Drivers of choice for fluid milk versus plant-based alternatives: What are consumer perceptions of fluid milk?

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ABSTRACT

Fluid milk consumption has declined for decades while consumption of nondairy alternatives has increased. A better understanding of why consumers purchase fluid milk or nondairy alternatives is needed to assist increased sales of milk or maintain sales without further decline. The objective of this study was to determine the extrinsic attributes that drive purchase within each product category. The second objective was to determine the personal values behind the purchase of each beverage type to give further understanding why particular attributes are important. An online conjoint survey was launched with 702 dairy consumers, 172 nondairy consumers, and 125 consumers of both beverages. Individual means-end chain interviews were conducted with fluid milk consumers ($n = 75$), plant-based alternative consumers ($n = 68$), and consumers of both beverages ($n = 78$). Fat content was the most important attribute for dairy milk followed by package size and label claims. Consumers of fluid milk preferred 1 or 2% fat content, gallon, or half-gallon packaging, conventionally pasteurized store-brand milk. Sugar level was the most important attribute for plant-based beverages, followed by plant source and package size. Almond milk was the most desirable plant source, and half-gallon packaging was the most preferred packaging. Means-end chain interviews results suggested that maintaining a balanced diet and healthy lifestyle was important to all consumer groups. Lactose free was an important attribute for plant-based alternative consumers and consumers of both dairy and nondairy. A distinguishing characteristic of those who only drank nondairy plant-based alternatives was that plant-based beverages contributed to a goal to consume less animal products, beliefs about animal mistreatment, and perceived lesser effect on the environment than fluid milk. Unique to fluid milk consumers was that fluid

milk was perceived as a staple food item. These results suggest that the dairy industry should focus on the nutrition value of milk and educating consumers about misconceptions regarding dairy milk. Future beverage innovation should include the development of lactose-free milk that is also appealing to consumers in flavor.

Key words: fluid milk, nondairy alternative, means-end chain analysis, conjoint analysis, consumer liking

INTRODUCTION

Overall US fluid milk sales have steadily declined since January 2011, with retail sales down an estimated 3.8% in 2014 (DMI, 2014; Kennedy, 2015). As fluid milk sales have declined, nondairy alternative plant-based beverage sales have concurrently seen a strong increase in the past few years, up a projected 30.0% from 2010 as of the end of 2015, with a growth of 13.7% in 2014 alone (DMI, 2014; IFT, 2015). Almond milk and coconut milk led the 2014 increases, with the ever-expanding nondairy alternative varieties also including options such as soy, rice, and quinoa milks (DMI, 2014; IFT, 2015). This expansion and sales increase appears to be driven by increased consumer interest in nondairy plant-based beverages due to health trends, allergen concerns, and health claims made on these products (IFT, 2015). Fluid milk comprises 68.0% of dairy/nondairy beverage sales, but per capita consumption of fluid milk has decreased steadily since 1975 by a rate of 830 mL/yr (Geuss, 2013). More than half of dairy consumers also purchase (nondairy) plant-based beverages and US retail sales of plant-based beverages are projected to increase 2-fold by 2019 at the expense of fluid milk purchases (Baertlein, 2015; Mintel Group Ltd., 2015a).

Several theories have been proposed regarding the decline in fluid milk consumption from increased choices in the beverage category to consumer dissatisfaction with fluid milk flavor, shelf life, or both. Plant-based beverages vary widely in their nutritional content (protein, fat, sugar, minerals) with some similar to fluid milk in gross composition and others with lower protein

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and nutritional value. Milk protein is also a complete protein, whereas plant proteins are not. Consumer-perceived differences in nutrition may or may not be a contributor to decreased fluid milk consumption. With the decline in fluid milk purchase and consumption, gaining an understanding of how consumers make choices in their beverages has become of particular interest and might be useful to shift consumer choices back to fluid milk from nondairy options. One way to gain this insight is by conjoint analysis. Conjoint analysis is a survey technique used to evaluate consumer preferences for a product or product category with varying product attributes (Green and Srinivasan, 1978). The goal is to understand the attributes within a product category that drive purchase (Ewald and Moskowitz, 2007). Consumers are presented with combinations of product attributes and must choose which attributes are most appealing. Several types of conjoint analysis exist: full-profile conjoint analysis, adaptive conjoint analysis, choice-based conjoint, menu-based conjoint, and adaptive choice-based conjoint (**ACBC**) analysis (Jervis et al., 2012; Rao, 2014). Conjoint surveys have been successfully applied to explore consumer insights for several dairy foods including chocolate milk, cottage cheese, and sour cream (Jervis et al., 2012; Kim et al., 2013; Li et al., 2014; Hubbard et al., 2016).

Another means of understanding consumer purchase habits within a product category is to use means-end-chain (**MEC**) analysis. Means-end-chain analysis is a qualitative market research technique based on the psychology of human behavior and decision making, in which consumers are interviewed to elicit responses that can be categorized as attributes, consequences, or values (Gutman, 1982). These responses are then linked using a laddering technique to show how they relate in a hierarchical relationship (Gutman, 1982; Reynolds and Gutman, 1988). A hierarchical values map (**HVM**) is then constructed to illustrate the overall qualities that influence decisions for that category of consumers (Reynolds and Gutman, 1988). The objective of MEC interviews is to determine how a product or service enables the consumer to reach their desired end state (Gutman, 1982). As such, this qualitative technique can be applied alone or in conjunction with a quantitative research tool. Gutman (1984) used MEC analysis to determine consumer choices related to beverages. Attributes such as natural/sugar free led consumers to achieve a higher self-esteem through healthy food choices in all beverage consumption. Milk was consumed due to calcium content, which led to being healthy, which in turn, achieved the value of happiness for consumers (Gutman, 1984).

