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Content Analysis of Health and Nutrition Claims and Marketing Strategies on Commercial Infant Formula Packaging Available in Mexico

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Abstract

Background: Breastfeeding is the optimal method of infant feeding. However, the marketing of Commercial Infant Formulas (CIFs) remains one of the major barriers to its practice. This study analyzed health and nutrition claims, and marketing strategies on CIF packaging and labeling in Mexico and assessed compliance with the International Code of Marketing of Breast-milk Substitutes (the International Code) and the Mexican Official Standard.

Methods: We conducted a cross-sectional quantitative content analysis of 113 CIF packages collected in supermarkets in Mexico City and Querétaro (August–December 2022), which accounted for 96% of CIF purchase volume in the Kantar Worldpanel. Products were classified as Infant and Follow-on Formulas, Specialized Formulas, or Growing-up Milks/Formulas. Compliance with NOM-131 and the International Code was scored against predefined criteria, and differences across product categories were assessed with Fisher's exact and Kruskal–Wallis tests.

Results: Overall, 94.7% of products displayed marketing strategies, 86.7% nutrition claims, and 15.9% health claims. Growing-up Milks/Formulas were the most heavily promoted, with 100% including marketing strategies. No product fully complied with either regulatory framework. High compliance with the Mexican Official Standard and the International Code was observed in 34.5% and 41.6% of CIFs, respectively. Infant and Follow-on Formulas showed the highest compliance, whereas Growing-up Milks/Formulas showed the lowest.

Conclusions: CIF packaging and labeling in Mexico is widely used as a promotional tool, particularly for Growing-up Milks/Formulas, highlighting the need to strengthen and update regulations to better protect breastfeeding.

Keywords: Commercial Infant Formulas (CIFs), Marketing, Labeling, International Code, NOM-131, Breastfeeding.

Background

The International Code of Marketing of Breast-milk Substitutes (hereinafter, “the International Code”) was adopted in 1981 by the World Health Assembly as a voluntary international instrument, with the objective of protecting and promoting breastfeeding as the recommended standard for infant nutrition, restricting the marketing practices of commercial infant formulas (CIFs), and ensuring that substitutes are used only when necessary, based on adequate information.[1, 2] The International Code establishes clear restrictions to avoid marketing practices such as the provision of free samples, incentives to healthcare professionals, and the use of messages that idealize the use of CIFs or present them as superior or equivalent to breast milk. Despite its adoption by 136 countries, compliance remains a challenge, especially in low- and middle-income countries (LMICs).[3]

The World Health Organization (WHO) recommends exclusive breastfeeding for the first six months of life.[2] In 2024, 48% of infants under six months of age were exclusively breastfed worldwide, approaching the previous global target of 50% for 2025. In response to this progress, the World Health Assembly revised the global target to 60% by 2030, highlighting the need for continued investment and coordinated efforts to further improve breastfeeding practices.[4] In Mexico, the rate of exclusive breastfeeding in children under 6 months is 34.2%,[5] while 42.9% of children under one year consume CIFs.[6]

Adequate nutrition is critical during the first 1000 days of life, a key stage for physical and cognitive development. Evidence shows that inadequate nutrition during this period can have negative long-term effects, reinforcing the importance of appropriate

infant feeding practices.[7] Both WHO and UNICEF (United Nations Children's Fund) promote breastfeeding as the best source of nutrition during this critical period.[8] However, barriers such as lack of support, early return to work, and exposure to CIF marketing may contribute to the use of these products.[8, 9]

Moreover, CIF consumption entails a considerable financial burden for families. It has been estimated that an infant may consume approximately 51 cans of 400 g powdered CIF during the first six months of life.[10] Based on the average retail price of a 400 g can of infant formula reported by the Mexican Consumer Protection Agency (PROFECO) in 2022 and adjusted to June 2026 values using the Mexican National Consumer Price Index (INPC), the estimated retail price is MXN 208.22 per can. Consequently, the estimated expenditure during the first six months of life is approximately MXN 10,619 (USD 621, at August 2026 exchange rates), highlighting the substantial economic burden of infant formula feeding for Mexican households. [11, 12] This represents a particular burden for low-income households, potentially reducing access to adequate infant nutrition, increasing inequalities, and displacing other essential expenses.[13]

Despite global and local efforts, CIF marketing remains prevalent, utilizing strategies such as promotions and contact with healthcare professionals.[14] Between 2005 and 2019, global sales of CIFs experienced notable growth, with increases of 64% in infant CIFs (aimed at babies 0–6 months), 77% in follow-on formulas (for those over 6 months), 214% in growing-up formulas (for children 1–3 years), and 95% in specialized CIFs (aimed at specific needs).[15]

The rapid expansion of the Growing-up Milks/Formulas market has raised concerns among public health organizations. WHO has stated that products marketed for children aged 12–36 months may be considered breast-milk substitutes when they are represented as suitable replacements for breast milk and are therefore subject to the principles and recommendations of the International Code.[1, 16] Despite this, Growing-up Milks/Formulas are frequently promoted through health, nutrition, and emotional appeals on product packaging and across digital media, which may influence caregivers' perceptions regarding their necessity and benefits. [17–20]

Packaging not only protects the products but also functions as a persuasive marketing tool that can influence parents' attitudes, perceptions, and behavioral intentions. [21, 22] Experimental evidence indicates that claims displayed on toddler food and milk products can influence parents' perceptions, beliefs, and behavioral intentions. [21, 22] These findings highlight the importance of monitoring packaging and labeling practices in products marketed to infants and young children.

Evidence shows that CIF packaging often includes health and nutrition claims, such as "boosts the immune system," "with DHA (Docosahexaenoic Acid) and ARA (Arachidonic Acid)," or "contains prebiotics," as well as marketing strategies that appeal to the emotions of mothers and caregivers, such as images of tenderness or references to development.[18] These messages can generate positive perceptions about the product's nutritional quality and its supposed equivalence or superiority to breast milk. Various studies have documented that these types of messages can influence attitudes, perceptions, and purchasing decisions among mothers and families.[17, 23]

In Mexico, the International Code has been endorsed as an international framework for protecting breastfeeding; however, its provisions have not been fully incorporated into a comprehensive legal framework.[14] In contrast, the national regulation, Mexican Official Standard NOM-131-SSA1-2012 (NOM-131), focuses on the sanitary regulation of advertising and establishes requirements for the labeling and advertising of CIFs. It includes provisions that limit certain advertising practices and prohibit unproven property claims, while requiring promotion to encourage breastfeeding and highlight its benefits.[24] The main difference in scope is that the International Code provides broader recommendations for restricting the promotion of breast-milk substitutes and addressing conflicts of interest, whereas NOM-131 establishes specific mandatory requirements for the labeling and advertising of regulated products in Mexico. [1, 24]

In Mexico, the General Law on Adequate and Sustainable Food, enacted in 2024, explicitly calls for the proper implementation of the International Code of Marketing of Breast-milk Substitutes.[25] At the regional level, UNICEF's Model Law for Latin America and the Caribbean highlights the need for comprehensive regulatory frameworks that address evolving marketing practices, including cross-promotion and digital marketing.[26] In this context, examining the marketing practices displayed on commercial infant formula packaging can help identify potential gaps between current practices and applicable regulatory provisions.

