










## Front-side nutritional information affects the perception of consumption of UHT milk drinks

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### Abstract

Research indicates that front labeling of foods that mention dietary concerns, such as reduced sugar content, has reduced consumer expectations and their preference for the product. The objective was to analyze the impacts of the new labeling on chocolate-flavored ultra-high temperature dairy products intended for lactose-restricted diets, in accordance with Normative Instruction No. 75 of 2020 and Collegiate Board Resolution No. 429 of 2020. Five dairy products were evaluated through qualitative and quantitative analyses, following the criteria defined by current standards. Additionally, 100 consumers who practice physical activity responded to a questionnaire, analyzing factors such as clarity, accessibility, and the impact of the information contained on labels. The findings indicated that, although most labels met the fundamental requirements, non-conformities were still identified, particularly linked to legibility and the lack of essential information. However, there was a need for greater consumer awareness and supervision to ensure full compliance with the new rules.

**Keywords:** labeling; compliance; dairy; restricted diets.

**Practical Application:** Impact of labeling on dairy beverages.

## 1 INTRODUCTION

Studies by Kongstad and Giacalone (2020) and Liem et al. (2012) have shown that labels with dietary information, such as “low sodium,” can reduce both consumer expectations and preferences.

Food packaging goes beyond physicochemical and microbiological protection, acting as a communication tool that influences the perception of flavor, healthiness, sustainability, and value (Piqueras-Fiszman & Spence, 2015; Velasco & Spence, 2019).

Well-designed labels tend to align with consumer expectations, contributing to greater satisfaction and product success (Apaolaza et al., 2017; Fernqvist & Ekelund, 2014; Samant & Seo, 2016). Smart packaging can also add value and reduce waste (Rethink Food Waste through Economics and Data [ReFED], 2021; Roe et al., 2018; Skinner, 2015). Although broad labels are initially more attractive, specific labels encourage loyalty (Köster & Mojet, 2016), while “clean labels” are associated with healthier and more attractive products (Cao & Miao, 2023).

In view of this, this study sought to analyze consumers’ perceptions of the new labeling of ultra-high temperature (UHT) dairy products with chocolate flavor, lactose-free, in accordance

with Normative Instruction (IN) No. 75/2020 and Collegiate Board Resolution (RDC) No. 429/2020 (Brasil, 2020a, 2020b).

### 1.1 Relevance of the work

The relevance of this study lies in the analysis of the effect of front-of-pack nutrition labeling on the perception of the consumption of ultra-high temperature (UHT) dairy beverages, a current issue in light of recent labeling regulations. The findings may assist in nutritional education initiatives and communication tactics for the food industry, in addition to supporting government policies focused on consumer health.

## 2 MATERIAL AND METHODS

### 2.1 Recruitment

The study was conducted with 100 participants over the age of 18 years, living in Rio Verde (GO) and nearby regions, accustomed to practicing physical activities and consuming lactose-free, chocolate-flavored UHT milk drinks. The research involved untrained volunteers of both sexes and was conducted through an online questionnaire on Google Forms, published

Received: Apr. 29, 2025.

Accepted: May 23, 2025.

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Conflict of interest: nothing to declare.

Funding: Coordination for the Improvement of Higher Education Personnel (CAPES), the National Council for Scientific and Technological Development (CNPq) (Process No. 303505/2023-0), the Goiás State Research Support Foundation (FAPEG) Public Call No. 21/2024: Scientific and Technological Research Assistance Program – 2024 Edition, the Study and Project Financing Agency (FINEP), and the Instituto Federal Goiano.

on gyms' social media, Instagram, and WhatsApp. The project was approved by the Research Ethics Committee (CAAE 58334222.2.0000.5077), ensuring compliance with ethical standards. All participants accepted the free and informed consent form and were free to withdraw from the research or not to answer any question, without needing to justify themselves.