Other studies have explored consumer attitudes toward conventional milk (Horwath et al., 1995; Mo-

bley et al., 2014) and acceptability of soy beverages compared with lactose-free dairy milks (Palacios et al., 2009). Mobley et al. (2014) evaluated attitudes and beliefs using focus groups of older, lower income women in the United States. Primary reasons for dairy milk consumption included that it was “good for bones/osteoporosis,” “good for health,” and “what the doctor recommended.” Horwath et al. (1995) studied reasons for low milk consumption in young and elderly women in New Zealand. For young women, the health concerns were weight loss or lower fat intake, with milk being negatively associated with these needs. Lactose intolerance was mentioned by both young and elderly women. Palacios et al. (2009) showed that lactose-free dairy milks at 2% milkfat, 1% milkfat, and skim (0.1% milkfat) were rated higher in overall liking than soy beverages regardless of if the consumers were lactose intolerant. Based on these previous studies, a more targeted evaluation and understanding of why consumers purchase milk, both milk and plant-based beverages, or only plant-based beverages is needed if the dairy industry hopes to maintain or gain market shares of beverage sales.

Several research studies have been performed using MEC theory and conjoint analysis, including several applicable to the food and beverage industry. However, no study has directly related key attributes to values held by consumers and how that influences fluid milk versus nondairy alternative beverage purchase. A survey format, such as conjoint analysis with other questions, followed by personal interviews, provides a unique opportunity for quantitative and qualitative understanding of consumer perception and attitudes. The objectives of this study were to determine and compare drivers of choice for fluid milk and nondairy plant-based beverage consumers and to subsequently uncover the underlying values behind nondairy plant-based alternatives or fluid milk purchase in these different consumer segments.

MATERIALS AND METHODS

Experimental Overview

Online surveys were uploaded to an Internet server and completed by consumers from the Raleigh, North Carolina, area from a database of over 8,000 individuals maintained by the North Carolina State University Sensory Service Center. Qualified consumers were primary shoppers (25–70 yr old) who purchased cow milk, nondairy plant-based alternative beverages, or both at least 2 to 3 times per month. After demographic questions and based on product usage, participants were designated as dairy-only consumers, nondairy-only

consumers, or consumers of both types of beverages. Participants completed a series of usage questions, emotion questions, and Kano-related questions before the conjoint survey. Consumers of dairy only completed a dairy milk conjoint section followed by a dairy Kano analysis section and consumers of nondairy completed a nondairy plant-based alternatives conjoint section followed by a nondairy Kano analysis section. Consumers of both completed the dairy and nondairy plant-based beverage conjoint analyses in succession followed by the dairy and nondairy Kano sections in succession. Upon completion of the entire survey, participants were entered into a drawing for one \$100 gift card and five \$20 gift cards. Qualitative interviews with MEC analysis were subsequently conducted with a subset of consumers from each group to further understand the values behind the conjoint results. All consumer research was conducted in accordance with regulations from the North Carolina State University Institutional Review Board for the Protection of Human Subjects in Research.

Conjoint Analysis

An ACBC survey was conducted for dairy and nondairy plant-based beverages using SSI Web (Sawtooth Software version 8.3, Orem, UT). The fluid milk survey addressed fluid-milk-related attributes (fat content, packaging, label claims, shelf life, protein content, pasteurization, and brand) with 3 to 7 levels per attribute (Table 1). The nondairy plant-based beverage survey addressed 7 plant-beverage-related attributes (sugar level, milk source, package size, fat content, protein content, label claims, and brand) with 3 to 7 levels per attribute (Table 1). Each ACBC survey was designed with 1 build-your-own task followed by 10 screening tasks. Each screening task contained 4 product concepts and possible responses of “it won’t work for me” or “a possibility” for each product concept. For each product concept, a random presentation was generated for each attribute with every attribute presented in all 10 choice tasks. Six unacceptable questions and 4 must-have questions were built into the survey. After the screening task, panelists completed a 10-question choice task tournament section with a maximum of 18 product concepts and 3 concepts per choice task (Hubbard et al., 2016).

Emotion Questions. Consumers were asked to complete a choose all that apply section regarding their emotions when purchasing nondairy plant-based beverages, fluid milks, or both, for their household as described by Li et al. (2014). This section was completed by panelists after conjoint analysis and before Kano analysis. Emotions selected by over 20.0% of

respondents were reported. Consumers of both types of beverages completed separate emotion questionnaires for each type of beverage.

