames began with a review of literature. Meyer’s (2017) examination of gluten-free news media coverage informed the creation of several frames in the current study: economics, health, labeling, and trend. The frames of animal welfare and environment were noted when reading other news articles on this topic. Finally, McCarthy et al.’s (2017) study on perceptions of fluid

milk listed taste as a concern when consumer sought out plant-based milk. The description for each frame was refined and confirmed during the coder training process. The frames sought to be exhaustive of the possibilities available in articles for the main idea the journalist was portraying to the reader.

Table 2

Description of Frames Used in the Study

Frame	Description
Animal Welfare	Explanation that plant-based milk does not use animals for production of the product. Keywords: animal welfare, ethical reasons, animal well-being.
Economics	Emphasizes the economic impacts of increasing plant-based milk sales. Price of products, size of market, or shares in a company are listed. Keywords: more sales, growing market of plant-based milks, price, competition.
Environment	Emphasizes how consuming plant-based milks has environmental impacts such as a more sustainable environment and ecosystem. Climate is discussed. Keywords: environment, sustainable, better for the world, eco-friendly.
Health	Health impacts of drinking plant-based milk are listed such as fewer calories, less fat, or less sugar. Lactose intolerance or milk allergy are listed. Other diseases are mentioned. Keywords: nutrition, digestion, health, lactose intolerance, allergic, vegan, dairy free, healthier.
Labeling	Legislation debate on if the word “milk” should be allowed to be used in plant-based products’ packaging and marketing. Keywords: debate, discussion, branding, definition of milk, label, labeling.
Taste	Plant-based milk is selected by people because it tastes better than dairy milk. Recipes are considered to be put into this frame. Keywords: taste, better tasting.
Trend	Impact of popularity or popular culture on plant-based milk choices. This frame details new plant-based product innovation and explains the increased popularity in consumption. Keywords may include rise in popularity, influencers, trend, new product.

Coder Training

For coder training, 10% of articles were randomly selected from the existing 250 articles using a systematic sampling process to pull every 10th article. The lead researcher and two graduate students in agricultural communications coded these 25 articles. The coder training process began with a meeting to go over the coding process where we reviewed the researcher-developed codebook, discussed the variable descriptions, practiced coding some articles together

(not part of the final sample), and explored how to enter data in the Excel file. Coders discussed suggestions to clarify or refine the frames to ensure they were exhaustive and descriptive enough to be recognized in the analysis process. Additional expectations and guidelines for the coding process were also discussed, which included working independently, assigning one frame and type of publication per article, taking breaks in the coding process, and coding accurately.

After the coder training, the three coders independently coded the articles then returned the Excel file with their results. Krippendorff's Alpha reliability was calculated for the two variables of interest – article type and frame. An acceptable level of intercoder reliability was not achieved on this first effort. Initial Krippendorff's Alpha reliability for frame was 0.469. For article type, the initial Krippendorff's Alpha reliability was 0.478.

Following this, we had another meeting with the coders to discuss results and discrepancies. The articles were then recoded, and reliability was calculated again using ReCal, an online reliability calculator (Freelon, n.d.). Krippendorff's Alpha was 0.85 for both article type and frame. According to Krippendorff (2018), a reliability of 0.8 is acceptable for the articles to meet intercoder reliability. Once this level of reliability was obtained, the lead researcher completed the coding process for the remaining 225 articles.

Data Analysis

Once all the data were collected and entered into the Microsoft Excel file, they were analyzed in SPSS to calculate descriptive statistics, specifically frequencies, to answer the descriptive research questions. Crosstabulation statistics were used to answer the final research question.

