


# The Idealization of Infant Formula: A Longitudinal Analysis of Labels in Uruguay

Journal of Human Lactation  
2023, Vol. 39(3) 519–528  
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DOI: 10.1177/08903344231172478  
journals.sagepub.com/home/jhl



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## Abstract

**Background:** Labels are a key element of the marketing strategies of infant formula companies, and often include text or images that idealize their use, undermining efforts to promote breastfeeding.

**Research Aims:** To evaluate the prevalence of marketing cues that idealize infant formula on labels of products commercialized in Uruguay and to assess changes after a periodic monitoring of compliance with the International Code of Marketing of Breast-Milk Substitutes (IC).

**Method:** This study is a descriptive, observational, and longitudinal assessment of the information included on infant formula labels. The first data collection was in 2019, as part of a periodic assessment to monitor the marketing of human-milk substitutes. In 2021, the same products were purchased to evaluate changes in their labels. Thirty-eight products were identified in 2019, of which 33 were still available in 2021. All information available on the labels was analyzed through content analysis.

**Results:** Most products included at least one textual or visual marketing cue idealizing infant formula in both 2019 ( $n = 30$ , 91%) and 2021 ( $n = 29$ , 88%). This represents a violation of both the IC and national regulations. References to nutritional composition were the most frequent marketing cue, followed by references to child growth and development. No relevant changes were observed after the periodic assessment conducted by the Uruguayan government.

**Conclusions:** Monitoring compliance with the IC per se cannot be expected to trigger changes in the marketing strategies of infant formula companies. More explicit regulations and strong enforcement mechanisms are needed to end the inappropriate marketing practices on infant formula labels.

## Keywords

breastfeeding, content analysis, food policy, human milk substitute, International Code of Marketing of Breast-Milk Substitutes, labeling, longitudinal analysis, monitoring formula manufacturers, NetCode

## Background

Breastfeeding has been associated with optimal growth and development, as well as with multiple health benefits for both children and mothers in the short, medium, and long term (Pérez-Escamilla et al., 2023). Although global breastfeeding practices have improved in the past decade, the prevalence of exclusive breastfeeding under 6 months and continued breastfeeding at 1 and 2 years still lag behind the recommendations of the World Health Organization (WHO; Zong et al., 2021).

Commercial infant formula has been identified as one of the key contemporary barriers to breastfeeding (Tomori, 2022). These products are the only safe and suitable alternative for infants who cannot be breastfed (National Academies of

Sciences, Engineering, and Medicine, 2020). However, for decades, infant formulas were positioned as equivalent to human milk and as a modern and convenient way to feed

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Date submitted: December 6, 2022; Date accepted: March 17, 2023.

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infants, even by the medical establishment (Rollins et al., 2023). The infant formula industry engaged in a series of intensive and sophisticated marketing practices to expand and sustain their sales worldwide, which contributed to reducing the prevalence of breastfeeding (Baker et al., 2021; Tomori, 2022). In order to protect breastfeeding and ensure a more ethical form of marketing, the WHO and the United Nations Children's Fund (UNICEF) developed the International Code of Marketing of Breast-Milk Substitutes (IC; Rollins et al., 2023). IC sets global standards of corporate responsibility to protect breastfeeding from deleterious marketing practices of infant formula and other human-milk substitutes (WHO, 1981).

According to the IC, labels of infant formula should "provide the necessary information about the appropriate use of the product, and so as not to discourage breastfeeding" (WHO, 1981, Article 9.1). It explicitly prohibits the inclusion of text or images that idealize the use of infant formula. These visual and textual elements can undermine efforts to promote breastfeeding by creating the belief that infant formula is superior or equivalent to breastfeeding, motivating caregivers to choose formula over human milk (Malek et al., 2019; Salem, 2019).

In order to make the provisions of the IC compulsory, governments should enact national regulations (Michaud-Létourneau et al., 2019). As of March 2022, 144 of the 194 countries that are members of the WHO had adopted legal measures covering at least some of the provisions of the Code, 32 of which substantially aligned with the provisions of the IC (WHO, 2022). Uruguay, the Latin American country where this study was conducted, adopted the IC as part of the National Breastfeeding Standard—an ordinance enacted by the Ministry of Public Health in 2009—and internalized the stipulations related to the labeling of infant formula for children up to 12 months old within the National Bromatological Regulation, in 1994 (Ministerio de Salud Pública [MSP], 1994, 2017).