Kano Analysis. After the emotions section, participants completed a Kano questionnaire for fluid milk, nondairy plant-based beverages, or both, to determine how consumer satisfaction was affected by product attributes. In Kano analysis, attributes are classified into 1 of 5 quality-based attributes (Kano et al., 1984; Kim et al., 2013). These categories include “attractive,” unexpected by the consumer—consumers are satisfied if this attribute is present; “indifferent,” attributes that the consumer does not care about; “must have,” expected by the consumer—if unavailable, consumers are dissatisfied; “1 dimensional,” as the attribute increases, so does consumer liking; and “reverse,” leads to dissatisfaction. All questions were first asked in positive format such as “Milk that is creamy” before being asked in a negative format such as “Milk that is NOT creamy.” For each statement, participants selected 1 of 5 responses from “I will like it,” “I must have it,” “I do not care,” “I can live with it,” and “I will dislike it.” Consumers of both types of beverages completed separate Kano questionnaires for each type of beverage. Responses for consumers of both beverages were placed into respective categories for analysis.

Means-End Chain Analysis

Consumers were recruited from the online database maintained by the Sensory Service Center (Raleigh, NC) from the pool of consumers that had completed the conjoint analysis survey. Consumers were asked to identify if they purchased and consumed only fluid milk, only nondairy plant-based beverages, or if they purchased and consumed both. They were asked how they normally consumed the beverages as the objective was to interview those who consumed the beverages as a drink and not just as an ingredient. Consumers who were interviewed were 65.3% females, 34.7% males, 19 to 45 yr old, and mostly Caucasian (66.8%).

Interviews were conducted in a 1-on-1 setting, each interview lasting approximately 30 to 45 min. The same individual conducted all interviews to assist with consistency of responses and interpretation. Consumers were first asked to identify if they consumed only dairy milk ($n = 75$), only nondairy plant-based alternatives ($n = 68$), or if they purchased and consumed both ($n = 78$). They were then asked how they typically consumed each beverage type to ensure that self-classification aligned with classification for this study. Consumers were then asked why they consumed their particular beverage. In the cases where consumers drank both, laddering questions were conducted with both beverage

Table 1. Attributes, levels, and utility scores of conjoint analysis of fluid milk and plant-based beverages¹

Attribute	Fluid milk		Nondairy	
	Level	Utility score ²	Level	Utility score ³
Fat content per 8 oz serving	0 (skim/fat free)	−18.3 ^c	1 (skim/fat free)	5.6 ^b
	1 (2.5 g of fat)	29.6 ^b	2 (2.5 g of fat)	16.6 ^a
	2 (5 g of fat)	31.9 ^a	3 (5 g of fat)	3.8 ^b
	3.25 (8 g of fat; whole milk)	−43.2 ^c	4 (8 g of fat; whole milk)	−26.1 ^c
Package size	Gallon	30.3 ^a	Gallon	−17.3 ^c
	Half gallon	26.3 ^b	Half gallon	39.7 ^a
	Liter	−11.4 ^c	Liter	6.1 ^b
	Pint (16 oz)	−45.2 ^c	Pint (16 oz)	−28.5 ^d
Label claims	Locally farmed	19.8 ^a	Fortified (vitamin A/D, calcium)	13.6 ^a
	Extra calcium	14.4 ^b	Organic	7.4 ^{ab}
	Extra protein	4.2 ^b	GMO (genetically modified organism) free	4.4 ^{bc}
	Reduced calorie	4.0 ^b	Extra protein	−0.7 ^{cd}
	Omega-3 fortified	3.0 ^b	Omega-3 (n-3) fortified	−4.5 ^{de}
	Recombinant bovine somatotropin (rBST)-free	1.9 ^c	Reduced calorie	−8.6 ^e
	Lactose free	−47.3 ^d	Conventional (no claim)	−11.6 ^f
	Conventional pasteurized (refrigerated shelf life of 18–21 d)	43.8 ^a	N/A	
Shelf life	Ultrapasteurized (refrigerated shelf life of 30–65 d)	−1.9 ^b		
	Shelf stable (does not have to be refrigerated until opened)	−41.9 ^c		
	Conventional	8.1 ^a	N/A	
	Organic	0.4 ^b		
Milk type	Pasture based	−8.5 ^c		
	N/A ⁴			
Sugar level			Naturally sweetened	52.1 ^a
			No added sweetener	49.9 ^b
			Nonnutritive (no calorie) natural sweetener (e.g., stevia, monk fruit)	−22 ^c
			Nonnutritive (no calorie) artificial sweetener (e.g., acesulfame-K, aspartame)	−80 ^c
			Almond	57.7 ^a
Plant source	N/A		Soy	−6.3 ^b
			Coconut	−6.3 ^b
			Rice	−45.1 ^c
			1	−26.8 ^d
			2	−16.1 ^{cd}
Protein content per 8-oz serving (g)	1	−26 ^d	5	12 ^c
	2	−13 ^{cd}	8	16.5 ^a
	5	14.6 ^a	9	14.4 ^b
	8	12.5 ^b		
	9	11.9 ^c		
Brand	Store brand (e.g., Archer Farms, Great Value)	16.2 ^a	Store brand (e.g., Archer Farms, Great Value)	1.9 ^b
	Regional brand (e.g., PET, Hunter Farms)	−1.1 ^b	Regional brand (e.g., Westsoy, Zensoy)	−13 ^d
	Organic brand (e.g., Horizon, Organic Valley)	−2.1 ^b	Organic brand (e.g., Eden Soy, Organics, Pacific)	−3.1 ^c
			National brand (e.g., Silk, Blue Diamond, 8th Continent, So Delicious)	14.2 ^a
	National brand (e.g., Dean's)	−13 ^c		

^{a–f}Within a column, different superscripts denote significant differences within each attribute ($P < 0.05$).

