



Breastfeeding 2

Marketing of commercial milk formula: a system to capture parents, communities, science, and policy



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This is the second in a *Series* of three papers about breastfeeding. All papers in the *Series* are available at <https://www.thelancet.com/series/breastfeeding-2023>

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Despite proven benefits, less than half of infants and young children globally are breastfed in accordance with the recommendations of WHO. In comparison, commercial milk formula (CMF) sales have increased to about US\$55 billion annually, with more infants and young children receiving formula products than ever. This *Series* paper describes the CMF marketing playbook and its influence on families, health professionals, science, and policy processes, drawing on national survey data, company reports, case studies, methodical scoping reviews, and two multicountry research studies. We report how CMF sales are driven by multifaceted, well resourced marketing strategies that portray CMF products, with little or no supporting evidence, as solutions to common infant health and developmental challenges in ways that systematically undermine breastfeeding. Digital platforms substantially extend the reach and influence of marketing while circumventing the International Code of Marketing of Breast-milk Substitutes. Creating an enabling policy environment for breastfeeding that is free from commercial influence requires greater political commitment, financial investment, CMF industry transparency, and sustained advocacy. A framework convention on the commercial marketing of food products for infants and children is needed to end CMF marketing.

Introduction

The feeding practices for infants (aged ≤ 12 months) and young children (aged 12–36 months) have a profound effect on child survival, growth, and development, with lifelong consequences for women, children, and society as a whole. Commercial milk formula (CMF) products have substantial health,¹ economic,^{2,3} and environmental costs,⁴ yet less than half of infants and young children are breastfed according to WHO recommendations to exclusively breastfeed for the first 6 months of life, then to introduce complementary foods and to continue breastfeeding for 2 years or longer.⁵

The 2016 *Lancet* breastfeeding *Series*² pointed to the powerful influence of the CMF industry as a barrier to breastfeeding, but it did not explore the full scope of this influence and how it is exerted. This paper, the second in a *Series* of three, aims to show how the marketing of CMFs comprehensively undermines access to objective information and support related to feeding of infants and young children. Additionally, CMF marketing seeks to influence normative beliefs, values, and political and business approaches to establish environments that favour CMF uptake and sales. In so doing, CMF marketing contributes to reduced global breastfeeding practices. This paper builds on new evidence presented in the first paper in this *Series*⁶ about the misinterpretations of infant behaviour that favour CMF introduction, updated breastfeeding epidemiology, and interventions for supporting breastfeeding. This paper sets the stage for the third paper in this *Series*,⁷ which investigates how political power and policies create or mitigate structural barriers to improve infant and young child feeding practices.

Together, they typify private sector activities that can harm public health and epitomise the commercial determinants of ill health. Throughout this *Series*, we use the term CMF instead of breastmilk substitute to highlight the artificial and ultraprocessed nature of formula products.

In this paper, we summarise the history of CMF and its marketing; present trends in CMF sales, marketing expenditures, and consumption by children; and describe the development of the CMF industry's marketing playbook and illustrate how caregivers experience the playbook, including the industry's use of digital technology and artificial intelligence. We also show how the CMF industry uses science and health professionals to build confidence in their products and how CMF marketing capitalises on deficiencies in public health policies and regulations.

Throughout, we draw attention to how CMF marketing disrupts access to impartial and truthful information, an essential human right affirmed in the UN Convention on the Rights of the Child (CRC).⁸ The CRC states that governments, as part of ensuring children realise their right to health, have legal obligations to “ensure that all segments of society, in particular parents...are informed, have access to education and are supported in the use of basic knowledge of child health and nutrition”.⁸ Further, that “institutions, services, and facilities...conform with the standards established by competent authorities”, such as the provision of accurate and unbiased information, and must also protect parents and caregivers from interference from third parties including private sector entities.⁸ Other rights protecting women are examined in the third paper in this *Series*.⁷

We use the terms women and breastfeeding throughout this Series for brevity and because most people who breastfeed identify as women; we recognise that not all people who breastfeed or chestfeed identify as women.

Methods

We developed a conceptual framework (figure 1) that depicts the approaches by which CMF marketing operates to increase sales, profits, and industry political power. We define marketing to be any form of commercial communication or activity that is “designed to, or has the effect of, increasing recognition, appeal and [or] consumption of particular products and services”.⁹ This definition includes advertising, distribution, promotion, lobbying, and sponsorship, but excludes transportation and sales of the product itself.

We used a combination of methods in our analyses. Marketing expenditure in four countries was compared with sales data to show the CMF industry’s investment in marketing (appendix pp 2–3). We analysed national datasets to show trends and relationships between CMF sales and feeding practices of infants and young children (appendix pp 1, 4). We conducted systematic and scoping reviews of public health literature and CMF industry publications to understand key approaches within the CMF marketing playbook and how they are inconsistent with the International Code of Marketing of Breast-milk Substitutes¹⁰ and subsequent resolutions (herein referred to as the Code). Two comprehensive multicountry studies—one of how pregnant women, mothers, marketing executives, and health professionals experience CMF marketing¹¹ and another on the scope and effect of digital marketing¹²—were commissioned to illustrate how CMF marketing affects feeding decisions. Case studies are used to exemplify CMF industry opportunism and interference in the setting of standards (appendix pp 5–10).