Monitoring and enforcement of the IC have been identified as a key challenge worldwide (Michaud-Létourneau et al., 2019). The Network for Global Monitoring and Support for the Implementation of the International Code of Marketing of Breast-Milk Substitutes and Subsequent Relevant World Health Assembly Resolutions (NetCode) developed a toolkit to reinforce monitoring and periodic assessment of the IC (WHO & UNICEF, 2017a, 2017b). However, so far few countries have implemented effective mechanisms to detect violations to the stipulations of the IC and impose sanctions (WHO, 2022). In addition, little research analyzing violations of the stipulations of the IC have been published in international peer-reviewed journals. In the specific case of Uruguay, no systematic processes are in place to monitor compliance with the stipulations of the IC. In 2019, the Uruguayan government performed the first periodic assessment of compliance using the NetCode toolkit (Ares & de León, 2019).

Compliance of infant formula labels with the stipulations of the IC is low across the globe (Ergin et al., 2013; Funduluka et al., 2018; Hernández-Cordero et al., 2019; Parrilla-Rodríguez & Gorrín-Peralta, 2008; Pomeranz et al., 2018).

## Key Messages

- The prevalence of text or images that idealize the use of infant formula on the labels of products commercialized in the Uruguayan marketplace was analyzed, before and after a periodic assessment of compliance with the International Code of Marketing of Breast-Milk Substitutes.
- Marketing cues mainly related to references to the nutritional composition of the products, child growth, and health and development.
- No relevant changes in the prevalence of marketing cues that idealize infant formula were observed before and after the periodic assessment conducted by the Uruguayan government.
- More explicit regulations and strong enforcement mechanisms are needed to end the inappropriate marketing practices on infant formula labels.

One of the most frequent violations is the inclusion of visual and textual marketing cues that idealize the use of infant formula (Ergin et al., 2013; Funduluka et al., 2018; Hernández-Cordero et al., 2019; Parrilla-Rodríguez & Gorrín-Peralta, 2008; Pomeranz et al., 2018). These marketing cues can be defined as any textual or visual element of the labels that may create an idealized image of the use of human-milk substitutes or the belief that they are equivalent or superior to human-milk (WHO & UNICEF, 2017b). Similar results have been recently reported for the labels of other products included in IC, like foods targeted at infants and young children, feeding bottles and teats (Alcaire et al., 2020; Karageuzián et al., 2021; Pomeranz et al., 2018).

To the authors' knowledge, there is no published study reporting an in-depth analysis of the prevalence of marketing cues that idealize the use of infant formula before and after a periodic monitoring according to the NetCode toolkit. This type of comparison is expected to provide empirical evidence for the development of strategies to invigorate national regulations to protect breastfeeding and enable informed feeding decisions for infants. In this context, the aims of the present work were: (i) to analyze the prevalence of marketing cues that idealize the use of infant formula on the labels of products commercialized in the Uruguayan marketplace, and (ii) to assess changes in the prevalence of these cues after a periodic assessment of compliance with the International Code of Marketing of Breast-Milk Substitutes performed by the Uruguayan government.

## Methods

### Research Design

The present study has a descriptive, observational, and longitudinal design. It involved the evaluation of the information

included on the labels of infant formula commercialized in the Uruguayan marketplace at two time points. This longitudinal design enabled the assessment of changes in the prevalence of marketing cues idealizing the use of infant formula after a periodic assessment of compliance with the International Code of Marketing of Breast-Milk Substitutes performed by the Uruguayan government. A 2-year period between data collection points was deemed reasonable considering that 12–18 months have been granted as a grace period to the food industry to modify food labels in national and international regulations (Ares et al., 2021; Ministerio de Salud, 2015; Secretaría de Economía, 2020).

The study received full ethical approval from the Ethics Committee of the School of Chemistry of Universidad de la República in Uruguay on February 28, 2019 (approval number 101900-000170-19) and on December 20, 2020 (approval number 101900-000755-20).