¹Attributes and utility scores cannot be directly compared between fluid milk and plant-based beverages or between different attributes within a column. 8 oz (237 mL), 16 oz (473 mL).

²Zero-centered utility values for levels within dairy attributes.

³Zero-centered utility values for levels within plant-based attributes.

⁴N/A = not applicable. Data represent responses from 827 consumers for fluid milk and 293 consumers for plant-based beverages.

types. After the first reason of purchase and consumption was established, the interviewer proceeded with “why?” questions (Reynolds and Gutman, 1988). This series of questioning was allowed to proceed beyond the focus of the beverage type as the goal was to determine how the product fit into the consumer’s personal life

and ultimately, what they were trying to achieve and or gain by the decision of buying dairy, nondairy alternatives, or both beverages (Reynolds and Gutman, 1988). During each session, the interviewer took written notes and interviews were also recorded for later content review.

Statistical Analysis

The online survey data analysis was performed using XLSTAT version 2012.6.04 (Addinsoft, New York, NY). For conjoint analyses, individual utility scores were extracted by hierarchical Bayesian estimation and rescaled using a zero-centered difference method to standardize utility scores (Jervis et al., 2012; Li et al., 2014). A 1-way ANOVA with Fisher's least significant difference was used for analysis of utility scores and clusters; cluster analysis was performed using XLSTAT to categorize similar responses into groups. Emotion questions were analyzed for frequency of choice using a chi-squared significance test and Kano questions were evaluated according to the model proposed by Kano et al. (1984).

Data for the MEC interviews were analyzed as described by previous studies (Reynolds and Gutman, 1988; Santosa and Guinard, 2011). The ladders were first analyzed for content; any similar elements were combined into a single code at each level of attributes, consequences, and values. Nutrition and health factors were categorized separately in the coding process to distinguish between positive attributes (nutrients available in the products), compared with negative attributes or what consumers did not want the product to contain (fat, carbohydrates, calories). A summary matrix was constructed to display connections within the ladders. Connections were categorized into 2 types: direct (elements that lead directly to another within a ladder) and indirect (for example, an attribute to a value). A minimum cut-off point of $n = 5$ for each connection was selected to construct the HVM to ensure the HVM represented the majority of respondents (Reynolds and Gutman, 1988).

RESULTS AND DISCUSSION

Online Survey

A total of 999 consumers participated in the survey (702 dairy consumers, 172 nondairy plant-based beverage consumers, and 125 dairy/nondairy consumers). Seventy-eight percent of participants were female and 22.0% were male. Participants were mostly Caucasian (69.6%) followed by African American (19.2%). Eighty-seven percent of participants had completed 2+ yr of college, income was spread evenly (\$25,000 to >\$100,000), and 98% of participants were between 34 and 64 yr of age. The majority of consumers (87.8%) did not claim to follow any specific diet plan or claim to be lactose intolerant (88.4%). All participants had purchased fluid milk, plant-based beverages, or both in the past month. Twenty-seven percent of consumers

purchased 1 or both beverages more than once a week, 47.0% purchased 1 or both beverages once a week, and 25.0% purchased 1 or both beverages 2 to 3 times per month. No significant differences in purchase frequency or demographics were detected between the 3 user groups of dairy, nondairy, and both ($P > 0.05$). Based on no differences in demographics ($P > 0.05$) and no differences in conjoint responses between dairy and both, and nondairy and both, results from users of both products were pooled into dairy and nondairy results, respectively (827 fluid milk consumers, 293 nondairy plant-based alternative consumers).

Conjoint Analysis. Conjoint importance scores indicate which attributes are most important and conjoint utility scores indicate which levels within an attribute are most desirable to the consumer. Fat content ($P < 0.05$) was the most important attribute for fluid milk followed by package size and label claims. Pasteurization type (heat treatment) and milk brand were the least important attributes (Table 2). Dairy milk consumers preferred 2 or 1% fat content and gallon or half-gallon packaging ($P < 0.05$). They also preferred conventional pasteurized milk and store brand milk (Table 1). Dairy conjoint results were consistent with data from previous studies (Goff and Griffiths, 2006; Kim et al., 2013; DMI, 2014). Almost 70.0% of 2014 dairy milk sales were reduced or fat-free milk with gallon or half-gallon jugs followed by tabletop liter cartons as the most popular packaging (Goff and Griffiths, 2006; DMI, 2014). Over 90.0% of milk sold in 2014 was conventionally pasteurized and pasteurization temperature was not listed among the 11 value-added food trends for milk (DMI, 2014). Ultrapasteurization is appealing to the dairy industry to increase shelf life and to facilitate the consumer supply chain. The heat pasteurization treatments presented in the current study were defined to consumers in terms of shelf life (Table 1). However, our results suggest that increased shelf life is not a key value for most fluid milk consumers. To our knowledge, no recent published study demonstrates that consumers understand the meaning and purpose of pasteurization or the different types of pasteurization, which was another reason why we defined the different pasteurization categories in terms of shelf life. Similarly, very little advertising has been devoted to branding fluid milk and consumers are not generally brand aware for this product.