Marketing and the global rise of CMFs

German chemist Justus von Liebig patented the first CMF in 1865, at a time when breastfeeding and infant health were increasingly threatened by industrialisation, erosion of social support, and the growing medicalisation of childbirth and infant care.^{13,14} Manufacturers pioneered marketing strategies, including targeted advertisements to mothers and health professionals and the recruitment of doctors and scientists, to generate support for their products. Even at that time, marketing materials cast doubt on the quality of mothers’ milk and claimed to provide the perfect medically endorsed solution: a product “closest to mother’s milk”.¹³

European companies successfully expanded these marketing strategies to Africa, the Middle East, Asia, and the Americas.^{15–17} Nestlé quickly became the global market leader,¹⁸ creating 80 factories and 300 sales offices or agencies within 50 years.¹⁹ Most of today’s leading brands

Key messages

- 1 The marketing of commercial milk formula (CMF) for use in the first 3 years of life has negatively altered the infant and young child feeding ecosystem. CMF sales approach US\$55 billion annually. Nowadays, more infants and young children are fed ultraprocessed formula milks than ever before. Breastfeeding and breastmilk are unparalleled in composition, immune properties, and health and development outcomes.
- 2 CMF marketing is a multifaceted, sophisticated, well resourced, and powerful system of influence that generates demand and sales of its products at the expense of the health and rights of families, women, and children. Digital platforms and use of individual data for personalised and targeted marketing have substantially enhanced the reach and influence of this system.
- 3 CMF marketing oversimplifies parenting challenges into a series of problems and needs that can be resolved by buying specific products. Marketing of CMF manipulates and exploits emotions, aspirations, and scientific information with the aim of reshaping individual, societal, and medical norms and values.
- 4 CMF marketing targets health professionals and scientific establishments through financial support, corporate-backed science, and medicalisation of feeding practices for infants and young children. Conflicts of interest threaten the integrity and impartiality of health professionals.
- 5 Violations of the International Code of Marketing of Breast-milk Substitutes and subsequent resolutions,¹⁰ which express the collective will of the World Health Assembly, have never stopped. These violations occur despite 40 years of effort by World Health Assembly member states and the international community to hold CMF industries to account. CMF companies continue to defy the principles and recommendations of the Code knowingly and regularly.
- 6 Governments have obligations to ensure their citizens have access to impartial information about feeding infants and young children and to enact policies that are free from commercial influence. Fully and equitably supporting women and children’s rights at home, at work, in public spaces, and in health care is a societal responsibility.
- 7 Marketing of CMF products should not be permitted. A framework convention, placing the rights of children and women at its heart, is needed to protect parents and communities from the commercial marketing of food products for and to children younger than 3 years old, including CMF marketing systems. The framework would restrict marketing but not the sale of these products.

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See Online for appendix

emerged by the 1920s. By the mid-20th century, aggressive CMF promotion was firmly embedded in the health systems of many countries.

With sales stagnating in high-income countries through the mid-20th century, companies promoted

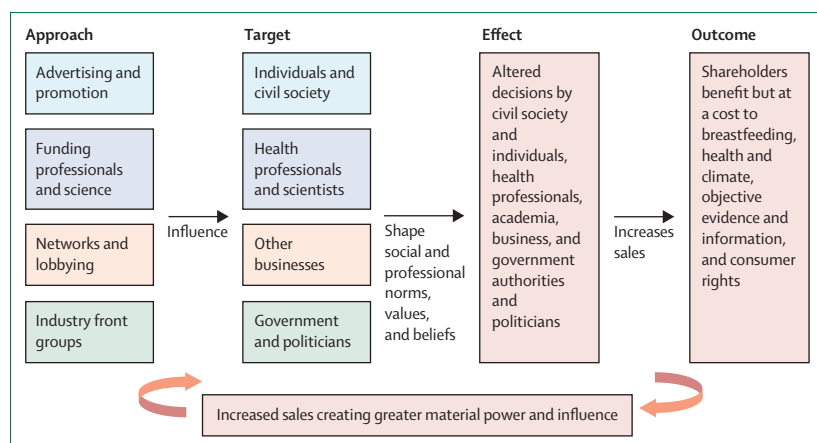


Figure 1: Conceptual framework of commercial milk formula marketing—a reinforcing system of influence

CMF feeding by distributing free samples and depicting CMF as modern, scientific, prestigious, and superior to breastmilk. Companies then intensified their marketing in low-income and middle-income countries (LMICs),^{20,21} even employing sales people dressed as nurses who engaged with new mothers in hospitals and at home.^{15,17}

Intense public scrutiny of these marketing strategies, exposed by the investigative report *The Baby Killer*,²² fuelled a global boycott of Nestlé products from 1977 and generated political pressure that resulted in the development and adoption of the Code by the World Health Assembly in 1981.¹⁰ In those years, the promotion and use of formula milk by mothers without access to clean water is estimated to have increased infant mortality by 9·4 per 1000 livebirths (95% CI 3·6–15·6).²³