### Setting and Relevant Context

The study was conducted in Uruguay, a high-income country in South America. Between 2011 and 2014, 54 of the 64 hospitals with maternity services were certified or re-certified as Baby Friendly Hospitals (Pan American Health Organization, 2016). According to the most recent National Survey on Breastfeeding, Feeding Practices and Anemia, in 2019 88.5% of infants were breastfed in the first 48 hours after birth, and 57.2% of them within the first hour of life (MSP et al., 2019). However, the prevalence of exclusive breastfeeding in infants under 6 months was 57.4% and only 43.4% at the 6th month of life. The main reasons for weaning from breastfeeding before the 6th month of life were self-reported insufficient milk (59.0%), perception that the baby was not sucking properly (15.3%) and work-related reasons (12.8%). It is worth noting that according to Uruguayan legislation women who are formally employed have the right to 14 weeks of paid maternity leave (MSP, 2017), and usually return to work around the 3rd month of life of their infants. Furthermore, in 2019 44.5% of the infants had received infant formula before leaving the maternity ward (MSP et al., 2019). Furthermore, in a recent study on social representations of breastfeeding and infant formula in Uruguay, researchers found that mothers mainly positioned breastfeeding as a feeding practice, while infant formula was regarded as a complement to human-milk that provides support (Ares et al., 2020).

### Sample

The target population of the present study was the infant formula commercialized in Montevideo, the capital city of Uruguay. The products were surveyed following a multi-step procedure, according to the procedure described by the NetCode toolkit. First, 33 health facilities were randomly selected from the list of health facilities in the city. A probability proportional to size was considered to select the health

**Table 1.** Infant Formula Identified in 44 Retail Outlets in Montevideo (Uruguay) in the Data Collections Performed in 2019 and 2021.

Categories	Number of Products <i>n</i> (%)	
	2019	2021
Infant formula (0+ months)	21 (55)	20 (61)
Follow up/on formula (6+ months)	6 (16)	3 (9)
Growing up milk (12+ months)	10 (26)	9 (27)
Other milk for children (0-36 months)	1 (3)	1 (3)
Total	38 (100)	33 (100)

facilities, considering the number of births in 2018; that is, the probability of a health facility being included in the sample was defined according to the proportion of the total number of births in Montevideo that occurred in that health facility in 2018. Once the 33 health facilities were selected, the pharmacy in closest proximity to each of the 33 health facilities was selected using GoogleMaps®. In addition, 11 retail stores (two pharmacies, six supermarkets, two baby stores, and one perfumery) were purposively sampled based on local knowledge to include a diversity of retail stores selling human-milk substitutes. All the infant formula sold in the 44 retail outlets in 2019 and 2021 composed the sample of the present study. No exclusion criteria were considered. In 2019 a total of 38 products were identified, which corresponded to the following categories: infant formula (0 + months,  $n=21$ ), follow up/on formula (6 + months,  $n=6$ ), growing up milk (12 + months,  $n=10$ ) and other milk for children (0–36 months,  $n=1$ ). In 2021, five of the products identified in 2019 were not found, leaving 33 different products (Table 1). The sample size was adequate for this study, as it corresponded to a survey of all products identified in the marketplace following a standardized procedure.

### Data Collection

The first data collection was performed between March and June 2019, as part of the periodic assessment performed by the Uruguayan government to monitor the marketing of human-milk substitutes according to the NetCode toolkit (WHO & UNICEF, 2017b). The second data collection was performed 2 years after, between July and November 2021, to assess changes in the information included on the labels of the infant formula identified in the first assessment. For the data collection performed in 2019, a master list of infant formula, including brands and product names, was developed based on the products registered at the Ministry of Public Health, and a compendium of foods of nutritional interest commercialized in the Uruguayan market (Nutriguía, 2018). Four fieldworkers visited the 44 retail stores and used the spreadsheet to register all the infant formula available at each of the stores. A single item of every product was purchased.

For the data collection performed in 2021, the products identified in the first data collection were either acquired at different pharmacies in the city or directly at the importer. The updated version of the compendium of foods of nutritional interest (Nutriguía, 2021) was checked to confirm whether the products not found at pharmacies were still being commercialized in the country. No new products were identified in this data collection.