Although marketing has been frequently monitored, few studies have analyzed in detail the claims present on CIF packaging. [27] Monitoring CIF marketing strategies is crucial to identify how CIF companies promote their products, evaluate compliance

with current regulations, and identify opportunities for improving current regulations and mobilizing new regulations that promote healthy environments.[18] Therefore, this study conducted a quantitative content analysis of the health, nutrition, and marketing claims present on CIF packaging available in the Mexican market, evaluating both the frequency and the type of content of these claims, as well as their compliance with the International Code and NOM-131.

Methods

Study design

This study was a cross-sectional content analysis using data from NutrINSPector 2022, a data collection and monitoring system developed by the National Institute of Public Health in Mexico to evaluate the content displayed in food packages. The system uses a standardized mobile application to capture photographs of packaged products and all its information. The photographs are collected at points of purchase (i.e. supermarkets), and are then stored in a centralized web-based platform where nutritional, ingredient list, claims and other packaging information is captured following the International Network for Food and Obesity/non-communicable diseases Research, Monitoring and Action Support (INFORMAS) food labelling protocol.[28] Further description of the NutrINSPector platform is detailed elsewhere.[29]

Sample selection

Store selection was conducted using the National Statistical Directory of Economic Units from INEGI (National Institute of Statistics and Geography).[30] Supermarkets

were identified using the North American Industry Classification System code

462111 (“retail trade of supermarkets”). A total of 501 economic units were identified in Mexico City and Queretaro (two states of Center Mexico) classified into four categories: hypermarkets, mega-markets, supermarkets, and discount stores (“bodegas”). Using ArcGIS 10.6, each unit was assigned population data from the Basic Geostatistical Area [31] and the Degree of Urban Marginalization. Stores were stratified into four levels of urban marginalization (very low, low, medium, and high), and within each stratum, 4–5 establishments were selected, prioritizing those located in areas with the largest population and ensuring diversity in store type and commercial chain. Mexico City was selected as the primary urban setting due to its high population density and diversity of retail environments, while Querétaro was included to increase variability in product availability and retail contexts. After product collection reached saturation in selected supermarkets, nearby convenience stores were included to increase product variability. In total, 107 stores were visited between August and December 2022, from which all available CIF packages were captured.

Images were taken of all sides of each product package, including front-of-package labeling, ingredient lists, preparation instructions, warnings, and nutritional information. In addition, the retail price of each product was recorded at the time of collection.

The sample for the present study initially consisted of 126 CIF products. Inclusion criteria for the CIF products were: (1) commercially available infant formula products,

including infant, follow-on, specialized, and growing-up formulas, and (2) products

with complete packaging information available at the time of data collection. Duplicate products (n=13) were identified when items had the same brand and formulation but differed only in package size or presentation. These 13 duplicate products were excluded to avoid overrepresentation, resulting in a final analytical sample of 113 distinct products.

The representativeness of the sample was assessed using data from the 2021 Kantar Worldpanel México, which includes 8,500 households and represents 82% of the urban population of Mexico, with coverage across six regions and 123 cities. [32] The purchase volume of the CIFs included in the physical analysis was compared with the total purchase volume of CIFs registered in the panel during the study period. Representativeness was estimated as the proportion of the total purchase volume of CIFs accounted for by the products included in the sample.

CIFs were initially classified into four categories according to their intended use and target age group: (1) infant formula, defined as a product intended for infants during the first months of life that satisfies their nutritional needs until the introduction of appropriate complementary feeding; (2) follow-on formula, intended for infants older than six months as part of a progressively diversified diet; (3) specialized CIFs, formulated for infants or young children with specific medical conditions or nutritional needs; and (4) Growing-up Milks/Formulas, products marketed for children aged 12–36 months. For the statistical analyses, infant formula and follow-on formula were subsequently combined into a single category due to the limited sample size of the individual categories. Thus, the final analytical sample comprised three categories:

(1) infant and follow-on formulas, (2) specialized CIFs, and (3) Growing-up Milks/Formulas, for a total of 113 products.

Information Coding

The images of the packages were coded using a codebook developed specifically for this analysis, which was based on the NETCode Protocol (Network for Global Monitoring and Support for Implementation of the WHO International Code of Marketing of Breast-milk Substitutes) [33] but was adapted to include and reflect the sanitary and labeling provisions of the Mexican Official Standard NOM-131. [1, 18, 34, 35, 36, 37]

Claims and marketing strategies present on CIF packaging were classified into three main categories. The first category corresponded to health claims and included three types: immune development support, healthy growth and development, and digestive health. The second category corresponded to nutrition claims and included six types: proteins, biologically active substances (such as prebiotics and probiotics), minerals, essential fatty acids (DHA and ARA), vitamins, and carbohydrates.[11, 18, 34, 38, 39, 40]

The third category corresponded to marketing strategies, which included the use of cartoon characters; images of children, women, and adults designed to generate emotional identification; emotional appeals and visual elements such as hearts or united families that appeal to care, protection, and affection toward the baby; claims

213 of product superiority or idealization (e.g., phrases on the name or packaging such

as “Pro” or “Optimum”); cross-promotions; limited editions; packaging innovation; free portions; gifts; contests or raffles; product yield; use of QR codes or website links; sustainability messages; and references to the product as “natural” or “made from natural ingredients”.[39, 40]

To evaluate compliance with NOM-131 and the WHO International Code of Marketing of Breast-milk Substitutes, two composite compliance scores were constructed. The NOM-131 score included 12 criteria, while the International Code score included 11 criteria. For comparability purposes, the same compliance assessment framework was applied across all analytical categories. Although products marketed for young children are incorporated within the broader category of follow-on formulas under NOM-131, they were evaluated separately to explore potential differences in compliance and marketing practices across product segments. Both scores assessed: (1) absence of health claims; (2) absence of nutrition claims; (3) presence of a breastfeeding superiority statement; (4) appropriate text size of the breastfeeding superiority statement (NOM-131 only); (5) absence of statements discouraging breastfeeding; (6) absence of direct comparisons with breastfeeding; (7) absence of images that idealize or minimize breastfeeding; (8) inclusion of preparation instructions; (9) inclusion of preparation warnings; (10) recommendation to consult a health professional; (11) inclusion of the ingredient list; and (12) inclusion of nutritional information. The full set of assessment criteria for both regulatory frameworks is provided in Additional file 1. Each criterion was coded as 1 if the product met the requirement and 0 otherwise, and summed to obtain total scores ranging from 0 to 12 for NOM-131 and 0 to 11 for the International Code. Full compliance was defined as meeting all criteria (score = 12 for NOM-131