In reaction, the CMF industry adapted its marketing.²⁴ It established international lobby groups,²⁵ created corporate policies on so-called responsible marketing to discourage external regulation, engaged in brand image repair,²⁶ and diversified its products to working mothers,²⁷ for older children, and for therapeutic purposes.²⁸ We refer to four categories of product: standard (for ages 0–6 months), follow-on (ages 7–12 months), growing-up (ages 13–36 months, including toddlers), and special formula. These strategies enabled companies to cultivate new markets and use product cross-promotion to circumvent Code regulations.²⁹ Subsequently, CMF sales have grown over the past four decades from US\$1·5 billion in 1978, to \$55·6 billion in 2019.^{28,30,31}

Publicly available data on what the CMF industry spends on marketing are scarce. Using data from Nielsen and Euromonitor International—market research companies that collect and analyse data of global sales in multiple market areas and whose data are available through licences or commissioned reports—we examined advertising expenditures of four major CMF manufacturers in four countries in 2010–11 and 2020 (appendix pp 2–3). This analysis included spending on television, print, internet (ie, advertising on websites),

magazine, radio, and outdoor displays, but did not include other marketing activities, such as lobbying, social media, or health professional sponsorships; the analysis is therefore an underestimate. Advertising outlay ranged from 0·9 to 33·3% of annual sales (median 6·3% in 2010–11; 4·8% in 2020) and increased by 164% over the 10 years, whereas sales increased by only 21% (appendix pp 2–3). For 2019, the percentage advertising outlay would equate to \$2·7–3·5 billion. Data published by one major brand that only produced CMF reported spending of \$627 million on advertising and promotion in 2016.³² This amount represented 16·7% of net sales (\$3·743 billion) and 46·7% of total product costs (\$1·341 billion) in a year when gross profit was \$2·402 billion.³² Notably, marketing expenditure is a tax-deductible expense in many countries' corporate tax systems.³³

The ability of marketing to encourage consumption of unhealthy products and worsen health outcomes is well established; multiple studies have shown this ability for tobacco,³⁴ alcohol,³⁵ and ultraprocessed foods.³⁶ The evidence is now clear that the marketing of CMF undermines breastfeeding and this, in turn, is associated with reduced health outcomes.^{37–40} Our analysis of national data from 126 countries (appendix pp 1, 4) found that CMF sales are inversely associated with breastfeeding at 1 year of age (figure 2A). For each additional kilogram of standard formula sold per child each year, breastfeeding was 1·9 percentage points lower (95% CI 1·5–2·2). This inverse association is largely driven by country income levels.

Between 2005 and 2019, sales increases were recorded for standard (64%), follow-on (77%), growing-up (214%), and special formula (95%; figure 2B). Over the same period, in 83 LMICs with both Euromonitor International and national survey estimates, exclusive breastfeeding increased from 38·8% to 48·6% (25·3% increase). 10·3% of children younger than 24 months in LMICs and 34·9% of children younger than 24 months in upper-middle-income countries consumed CMF in the 24 h before interviews with caregivers (appendix p 1). Because there are few data on national-level feeding of infants and young children, we could not estimate comparable trends in high-income countries.

The CMF marketing playbook

Marketing is a strategic approach to business, focused on maximising sales and shareholder returns.⁴¹ It comprises four overlapping activities: product design, development, and packaging; price management; placement (ie, distribution and retail presence); and promotion. These activities aggregate to establish the brand. Marketing's direct link with sales, market share, and profitability has made it an immensely important business function. By the turn of the millennium, in the USA alone, 30 million people were employed in marketing businesses.⁴²

Marketing strategies lay out who the company wants to reach, what they want them to do, and how they can be encouraged to do it. Research among individuals helps to segment them into distinct target markets with similar needs, anxieties, and aspirations. For example, one major CMF producer segments parents according to one of three parenting styles: parents concerned primarily with future aspirations and ambitions for their infants; those who are primarily concerned about ensuring the infant is happy today; and cocooning, protective parents.⁴³ Consumers are offered attractively tailored, priced, and presented products. Digital technology, the harvesting of personal data, and artificial intelligence have made these processes extremely sophisticated, customised, and effective.^{12,44}

As in other consumer markets, CMF marketers seek long-term, loyal customers. Brand lines have been diversified from largely single formula products for infants aged 0–6 months to include nearly identical product ranges, including follow-on, toddler, and growing-up milks for older children. CMFs marketed for mothers are now also promoted with the aim of establishing brand loyalty even before the birth of a child.⁴⁵ These so-called brand families are cross-promoted as a natural, numbered progression from 1 to 4 based on age and development, with themed packaging to emphasise their complementarity.^{46–49}

Specialised formula (eg, sold as comfort milks for hungry babies, colic, sensitivities, and prolonged sleep) further commodify infant and young child feeding (panel 1). These products offer scientifically unsubstantiated solutions^{53,65–68} for medical or quasimedical problems, and they are important for sales (in the first paper in this Series).⁶ Business reports note that hypoallergenic milks are “increasingly playing a key role in the growth strategy of major manufacturers, fuelled by a rising awareness about allergies and food intolerance among parents”.⁵⁴ One major CMF manufacturer opened a new, €240 million facility in the Netherlands focusing on specialised formula in order to “meet growing, global demand for specialized infant formula”.⁶⁹

By contrast, breastfeeding is portrayed in CMF marketing as generic, outmoded, and antifeminist⁷⁰ despite increasing evidence on the wide gap between CMF and human milk composition, systems biology interactions, and better health outcomes (in the first paper in this Series⁶).^{1,71}