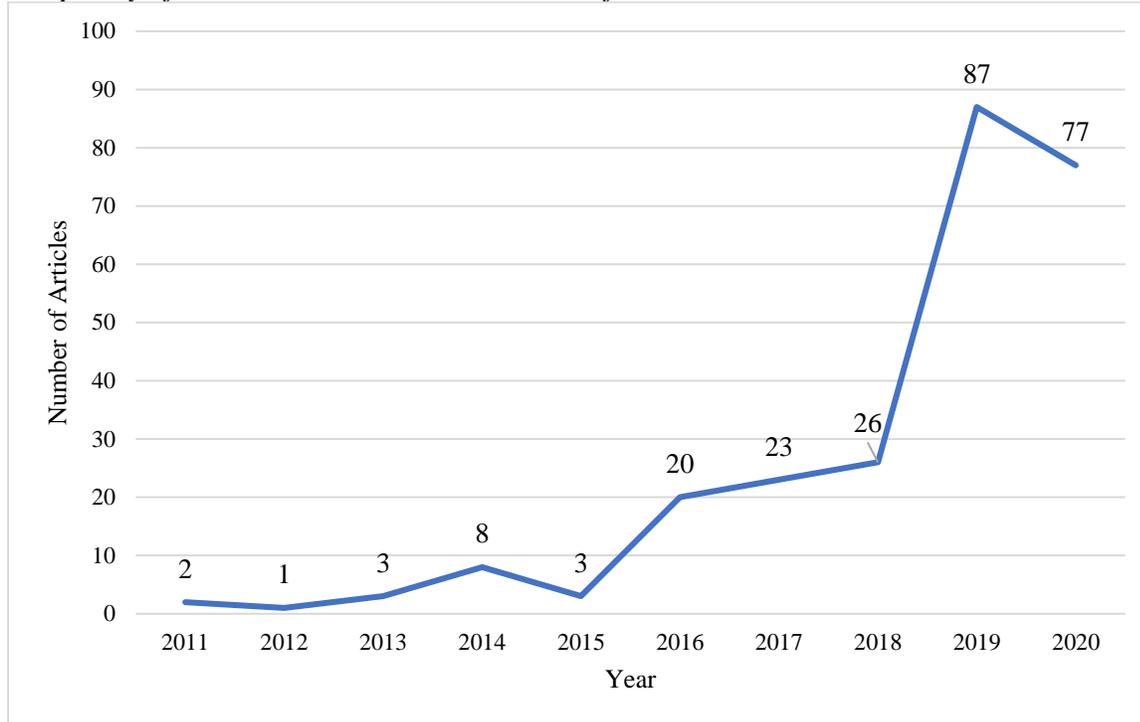
Findings

RQ1: What was the frequency of articles in news coverage about plant-based milk?

Articles found in this sample ($n = 250$) were published from 2011-2020 (Figure 1). The earliest article published about plant-based milk found in the Nexis Uni database was published in 2011. This study was completed in September 2020 so the entire year was not available for analysis. Most of the articles were published in 2019 ($n = 87$) and 2020 ($n = 77$). Three years had at least 20 articles published (2016, 2017, and 2018). The fewest number of articles were published in the earliest years of this study's timeframe: 2011 ($n = 2$), 2012 ($n = 1$), and 2013 ($n = 3$).

Figure 1

Frequency of Articles About Plant-Based Milk from 2011-2020



RQ2: What types of articles appeared in news coverage about plant-based milk?

The article types were feature, general news, opinion, and recipe (Table 2). The most common article type was Feature with 100 articles (40%) represented in the sample. The second most frequent article type was General News ($n = 81$) at 32.4% of the article sample size. The two least common article types were recipe ($n = 36$, 14.4%) and opinion ($n = 33$, 13.2%).

Table 2

Frequency of Article Types About Plant-Based Milk

Type	<i>n</i>	%
Feature	100	40.0
General News	81	32.4
Recipe	36	14.4
Opinion	33	13.2
Total	250	100.0

RQ3: What frames were present in news coverage about plant-based milk?

Table 3 provides the number of articles and percentage within each of the seven *a priori* frames. The most common frame was Trend with 74 articles (29.6%). These articles discussed the popularity of plant-based milk choices and highlighted product innovation. Taste was ranked

second with 49 articles (19.6%). Articles with this frame emphasized that people selected plant-based milk because of its taste. Health was the third most common frame found in 16.4% ($n = 41$) of the articles, which focused on the positive health aspects of consuming plant-based milk. The remaining frames were identified less frequently: Economics (15.2%, $n = 38$), Labeling (14%, $n = 35$), Environment (2.8%, $n = 7$), and Animal Welfare (2.4%, $n = 6$).