238 and score = 11 for the International Code). Compliance was subsequently
239 categorized according to NOM-131 as high (≥10 points), medium (7–9 points), or
240 low (<7 points); for the International Code, high (≥9 points), medium (7–8) and low
241 (<7).
242

243 Coding was carried out by two researchers (AA, RC) both with a bachelor's degree
244 in Nutrition, who received training in 2–3 sessions of approximately 1–2 hours each.
245 First, both coders independently coded a subset of photographs of infant formula
246 packaging in Excel as a pilot exercise. The coding was then reviewed to identify and
247 discuss inconsistencies, followed by an additional session to address questions that
248 arose during the initial coding process. Subsequently, both coders independently
249 coded 20% of the sample. Inter-rater reliability was assessed using the Kappa
250 coefficient, with a value of 0.98, indicating excellent agreement. [41] After
251 establishing reliability, the remaining sample was coded.

Statistical Analysis

Frequency analyses were performed to estimate the prevalence of health claims, nutrition claims, and marketing strategies on CIF packaging, as well as the proportion of products meeting or failing to meet the criteria established by the International Code and NOM-131. Differences in the prevalence of categorical variables across the three CIF categories were assessed using Fisher's exact test. Differences in the number of health claims, nutrition claims, and marketing strategies per package were assessed using the Kruskal–Wallis test. Compliance scores with the International Code and NOM-131 were summarized descriptively and compared across CIF categories using Fisher's exact test after categorization into compliance levels. Given the descriptive nature of the study, no adjustment for multiple comparisons was performed. A p-value <0.05 was considered statistically significant. All analyses were performed using Stata version 14 software.

Results

Sample representativeness

The representativeness assessment based on Kantar Panel purchase volume showed that the 113 CIF products included in the physical packaging analysis accounted for 96% of the total CIF purchase volume recorded in the Kantar Panel during the study period in urban areas of Mexico. This indicates that the analyzed sample captured the vast majority of the CIF market volume represented in the panel.

Health and Nutrition Claims, and Marketing strategies on Packaging

Of the 113 products analyzed, 15.9% (n=18) included at least one health claim on the packaging. This proportion varied widely by CIF categories. None of the products classified as Infant and follow-on formulas presented this type of claim, while 3.6% (n=2) of Specialized CIFs and 51.6% (n=16) of Growing-up Milks/Formulas did ($p<0.001$) (Table 1).

Table 1. Distribution of health and nutrition claims, and marketing strategies on commercial infant formulas (CIFs) available in Mexico

	Infant and Follow-on Formulas** (n=27)		Specialized CIFs+ (n=55)		Growing-up Milks/Formula° (n=31)		Total (n=113)		p-value*
	n(%)		n(%)		n(%)		n(%)		
Products with health claim	0 (0)		2 (3.6)		16 (51.6)		18 (15.9)		<0.001
Products with nutrition claim	22 (81.5)		47 (85.4)		29 (93.5)		98 (86.7)		0.4
Products with marketing strategies	24 (88.8)		52 (94.5)		31 (100)		107 (94.7)		0.2
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*	
Number of Health Claims per Package	0	0	0.2	1.6	2.0	3.1	0.6	2.1	<0.001
Number of Nutrition Claims per Package	6.7	5.0	3.6	3.4	8.0	6.0	5.5	5.0	<0.001
Number of marketing strategies per Package	2.5	1.6	2.6	1.4	3.2	1.6	2.7	1.5	0.07

***Infant and Follow-on Formulas: T Infant Formulas, intended for babies from birth to six months, and Follow-on Formulas, suitable for infants from six months onwards.*
+ Specialized CIFs: Infant and Follow-on Formulas, but is intended for infants with specific medical conditions (e.g., allergies or intolerances).
° Growing-up Milks/Formulas: T CIFs aimed at children older than 12 months, commonly marketed as "growing-up milk" or "toddler milk."
*N**ote on product classification:** For analytical purposes, Growing-up Milks/Formulas were classified separately from Infant and Follow-on Formulas based on their intended age group (12–36 months). Although NOM-131-SSA1-2012 includes products intended for young children within the broader category of follow-on formulas, these products were analyzed separately because they represent a distinct market segment and may be associated with different marketing practices and promotional strategies.*
Health claims** included references to benefits for immunity, healthy growth and development, or digestive health. **Nutrition claims** included statements regarding the presence or benefits of nutrients and ingredients such as vitamins, minerals, essential fatty acids, proteins, prebiotics, and probiotics. **marketing

strategies *included emotional appeals, cartoon characters, images, superiority claims, cross-promotions, QR codes, website links, sustainability messages, and other promotional elements.*
Values are presented as n (%) or mean (SD).
**p-values represent differences in categorical variables across product categories, assessed using Fisher's exact test. Differences in the number of claims and marketing strategies per package were assessed using the Kruskal–Wallis test.*

Nutrition claims were observed in 86.7% (n=98) of the total products, with a high presence across the three categories: 81.5% in Infant and Follow-on Formulas, 85.4% in Specialized CIFs, and 93.5% in Growing-up Milks/Formulas. Marketing strategies were found in 94.7% (n=107) of the total products, with 88.8% of Infant and follow-on formulas, 94.5% in Specialized CIFs, and 100% in Growing-up Milks/Formulas presenting these strategies (p=0.2).

Regarding the average number of claims per package, Growing-up Milks/Formulas presented, on average, more health claims (mean=2.0), nutrition claims (mean=8.0), and marketing strategies (mean=3.2) compared to the other CIF types. Specialized CIFs presented, on average, 0.2 health claims, 3.6 nutrition claims, and 2.6 marketing strategies. Infant and Follow-on Formulas had no health claims (mean=0) but did include 6.7 nutrition claims and 2.5 marketing strategies, on average. The difference in the mean number of health claims, and nutrition claims per package was statistically significant (p<0.001).

Types of Health and Nutrition Claims, and Marketing strategies

Among the health claims, the most common overall were those related to healthy growth and development (10.6%, n=12), digestive health (8.8%, n=10) and immune development support (8.0%, n=9) (Table 2). All health claims were highly

303 concentrated in the Growing-up Milks/Formulas, with 25.8% presenting immune

support claims, 32.3% presenting healthy growth and development claims, and 29.0% presenting digestive health claims (p<0.001for each claim type). Infant and Follow-on Formulas presented no health claims (0.0%).