### Measurement

Only the 33 products identified in both time points were considered for this research. After data collection was completed, the information available on the labels of each of the identified products was extracted, following the procedure proposed by the NetCode toolkit. One researcher used a spreadsheet to extract the following variables from the labels: Product name (categorical variable), Brand (categorical variable), Type of formula (categorical variable with the following levels: Infant formula [0 + months], Follow up/on formula [6 + months], Growing up milk [12 + months], or Other milk for children [0–36 months]), Presence of text or images that may idealize the use of human-milk substitutes (Binary variable: Yes/No), Presence of text or images that may create the belief that human-milk substitutes are equivalent or superior to human milk (binary variable: Yes/No). When the presence of marketing idealization cues was identified on a product, two additional qualitative variables were considered to provide a detailed description of the cues present in the labels. Textual cues were transcribed verbatim to the spreadsheet, whereas visual marketing cues were described in detail. Once the information from all products was extracted, it was checked by a second researcher to reduce measurement error.

### Data Analysis

To achieve the first aim, the number of products featuring at least one visual or textual marketing cue idealizing the products—that is, idealizing the use of human-milk substitutes or creating the belief that human-milk substitutes are equivalent or superior to human milk—was counted and expressed as absolute and relative frequencies.

Content analysis was used to obtain an in-depth assessment of the type of marketing cues included in the labels (Krippendorff, 2004). The first step of the analysis involved the identification of categories of visual and textual cues. For this purpose, two researchers with previous experience in content analysis summarized the information extracted from the labels through inductive coding (Hsieh & Shannon, 2005). Two main themes identified in the NetCode toolkit (idealization of infant formula and equivalency to human milk) were considered. For each of the themes, the researchers identified categories of meaning by repeatedly reading the information extracted from the labels to the spreadsheet.

Categories were first identified individually by each of the researchers. Then, a meeting between the researchers was performed to define the final categories by consensus. The final step of the analysis involved using a binary variable to indicate whether each of the labels included cues related to each of the categories identified in the inductive coding. This step was conducted separately by each of the researchers to reduce any type of bias and increase reliability. No disagreements were identified and therefore no changes were made.

Descriptive statistics were used to summarize the information. Then, to achieve the second aim, the number of products featuring at least one marketing cue, and cues related to each of the categories identified in the coding, was calculated at each time point. Results were expressed as absolute and relative frequencies. Examples of texts and images were selected to illustrate the identified categories.

## Results

### *Aim 1: Prevalence of Marketing Cues Idealizing Infant Formula*

In 2019, 30 of the 33 products (91%) included at least one textual or visual marketing cue that idealized infant formula. Idealizations tended to be least frequent in infant formula 0 + months (18 products, 85%), whereas all the other products contained at least one visual or textual element idealizing the products. In 2021, one of these products (infant formula 0 + months) had changed its package design, removing all idealization cues. Thus, at this time point the number of products with marketing cues idealizing the use of infant formula was 29 (88%).

The number of visual and textual marketing cues on the labels idealizing the products ranged from 0 to 13. As shown in Table 2, references to the nutritional composition of the products were the most frequent textual marketing cue identified in the packages. Products were described as nutritionally complete and balanced, stressing that they contained the nutrients needed for optimal growth and development. References to individual nutrients were also found: fatty acids, minerals, proteins, vitamins, fiber and probiotics were the most prevalent (Table 2).

References to growth and development were found in 20 (61%) and 19 (58%) of the 33 products in 2019 and 2021, respectively. As shown in Table 2, the marketing cues stressed the products' contribution to child growth and development and claimed positive associations between specific characteristics of the products and body functioning. The contribution of the products to adequate functioning of the digestive system was the most frequent, followed by references to immunity, the nervous system, muscles and bones, and vision. Finally, in both time periods, three of the products included references to specific health conditions, undernutrition, and allergies, creating the belief that they could have a unique contribution.

**Table 2.** Prevalence of Different Categories of Textual Marketing Cues That Idealize the Use of Infant Formula on the Packages of Products Commercialized in Montevideo, Uruguay (N=33).