Table 3

Frequency of Frames Used in Plant-Based Milk Articles

Frame	n	%
Trend	74	29.6
Taste	49	19.6
Health	41	16.4
Economics	38	15.2
Labeling	35	14.0
Environment	7	2.8
Animal Welfare	6	2.4
Total	250	100.0

RQ4: What was the pattern between frame and article type and frame and year published?

Crosstabulation statistics were calculated for the frequency of article type and frame (Table 4). The most common frames in General News articles were Trend (38.3% of the article type) and Economics (25.9% of the article type). For Feature articles, the most commonly found frames were Trend (40% of Features) followed by Health (25% of Features) articles. For Opinion articles, Taste (27.3% of Opinions) and Labeling (21.2% of Opinions) were the most identified frames. Finally, Recipe articles were overwhelmingly framed as Taste (94.4% of the Recipe articles).

Table 4

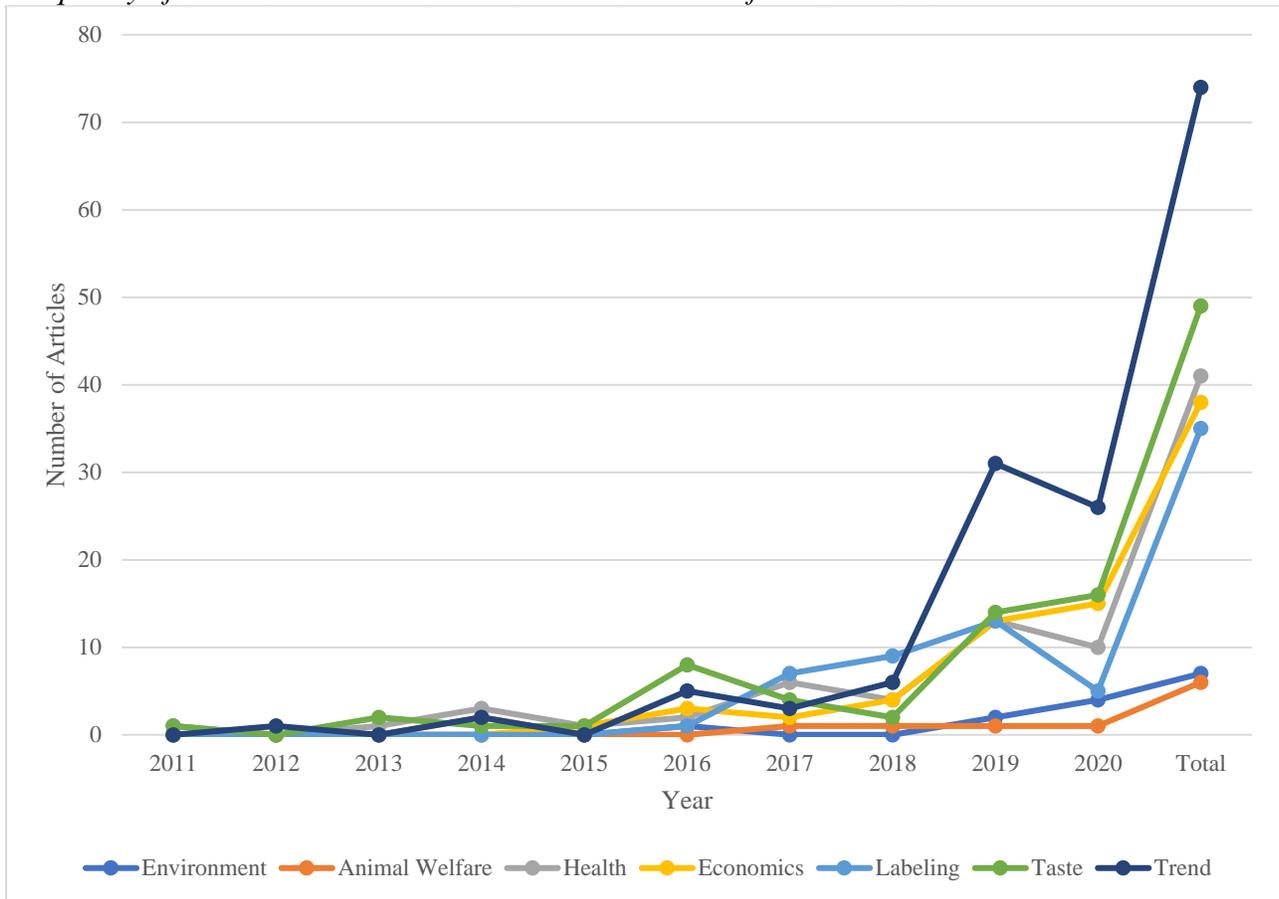
Frequency of Frame and Article Type

Frame	Type				Total
	General News	Feature	Opinion	Recipe	
Environment	3	3	1	0	7
Animal Welfare	2	1	3	0	6
Health	10	25	5	1	41
Economics	21	11	5	1	38
Labeling	14	14	7	0	35
Taste	0	6	9	34	49
Trend	31	40	3	0	74
Total	81	100	33	36	250

For the pattern between Frame and Year Published (Figure 2), most of the Trend articles (41.9%) were published in 2019. Environment and Taste frames were always present during the study’s timeframe. Labeling articles did not start being published until 2016 and the Economic frame was not used until 2015. As Figure 2 demonstrates, as more articles were published about this topic, more frames were identified.

Figure 2

Frequency of Plant-Based Milk Article Frames Published from 2011-2020



Discussion & Conclusion

Monitoring media coverage about topics can provide communicators with an idea of how the public is influenced (Happer & Philo, 2013). In recent years, this alternative milk option has increased in popularity, which is evident from increasing sales data (Goldschmidt, 2021). This growth in popularity and sales warrants the need to explore how the topic is framed in media coverage because, as Runge et al. (2018) stated, media coverage may be the primary way people are learning about novel food technologies.

Nearly nine years of articles were included in the study. The most articles were published in 2019 and 2020. While the number of articles fluctuated from year to year, the number of articles appeared to be trending up. Fewer than 10 articles were published each year from 2011-2015, then in 2016, 20 articles were published. Plant-based milk consumption has increased in recent years (Goldschmidt, 2021; Lucas, 2019) so an increase in news coverage could be