Table 2. Distribution by Type of Nutrition and Health Claims, and marketing Strategies on Products

	Infant and Follow-on Formulas** (n=27)	Specialized CIFs+ (n=55)	Growing-up Milks/Formula°(n=31)	Total (n=113)	p-value*
	n (%)	*n (%)*	*n (%)*	*n (%)*	
Types of Health Claims					
Immune Development Support	0 (0.0)	1 (1.8)	8 (25.8)	9 (8.0)	<0.001
Healthy Growth and Development	0 (0.0)	2 (3.6)	10 (32.3)	12 (10.6)	<0.001
Digestive Health	0 (0.0)	1 (1.8)	9 (29.0)	10(8.8)	<0.001
Types of Nutrition Claims					
Protein	3 (11.1)	22 (40.0)	13 (41.9)	38 (33.6)	0.014
Biologically Active Substances	17 (62.9)	22 (40.0)	22 (70.9)	61 (53.9)	0.011
Minerals	13 (48.1)	11 (20.0)	19(61.2)	43 (38.0)	<0.001
Essential Fatty Acids	19 (70.3)	31 (56.3)	16(51.6)	66 (58.4)	0.3
Vitamins	8 (29.6)	4 (7.2)	16 (51.6)	28 (24.7)	<0.001
Carbohydrates	6 (22.2)	26 (47.2)	6 (19.3)	38(33.6)	0.014
Marketing strategies					
Use of Cartoon Characters	19 (70.3)	37 (67.2)	22 (70.9)	78 (69.0)	0.9
Presence of images of girls, boys and women	2 (7.4)	1(1.8)	6(19.3)	9(7.9)	0.012
Product Superiority	19 (70.3)	39 (70.9)	18 (58.0)	76 (67.2)	0.5
Packaging Innovation	2 (7.4)	11 (20.0)	5 (16.1)	18 (15.9)	0.4
Emotional appeals	8 (29.6)	17 (30.9)	14 (45.1)	39 (34.5)	0.4
Product yield	1 (3.7)	2(3.6)	7(22.5)	10 (8.8)	0.010
Gifts	0 (0.0)	0 (0.0)	2 (6.4)	2(1.7)	0.1
Health Certifications or Endorsements	0 (0.0)	0 (0.0)	2 (6.4)	2 (1.7)	0.1
Links and QR	4(14.8)	14 (25.4)	6(19.3)	24(21.2)	0.6

Infant and Follow-on Formulas: This category includes Infant Formulas, intended for babies from birth to six months, and Follow-on Formulas, suitable for infants from six months onwards.
+ Specialized CIFs: This covers both Infant and Follow-on Formulas, but is intended for infants with specific medical conditions (e.g., allergies or intolerances).
° Growing-up Milks/Formulas: This category includes CIFs aimed at children older than 12 months, commonly marketed as "growing-up milk" or "toddler milk."
***p-values represent differences across the three product categories and were calculated using Fisher's exact test**.*
Note on NOM-131 and Growing-up Milks: For this analysis, Growing-up Milks/Formulas were classified separately from Infant and Follow-on Formulas based on the intended age group (above 12 months). The Mexican Official Standard NOM-131-SSA1-2012 does not specifically contemplate the Growing-up Milks/Formulas category, although its scope technically includes them within the broader "Follow-on Formula" definition by referring to young children (12–36 months).

The most prevalent nutrition claims overall were the presence of essential fatty acids (58.4%, n=66), biologically active substances (53.9%, n=61), and minerals (38.0%,

n=43). Biologically active substances were significantly more frequent in Growing-up Milks/Formulas (70.9%) compared to Specialized CIFs (40.0%) (p=0.012). Presence of minerals nutrition claims were also highly prevalent in Growing-up Milks/Formulas (61.2%) and Infant and Follow-on Formulas (48.1%) (p=0.001). The prevalence of Essential Fatty Acids was high and similar across categories.

In terms of marketing strategies, the most frequent overall were the use of cartoon characters (69.0%, n=78), product superiority claims (67.2%, n=76), and emotional appeals (34.5%, n=39). Differences across the three formula categories were statistically significant for the presence of images of girls, boys, and women, which were more prevalent in Growing-up Milks/Formulas (p=0.01). Gifts and health certifications or endorsements were exclusively observed in Growing-up Milks/Formulas.

Compliance with NOM-131 and the International Code

No product in the sample achieved full compliance with either regulatory framework, (Table 3). Overall, 34.5% of products reached high compliance with NOM-131 (≥10 criteria met), 54.0% reached medium compliance (7–9 criteria), and 11.5% showed low compliance (<7 criteria). For the International Code, 41.6% achieved high compliance (≥9 criteria), 46.9% medium compliance (7–8 criteria), and 11.5% low compliance (<7 criteria). Infant and Follow-on Formulas showed the highest compliance levels, with 77.8% reaching high compliance with NOM-131 and 96.3% with the International Code. In contrast, Growing-up Milks/Formulas had the lowest

compliance, with only 12.9% achieving high compliance with NOM-131 and 16.1% with the International Code.

Table 3. Compliance with NOM-131 and the International Code by Formula Type

Regulatory framework	Level of compliance	Infant & follow-on formulas (n=27)	Specialized CIFs (n=55)	Growing-up milks/formulas (n=31)	Total (n=113)	P-value+
NOM-131 (12 points criteria)	High (≥10)	21 (77.8)	14 (25.5)	4 (12.9)	39 (34.5)	**<0.001**
	Medium (7–9)	6 (22.2)	40 (72.7)	15 (48.4)	61 (54.0)	**<0.001**
	Low (<7)	0 (0.0)	1 (1.8)	12 (38.7)	13 (11.5)	**<0.001**
International Code (11 points criteria)	High (≥9)	26 (96.3)	16 (29.1)	5 (16.1)	47 (41.6)	**<0.001**
	Medium (7–8)	1 (3.7)	38 (69.1)	14 (45.2)	53 (46.9)	**<0.001**
	Low (<7)	0 (0.0)	1 (1.8)	12 (38.7)	13 (11.5)	**<0.001**

** Values are presented as n (%). Percentages are calculated by column.*

Compliance levels were defined based on the number of criteria met: for nom-131, high (≥10), medium (7–9), and low (<7); for the international code, high (≥9), medium (7–8), and low (<7).

+ p-values represent differences across the three product categories.

No products achieved full compliance (score = 12 for nom-131; score = 11 for the international code).