### 2.2 Online questionnaire

Data were collected through an online questionnaire on Google Forms, available for 2 months (Tables 1–4). The form was divided into five sections: (1) Volunteer profile; (2) Legislation; (3) Chocolate-flavored UHT milk drinks for lactose-restricted diets; (4) Labeling; and (5) Purchase intention. The answers were kept confidential, without identifying the participants, and used exclusively for academic purposes. The questionnaire lasted approximately 15 min, and in the case of questions, participants could contact the researcher via the telephone number indicated in the informed consent form (TCLE).

The profile section aimed to identify demographic data and sports habits (12 questions). The legislation section assessed the volunteers' knowledge of labeling standards (three questions). The section on the milk drink investigated consumption,

intolerance, and perceptions about packaging and labeling (10 questions). The labeling section explored familiarity and clarity of information (five questions). Finally, the purchase intention section analyzed the impact of the high-sugar label in 11 questions, using images of the product—one without the high added sugar label (Figure 1) and one with the label (Figure 2)—and a 5-point hedonic scale to assess purchase intention (Stone & Sidel, 1985).

The study also assessed the conformities and non-conformities of the labels of chocolate-flavored UHT dairy beverages, aimed at lactose-restricted diets, based on RDC No. 429/2020 and IN No. 75/2020. Based on the data obtained, an ideal label was suggested, considering the identified conformities, the clarity of the information, and the visual communication, especially aimed at the public that practices physical activities and seeks products suitable for their diets.

## 3 RESULTS AND DISCUSSION

### 3.1 Participant data

The gender distribution was balanced, with a slight female predominance (52%). Most participants were between 26 and 30

**Table 1.** Volunteer profile.

Questions	Answers
1) Gender?	Female/Male/Other
2) Currently living in:	Rio Verde/Santa Helena/Jataí/Montividiu/Other:
3) What is your age?	18 to 20 years/21 to 25 years/26 to 30 years/31 to 35 years/36 to 40 years/41 to 45 years/46 to 50 years/51 to 55 years/56 to 60 years/Over 61 years
4) What is your educational level?	Incomplete elementary school/Complete elementary school/Incomplete high school/Complete high school/Incomplete higher education/Complete higher education/Complete postgraduate education/Incomplete post graduate education
5) What is your household income (sum of all salaries of residents in the same household)?	1 to 2 minimum wages/2 to 4 minimum wages/4 to 10 minimum wages/10 to 20 minimum wages/Over 20 minimum wages
6) What is your profession?	Open-ended question
7) How often do you engage in physical activities?	Once a week/2 to 3 times a week/4 to 5 times a week/6 to 7 times a week
8) Do you use supplements (e.g., creatine, pre-workout, whey)?	Yes/No
9) What type of physical activity do you usually do? (you may select more than one option)	Weight training/Running/Swimming/Yoga/Muay Thai/Boxing/Cycling/Jiu-Jitsu/Taekwondo/Walking/Cross training/Dance/Other:
10) How much time do you usually dedicate to each exercise session?	Less than 1 h/1 to 2 h/More than 2 h
11) What are your goals when practicing physical activities? (you may select more than one option)	Hypertrophy/Bulking/Cutting/Maintaining healthy habits/Weight loss/Mobility/Postoperative strengthening/Esthetics/Self-confidence/Body composition improvement/Self-esteem/Acquiring healthy habits/Stress and anxiety control/Medical recommendation
12) How often do you consume lactose-restricted UHT chocolate-flavored dairy drinks?	1 to 2 times a week/3 to 4 times a week/5 to 6 times a week/Every day/Once a month

Source: Author (2024).

**Table 2.** Legislation.

Questions	Answers
1) Were you aware that there is legislation regulating food labeling?	Yes/No
2) How often do you check the labeling of the items you purchase?	Every day/Several times a week/Once a week/Once a month/Rarely or never
3) What information would you like to see highlighted on the labels of lactose-restricted UHT chocolate-flavored dairy drinks to facilitate your choice? (you may select more than one option)	Calories/Nutrition facts table/Brand/Flavor/Ingredients/Product benefits/Lactose restriction

Source: Author (2024).