Sugar level ($P < 0.05$) was the most important attribute for nondairy beverages, followed by plant source and package size (Table 2). Label claims and brand were the least important attributes for nondairy beverages (Table 2). Nondairy consumers preferred plant beverages that were naturally sweetened or had no added sugar ($P < 0.05$; Table 2). Mintel Group Ltd.

(2015b) reported that consumers are demanding more natural sweeteners and more information regarding the differences between each sweetener type. Confusion exists about which sweeteners are truly all natural, which may be a contributing factor as to why some consumers desire beverages that are unsweetened (Mintel Group Ltd., 2015b). Almond milk was the most desirable plant source and half-gallon packaging was the most preferred packaging (Table 2). Over 65.0% of nondairy beverages sold in 2014 were almond milk (DMI, 2014). For both milk and nondairy beverages, utility scores were higher for higher levels of protein content, confirming the universal appeal of protein in beverages. Protein utility scores were consistent with 2014 marketing results, where more than half of US consumers expressed a desire to consume more protein and also claimed nonmeat sources as the best source for this increased protein (NPD Group Inc., 2014).

Three consumer clusters were identified for fluid milk and 3 consumer clusters were identified for nondairy alternatives based on utility scores (Figures 1 and 2). Fluid milk consumers as a whole were associated with conventional pasteurization and half-gallon packaging and did not prefer 3.25% fat (whole milk), lactose free, and shelf-stable milk (Figure 1). Dairy cluster 1 ($n = 351$) was characterized by a preference for 2% milk that was locally farmed, and conventionally pasteurized milk (Figure 1). Cluster 1 gave 2% milk a high utility score followed by whole milk coming in second; this group may be considered the fat seekers. Dairy cluster 2 ($n = 275$) was characterized by preference for skim and 1% milk, store brand, half-gallon packaging,

and again conventionally pasteurized milk (Figure 1). Cluster 2 can be considered the fat-free seekers. Dairy cluster 3 ($n = 201$) was split between the previous 2 clusters and loaded most closely toward 1% milk and half-gallon packaging but also preferred conventionally pasteurized milk (Figure 1). This cluster gave 1 and 2% milkfat equal utility scores and can be considered the low-fat seekers (data not shown). Protein utility scores for 5, 8, and 8 g all had similar loadings on factor 1, whereas 1 and 2 g of protein loaded negatively on factor 1 and away from all clusters (Figure 1). This suggests that consumers are attracted by higher protein but do not associate milk as a source of protein or are unaware of the specific amount of protein per serving.

All nondairy consumers were associated with the utility scores that loaded positively on principal component 1: national brand, vitamin and calcium fortified, no sugar added, and naturally sweetened (Figure 2). Upon clustering, more specific consumer groups were defined. Nondairy cluster 1 ($n = 116$) was differentiated by soy, fat-free, or 1% fat, and naturally sweetened (Figure 2). Nondairy cluster 2 ($n = 107$) was characterized by preferences for almond milks with 1% fat, genetically modified organism free, and no added sweetener, whereas nondairy cluster 3 ($n = 74$) was characterized by organic, genetically modified organism free, naturally sweetened almond milk (Figure 2).

Nondairy and dairy conjoint results were consistent with previous studies from Saba et al. (1998), Jones et al. (2008), Palacios et al. (2009), Villegas et al. (2009), Kim et al. (2013), and Li et al. (2014). Villegas et al. (2009) suggested that different factors affected consumer acceptance of milk versus soymilk beverages. Li et al. (2014) and Kim et al. (2013) reported that fat content and sugar content were important attributes to consumers when purchasing chocolate milks and that fluid milk consumers preferred store and regional brand milks. Saba et al. (1998) established fat content as a differentiating feature among fluid milk consumers. Palacios et al. (2009) established sweetness as a key driver of liking for lactose-free dairy milk and plant-based beverages. This study also found that sweet-driven consumers preferred fat free and reduced fat nondairy alternatives (Palacios et al., 2009). Conjoint results from this study support previous work, but further understanding into why these attributes are important is revealed through the Kano results and MEC interview results.

Kano Analysis. Kano analysis is another question format to understand consumer satisfaction with product attributes or features. Must-have attributes are attributes that lead to consumer dissatisfaction if they are not present. One-dimensional attributes are attributes that will show linear increments of consumer

Table 2. Conjoint importance scores of fluid milk and plant-based beverages

Attribute	Importance score ¹	
	Fluid milk ²	Nondairy ³
Fat content (%)	26.9 ^a	15.2 ^c
Package size	18.6 ^b	16.7 ^b
Label claims	16.7 ^c	7.1 ^d
Shelf life	15.2 ^d	N/A ⁴
Milk type	7.1 ^f	N/A
Sugar level	N/A	26.9 ^a
Plant source	N/A	18.6 ^b
Protein content	9.1 ^e	9.1 ^d
Brand	6.4 ^f	6.4 ^e

^{a-f}Different superscripts within a column denote significant differences ($P < 0.05$).

¹Importance scores cannot be compared between fluid milk and plant-based beverage consumers.

²Attributes importance scores for the total population of fluid milk consumers ($n = 827$).

³Attributes importance scores for the total population of nondairy consumers ($n = 293$).