Health professionals, policy makers, and allied industries are similarly approached and segmented according to their capacity to encourage sales or optimise the business environment. For example, specialised milks are promoted to health professionals as the solution to digestive discomfort, a common human infant behaviour, and presumed allergy (in the first paper in this Series⁶).^{55,72} Pitches to health professionals are presented as the sharing of scientific information or professional training, creating an image of the CMF company as an objective and respectable adviser.^{28,29,73} For the company to

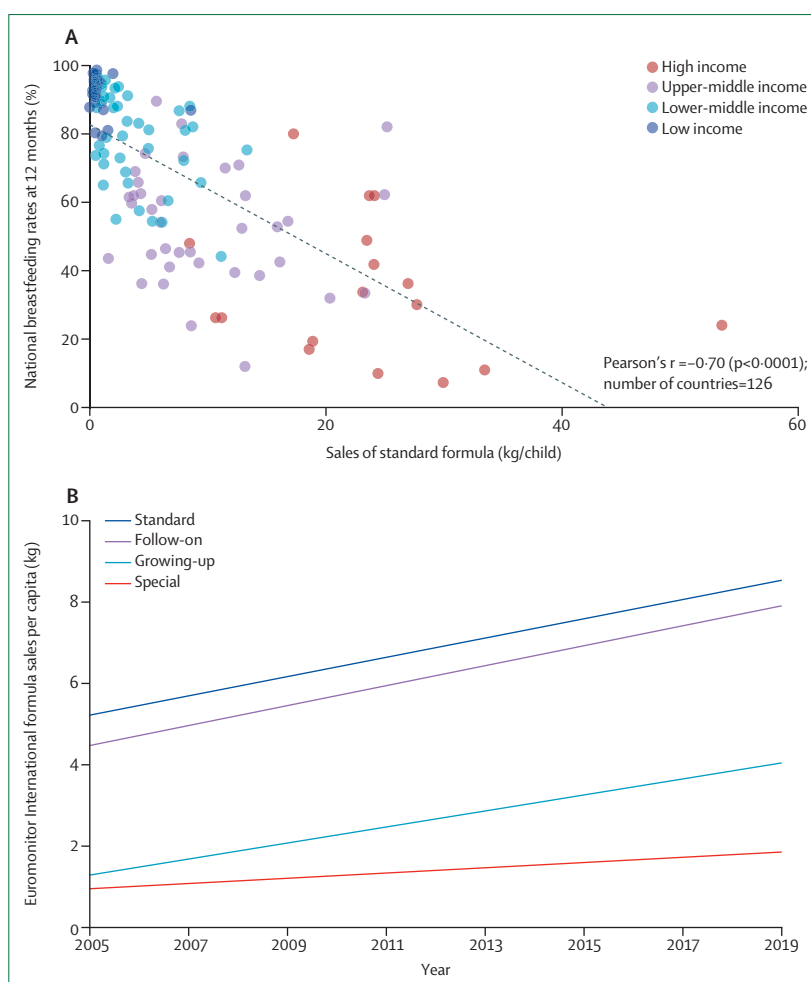


Figure 2: Rate of national breastfeeding at 12 months vs per capita sales of standard CMF by country income category and the sales of CMF per capita, 2005–19

(A) 126 countries by category of country income. (B) Sales of CMFs for ages 0–36 months from 190 countries. Data obtained from Euromonitor International database. CMF=commercial milk formula.

provide support materials, sponsor attendance at scientific meetings, and fund conferences and other needs therefore seems natural and acceptable. These activities are presented as professional collaborations rather than inducements.

Marketing takes careful cognisance of competition.^{74,75} CMF competes with breastmilk for “share of stomach”⁷⁴³ (ie, market share). Companies use strategies and messages that are subtle (eg, positioning CMF as an acceptable, harmless complement to breastfeeding), overt (eg, developing and cross-promoting follow-on milks), gendered (eg, enabling women to be free of biological constraints that infer sole responsibility for infant feeding and partners to have a role in infant care). Some messaging is even confrontational, depicting public health messages as antifeminist⁷⁰ (eg, the Sisterhood of Motherhood advert⁷⁶ that challenges the importance of breastfeeding and paints breastfeeding advocacy as trivial moralising). Mention of the downsides of CMF—risks of infant

Panel 1: The misuse of infant behaviour and development in commercial milk formula (CMF) marketing

Worldwide, parents want their children to be healthy and to have a good life. The CMF industry exploits these desires in their marketing efforts. A common approach is to suggest that CMF is a solution to parents' concerns about infant behaviour that is part of normal development. For instance, labels and advertisements highlight that use of a specific brand of CMF can alleviate fussiness, flatulence, and crying.^{50–52} We have recreated artwork that illustrate the messages commonly found on CMF packaging (figure 3A–C). One real-life label on CMF packaging indicates that relief from these infant behaviours can be accomplished within 24 h and brain development will be enhanced at the same time.⁵⁰ The words gentle, sensitive, soothe, and comfort appear frequently to reassure parents and terms such as premium appeal to emotional values, strengthening these associations.^{50,52} Comfort milks can have additives or special composition, such as prebiotics, hydrolysed proteins, xanthan gum, or low lactose. However, claims that these additives provide relief for infant discomfort are not supported by trials that meet evidence standards expected of health recommendations.⁵³