Category	Examples	Number of products n (%)	
		2019	2021
<i>References to nutritional composition</i>		26 (79)	23 (70)
Nutritionally complete/balanced	"Balanced and nutritionally complete formula for children from 1 to 10 years" "Nutritionally complete food for oral or enteral nutrition" "It is a balanced nutritional supplement for children" "An exclusive modified milk for children from XX that contains essential nutrients" "A nutritionally balanced powdered milk that provides your child with the nutrients needed for healthy growth and development"	21 (64)	18 (55)
Content of fatty acids	"Its formula includes a selected blend of vegetable oils that provide essential fatty acids with a high content of Omega 3 and MCT medium chain triglycerides" "Brain and visual development: ARA and DHA, long-chain polyunsaturated fatty acids"	11 (33)	9 (27)
Content of minerals	"Provides the additional iron needed in this phase of growth" ". . . and iron that support brain development" "Essential nutrients like. . . minerals. . ." "Calcium"	10 (30)	7 (21)
Content of proteins	"Contains XX, a combination of proteins both in quantity and quality, exclusive from XX, according to the nutritional needs of the child" "Did you know that proteins influence your baby's health for life? . . . The quality and quantity of protein you give today can help lay a solid foundation for a healthy future" "Provides proteins of high biological value of animal origin"	8 (24)	6 (18)
Content of vitamins	"Vitamins and minerals, important for healthy growth and development" "Vitamin K and D" "Vitamin A, C and D"	8 (24)	5 (15)
Content of fiber	"Contains our proprietary blend of scGOS/lcFOS prebiotics" "Additionally, it provides inulin (dietary fiber that contributes to normal intestinal transit)" "XX is our proprietary blend of select ingredients with scGOS/lcFO prebiotics"	8 (24)	8 (24)
Content of probiotics	"Lactobacillus" "Mixture of healthy bacteria. . ."	5 (15)	3 (9)
Content of other nutrients	". . . choline, taurine and antioxidants that help the baby grow" "L-Carnitina, Taurina and Inositol"	2 (6)	1 (3)
<i>References to growth and development</i>		20 (61)	19 (58)
Growth	"Growth" ". . . help the baby grow" "To support child growth"	19 (58)	17 (52)
Development	"To support child development" "Contains all the nutrients needed for healthy growth and development"	13 (39)	14 (42)
<i>References to body functioning</i>		17 (52)	13 (39)
Digestive system	". . . and stimulate the development of healthy bacteria for the baby's intestine" "Easy digestion for the baby's small stomach" "Specifically designed to help relieve colic and constipation"	9 (27)	8 (24)
Immune system	"5 nucleotides that strengthen the natural defenses" ". . . that act on the baby's natural defense system" ". . . vitamins A, C and D that contribute to a healthy immune system in children"	6 (18)	3 (9)
Nervous system	"Contain LCPs (DHA/ AA) that support brain development and iron a mineral that helps cognitive development" ". . . essential for optimal functioning of the baby's nervous system" "Brain development"	5 (15)	3 (9)
Muscles and bones	"Vitamin D and calcium that intervene at the bone level" "Proteins are one of the most important nutrients for your baby's growth and development because they contribute to the formation of his entire body, including his brain and muscles"	2 (6)	2 (6)
Vision	"for . . . and optimal vision" "Visual development"	2 (6)	0 (0)
<i>References to specific health conditions</i>		3 (9)	3 (9)
Undernutrition	"Highly indicated for the prevention and treatment of undernutrition" "Specifically designed for premature and low birth weight babies"	2 (6)	2 (6)
Allergies	"Specifically designed to reduce the risk of your baby developing an allergy to cow's milk protein" "Partially hydrolyzed proteins were specifically designed to reduce the risk of your baby developing an allergy to cow's milk protein"	1 (3)	1 (3)

Note. XX refers to brand or proprietary ingredients.



**Figure 1.** Visual Marketing Cues That Idealize the Use of Infant Formula on the Packages of Products Commercialized in Montevideo, Uruguay.

Textual marketing cues implying or creating the belief that infant formula is equivalent to human milk were found in three products at both time points. As shown in the quotes, the textual marketing cues included in the labels stressed the importance of human milk but implicitly established an equivalency between infant formula and human milk by describing the product's composition and benefits: "When mother's milk is not available, premature babies need a formula with a composition that ensures optimal nutrition and supports proper growth and development."

In the first few months of life, your baby gets the nutrients he needs for growth and development exclusively from milk. Good to know that XX is an infant formula that contains all the nutrients your baby needs between 0 and 6 months.

Although your baby is starting to take solid foods, milk is still his main source of nutrients for his growth and development. Good to know that XX is a follow-on formula that contains all the nutrients your baby needs between 6 and 12 months.

One of the products surveyed in 2019 and 2021, a growing up milk, included an endorsement by a health professional organization, the Uruguayan Society of Pediatricians. Endorsements by health professionals were not identified as a marketing cue in the content analysis.