Discussion

This study described the frequency and type of health and nutrition claims and marketing strategies displayed on CIF product packaging available in the Mexican market, and evaluated their compliance with the International Code of Marketing of Breast-milk Substitutes (the Code) and NOM-131. Health claims were identified on 15.9% of products, nutrition claims on 86.7%, and at least one marketing strategy on 94.7% of products. Growing-up Milks/Formulas consistently showed the highest prevalence of promotional practices and the lowest compliance with both regulatory frameworks. Although most products achieved medium or high compliance, no

product fully complied with either the Code or NOM-131. These findings indicate that packaging remains an important promotional channel for CIFs and that marketing practices continue to coexist with gaps in regulatory compliance.

Health and nutrition claims

Health claims were identified on 15.9% of the products analyzed, with a mean of 0.6 claims per package. These claims were concentrated among Growing-up Milks/Formulas (51.6%), whereas no Infant and Follow-on Formulas displayed health claims. Common claims referred to healthy growth and development, immune support, and digestive health. Nutrition claims were substantially more prevalent, appearing on 86.7% of products, with an average of 5.5 claims per package, and were particularly frequent among Growing-up Milks/Formulas (93.5%). Essential fatty acids, biologically active substances, and minerals were among the nutrients most frequently highlighted. These findings are consistent with previous international evidence documenting the widespread use of health and nutrition claims on products marketed to infants and young children. A multicountry study conducted in 15 countries, including Mexico, found that 80.3% of commercial infant formulas displayed at least one health claim, although results were not disaggregated by product category.[42] Similarly, Conway et al. reported widespread use of nutrition claims on follow-on and growing-up milks marketed in the United Kingdom.[18]

The extensive use of these claims is relevant because positive statements about individual nutrients or functional benefits may contribute to a health halo effect, whereby consumers generalize a specific favorable attribute to their perception of the product as a whole.[43–45] This may be particularly important for products

marketed to young children, for which claims related to brain development, immunity, growth, or digestion may imply that the product provides benefits that are necessary for healthy development. Experimental evidence from the United States found that exposure to structure/function claims commonly displayed on toddler-milk packaging increased parents' perceptions that toddler milk was nutritionally superior to, or a necessary complement to, cow's milk[22] Such effects are relevant in the context of CIF packaging because these messages are encountered directly at the point of purchase, where they may influence caregivers' perceptions and purchasing decisions.[14] The cumulative presence of multiple claims may therefore make products appear more beneficial or necessary than would be inferred from their nutritional composition alone.

Growing-up Milks/Formulas warrant particular attention in this context. In the present study, this category had the highest prevalence of health claims, nutrition claims, and marketing strategies, while also exhibiting the lowest compliance with both the Code and NOM-131. Evidence from Mexico suggests that these promotional practices may be relevant to caregivers' perceptions. In a study of 1,044 pregnant women and mothers of children aged 0–18 months in Mexico, most women who were aware of follow-up and growing-up formulas believed that older infants and young children needed these products, and the perceived benefits of the products were consistent with messages used in their marketing. [20] Together, these findings suggest that the extensive use of claims and promotional messages on Growing-up Milks/Formulas may contribute to perceptions of these products as beneficial or necessary for young children.

This concern is also relevant from a nutritional perspective. In Mexico, plain milk without added sugars is recommended from 12 months of age as part of a healthy diet.[46] However, evidence from other settings suggests that Growing-up Milks/Formulas may contain substantial amounts of added sugars despite being marketed with nutritional and developmental benefits. For example, Pries et al. found that 97% of 99 Growing-up Milks analyzed in Indonesia contained at least one added sugar, while 71% were classified as having high sugar content according to the UK Food Standards Agency front-of-pack criteria; nutrient claims were present on 97% of products.[47] Although these findings cannot be directly extrapolated to products marketed in Mexico, they highlight the importance of evaluating the nutritional composition of Growing-up Milks/Formulas alongside their marketing practices. In particular, future research in Mexico should assess their sugar content and overall nutritional composition to determine whether the nutritional characteristics of these products are consistent with the benefits suggested by their packaging.

Marketing strategies

Marketing strategies were identified on 94.7% of the products analyzed, and all Growing-up Milks/Formulas displayed at least one strategy. Product superiority claims, cartoon characters, and emotional appeals were among the most frequently observed practices. These findings are consistent with previous studies showing that packaging incorporates visual and textual elements designed to communicate health, growth, trust, and other positive associations beyond the nutritional information provided on the label.[17, 18, 23, 37] Because packaging is encountered immediately before or during purchase, these strategies may shape caregivers'

perceptions of the product and influence purchasing decisions, particularly when promotional elements are combined with nutrition or health claims.

The persistence of these practices has also been documented in countries with established regulatory frameworks. In Brazil, for example, studies have reported violations involving health and nutrition claims as well as promotional practices at the point of sale despite the implementation of the Brazilian Standard for the Commercialization of Foods for Infants and Young Children (NBCAL).[48] These findings indicate that regulating marketing requires continuous monitoring and enforcement across multiple commercial environments. They also support the importance of considering packaging as part of the broader marketing environment for CIFs rather than treating it only as a source of mandatory product information. [1, 48, 49]

Compliance and regulatory implications

Regarding compliance, no product achieved full compliance with either NOM-131 or the International Code. Overall, 34.5% of products achieved high compliance with NOM-131, compared with 41.6% under the International Code. Infant and Follow-on Formulas showed the highest compliance with both frameworks, whereas Growing-up Milks/Formulas showed the lowest levels, with only 12.9% achieving high compliance with NOM-131 and 16.1% achieving high compliance with the Code. Similar concerns have been reported in Ecuador and Chile, where Growing-up Milks/Formulas have also shown high levels of non-compliance with the International Code.[36] WHO has stated that products marketed for young children should be

considered breast-milk substitutes when promoted as such and should therefore be subject to the relevant provisions of the Code.[1, 50]

The present findings can also be considered in relation to previous evidence from Mexico. Hernández-Cordero et al. (2019) evaluated violations of the International Code in Mexico using data collected in 2016 and found that all 190 BMS labels assessed displayed health and nutrition claims, while 30% included pictures or text that idealized the use of BMS. They also documented widespread promotion at points of sale and through mass media.[51] In comparison, our study found a lower prevalence of health claims (15.9%) but continued widespread use of nutrition claims (86.7%) and marketing strategies (94.7%). Direct comparisons should be interpreted cautiously because the studies differed in sampling, product composition, assessment criteria, and coding methods. Nevertheless, the persistence of promotional practices several years after the earlier assessment suggests that challenges in implementing and monitoring the Code remain relevant in Mexico.