**Table 3.** Lactose-restricted UHT chocolate-flavored dairy drinks.

Questions	Answers
1) Do you have lactose intolerance?	Yes/No
2) How often do you consume lactose-restricted UHT chocolate-flavored dairy drinks?	Always/Almost always/Rarely/Never
3) What benefits would you like the packaging/label of lactose-restricted UHT chocolate-flavored dairy drinks to highlight? (you may select more than one option)	Healthy habit/Bone health maintenance/Brain development/Blood pressure balance/Helps regulate body sugar and fat levels
4) What is most important to you when purchasing a dairy drink?	Price/Brand/Flavor/Ingredient list/Nutritional value/Packaging
5) Have you ever considered switching brands of dairy drinks based on the nutritional information on the labels?	Yes/No
6) What do you look for on the label of a dairy drink before buying the product? (you may select more than one option)	Brand/Colors and material of packaging/Expiration date/Nutrition facts table/Ingredient list/I do not check the labeling
7) How do you identify if a food product is high in sugar, saturated fat, and sodium? (you may select more than one option)	Ingredient list/Product brand/Nutrition facts table/Flavor/I do not know how to identify/Other:
8) Do you believe that dairy drinks are high in sugar?	Yes/No/Maybe
9) Do you believe that dairy drinks are healthy foods?	Yes/No/Maybe
10) Did you know that a 68-kg person needs to consume 54 g of protein per day, which corresponds to nearly four servings of lactose-restricted UHT chocolate-flavored dairy drinks per day?	Yes/No/Maybe

Source: Author (2024).

**Table 4.** Labeling.

Questions	Answers
1) How often do you read nutritional labels?	Always/Almost always/Occasionally/Rarely/Never
2) Does the nutritional information on the product influence your purchase decision?	Yes/No/Maybe
3) Have you ever felt confused trying to understand food labeling information?	Always/Almost always/Rarely/Never
4) Do you think the font size makes reading difficult?	Yes/No/Maybe
5) Do you think the information on labels should use simpler language?	Yes/No/Maybe

Source: Author (2024).



Source: Author (2024).

**Figure 1.** Chocolate-flavored ultra-high temperature milk drinks for lactose-restricted diets without a high added sugar label.

years old (36%), followed by the age groups of 21–25 years (21%) and 31–35 years (11%). The other age groups showed lower representation, with a focus on young adults, a public more sensitive to labeling and health issues. Most volunteers lived in Rio Verde (41%) and Montividiu (36%), cities near the data collection site. Participants from other locations, such as Caldas Novas, Caxias, and Trindade, each represented 1%. The predominance of women was also observed in similar studies (Deimling et al., 2022; Morais et al., 2020), reinforcing the profile of greater female engagement in nutrition labeling research.

Regarding education level, 24% had incomplete higher education, 22% had completed undergraduate degree, and 19% had postgraduate education, indicating a good level of instruction among participants, potentially influencing their perception of nutritional labels. Additionally, 12% had completed high school, 8% had incomplete postgraduate education, and only 5 and 3% had incomplete and complete elementary education, respectively. Regarding income, most participants earned between one and two minimum wages (39%) or between two and four minimum wages (31%). Only 7% earned between 10 and 20 minimum wages, and 1% earned above 20 minimum wages. These findings highlight a discrepancy between high education levels and income concentration in lower ranges, reflecting labor market challenges.

These results contrast with Deimling et al. (2022), who indicated a higher average education level among consumers, but align regarding income. Heldt Júnior (2021) also observed that 45% of consumers had completed high school and 80% earned less than six minimum wages, linking low income to lower education levels.

### 3.1.1 Profession and lifestyle habits

The volunteers reported a wide variety of occupations, including students, teachers, administrative assistants, and

logistics managers, reflecting a diversity of profiles and increasing sample heterogeneity, enriching the data analysis. Similarly, Dourado et al. (2021) found a predominance of professions requiring higher education, notably public servants (42.6%) and students (39.7%).

Regarding lifestyle habits, 31% of the participants exercised two to three times a week, 30% once a week, 27% four to five times, and 12% six to seven times weekly. These figures suggest a relatively active routine among volunteers. Rebouças (2022) also noted that 51.6% of the participants engaged in physical activities, mainly weight training, indicating growing health and nutrition awareness among consumers.