In both time points visual marketing cues potentially conveying positive health-related associations with the products were identified in most of the products: 26 (79%) and 25 (76%) of the 33 products in 2019 and 2021, respectively. Figure 1 shows an overview of different types of images identified on the labels. The visual marketing cues identified on the packages were intended to convey positive health-related associations as well as trust and positive

emotions. Visual references to child growth were identified in 15 of the 33 products (45%) at both time points. These included a brand logo showing a series of figures of growing size ( $n=11$ , 33%), children or bears of different size ( $n=4$ , 12% in 2019, and  $n=5$ , 15% in 2021), a chart with an ascending arrow ( $n=3$ , 10% at both time points), and a figure of a child with an ascending arrow ( $n=1$ , 3% only in 2019). The labels also included visual cues to convey associations with health benefits, including shields referring to immunity ( $n=12$  [36%] in 2019 and  $n=11$  [33%] in 2021), hearts ( $n=3$ , 10% at both time points), descending arrows commonly used to depict intestinal transit ( $n=1$ , 3% at both time points), and a drawing of a bone ( $n=1$ , 3% only in 2019). Labels also included images conveying positive emotions and trust, by including references to growth and feeding through the drawing of a bird nest ( $n=9$ , 27% at both time points), trees ( $n=1$ , 3% at both time points) or natural foods such as fruits and vegetables ( $n=1$ , 3% at both time points). It is worth highlighting that some of these idealization cues corresponded to proprietary images or brand logos.

### *Aim 2: Changes in Prevalence of Marketing Cues Idealizing Infant Formula After a Periodic Assessment of Compliance With the IC*

A small reduction (17%) in the average number of marketing cues was observed between 2019 and 2021: 4.8 (3.3) versus 4.0 (2.7). Most of the products (26 out of 33, 79%) did not modify the number of marketing cues idealizing the use of infant formula, whereas one added two textual cues. The remaining six products reduced the number of cues featured on their labels. The most notable change was the product that

removed the 13 visual and textual marketing cues identified in the first evaluation.

The number of products including references to nutritional composition showed a small reduction between 2019 and 2021. As shown in Table 2, three products removed textual references to being nutritionally complete/balanced or containing minerals and vitamins from the label, whereas two products removed references to proteins, fatty acids, and probiotics, and one removed references to other nutrients. The prevalence of references to body functioning slightly decreased between 2019 and 2021 (Table 2).

## Discussion

The majority of infant formula commercialized in the Uruguayan marketplace included at least one textual or visual marketing cue that idealized their use, representing a violation of the stipulations established in both the IC and national regulations (MSP, 1994). This agrees with previous studies identifying these cues as one of the main violations of the IC in different countries across the globe (Ergin et al., 2013; Funduluka et al., 2018; Hernández-Cordero et al., 2019; Parrilla-Rodríguez & Gorrín-Peralta, 2008; Pomeranz et al., 2018). Visual and textual marketing cues on the labels of infant formula have the potential to largely influence caregivers' infant feeding decisions, as extensively reported for food and beverages (Ares et al., 2022), and for infant formula in particular (Malek et al., 2019; Salem, 2019). These types of references may lead caregivers to believe that infant formulas are necessary for infants' growth and development, when in fact their indiscriminate use has several risks and is not recommended (Zong et al., 2021).

No relevant changes in the prevalence of marketing cues that idealize infant formula were observed before and after the periodic assessment conducted by the Uruguayan government. Hence, monitoring compliance with the IC per se is not expected to trigger changes in the marketing strategies of infant formula companies, stressing the importance of approving strong national regulations that translate the IC into national legal frameworks, and then enforcing these regulations. In the specific case of Uruguay, the stipulations of the IC related to infant formula labeling have been included in national food regulation, which indicates the need to strengthen monitoring and enforcement mechanisms. Monitoring and enforcement have been identified as a key challenge in several countries (Michaud-Létourneau et al., 2019).