An important regulatory issue concerns Growing-up Milks/Formulas. NOM-131-SSA1-2012 establishes sanitary, nutritional, and labeling requirements for infant formulas, follow-on formulas, formulas for special nutritional needs, and foods and beverages for infants and young children. The standard defines young children as those older than 12 months and up to 36 months of age. [24] However, Growing-up Milks/Formulas are not established as a distinct product category within the regulatory framework in the same way as infant and follow-on formulas. This distinction may limit the extent to which specific marketing practices used for products targeted to children older than 12 months are explicitly addressed. The high

prevalence of promotional practices and low compliance observed for this category in our study therefore highlight an important area for regulatory clarification and strengthening.[24]

This issue is particularly relevant because evidence from Mexico indicates that caregivers are exposed to and receptive to the marketing of follow-up and growing-up formulas. Vilar-Compte et al. reported high exposure to these products among Mexican pregnant women and mothers and found that perceived benefits were consistent with the messages used in their marketing, while also highlighting the need for stronger regulatory and institutional frameworks for BMS in Mexico.[20] [26]More broadly, the International Code and subsequent WHO guidance emphasize the need to protect breastfeeding from marketing practices that may create perceptions of product necessity or superiority.[1, 50] The UNICEF Model Law for the Implementation of the International Code in Latin America and the Caribbean similarly proposes a broader regulatory approach that addresses cross-promotion, digital marketing, monitoring mechanisms, and products intended for young children.[26]

Other regulatory approaches illustrate mechanisms that could be considered in strengthening the Mexican framework. Brazil has established NBCAL through Law No. 11.265 and Decree No. 9.579, extending restrictions on the marketing of breast-milk substitutes and addressing promotional practices and breastfeeding protection.[52, 53] The European Union has also established specific requirements for the presentation of nutrition and health claims, including restrictions concerning their wording and presentation.[54] These approaches illustrate that regulatory

frameworks can address not only the presence of individual claims but also the broader visual and promotional environment in which products are marketed.

Cross-promotion represents an additional concern. Manufacturers may use similar packaging, colors, logos, typography, and brand names across product lines, creating brand recognition that can indirectly promote products subject to stricter restrictions. [17, 55] Evidence suggests that these strategies may make it difficult for caregivers to distinguish between infant formula and toddler milk. An Australian qualitative study, for example, found that two-thirds of surveyed parents reported seeing advertisements for infant formula when the product actually being advertised was toddler milk, illustrating how similar branding across product lines may blur distinctions between product categories.[56] WHO and UNICEF have identified cross-promotion as a marketing practice that can undermine implementation of the International Code and breastfeeding protection policies.[16, 55]

Taken together, these findings have implications for the protection of breastfeeding and young child nutrition in Mexico. In a country where only 34.2% of infants younger than six months are exclusively breastfed,[5] the widespread presence of health, nutrition, and marketing strategies on CIF packaging may contribute to an environment in which commercially marketed products are perceived as necessary or beneficial for child development. [16, 18, 57]Strengthening the Mexican regulatory framework should therefore consider not only individual claims but also the broader combination of promotional strategies, cross-promotion, and digital marketing. COFEPRIS, as the authority responsible for enforcement of NOM-131-SSA1-2012, could strengthen monitoring and enforcement mechanisms while collaborating with

independent monitoring initiatives such as the Mexican Monitoring System of the International Code (codigolactancia.org.mx), which may complement official surveillance activities.[24, 58]

Strengths and limitations

Among the strengths of this study is the use of national sales data from the Kantar Panel to assess the representativeness of the products analyzed, together with a codebook specifically developed for this study and based on the NETCode Protocol, the International Code, NOM-131-SSA1-2012,[24, 33] and previous literature. This approach allowed standardized assessment of both marketing practices and compliance with national and international regulatory frameworks. High inter-coder agreement further supports the reliability of the coding process.

This study also has several limitations. Product collection was limited to supermarkets in Mexico City and Querétaro, although the products analyzed represented a substantial proportion of the national CIF market according to Kantar sales data. In addition, given the descriptive nature of the study, no adjustment for multiple comparisons was performed. Therefore, the possibility of chance findings and an increased risk of type I error across the multiple statistical comparisons cannot be excluded. Nevertheless, the magnitude and consistency of the observed differences, particularly for the largest differences across product categories, should be considered when interpreting the findings. Finally, only information displayed directly on product packaging was evaluated; digital content accessed through QR codes or other links was not analyzed. This is relevant because digital marketing of CIFs, including social media, influencers, mobile applications, personalized

advertising, and QR codes linked to packaging, has become increasingly sophisticated and may further amplify the promotional impact of product packaging. [59–62] Future research should therefore assess the integration between packaging and digital marketing environments.

Conclusion

CIF packaging in Mexico is widely used as a promotional channel, with a high prevalence of nutrition claims and marketing strategies and continued use of health claims. Growing-up Milks/Formulas represented the product category with the highest prevalence of promotional practices and the lowest compliance with both the International Code and NOM-131. These findings, together with previous evidence from Mexico, indicate that strengthening the regulatory and monitoring framework should include greater attention to products marketed to young children, as well as cross-promotion and digital marketing. A comprehensive approach that addresses both the content of packaging and the broader marketing environment may strengthen protection of breastfeeding and support informed feeding decisions among caregivers in Mexico.

Abbreviations

CIFs	Commercial Infant Formulas
NOM-131	NOM-131-SSA1-2012 Norma Oficial Mexicana 131-SSA1-2012
WHO	World Health Organization
UNICEF	United Nations Children's Fund
PROFECO	Mexican Consumer Protection Agency
INPC	Mexican National Consumer Price Index
DHA	Docosahexaenoic Acid
ARA	Arachidonic Acid
INFORMAS	International Network for Food and Obesity/non-communicable diseases Research, Monitoring and Action Support
INEGI	National Institute of Statistics and Geography
NETCode	Network for Global Monitoring and Support for Implementation of the WHO International Code of Marketing of Breast-milk Substitutes
NBCAL	Brazilian Standard for the Commercialization of Foods for Infants and Young Children (Norma Brasileira de Comercialização de Alimentos para Lactentes e Crianças de Primeira Infância)
COFEPRIS	Federal Commission for the Protection against Sanitary Risks

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Authors' contributions

A.A.-C. developed the methodology, conducted the analysis, interpreted the findings, and drafted the manuscript. A.A.-C and T.C.A. conceived the study. F.M.-S. and T.C.A. contributed to the development of the international Codebook. A.L.L.-T., I.V.-M., S.B., and T.C.A. reviewed and edited the manuscript. L.S.P. provided the study data and oversaw their use. All authors read and approved the final version of the manuscript.