⁴N/A = not applicable.

satisfaction as these attributes are increased. Attractive attributes are unexpected attributes that can lead to greater satisfaction if present. Indifferent attributes do not affect consumer expectations for the product. Attractive features for fluid milk consumers ($n = 827$) included milk that was all natural, organic, reduced fat, and vitamin fortified (Table 3). Milk that was healthy and milk that tastes good were considered must-have attributes. Cluster 1 consumers ($n = 351$) were characterized by liking of milk that their family/spouse/partner also likes, cluster 2 consumers ($n = 275$) were characterized by liking of milk that helped with weight control and milk that was fat free (consistent with their utility scores for fat-free milk), and cluster 3 consumers ($n = 201$) were characterized by preferences for milk that helped with weight control, milk that was RGBH/growth hormone free, reduced fat/fat free, contained DHA, and contained probiotic/digestive benefits. Similar clusters were driven by household liking and fat content were identified from Kano results for consumer liking of chocolate milk and parents' pur-

chase of chocolate milk for their kids (Li et al., 2014). Consumers were also differentiated by preferences for milk that was reduced fat and milk that was all natural (Kim et al., 2013; Li et al., 2014). Parental purchase of chocolate milk was influenced by their children's liking of the milk, and the parent consumer clusters were differentiated by traditional consumers, organic consumers, and all-natural consumers (Li et al., 2014). Kim et al. (2013) identified organic as an attractive attribute for all consumers for chocolate milk, but found that it did not affect purchase decisions. Similar results were found in this study. Milk type (conventional, organic, pasture based) did not receive a high importance score, and within this category, the utility score for organic was lower than conventional ($P < 0.05$). Despite this result, an organic label was attractive to consumers by Kano questioning.

For nondairy plant-based beverage consumers ($n = 297$), beverages that tasted good and were healthy were must haves. Nondairy alternatives that helped with weight control, did not contain growth hormones, had

Figure 1. Principal component biplot of fluid milk consumers with respect to utility scores. RBST = recombinant bovine somatotropin; omg-3 = n-3; past. = pasteurized. Color version available online.

Table 3. Kano results for fluid milk with all fluid milk consumers, clustered consumers, and consumers who drink both fluid milk and plant-based beverages (both)¹

Feature	All consumers (n = 827)	Cluster 1 (n = 351)	Cluster 2 (n = 275)	Cluster 3 (n = 201)	Both (n = 112)
Milk that tastes good	Must have	Indifferent	Indifferent	Indifferent	1-Dimensional
Milk that helps me with weight control	Indifferent	Indifferent	Attractive	Attractive	Must have
Milk that is growth hormone free	Indifferent	Indifferent	Indifferent	Attractive	Attractive
Milk with probiotic benefits	Indifferent	Indifferent	Indifferent	Attractive	Attractive
Milk that is healthy	Must have	Indifferent	Indifferent	Indifferent	Indifferent
Milk that is all natural	Attractive	Indifferent	Indifferent	Indifferent	Attractive
Milk that is organic	Attractive	Indifferent	Indifferent	Indifferent	Attractive
Milk that is reduced fat	Attractive	Indifferent	Indifferent	Indifferent	Indifferent
Milk that is fat free	Indifferent	Indifferent	Attractive	Attractive	Reverse
Milk that my family likes	Indifferent	Must have	1-Dimensional	Indifferent	Indifferent
Milk that is vitamin fortified	Attractive	Indifferent	Indifferent	Indifferent	Indifferent
Milk plus added DHA omega-3 ²	Indifferent	Indifferent	Indifferent	Attractive	Indifferent
Milk with extra added protein	Attractive	Indifferent	Indifferent	Indifferent	Must have

¹Kano classifications were calculated as described by Kano et al. (1984). Questions were presented in positive and negative format for each feature to create the contingency table.

²DHA = docosahexaenoic acid; omega-3 = n-3.

digestive benefits, were all natural, organic, vitamin fortified, and contained as much protein and calcium as skim milk were attractive. Full-fat nondairy alter-

natives and those that had extra added protein were reverse features (Table 4). Cluster 1 consumers of non-dairy alternatives were categorized by fat free as an

Biplot (axes F1 and F2: 90.0%) **Figure 2.** Principal component biplot of nondairy alternative consumer clusters with respect to utility scores. Vit = vitamin; omg-3 = n-3; GMO = genetically modified organism. Color version available online.

Table 4. Kano results for nondairy plant-based (PB) alternatives with all nondairy consumers and consumers who drink both fluid milk and plant-based alternatives (both)¹