Claims to alleviate infant discomfort also provide the foundation for specialty formulas that aim to address various sensitivities and allergies. The specialty milk market has been one of the most profitable areas of expansion: an effect probably aided by industry's active role in supporting guideline development for diagnosing cow's milk allergy. Their marketing links normal baby behaviours, such as crying, to cow's milk allergy, undermining confidence in breastfeeding.^{54,55}

Another marketing target is sleep—or the lack of sleep for both parents and infants. In the first few months, infant sleep duration is short during day and night, and increasingly follows diurnal patterns. As part of normal human development, sleep patterns consolidate over the course of several months in concert with ongoing night-time breastfeeding. Yet, health-care providers and parents predominantly in high-income settings often have unrealistic expectations that their infants will sleep in a pattern that is synchronous with adult sleep.⁵⁶ This misconception is further compounded by structural conditions that oblige mothers to return to work shortly after birth. CMF marketing exploits this notion by claiming CMF improves or consolidates sleep so that infants sleep at night for longer periods of time. This claim is neither accurate, given that sleep consolidation is a product of human development, nor

desirable, given that formula feeding is associated with adverse health outcomes, including in high-income settings.^{1,57,58} Industry discussions are open about how they use parental fatigue and uncertainty to sell their product.⁵⁹

The published business report of an international trade event, 2017 Vitafoods,⁵⁹ described how the chief executive officer (CEO) of an Irish nutrition company tried “to define the sector's characteristics” and how “...infant nutrition wasn't necessarily about the ingredients or innovation”. The CEO was quoted as saying, “What we are selling is actually sleep...If the baby doesn't sleep for three nights and the mother is exhausted, the mother will change the infant formula. So that's what we're selling.” The report went on to describe how a fellow panellist, managing partner of another company, echoed these comments, adding that they were “selling peace of mind”.

However, one of the most pervasive suggestions is that CMF will encourage superior intelligence (figure 4A–C) compared with other products through advertisements that use terms such as brain, neuro, and intelligence quotient written in large font, and images that suggest achievement and early development. For instance, in one real-life advertisement a formula product is called Neuro Pro and claims to be “brain building” with additional text reading “for a life full of wonder”.⁶⁰ With another product, “Nurture Intelligence” is the dominant text on the packaging.⁶¹ Images show infants with glasses or holding a pencil to signal a precocious ability to read or write. In another, a baby boy is depicted using an abacus while an image behind shows an adult male solving mathematical equations, implying future intelligence as a result of CMF.⁶²

Yet intervention studies and systematic reviews show no benefit of the ingredients added to these products on academic performance or long-term cognition.^{63,64}

In these marketing efforts, the purpose of scientific claims and terminology is to add authority and create the impression—a false impression—that there is a strong body of scientific evidence in support of the claims, with little effort to establish the strength of evidence itself.^{28,31} Scientists are obligated to be cautious in their conclusions, whereas marketing exploits poor science for its objectives to create a persuasive story to sell more product.

mortality, maternal health, cost to family, environmental harm, and plastic waste—are avoided or misdirected.²⁶

Commercial competition is also a powerful force. The global CMF market is dominated by six companies (Abbott Nutrition [Chicago, IL, USA], Danone [Paris, France], Feihe [Beijing, China], Freisland Campina [Amersfoort, Netherlands], Nestlé [Vevey, Switzerland], and Reckitt Benckiser [Slough, UK]) who fight aggressively for market share (in the third paper in this Series).⁷ However, these companies also have mutual

interests in avoiding regulation, normalising CMF, and growing the market. So, they cooperate, lobbying through trade organisations and business interest groups.^{28,74,75}

Thus CMF marketing comprises hard and soft power that can purchase the best marketing expertise available and pay for strategic lobbying and influencers. Quantitative metrics, such as sales, margins, and share value, and disciplined tactics that are honed and tempered by competition, drive a tenacious focus on growth. However, customers—whether parents, health



Figure 3: Artwork illustrative of actual packaging that claim to alleviate infant discomfort. Any resemblance to actual product packaging is coincidental