### 3.1.2 Physical activity frequency and type

About 46% of the participants practiced weight training, 37% engaged in walking, and 22% in running, activities that often require more dietary attention, particularly regarding protein and supplements. Other cited sports included muay thai, jiu-jitsu, pilates, and soccer, each representing 1%. Swimming and yoga were mentioned by 3%, and cycling and dance by 5%. No participant reported practicing boxing. Lucena et al. (2025) also found high adherence to physical activity (56%), with emphasis on walking, weight training, and water aerobics, with 57.1% practicing for more than a year.

The data reveal a broad variety of sports practices among participants, highlighting the importance of nutritional strategies adapted to the type and frequency of activities. Furthermore, the increase in physical exercise practice suggests greater awareness of its health benefits.

### 3.1.3 Supplement use and exercise practice

The research revealed that 36% of the participants consumed supplements such as whey protein, creatine, and



**Product 1**

Source: Author (2024).

**Product 2**

**Product 3**

**Product 4**

**Product 5**

**Figure 2.** Chocolate-flavored ultra-high temperature milk drinks for lactose-restricted diets with a high added sugar content label.

pre-workout, usually linked to goals such as muscle gain or weight control. In contrast, 64% did not use these products, which could be related to a preference for balanced diets, lack of specific goals, economic factors, or a more natural lifestyle. Lopes et al. (2015) pointed out that the consumption of multiple supplements is influenced by factors such as media, friends, gyms, and physical educators.

Regarding exercise dedication, 61% of the participants exercised for 1–2 h per session, suggesting a healthy commitment. Only 1% exercised for more than 2 h, while 38% practiced for less than an hour, possibly because they were beginners or engaged in lighter activities. Araújo and Rosa (2016) observed that regions with lower income and population density tend to show greater dedication to physical exercise. Ferreira and Quintão (2016) reported that 75.85% of practitioners trained for more than 1 h, and 34.49% had been training for 3–5 years, highlighting the importance of programs adapted to the practitioners' reality.

Regarding goals, 50% of the participants aimed to maintain healthy habits and 34% aimed to acquire them. Other motivations included stress control (29%), hypertrophy (25%), and weight loss (26%). Less cited goals included post-operative strengthening (0%) and health maintenance (1%), showing a trend toward more immediate objectives. Methods such as bulking (7%) and cutting (5%) also had low adherence. Conversely, Santos and Pereira (2017) and Galati et al. (2017) found greater focus on muscle gain, associated with the consumption of high-protein, low-fat, or low-sugar products, especially in lactose-restricted diets.

#### *3.1.4 Consumption of ultra-high temperature chocolate-flavored lactose-restricted dairy beverages*

The results showed that 54% of the volunteers consumed UHT chocolate-flavored lactose-restricted dairy beverages once a month, while 37% consumed them one to two times a week, indicating that although the benefits of these products are recognized, there is still hesitation regarding regular consumption. The highest frequency was observed in 6% of individuals, consuming three to four times a week, and 2% consumed daily. These habits may be explained by the awareness of specific diet importance, but low consumption frequency may be related to factors such as price, taste, and lack of familiarity with the product.

Heldt Júnior (2021) revealed that 80% of UHT chocolate-flavored drink consumers consumed it one to five times per week, with 52% consuming at least twice per week. This highlights an opportunity for industries to invest in marketing and improve formulations to make the products more palatable and attractive. Education about the benefits of these products could help increase consumer engagement and loyalty.

#### *3.1.5 Knowledge about food labeling legislation*

The research revealed that 74% of the participants were aware of the legislation regulating food labeling, indicating that most consumers recognize the importance of label information

in making more conscious food choices. However, 26% of the respondents were unaware of the legislation, highlighting a lack of familiarity with regulations ensuring clarity and safety of nutritional information.

Marzarotto and Alves (2017) pointed out that the challenge for consumers lies in understanding and effectively using this information. The implementation of IN No. 75/2020 and RDC No. 429/2020 was a significant advance toward clearer and more objective labeling, but greater dissemination of these regulations is necessary to ensure all consumers can benefit, regardless of education level or access to information.