Feature ²	All consumers (n = 405)	Cluster 1 (n = 112)	Cluster 2 (n = 107)	Cluster 3 (n = 74)	Both (n = 112)
Nondairy PB alternative that tastes good	Must have	Indifferent	Indifferent	Indifferent	1-Dimensional
Nondairy PB alternative that helps me with weight control	Attractive	Indifferent	Indifferent	Indifferent	Indifferent
Nondairy PB alternative that is growth hormone free	Attractive	Indifferent	Indifferent	Indifferent	Attractive
Nondairy PB alternative that has digestive benefits	Attractive	Indifferent	Indifferent	Indifferent	Attractive
Nondairy PB alternative that is healthy	Must have	Indifferent	Indifferent	Indifferent	Indifferent
Nondairy PB alternative that is all natural	Attractive	Indifferent	Indifferent	Indifferent	Indifferent
Nondairy PB alternative that is organic	Attractive	Indifferent	Indifferent	Indifferent	Attractive
Nondairy PB alternative that is full fat	Reverse	Indifferent	Indifferent	Indifferent	Reverse
Nondairy PB alternative that is creamy	Indifferent	Indifferent	Attractive	Indifferent	Indifferent
Nondairy PB alternative that is reduced fat	Indifferent	Indifferent	Attractive	Attractive	Indifferent
Nondairy PB alternative that is fat free	Indifferent	Attractive	Attractive	Indifferent	Indifferent
Nondairy PB alternative that my family likes	Indifferent	Indifferent	Must have	Attractive	Indifferent
Nondairy PB alternative that does have a long shelf life	Indifferent	Indifferent	Indifferent	Indifferent	Indifferent
Nondairy PB alternative that is vitamin fortified	Attractive	Indifferent	Indifferent	Indifferent	Attractive
Nondairy PB alternative that does have added sweetener	Indifferent	Indifferent	Indifferent	Indifferent	Reverse
Nondairy PB alternative with Ca equal to 8 oz SM	Attractive	Indifferent	Indifferent	Indifferent	Attractive
Nondairy PB alternative with protein equal to 8 oz SM	Attractive	Indifferent	Indifferent	Indifferent	Attractive
Nondairy PB alternative that has extra added protein	Reverse	Indifferent	Attractive	Indifferent	Indifferent

¹Kano classifications were calculated as described by Kano et al. (1984). Questions were presented in positive and negative format for each feature to create the contingency table.

²PB = plant-based, and SM = skim milk. 8 oz (237 mL).

attractive attribute. Cluster 2 consumers categorized nondairy alternatives that their family would drink as a must have and found creamy, reduced fat, fat free, and no extra protein attributes attractive (Table 4). Cluster 3 consumers reported that reduced fat and nondairy plant-based alternatives their family would consume were attractive.

Consumers of both beverages (n = 125) had some distinctions from sole user groups in Kano results that were not detected in conjoint results (Tables 3 and 4). For consumers of both beverages, milk that tastes good was a 1-dimensional performer, and milk that helps with weight control and milk with extra added protein were considered must-have attributes. Growth hormone-free and milk with probiotic benefits were attractive attributes for consumers of both dairy and nondairy, and milk that was fat free was considered a reverse attribute. This result is distinct from dairy and nondairy consumers, suggesting consumers who drink both fluid milk and nondairy plant-based beverages are looking for beverages that fit into a healthy lifestyle or that they may pay more attention to nutritional labels. A nondairy plant-based beverage that tastes good was a 1-dimensional performer for consumers of both, whereas nondairy beverages with added sweetener were reverse attributes. This result suggests that consumers who drink both types of beverages are potentially more health conscious of what beverages should not have (i.e., no added sweetener, fewer calories, and fewer carbohydrates).

Emotional Results

All consumers had positive emotions toward purchase of their respective beverages. Both dairy and nondairy consumers reported the feelings happy, positive, and good (results not shown). No significant differences were noted between the user groups ($P > 0.05$).

Means-End Chain Analysis

Overall, consuming a beverage for a balanced diet and healthy lifestyle was a consequence that all consumer groups (dairy, nondairy, and both) had in common, which led to the value of living a long healthy life. Previous literature has demonstrated that consumers of both beverages believe in nutritional benefits for their respective category, fluid milk (Mobley et al., 2014) and plant-based foods (Lea et al., 2006). The exception of this ladder was for fluid milk consumers, where a balanced diet also led to their value of family, whether it was to practice good parenting through proper nutrition of their children or to live long because they wanted to be around for their family (Figure 3). Comfort was a value consumers of dairy and both dairy and nondairy had in common in their HVM of fluid milk, both stemming from flavor as the attribute and habit as the consequence (Figures 3 and 4). Habit has been stated as an important factor that policymakers and checkoff program managers might focus on, as increasing consumption of milk by chil-

Figure 3. Hierarchical value map for consumers of fluid milk ($n = 75$) from means-end-chain interviews. Numbers in parentheses are the number of times the link was evoked both directly and indirectly.

dren may form behavior as a child that might continue through adulthood (Stewart et al., 2012). School lunch milk represents one possible key to lifelong milk consumption if the milk is of consistent high quality and liked. Removal of flavored milk decreases school milk consumption and possibly lifelong milk consumption. Unpleasant experiences with school lunch milk (i.e., cardboard carton and other off flavors, fat free milk, and spoilage) may also have long-term negative effects on milk consumption. Tuorila and Pangborn (1988) also concluded that habit was an important factor in consumption of sweet, salty, and fatty foods. The dairy consumers also reached the comfort value through the attribute of staple food item and from flavor to the convenient attribute (Figure 3). Consumers in the both dairy and nondairy group reached comfort through the attribute of nutrition. They drank milk as a habit due to their knowledge of the nutritional benefits of milk (Figure 4). Consumers in the both group saw fluid milk flavor as a treat that led to their happiness and they also connected the flavor of milk to no waste due to the fact they knew their family would drink it (Figure 4). Flavor led to no waste for dairy consumers also, but the value differed from consumers of both dairy and nondairy in leading to peace of mind (Figure 3).

Comparing dairy consumers to nondairy consumers, dairy consumers were differentiated by staple food item as an attribute of fluid milk and the consequences of convenience and habit (Figure 3).