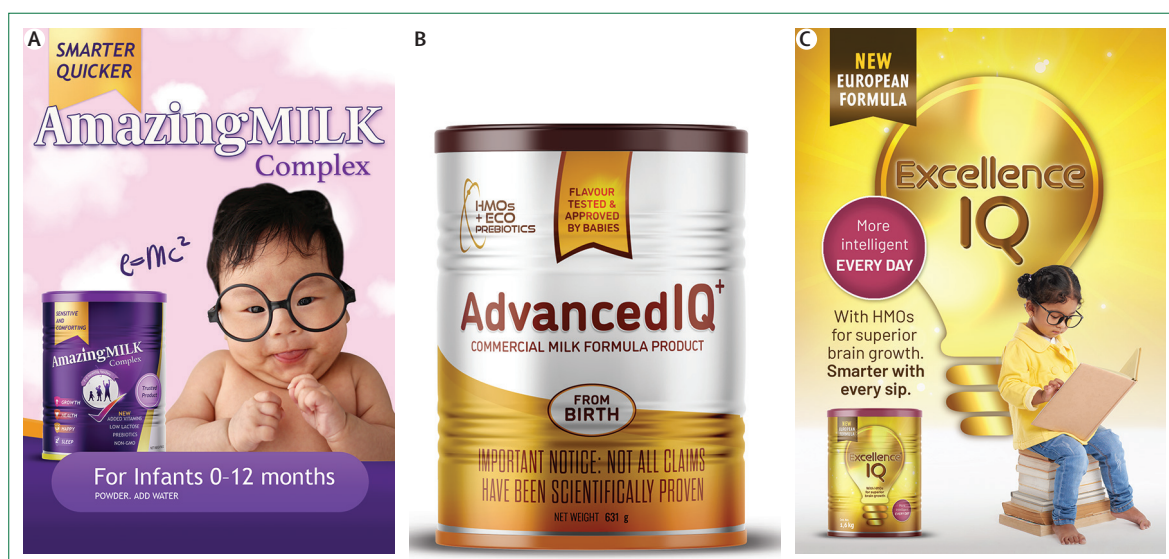


Figure 4: Artwork illustrative of actual packaging that make or imply claims about intelligence and intelligence quotient. Any resemblance to actual product packaging is coincidental

professionals, or politicians—must be captivated and convinced through identification, understanding, and empathy. Parents' experiences of CMF marketing vary by country, including how the claims of CMF are presented and understood (panel 2).

The value of health professionals to the CMF industry: category entry points

Midwives, nurses, doctors, and other health professionals are key influencers of health-related decisions because of their knowledge, expertise, and public trust in their professional ethic and duty of care. As experts, they have a crucial role in establishing technical guidelines and standards, informing political decisions on health, and communicating health information to the public. Health professionals influence the use of public and

philanthropic resources, including research funding; through scientific publications they influence services and programmes that shape future health trajectories. When CMF companies gain explicit or implicit support of health professionals, they not only gain sales but also gain social licence to act as legitimate health advisers. In marketing terms, health professionals are considered category entry points (ie, the mental cue that customers use to access thoughts and memories when in a buying situation).

Health professionals are frequently cited as influential sources of information about infant feeding,^{11,77} making them an important target for CMF marketing. In South Africa, a local marketing agency for a major global CMF manufacturer was tasked to conduct a stakeholder mapping with the aim of influencing

Panel 2: Commercial milk formula (CMF) marketing to pregnant women and mothers: the customer journey in their own words

The customer journey of women is exemplified with direct quotes from a 2022 study by WHO and UNICEF,²⁰ which interviewed 8528 pregnant women and mothers from Bangladesh, China, Mexico, Morocco, Nigeria, South Africa, the UK, and Viet Nam.⁸

Marketing portrays CMF as a problem-solving and confidence-boosting alternative to breastmilk. Products incorporate “all those scientific acronyms like DHA. You don’t know what it is but it sounds cool. It is supposed to be a nutrient that goes directly to the baby’s brain for stimulation”, says a mother in Guadalajara, Mexico. CMF marketing suggests it is possible to consider “the benefits my baby will get... if I want to promote brain development, height, or digestive system, I will find respective formulas”, says a mother in Ho Chi Minh City, Viet Nam, with the constant comfort of “how similar it is to breastmilk”, (mother from Glasgow, UK).

Packaging reinforces this sense of empowered choice: “we look at the colours, the writing...the ingredients of the milk, we have to know what they’re giving to the baby—calcium, proteins, iron, vitamins, fibre”, says a mother in Marrakesh, Morocco. A mother in Johannesburg, South Africa, says “I actually like that premium brand, I love the colour, I love that expensive look...the gold gives it that expensive taste as if it’s procured the best quality and it’s something unique and different. It looks subtle and it’s not too much information... It looks honest.”

Pricing strategies help emphasise this sense of premiumisation, incentivise purchase, and exploit the mother’s guilt: “my mommy instinct took over and I wanted the most expensive, because I am making up for not breastfeeding her”, says a mother in Johannesburg, South Africa. “I think at the hospital, I got vouchers for X brand milk... and I have been given free Y brand bottles, the 200 mL sizes they do”, (mother from London, UK). “I saw an advertisement on Facebook...the most important thing was ‘register immediately to receive £110 000 discount code’”, tells a mother in Ho Chi Minh City, Viet Nam.

Advertising adds another layer of reassurance, suggesting products are medically endorsed and scientifically proven: “I find those advertisements more reliable when there is someone with a white lab coat...I don’t know if it’s a marketing thing, but they show those letters so that you can remember the contents of the formula”, says a mother in Guadalajara, Mexico.

All of this activity is encapsulated and given strategic power by the brand: a mother in Johannesburg, South Africa, says

“Brand X, it looks so nice—it does show it’s for babies, the handwriting and the colours...the heart, you know.” A mother in London, UK, adds “I do like the look of the Brand Y one, where it’s scientific. It would make me feel like more research had been done into the ingredients that might be better for my baby...I like the phrase, ‘Bringing science to early life’...because, you know, we all want the best for our children and I think, there, that phrase just really catches me.”

Digital technology has made CMF marketing smart, perfecting both targeting and pitch: “After I gave birth to him, I didn’t know who leaked the information, the [advertisement] person or others would send me one pack, they seemed to be fighting for the first sip of formula milk”, says a mother in Jinan, China. “We were looking online and that little [advert for] brand Z milk popped up. With these cookies, they must know we’re looking at baby stuff, and it’s popped up out of nowhere”, adds a mother from London, UK.