attributed to more consumer interest and information being shared about the plant-based milk industry. As Bellotti and Panzone (2016) stated, providing more information about food topics through media coverage may influence public opinion.

Research Question Two identified what article types were being used to present information about plant-based milk. Feature articles were the most common article type representing 40% of the articles followed by General News articles with 32.4% of the sample. Features are typically longer articles that highlight less time-sensitive information than a General News article. With Features identified as the most common article type, this issue is receiving more in-depth coverage than the other article types would allow. This could indicate people are learning more about the plant-based milk industry from multiple perspectives on the topic than what General News articles might provide. However, this could lead to bias in the article if only one side is mentioned or prioritized. Another interesting finding is that Recipe and Opinion articles each had less than 15% of the sample's articles. This may increase over time as people look for ways to incorporate plant-based milk in their diets and have more opportunities to consider this dietary choice.

Research Question Three identified what frames were most popular in plant-based milk news coverage. Frames in news articles highlight topics in a certain way (Shen, 2004) and can indicate what is being discussed about agricultural topics (Meyer, 2017; Steede et al., 2019). How the topic is presented can also influence public perceptions as Marks et al. (2007) concluded in their study about how biotechnology was presented in the media. Bryant and Dillard (2019) found message frames can influence consumer acceptance of cultured meat. In the current study, the most common frame was Trend with 29.6% ($n = 74$) of the sample. The prevalence of this frame is likely related to the increasing popularity of the plant-based milk industry evident in the current sales and consumption of plant-based milk products (Goldschmidt, 2021; Lucas, 2019). The second most identified frame was Taste followed by Health. Meyer (2017) found that newspaper articles about gluten-free diets focused on advice and health frames. Recipe articles that discussed the taste of plant-based milk could influence an individual's motivation and willingness to try a new food option.