#### *3.1.6 Habits regarding checking food labels*

The analysis of the frequency with which volunteers checked product labels showed that 22% checked them daily, 10% once a week, and 18% a few times a week. However, 38% reported that they "rarely" checked labels, and 12% did so once a month, indicating that many consumers still do not regularly pay attention to nutritional information.

Nobre et al. (2023) revealed that 49.4% of participants checked labels, with higher prevalence among women (53.7%) and adults, while only 31.2% of adolescents had this habit. These data highlight the need for educational initiatives encouraging label reading, especially among groups with a lower frequency of this behavior. Furthermore, public policies improving label comprehension and accessibility are essential to consolidate this habit across different population segments.

#### *3.1.7 Preferences regarding labeling of lactose-restricted ultra-high temperature dairy beverages*

The research revealed that 49% of the participants would like the nutritional table to be highlighted on the labels of chocolate-flavored UHT dairy beverages for lactose-restricted diets, while 48% preferred information about the product's benefits. Only 17% considered the brand a decisive factor in purchasing. Additionally, 44% indicated a preference for highlighting calories and ingredients, and 40% preferred highlighting lactose restriction, reflecting a growing demand for transparency in food composition.

The preference for clear and accessible labels reflects the search for products that meet specific dietary needs. According to Zafar et al. (2022), consumers prefer labels that focus on health and environmental impacts, and the effectiveness of these labels depends on familiarity with the presented information. Boscardin et al. (2020) emphasized the importance of appropriate labeling for lactose-intolerant individuals, assisting in the selection of a balanced diet. Customizing labels according to consumer preferences can increase decision-making effectiveness.

#### *3.1.8 Lactose intolerance*

The research revealed that 21% of the participants reported lactose intolerance, highlighting the importance of lactose-free dairy products to meet the nutritional needs of this population. The remaining 79% did not report intolerance, but many

opted for lactose-free products for health reasons or to reduce sugar intake.

The prevalence of lactose intolerance varies among populations, being more common in Africa and Asia and less frequent in Northern Europe, due to genetic and evolutionary factors related to lactation (Batista et al., 2018). Common symptoms include abdominal pain, bloating, gas, and diarrhea, which may occur between 30 min and 2 h after lactose consumption, varying in intensity depending on the amount consumed and the degree of lactase deficiency (Agência Nacional de Vigilância Sanitária [ANVISA], 2018).

### 3.1.9 Consumption frequency

The research revealed that 49% of lactose-restricted volunteers rarely consumed chocolate-flavored UHT dairy beverages, while 6% reported always consuming them and 18% almost always. Additionally, 27% had never consumed these beverages, suggesting a lack of information about the benefits or availability of these products, or a preference for non-dairy alternatives.

A study by Pecenin (2020) showed similar results, with low consumption of fermented dairy products, with most participants consuming them once every 15 days or three to five times a week. Daily consumption was only 19.2%, possibly related to income, as most participants reported a family income between one and four minimum wages. Souza (2014) and Bastos et al. (2018) affirmed that in lower-income families, the consumption of dairy products tends to be reduced, prioritizing fluid or powdered milk and limiting spending on other dairy products.

### 3.1.10 Desired benefits in labeling of lactose-restricted ultra-high temperature dairy beverages

The survey on consumers' expectations regarding the labeling of chocolate-flavored UHT dairy beverages for lactose-restricted diets revealed that 57% of the participants want to see benefits related to the regulation of sugar and fat levels in the body, reflecting an interest in information that directly influences their diet and health. Additionally, 50% of the volunteers would like to know more about healthy habits and 36% about bone health. Lower percentages (23 and 24%) highlighted interest in information about brain development and blood pressure balance.

Salazar et al. (2019) observed that physically active consumers may have a limited understanding of nutrition, often interpreting nutritional labels inconsistently. Authors like Plasek et al. (2020) and Benajiba et al. (2020) suggest that the effective use of nutritional claims depends on consumer knowledge to properly understand and use label information.