One of the potential problems for enforcing compliance with the stipulations of the IC related to infant formula labeling is the lack of clear definitions of what types of elements should be regarded as marketing cues that idealize their use. Vagueness in policy terminology is justified when it is difficult to provide exact criteria for the application of a specific term (Dowding & Bosworth, 2021). Although vagueness may enable covering a wide range of scenarios, it may contribute to policy failure by making it difficult to determine

whether stipulations apply to specific cases or not (Dowding & Bosworth, 2021; Organisation for Economic Co-Operation and Development 2000). In this sense, one of the main contributions of the present work is the description of a wide range of textual and visual marketing cues that idealize the use of infant formula.

Textual marketing cues included references to nutritional composition, growth and development, body functioning, and specific health conditions. Some of the claims identified in the present research (cf. Table 2) do not seem to have a strong scientific basis, as previously highlighted by other authors (Hughes et al., 2017; Pomeranz et al., 2018). Explicit bans on nutrient and health claims on the labels of infant formula can provide clearer guidance to both manufacturers and governmental agencies monitoring compliance with the IC. This regulatory approach has been used in food products with a high content of nutrients associated with non-communicable diseases (Ares et al., 2022).

Labels also included several visual marketing cues conveying health-related associations, for instance hearts, growing shapes, and figures (cf. Figure 1). Visual elements are more vivid and require less cognitive effort to be processed than textual elements (Gil-Pérez et al., 2020). Thus, they can have a greater effect on caregivers' perceptions of healthiness and their infant feeding decisions. Considering this, it becomes clear that introducing explicit restrictions to the inclusion of these types of elements on the labels of infant formula, as suggested by Rollins et al. (2023), is of utmost importance. Some of the visual elements conveying health-related associations correspond to brand trademark logos. Although banning elements of this kind could be regarded as an infringement of intellectual property rights, the experience of plain tobacco packaging evidence its feasibility (Davison & Emerton, 2019; Peruga et al., 2021; Wilkinson, 2022).

The key strength of the present work is the use of a longitudinal study design to evaluate the prevalence of marketing cues that idealize infant formula. To the authors' knowledge, this is the first study where the prevalence of these types of cues before and after a periodic assessment of compliance with the IC, according to the NetCode toolkit, has been reported. In addition, the study includes a detailed analysis of visual and textual marketing cues, which provide insights to strengthen the stipulations of the IC, as well as current Uruguayan and international regulations. Future research should focus on finding the most effective way to measure the impact of governmental regulations and the possible modifications arising from current evidence.

## Limitations

Despite its strengths and novelty, the study is not free of limitations. First, it reports results from a single city in one Latin American country. Although additional research is

necessary to extend results to other settings, results from studies conducted in other countries suggest that the marketing strategies of infant formula share a high degree of similarity across countries (Ergin et al., 2013; Funduluka et al., 2018; Hernández-Cordero et al., 2019; Parrilla-Rodríguez & Gorrín-Peralta, 2008; Pomeranz et al., 2018). Finally, the study did not assess how caregivers perceive the visual and textual marketing cues identified in the labels. Further research is needed to explore how caregivers interpret the information included on the labels on infant formula, as well as how it may influence their infant feeding decisions.

## Conclusion

The labels of infant formula commercialized in the Uruguayan marketplace frequently included visual and textual marketing cues idealizing their use. The development of more explicit labeling regulations and strong enforcement mechanisms seem necessary to put an end to the inappropriate marketing practices on infant formula labels. Following the experience of anti-tobacco policy, plain packaging for infant formula and other human-milk substitutes may be a feasible and powerful strategy to protect the human right to breastfeeding.

## Authors' Note

This study was part of a larger project designed to explore the determinants of the use of human-milk substitutes in Uruguay and received full approval from the Ethics Committee of the School of Chemistry of Universidad de la República in Uruguay on December 20<sup>th</sup>, 2020 (Exp.101900-000755-20). Data collection in 2019 was part of the periodic assessment performed by the Uruguayan government to monitor the marketing of breast-milk substitutes, which also received full approval from the Ethics Committee of the School of Chemistry of Universidad de la República in Uruguay, on February 28<sup>th</sup>, 2019 (Exp.101900-000170-19).

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## Author Contributions

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## Disclosures and Conflicts of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

## Funding

The authors disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: Financial support was obtained from Comisión Sectorial de Investigación Científica (Universidad de la República, Uruguay), Espacio Interdisciplinario (Universidad de la República, Uruguay) and UNICEF Uruguay. The funding agencies were not involved in the design of the study, data collection, data analysis, the preparation of the manuscript or the decision to publish.

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