Brands are cited in patient diagnoses and recommended as part of clinical advice: “Brand X is being sponsored to the hospital. If it doesn’t work [for the mom], we will recommend another one within the Brand X range. I trust the brand”, says a doula from Johannesburg, South Africa.

This advice influences mothers: “It is easier for me to go either to a sister or a doctor to know what I am buying”, says a mother from Lagos, Nigeria; “the paediatrician suggested one and that’s what I chose...I trusted what the paediatrician told me”, adds a mother from Guadalajara, Mexico. The recommendations coming from some health professionals make other health workers uncomfortable: “It almost is a feeling that the dieticians are working for the formula companies. It really feels like that”, states an infant-feeding coordinator in London, UK.

These experiences are consistent with reports elsewhere and with marketing approaches for other products. However, they are in blatant disregard of the International Code for the Marketing of Breast-milk Substitutes. For example, article 5 of the code prohibits companies from providing or health workers from receiving free samples and promotional gifts, and making contact with marketing personnel; article 5 also prohibits discount coupons, special displays, and tie-in sales; articles 6 and 7 prohibit inducements to health professionals and product promotion in facilities; and article 9 prohibits labels with pictures or text that idealise the product or nutrition and health claims.²⁰

national policies and increasing sales. The activity examined the level of each stakeholder’s influence on government agenda setting, their peer credibility, and their disposition towards the company or brand. They placed scientific and academic communities at the centre of their analysis by listing prominent scientists,

influential health professionals, and institutions by name.⁷⁸

Although most health professionals acknowledge the importance of breastfeeding for infant and child health, paradoxes persist. Medical and nursing curricula commit little time to skills-building for effective breastfeeding

support;^{79–81} public health education and funding for breastfeeding is modest; and when support is present for 6 months of exclusive breastfeeding, follow-on milks are commonly thereafter recommended.¹¹ In the absence of other funding, professional associations in medicine, midwifery, and nutrition continue to accept sponsorship from CMF manufacturers even when companies are known to violate the Code.^{82–84} Additionally, practitioners often do not understand or know about the Code^{11,85,86} and do not critically examine and comment on the evidence base cited in CMF health claims. Thus, although health professionals generally promote breastfeeding, these professional and ethical incongruities result in failure to protect breastfeeding in a competitive, commercial world.

CMF marketing's capture of science

CMF marketing commonly and effectively uses science to build brand credibility and influence among health and other professionals. Here, we examine two approaches used by the CMF industry to engage and influence the scientific community.

Arbitration of scientific evidence and misrepresentation of research

Oversight of CMF products, including their composition, quality control, and review of specific claims, generally falls under national and international food and nutrition standards rather than pharmaceutical regulations.⁸⁷ Being classified as food products, the CMF industry is not obliged to provide evidence at the same level of certainty as international standards for medical interventions³¹ despite marketing claims that CMF products influence health outcomes such as brain development, immunity, growth, and allergy risk.

Medically unsubstantiated claims for CMF products leave parents and caregivers uncertain of facts for decision making.^{53,88–90} For instance, a CMF can be positioned as having greater nutritional value than other CMF brands or characteristics closer to breastmilk, and manufacturers charge higher prices—known as premiumisation—without evidence for improved health outcomes. New products, such as hypoallergenic, organic, and sheep-milk-derived or goat-milk-derived CMFs, are marketed with the inference that they have special benefits and prices are set to suggest a better, more sophisticated product.^{91,92} Sugar, sweeteners, emulsifiers, and thickeners are added to enhance taste and acceptability without thorough independent study of their health consequences in infants and young children (appendix pp 5–8).^{93,94}

One analysis of CMF health claims reported that most claims are poorly substantiated, concluding that health claims by CMF manufacturers should be prohibited due to potential for harm and product development should be better regulated.³³ Another systematic review examined the quality and potential for bias in 125 CMF comparative trials involving 23 757 infants and young children.⁹⁵ A high risk of bias (80% based on the Cochrane risk of bias

assessment 2.0), selective reporting (90% of trials had a positive conclusion), and substantial CMF industry research funding and influence (84% of trials were funded by industry and 77% had at least one industry-associated author) were reported. The authors concluded that CMF trials have little independence and transparency.

International food standards are also subject to CMF industry capture. Obligations under World Trade Organization (WTO) agreements can make it difficult for individual countries to set national regulations that are more comprehensive or stricter than the international food standards, known as the Codex Alimentarius. Despite obvious conflicts of interest, CMF industry observers are permitted to actively participate in meetings of the Codex Alimentarius standard-setting process, which provides access to national policy makers and compromises the setting of standards for CMFs. Member states can choose to embed private-sector lobbyists within their national delegations, and often do (appendix pp 9–10).^{96,97}

The consequences of the selective and misleading use of science in CMF marketing are concerning. Similar to what has been seen with the sugar, tobacco, and fossil fuel industries, current standards-setting and regulatory practices allow the CMF industry to use evidence that it generates itself to reframe and undermine high-quality, science-based policy frameworks, including the Code.^{74,98–104}