### 3.1.11 Purchase criteria for dairy beverages

The research on purchase criteria for UHT dairy beverages revealed that 44% of the volunteers prioritized nutritional value, while 42% considered price the most important factor in purchasing decisions, highlighting the concern with cost, especially among consumers with limited budgets. Flavor was the most relevant criterion for 51% of the participants, indicating that

the sensory experience cannot be compromised. Furthermore, 24% prioritized the brand, 36% the ingredient list, and 13% the packaging.

These results are consistent with studies by Pfrimer (2018), who found that flavor was the main purchasing factor for dairy beverages developed with cagaita pulp, followed by price. Santos (2017) also emphasized the positive influence of flavor on the acceptance and preference for products such as dairy beverages fermented with Goji Berry flour.

### 3.1.12 Consideration of brand switching based on nutritional information

The survey revealed that 70% of consumers considered switching dairy beverage brands upon realizing that the nutritional composition of a product better met their needs or preferences, highlighting the importance of labels in purchase decisions. However, 30% of the participants reported that they never considered switching brands based on nutritional information, indicating brand loyalty influenced by flavor preferences or product trust.

Research by Siqueira and Rocha (2020) found that 61% of dairy beverage consumers in Brazil purchase regularly, with the brand being the decisive factor for 37% of them, followed by price (32%). These data suggest that companies must clearly highlight the benefits and costs of their products to attract consumers seeking healthier eating options.

### 3.1.13 Relevant information on dairy beverage labels

When asked about the most important information on dairy beverage labels, 68% of the participants indicated that calorie content was the most relevant factor, followed by 55% who considered the nutritional table important.

The expiration date was prioritized by 68%, reflecting the growing interest in healthier eating and concern with sugar intake. Additionally, 47% of the participants mentioned the ingredient list, while 33% valued the brand. Only 8% of the respondents reported that they did not observe labeling, possibly due to the complexity of the information or a lack of knowledge about labels.

These results align with the study by Hermes (2023), where flavor was the main purchasing criterion for 78.29% of consumers, followed by price (49.61%) and brand (37.98%).

### 3.1.14 Identification of foods high in sugar, saturated fat, and sodium

When asked how they identify foods high in sugar, saturated fat, and sodium, 64% of the participants mentioned the nutritional table on labels, while 21% did not know how to identify such information. Additionally, 53% checked the ingredient list, highlighting the importance of reviewing product composition. Only 4% considered the brand, 11% relied on taste, and 1% observed reference seals.

These findings indicate a preference for clear and objective information. RDC No. 429/2020, which establishes rules for



highlighting this information on the front of packaging, aims to facilitate consumer choice. However, it is also important to invest in food education, as many consumers struggle to understand technical label information (Ricardi, 2023).

#### 3.1.15 Perception of sugar content in dairy beverages

Consumers' perception of sugar content in dairy beverages varies considerably. Notably, 39% of the participants believed these beverages have a high sugar content, while 27% did not, possibly due to the consumption of options with alternative sweeteners. Furthermore, 34% were unsure about the amount of sugar in the beverages, reflecting difficulty in interpreting nutritional tables or a lack of confidence in information provided by the brand.

The Ministry of Health indicates that Brazilians consume, on average, 80 g of sugar per day, exceeding the recommended 12 g. Although the industry is working to reduce sugar in processed products, it is also necessary to reduce consumption at home and in establishments such as restaurants and snack bars (Agnez, 2018; Cadegiani et al., 2019).

#### 3.1.16 Perception of the healthiness of dairy beverages

Consumers' opinions about the healthiness of dairy beverages reveal different perceptions. Notably, 50% of the participants considered dairy beverages healthy due to nutrients such as calcium and protein. However, 22% did not see them as healthy, mainly due to the sugar content in flavored versions, such as chocolate-flavored UHT beverages. Additionally, 28% had a more ambivalent view, considering them potentially beneficial but harboring doubts about their nutritional advantages. Health-conscious consumers seek quick and nutritious products that meet their dietary needs, encouraging the food industry to create functional and differentiated nutritional options, such as dairy beverages (Chen & O'Mahony, 2016).