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Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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References:

1. World Health Organization (WHO). Código Internacional de Comercialización de la Sucedaneos de la Lactancia Materna. 1981.
2. World Health Organization (WHO). Alimentación del lactante y del niño pequeño. 2023.
3. Marketing of breast-milk substitutes: national implementation of the International Code, status report 2026. 2026.
4. World Health Organization (WHO), United Nations Children's Fund (UNICEF). Global nutrition targets 2030 Breastfeeding brief. Geneva; 2025.
5. González-Castell LD, Unar-Munguia M, Bonvecchio-Arenas A, Rivera-Pasquel M, Lozada-Tequeanes AL, Ramirez-Silva CI, et al. Lactancia materna. Salud Publica Mex. 2024;66:498–508.
6. Shama Levy T, Vielma-Orozco E, Heredia-Hernández O, Romero-Martínez M, Mojica-Cuevas J, Cuevas-Nasu L, et al. Encuesta Nacional de Salud y Nutrición 2018-19: Resultados Nacionales. México; 2020.
7. López Rello R, Abreu Mejia D, Porras Peréz Guerrero M del C. DE LOS PRIMEROS 1000 DÍAS A UN FUTURO RESILIENTE. Panama ; 2023.
8. United Nations. Baby formula marketing 'pervasive, misleading and aggressive' – UN report. 2022.
9. Baker P, Smith JP, Garde A, Grummer-Strawn LM, Wood B, Sen J, et al. The political economy of infant and young child feeding: confronting corporate power, overcoming structural barriers, and accelerating progress. The Lancet. 2023.
10. Infant and young child feeding counselling: an integrated course. Course handouts. Geneva; 2021.
11. Fórmulas para lactantes . Revista del Consumidor . 2022. https://www.gob.mx/cms/uploads/attachment/file/714697/ESTUDIO_DE_CALIDAD_FORMULAS_PARA_LACTANTES.pdf. Accessed 19 Aug 2026.
12. Instituto Nacional de Estadística y Geografía (INEGI). Calculadora de inflación. 2026. https://www.inegi.org.mx/app/indicesdeprecios/calculadorainflacion.aspx. Accessed 19 Aug 2026.
13. Rothstein JD, Winch PJ, Pachas J, Cabrera LZ, Ochoa M, Gilman RH, et al. Vulnerable families and costly formula: a qualitative exploration of infant formula purchasing among peri-urban Peruvian households. International Breastfeeding Journal volume. 2021;16.
14. Marketing of breast-milk substitutes: national implementation of the International Code, status report 2024. Geneva ; 2024.
15. Rollins N, Piwoz E, Baker P, Kingston G, Matlwa Mabaso K, McCoy D. Marketing of commercial milk formula: a system to capture parents, communities, science, and policy. The Lancet. 2023;401:486–502.
16. World Health Organization (WHO). Guidance on ending the inappropriate promotion of foods for infants and young children: implementation manual. Geneva; 2017.
17. Pereira C, Ford R, Feeley AB, Sweet L, Badham J, Zehber E. Cross-sectional survey shows that follow-up formula and growing-up milks are labelled similarly to infant formula in four low and middle income countries. Matern Child Nutr. 2016.

18. Conway R, Esser S, Steptoe A, Smith AD, Llewellyn C. Content analysis of on-package formula labelling in Great Britain: use of marketing messages on infant, follow-on, growing-up and specialist formula. Public Health Nutr. 2022;26:1696–705.
19. Aureoles-García V, Unar-Munguia M, Santos-Guzman A, Tolentino-Mayo L, Pérez-Escamilla R. Digital Marketing Claims and Their Association With the Perceptions of Parents of Children Under 2 Years Old of Commercial Milk Formulas in Mexico. Matern Child Nutr. 2025;21.
20. Vilar-Compte M, Hernández-Cordero S, Catañeda-Marquéz AC, Rollins Ni. Follow-up and growing-up formula promotion among Mexican pregnant women and mothers of children under 18 months old. Matern Child Nutr. 2022;18.
21. Dixon HG, Awoke MA, Scullly M, McCan J, Martin J, Morley B, et al. Effects of marketing claims on toddler food products on parents' product preferences, perceptions and purchasing intentions: an online experiment. International Journal of Behavioral Nutrition and Physical Activity. 2024;21.
22. Richter AP, Duffy E, SmithTaillie L, Harris JL, Pomeranz JL, Hall MG. The Impact of Toddler Milk Claims on Beliefs and Misperceptions: A Randomized Experiment with Parents of Young Children. J Acad Nutr Diet. 2022.
23. Piwoz EG, Huffman SL. The Impact of Marketing of Breast-Milk Substitutes on WHO-Recommended Breastfeeding Practices. Food Nutr Bull. 2015;36:373–86.
24. Secretaria de Salud. NORMA Oficial Mexicana NOM-131-SSA1-2012, Productos y servicios. Fórmulas para lactantes, de continuación y para necesidades especiales de nutrición. Alimentos y bebidas no alcohólicas para lactantes y niños de corta edad. Disposiciones y especificaciones sanitarias y nutrimentales. Etiquetado y métodos de prueb. México; 2012.
25. Diario Oficial de la Federación. Ley General de la Alimentación Adecuada y Sostenible. Mexico ; 2024.
26. Ramos Q, Alvarez M. Ley modelo para la implementación del Código Internacional de Comercialización de Sucedáneos de la Leche Materna en América Latina y El Caribe. United Nations Children's Fund (UNICEF). 2025.
27. Zapata ME, Veliz P, Rovirosa A, Nessier MC, Risso Patrón V, De Bustos C, et al. Alimentos complementarios comerciales en Argentina y México: análisis de su composición nutricional, etiquetado y promoción. PAN AMERICAN JOURNAL OF PUBLIC HEALTH . 2026.
28. Swinburn B, Sacks G, Vandevijvere S, Kumanyika S, Lobstein T, Neal B, et al. INFORMAS (International Network for Food and Obesity/non-communicable diseases Research, Monitoring and Action Support): overview and key principles. Obesity Reviews . 2013.
29. Salgado JC, Pedraza LS, Contreras-Manzano A, Aburto TC, Tolentino-Mayo L, Barquera S. Product reformulation in non-alcoholic beverages and foods after the implementation of front-of-pack warning labels in Mexico. PLoS Med. 2025.
30. Instituto Nacional de Estadística y Geografía. Directorio Estadístico Nacional de Unidades Económicas (DENUE Interactivo) 11/2021. Aguascalientes; 2021.
31. Instituto Nacional de Estadística y Geografía. Áreas Geoestadísticas Básicas (AGEB) urbanas. Censo de Población y Vivienda 2020. Aguascalientes; 2020.
32. Kantar Worldpanel. Comportamiento del consumidor mexicano en el primer trimestre del año. 2024.