For nondairy consumers and consumers of both dairy and nondairy, consumption of nondairy plant-based beverages, the attribute of lactose free led to physical consequences such as easier on digestive tract, increased productivity, and feeling better physically, laddering up to the value of living a long and healthy life. Interestingly, less than 15% of these consumers self-reported lactose intolerance. Both groups also saw beverage flavor as a self-reward that led to their happiness (Figures 5 and 6). This result suggests that consumer education as well as innovation and new dairy beverages that are flavored or provide a variety of options for consumers might appeal to some consumers in these segments, especially those who consume both beverage types. Key differences in the 2 groups were that nondairy consumers had nutrition, meaning perceived calcium and protein, and plant based as attributes in their hierarchical value map (Figure 5), whereas consumers of both dairy and nondairy had health factors such as lower calories or useful calories, lower carbohydrates, and milk substitute as attributes (Figure 4). In previous research,

Figure 4. Fluid milk hierarchal value map for consumers of both types of beverages ($n = 78$) from means-end-chain interviews. Numbers in parentheses are the number of times the link was evoked both directly and indirectly.

Figure 5. Hierarchal value map for consumers of plant-based alternative beverages ($n = 68$) from means-end-chain interviews. Numbers in parentheses are the number of times the link was evoked both directly and indirectly.

misconceptions of fluid milk include the perceived high fat, high cholesterol, and high calories of whole milk (Bus and Worsley, 2003). From the results of consumers in the both group, these misconceptions may be held about all milkfat levels of fluid milk.

Another unique ladder nondairy consumers elicited was flavor, leading to no waste, which led to the value of relief of stress (Figure 5). The plant-based attribute led to ease of mind, which included choosing nondairy alternatives because they are not animal products, morals based on animal mistreatment, and the environmental effect of fluid milk production compared with nondairy plant-based alternatives, which led to the value of feeling achievement or accomplished (Figure 5). This ladder is supported by previous research by Izmirli and Phillips (2011) who reported that students from 11 countries in Europe avoided meat products due to environmental and health reasons. Milk produced sustainably, green, and with low environmental effect would appeal to consumers that purchase plant-based alternatives due to a perceived lower carbon footprint.

Consumers of only nondairy alternatives were not necessarily vegetarian or vegan but sought plant-based beverages for various reasons including their desire to limit animal-based foods due to health concerns, their beliefs about animal mistreatment, and that plant-based beverages were more environmentally friendly than dairy milk. Some vegetarian consumers (whether in the dairy or both group) did consume fluid milk because they believed in the nutritional value of fluid milk (Figures 3 and 4). Collectively, these interview results with nondairy consumers, and to a lesser extent consumers of both dairy and nondairy, suggest that the dairy industry needs to build trust and provide consumers with more education on milk nutrition, dairy farm practices, and animal care.

Another interesting observation is that consumers of both dairy and nondairy had lactose free as an attribute in their nondairy alternative map (Figure 6). They then had flavor as a self-reward in their dairy map (Figure 4). Palacios et al. (2009) determined that lactose-intolerant consumers still rated lactose-free

Figure 6. Plant-based alternative hierarchal value map for consumers of both types of beverages ($n = 78$) from means-end-chain interviews. Numbers in parentheses are the number of times the link was evoked both directly and indirectly.

fluid milk higher than soy beverages in overall liking. During the MEC interviews, some consumers of both types of beverages stated they consumed fluid milk due to preference in flavor at the cost of willing to feel uncomfortable due to their lactose intolerance. Differentiating consumers of both beverage types from nondairy and dairy was the attribute of health factors, meaning their desire for a product with less calories, less fat, and lower carbohydrates (Figure 6). Milk or milk-based beverages that are lactose free or reduced carbohydrate with more protein and calcium could be very successful in bringing consumers of both beverages back to solely consuming fluid milk and dairy milk-based beverages.

The results of this study provide insight as to which fluid milk attributes are most important or appealing to consumers and why they are important as it relates to their personal life. The same attributes were identified for plant-based beverages. This information is useful for the dairy industry to understand how to effectively market and position fluid milk, to identify improvements for fluid milk, and to aid in fluid milk beverage innovation. A balanced diet and healthy lifestyle were values for all consumers. Health factors such as lower fat and lower carbohydrates were attributes that drove purchase of nondairy alternatives. This result suggests that misconceptions exist about milk as a healthy food within this consumer group. The dairy industry should emphasize educating consumers on nutrition as well as misconceptions held for milk. A beverage that tastes good was a must have for both milk and nondairy alternatives. The dairy industry should continue its focus on starting children to drink milk at an early age to create a lifelong habit, but the product needs to be appealing in flavor for this approach to be successful. Lactose free as well as flavor were key attributes for fluid milk for consumers of both types of beverages. Beverage innovation with lactose-free milk would appeal to these consumers and may eliminate their need to purchase nondairy alternatives altogether.

CONCLUSIONS

These results suggest that consumers who drink milk do so out of habit or because they like the flavor. Consumers who still purchase milk but use nondairy alternatives as well might not have a need to consume nondairy beverages if new dairy products are developed that are appealing in flavor but are also lactose free. To those who only drink nondairy alternatives, grass-fed milk that has a lower carbon footprint may be appealing as long as flavor is appealing. Additional consumer education focused on trust building and nutrition and farm practices will further enhance milk's appeal.

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