#### 3.1.17 Knowledge of protein requirements and dairy beverage consumption

The survey revealed that only 21% of the participants knew that the daily protein intake required for a 68-kg person corresponds to almost four chocolate-flavored UHT dairy beverages. This indicates a moderate understanding of protein needs and the role of dairy beverages in nutrition. Conversely, 70% of the participants were unaware of this relationship, suggesting a lack of understanding about the importance of nutritional labels. Additionally, 9% were unsure about this connection.

Studies indicate that an intake of about 1.2 g of protein per kg of body weight per day is effective in maintaining lean mass, emphasizing the relevance of dairy beverages as important nutritional sources, rich in proteins, vitamins, and minerals (McDonald et al., 2016; Mendes et al., 2024; Phillips et al., 2016).

#### 3.1.18 Influence of nutritional information on purchase decisions

The survey results indicate that 59% of the consumers are influenced by nutritional information on labels when making

purchasing decisions, highlighting the importance of this information for those seeking a healthier diet. Labels offering clear nutrient data have greater potential to attract health-conscious customers. On the other hand, 18% of the participants stated that nutritional information does not influence their choices, and 23% reported that it might, prioritizing other factors such as flavor, price, or brand trust.

Understanding consumer behavior is crucial for companies to better meet customer needs and preferences. The purchasing decision process is complex, involving various internal and external factors that shape consumer choices (Machado et al., 2014).

#### 3.1.19 Confusion in understanding label information

The survey showed that 19% of the consumers have felt confused when trying to understand nutritional information on labels, evidencing a common difficulty possibly caused by complex language or poor data presentation. On the other hand, 6% reported never having difficulties, 26% frequently felt confused, and 49% reported that they rarely feel confused—a group possibly more accustomed to reading labels.

These findings are similar to those of Goyal and Deshmukh (2018), who observed that many consumers only partially understand label information. Additionally, 70% of the participants considered font size to hinder readability, while 18% did not see it as a problem and 12% were unsure, indicating varied perceptions. Regarding language clarity, 81% pointed out the importance of simpler communication, reinforcing the need for more accessible labels, especially for people with lower nutritional literacy, as highlighted by Persoskie et al. (2017), Van der Merwe et al. (2013), and Hassan and Dimassi (2017).

#### 3.1.20 Purchase intention with and without added sugar seal

Consumers' purchase intention was significantly influenced by the presence of the added sugar seal on the analyzed products. For Product 1, 41% of the consumers stated that they would "probably buy" it without the seal, but when exposed to the seal, 35% indicated that they would "probably not buy" it, demonstrating the impact of the seal on purchase decisions. A similar trend was observed for the other products.

For Product 2, 42% initially stated that they would "probably buy" it without the seal, but with the seal, 26% moved to "probably not buy."

For Product 3, without the seal, 40% "probably would buy," but with the seal, 32% "probably would not buy." Product 4 followed the same pattern, with 41% indicating that they would "probably buy" it without the seal, but only 25% maintained this intention after the seal was shown. For Product 5, the presence of the seal caused a similar reduction in purchase intention, with 32% stating that they would "probably not buy" after seeing the seal.

These results reflect the growing awareness about sugar content in products and how nutritional warnings influence purchase decisions, pushing industries to reformulate their recipes to offer healthier options, as pointed out by Polari (2019).

### 3.1.21 Can front-of-package labeling affect purchase decisions?

The results showed that nutritional seals on the front of packaging are crucial for consumers' purchase decisions. The vast majority (98%) recognized the importance of having nutritional information in that position, emphasizing the value placed on transparency and clarity regarding food information. However, 2% of the respondents disagreed on the relevance of these front-of-package labels, possibly due to label complexity or a lack of interest and knowledge in nutrition. Some consumers may consider health and food issues too broad to be represented only by label information. These findings are consistent with studies by Viola et al. (2016) and Machado et al. (2014), who indicated that label information influences changes in eating habits and is helpful in purchase decisions.