33. World Health Organization (WHO). Conjunto de instrumentos de NetCode. Seguimiento de la comercialización de sucedáneos de la leche materna: protocolo para sistemas de seguimiento permanente. Ginebra; 2018.
34. Berry NJ, D Gribble K. Health and nutrition content claims on websites advertising infant formula available in Australia: A content analysis. Matern Child Nutr. 2016.
35. Simmonds L, Brownbill AL, Zee A, Netting MJ. Health-related marketing messages on product labels of commercial infant and toddler food packaging in Australia: a cross-sectional audit. BMJ Paediatr Open. 2021;5:1–5. https://doi.org/10.1136/bmjpo-2021-001241.
36. Lutter C, Hernandez-Cordero S, Grummer-Strawn L, Lara-Mejia V, Hernandez-Cordero AL. Violaciones del Código Internacional de Comercialización de Sucedáneos de la Leche Materna: un análisis multipaís. BMC Public Health. 2022.
37. Rodriguez R, De León C, Girona A, Alcaire F, Antúnez L, Ares G, et al. La idealización de la fórmula infantil: un análisis longitudinal de las etiquetas en Uruguay. Journal of Human Lactation. 2023;39:519–28.
38. Cattaneo A, Pani P, Carletti C, Guidetti M, Mutti V, Guidetti C, et al. Advertisements of follow-on formula and their perception by pregnant women and mothers in Italy. Arch Dis Child. 2015;100:323–8.
39. Mulligan C, Remedios L, Ramsay T, Pauzé E, Bagnati M, Potvin Kent M. The impact of characters like Tony the Tiger and other child-targeted techniques used in food and beverage marketing. Front Nutr. 2023.
40. Dangelico RM, Vocalelli D. “Green Marketing”: An analysis of definitions, strategy steps, and tools through a systematic review of the literature. J Clean Prod. 2017.
41. Riffe D, Lacy S, Watson BR, Lovejoy J. Analyzing Media Messages Using Quantitative Content Analysis in Research. 2023.
42. Cheung KY, Petrou L, Helfer B. Health and nutrition claims for infant formula are poorly substantiated and potentially harmful. BMJ. 2023. https://doi.org/10.1136/bmj-2022-071075.
43. Brown HM, Rollo ME, M de Vlieger N, Collins CE, Bucher T. Influence of the nutrition and health information presented on food labels on portion size consumed: a systematic review. Nutr Rev. 2018;76.
44. Van Kleef E, Dagevos H. The Growing Role of Front-of-Pack Nutrition Profile Labeling: A Consumer Perspective on Key Issues and Controversies. Crit Rev Food Sci Nutr. 2015;55:291–303.
45. Santos-Antonio G, Bravo-Rebatta F, Velarde-Delgado P, Aramburu A. Efectos del etiquetado nutricional frontal de alimentos y bebidas: sinopsis de revisiones sistemáticas. Revista Panamericana de Salud Publica. 2019. https://doi.org/10.26633/RPSP.2019.62.
46. Guías Alimentarias saludables y sostenibles para la población mexicana. Mexico ; 2025.
47. Pries AM, Mulder A, Badham J, Sweet L, Yuen K, Zehner E. Sugar content and nutrient content claims of growing-up milks in Indonesia. Matern Child Nutr. 2021;17.
48. Siqueira Boccolini C, Couto de Oliveira MI, Setsuko Toma T, Lima Pereira Peres P, Kotzias Atherino dos Santos E, Passos MC, et al. Methodology and

indicators for NBCAL monitoring in stores and health services: a multicenter study (Multi-NBCAL). Cad Saúde Pública. 2021;37.
49. Kukreja N, Patil PC. Packaging as a Strategic Communication Tool: Influencing Consumer Perception in Processed Food Markets. Journal of Marketing & Social Research. 2025;2:487–98.
50. Scope and impact of digital marketing strategies for promoting breastmilk substitutes. Geneva; 2022.
51. Hernandez-Cordero S, Lozada-Tequeanes AL, Shamah-Levy T, Lutter C, Gonzalez de Cossio T, Saturno-Hernandez P, et al. Violations of the International Code of Marketing of Breast-milk Substitutes in Mexico. Matern Child Nutr. 2019.
52. Brazil - Presidência da República. Regulamenta a comercialização de alimentos para lactentes e crianças de primeira infância e também a de produtos de puericultura correlatos. Brasilia; 2006.
53. Presidência da República (Brasil). Decreto Nº 9.579, de 22 de novembro de 2018. Consolida atos normativos editados pelo Poder Executivo federal que dispõem sobre a temática do lactente, da criança, do adolescente e do aprendiz [Internet]. Diário Oficial da União; 2018 [cited 2026 Oct 25]. Available from: planalto.gov.br.
54. Parlamento Europeo y Consejo de la Unión Europea. Reglamento (CE) N.º 1924/2006 sobre las declaraciones nutricionales y de propiedades saludables en los alimentos. Bruselas; 2006.
55. World Health Organization (WHO). Cross-promotion of infant formula and toddler milks. 2019.
56. Berry N, Jones S, Iverson D. It's all formula to me: women's understandings of toddler milk ads. Breastfeeding Review; East Malver. 2010;18:21–30.
57. World Health Organization (WHO). How the marketing of formula milk influences our decisions on infant feeding. Geneva; 2022.
58. Instituto Nacional de Salud Pública. Código LactancIA. 2025. https://codigolactancia.org.mx. Accessed 19 Aug 2025.
59. Unar-Munguia M, Mota-Castillo P, Santos-Guzmán A, Bonvecchio-Arenas A. Publicidad digital de sucedáneos de la leche materna, alimentos y bebidas para niños y niñas menores de dos años en México RECOMENDACIONES DE POLÍTICA PÚBLICA. Instituto Nacional de Salud Pública. 2024.
60. World Health Organization (WHO). WHO reveals shocking extent of exploitative formula milk marketing. Geneva ; 2022.
61. Lozada-Tequeanes AL, Hernandez-Cordero S, Shammah-Levy T. Marketing of breast milk substitutes on the internet and television in Mexico. Journal of Pediatrics and Child Health. 2020.
62. Lara-Mejia V, Franco-Lares B, Lozada-Tequeanes AL, Villanueva Vazquez C, Hernández-Cordero S. Methodologies for Monitoring the Digital Marketing of Foods and Beverages Aimed at Infants, Children, and Adolescents (ICA): A Scoping Review. Int J Environ Res Public Health . 2022;19.

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Additional file 1

Title: Criteria for compliance with the International Code and NOM-131

Description: Comparative table detailing the criteria used to assess compliance with the WHO International Code of Marketing of Breast-milk Substitutes (1981) and the Mexican Official Standard NOM-131-SSA1-2012. The table includes criteria related to health and nutrition claims, statements regarding breastfeeding, comparisons with breast milk, idealized images, preparation instructions, safety warnings, recommendations for professional consultation, ingredient lists, and nutritional information.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- Additionalfile1..docx