Labeling, Environment, and Animal Welfare frames were each identified in less than 15% of the sample. The Labeling frame refers to the discussion around whether plant-based milk should be allowed to be marketed with words related to milk (National Milk Producers Federation, 2019). The Labeling frame may not be used in as many articles in the coming years because the discussion around the United States Senate Dairy Pride Act was discussed mainly in 2017 and has not been passed into law as of 2020 (National Milk Producers Federation, 2020). This supports why there were 13 Labeling framed articles written in 2019 but only five in 2020.

Environment and Animal Welfare frames were only found in a combined 13 articles. This was less than expected based on previous research. McCarthy et al. (2017) listed environmental benefits and animal welfare concerns as primary reasons people are choosing plant-based milks over dairy milk. However, it could be suggested that these frames are not the main frames in plant-based milk news coverage but rather secondary or tertiary frames. This provides an area for additional research to explore.

Research Question Four determined if there were any patterns between the variables measured. Cross tabulation frequencies for frame and article type indicated that General News articles were typically Trend articles (38.3%). In addition, the most common Feature articles were Trend (40%). Trend was the most common frame identified in the study so it is consistent that it would be the focus for General News and Feature articles. Taste (94.4%) was the most

common frame for Recipe articles. The other six percent of Recipes articles were Health and Economic frames. Recipe articles being linked to the Taste frame was expected because it was listed in the codebook to include recipes in the Taste frame. These Recipes typically discussed how plant-based milk can be used as an alternative to dairy milk or simply listed plant-based milk in the recipe.

For frame and year published, many Trend articles were published in more recent years in the study's time frame. Nearly 42% (41.9%) were published in 2019. This relationship could be explained by the increased recent interest and innovation of plant-based milk products. The Labeling frame was not identified until 2016 and was found in 35 articles. This is when the debate around plant-based milk having the word milk on the label began. The Labeling frame likely persisted into 2017 because that is when the Dairy Pride Act was introduced (DAIRY PRIDE Act, 2017; National Milk Producers Federation, 2020). It would be interesting to continue to monitor articles for this frame because the Dairy Pride Act has not yet been passed into law.

Article Type and Year Published frequencies showed high levels of General News and Feature articles published in 2019 and 2020. Recipe articles increased to the highest number in 2020. One reason for this pattern is that as popularity of plant-based milk increases, there is more interest in creating recipes that use these products as a substitution or alternative.

Recommendations

In regard to future research, it would be interesting to compare the trends in news coverage to plant-based milk sales and consumption data. This would provide a more complete picture as to how the market has changed over time and the potential relationship to media coverage. As described previously, plant-based milk is derived from a variety of commodities such as soybeans, almonds, and oats. While the current study did not compare how each type of plant-based milk is being presented in media coverage, this does introduce another area of potential research. Additionally, this content analysis could extend to the individual commodity's marketing and promotion efforts such as social media, advertising, and owned print media.

Consumer preferences have been studied regarding why people choose plant-based milk instead of dairy milk (McCarthy et al., 2017). However, more research should be conducted to determine what factors influence a person to choose this alternative. Specific types of media coverage, such as opinion articles or recipes, may be one influence. Previous researchers (Bryant & Dillard, 2019; Pjesivac et al., 2020; Runge et al., 2018) developed framed messages about agricultural topics and used experimental designs to explore how frames influenced consumers' perceptions. Framing effects research regarding the topic of plant-based milk would provide actionable recommendations for practitioners and a better understanding of how messaging can influence consumer attitudes and behaviors.

Conducting consumer research in the form of focus groups, consumer panels, and survey research would lead to more effective communication strategies. As more consumers discover and adopt plant-based milk options, agricultural communicators should be monitoring developments in terms of innovation and consumer habits. Communicators should provide information through advertising campaigns, press releases, social media, and news stories to help provide accurate information and news about plant-based milk. As many articles about plant-based milk contained the Trend frame to highlight innovation and popularity of products, the dairy industry could emphasize innovations such as lactose-free, flavored milk, or shelf-stable products. For those promoting plant-based milk alternatives, it would be beneficial to use the

Taste and Trend frames to provide more information about how consumers can use plant-based milk to encourage them to try the product and adopt plant-based milk into their routine and diet.

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