### 3.1.22 Errors and correct practices found on labels

All evaluated products complied with RDC No. 429/2020, which requires a nutritional table, even in the absence of direct consumer interaction. Beverages 1, 2, and 4 were fully compliant; Beverage 3 did not indicate added sugars, and Beverage 5 incorrectly used the term "additional sugars."

Regarding lactose-restricted diets, all products were compliant in specifying lactose and galactose. The 100 mL serving size requirement was met by all products, but only Products 1, 3, 4, and 5 correctly informed the total 250 mL serving size. Product 2 failed to meet this requirement and also did not provide a household measure.

Regarding daily value percentages, only Products 1, 4, and 5 were correct.

Regarding table positioning, Products 2, 3, and 5 were compliant, while Product 1 lacked continuity and Product 4 did not place the table on the same panel as the ingredient list. The table was legible, although Sample 1 had a slight relief.

In terms of layout, Samples 2 and 3 were incorrect, using white characters on a black background and failing in the use of margins and borders.

Front-of-package labeling was not necessary because there was no excess sugar, saturated fat, or sodium in the products. However, Beverage 3 made a mistake by omitting information about added sugars.

Nutritional claims were correctly written in Portuguese, with Products 1, 3, and 5 declaring "low fat content." Beverage 3 incorrectly stated "no added sugar," despite the presence of natural sugar. Products 1, 2, 4, and 5 were compliant with the prohibition of functional claims, but Beverage 3 violated the regulation by attributing health benefits such as muscle recovery and joint resistance.

### 3.1.23 Correct practices found on labels

All analyzed dairy beverages met the requirements of IN No. 75/2020, particularly regarding rounding standards and the representation of quantities in the nutritional table. Beverages 1–5

correctly used the vertical model and maintained sugar, saturated fat, and sodium levels within limits, without needing warning seals.

Additionally, all beverages had 0 g of lactose, allowing them to be labeled as "lactose-free" according to the regulation. This demonstrates full compliance with the IN, ensuring clarity of information for consumers.

Proper labeling not only ensures regulatory compliance but also strengthens the brand's image of responsibility, adding value and encouraging sustainable practices.

### 3.1.24 Suggestions for future labels

Labels should be clear, informative, and in full compliance with RDC No. 429 and IN No. 75/2020. The following are suggestions for creating more effective labels (Figure 3):

**Clear Nutritional Information:** The nutritional table should highlight essential data such as sugar, sodium, and saturated fat levels. The language should be simple and direct, making it easier for consumers to understand.

**Effective Visual Alerts:** Products with high levels of critical nutrients should contain warning seals like "High in Sugars," using vibrant colors to catch the attention of consumers who need to monitor their intake.

**Technology and Interactivity:** Including a QR code with augmented reality features can provide detailed information about origin, ingredients, and even usage suggestions or recipes, promoting an interactive experience.

**Freshness Indicator:** A visual sensor that changes color depending on shelf life proximity or exposure to light/temperature would help consumers identify the ideal consumption point of the product.

## 4 CONCLUSIONS

The assessment of consumer perceptions of dairy product labels shows that most consumers value nutritional information on the front of the product, demonstrating greater concern for health and transparency in food choices. However, a minority questions this importance, prioritizing attributes such as taste and price or due to a lack of nutritional knowledge. These results highlight the need for communication strategies that emphasize the value of nutritional information, encouraging healthier choices. In addition, they guide the food industry to reformulate labels, making them clearer and more accessible. The study also reinforces the need for educational campaigns aimed at less educated audiences on healthy eating. Future research can evaluate the impact of different labeling formats on specific groups, such as children, the elderly, and people with special nutritional needs.

## ACKNOWLEDGMENTS

The authors would like to thank the Coordination for the Improvement of Higher Education Personnel (CAPES), the National Council for Scientific and Technological Development





Source: Author (2024).

**Figure 3.** Ideal packaging.

(CNPq), the Goiás State Research Support Foundation (FAPEG), the Study and Project Financing Agency (FINEP), and the Instituto Federal Goiano for providing financial support in carrying out the research.

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