Sponsorship, journals, and advisory roles

Similar to pharmaceutical companies, the CMF industry sponsors professional organisations and their conferences, meetings, and training, and posts adverts and publishes sponsored articles in scientific journals. The aim of investment in health professionals, their associations, and scientific journals is to establish familiarity, credibility, and indebtedness—it is commercially strategic and widespread. For example, in a review of paediatric association websites and Facebook accounts, 68 (60%) of 114 documented receiving financial support from CMF companies.⁸² Similar findings were reported among online platforms of maternity-care-provider associations; in Australia, New Zealand, Canada, the UK, and the USA, financial support from CMF manufacturers was acknowledged in six (21%) of 28 association websites.⁸³ Articles sponsored by the CMF industry in scientific and public health journals can be hard to recognise as commercial advertisements.^{105,106}

The CMF industry also invites leaders in public health onto advisory boards and committees, or positions its own representatives on public panels, to garner support and influence in the health policy and investment environment.^{107,108} Although construed as consultation with and learning from experts, this activity establishes a relationship that is used for strategy and advocacy in the CMF industry, and plausibly shapes those experts' voices in public debate about industry influence.^{109,110} These strategic engagements are sometimes recognised by civil society^{111,112} but pass unrecognised elsewhere.

The interactions constitute conflicts of interest at every level of influence. A conflict of interest “exists when an individual has an obligation to serve a party or perform a role, and the individual has either incentives or conflicting loyalties that encourage the individual to act in ways that breach his [or] her obligations”.¹¹³ This bias might occur through a sense of obligation, and manifest as hesitancy, reluctance to comment, or altered decision making. Although declarations of interest are sometimes disclosed, they do not, by themselves, offer meaningful protection from CMF industry interference.¹¹⁴ Some health professional associations and science journals have revised sponsorship policies to avoid conflicts of interest,^{115–117} but these examples remain the exception.

In conclusion, the capture of science as a strategic objective of CMF marketing fundamentally shapes medical practice in addition to boosting CMF sales. Science is used in a pincer movement: parents looking to resolve problems accentuated by marketing, with health professionals offering marketing-constructed solutions.

The erosion of legal and regulatory standards

CMF marketing does not exist in isolation. Legal and regulatory standards that affect CMF marketing exist but are underpowered and underused to counter the CMF industry’s power and highly adaptable marketing playbook.

The Code and subsequent World Health Assembly resolutions

The Code¹⁰ comprises the strongest international policy framework for public health to protect women, parents, children, and the health system from predatory and harmful marketing of CMF. Yet the Code needs to be enacted into national policy and legislation and rigorously enforced to exert its influence.^{28,96,118} Growing evidence on the corporate political activities of the CMF industry also shows the need to address industry interference in policy and regulation at national and international levels.^{28,96,119} A global approach is needed, drawing on the principles and approaches put in place in 2005 to limit tobacco industry influence (in the third paper in this Series).⁷

As of 2022, elements of the Code have been adopted into national regulations by 144 of 194 WHO member states.¹¹⁸ However, only 32 countries were deemed to be substantially aligned with the Code.¹¹⁸ For example, only 33 countries prohibit giving of any gifts or incentives by CMF companies to health workers, just 21 prohibit the sponsorship of health-professional association meetings by CMF companies, and only 37 explicitly mention digital promotion. Furthermore, national monitoring and enforcement mechanisms are often inadequately resourced and there have been few meaningful sanctions imposed on companies that violate national Code regulations.¹¹⁸

Violations of Code recommendations are not a problem of the past; there is extensive evidence showing that CMF marketing continues unabated. A systematic scoping

review that included 153 studies¹²⁰ showed how marketing practices in violation of the Code have continued in nearly 100 countries and in every region of the world since its adoption in 1981. The review showed that all major CMF manufacturers are implicated and that claims of Code compliance by several companies are not true. These practices include promotion in health facilities, use of health claims, advertisement in mass media, and point-of-sale marketing.¹²⁰ Increasingly, studies are documenting practices in violation of the Code occurring on digital platforms.¹²¹ The review also identified practices that effectively circumvent the Code, such as cross-promotion of growing-up milks, other specialised CMF, and CMF for pregnant and lactating women, that use the same brand visual identity. Mothers of infants and young children were found to be the most common target of these practices, but a substantial proportion (>70%) of studies also documented violations targeting health workers and health professionals. Such violations include sponsorship of training or research, financial inducements, gifts to promote products, and CMF advertising in medical journals.

Studies on the effect of the Code are methodologically complex, but evidence suggests that its adoption and enforcement can reduce CMF promotion by health workers⁹ and improve compliance by CMF companies.¹²² The CMF industry has argued for voluntary self-regulation, but self-regulation has consistently failed to reduce marketing practices that violate the Code and the argument for self-regulation is used to undermine the adoption of mandatory measures.^{24,28} In 2020, WHO, UNICEF, and six child health organisations issued a Call to the main CMF manufacturers to fully comply with the Code by 2030.¹²³ In 2020, one year before the 40th anniversary of the Code, only two companies—representing 1% of the global market—made the commitment to be fully compliant.¹²³

Data algorithms and targeting used in digital marketing^{4,5,8,9,11,12} (panel 3) reveal gaps in the Code and the need for effective monitoring of digital platforms. However, the transnational nature of the digital ecosystem substantially complicates the enforcement of marketing restrictions.^{12,140} Furthermore, exploitative marketing seen in emergencies and during the COVID-19 pandemic¹⁴¹ are potent reminders of the Code’s continued relevance today. More than ever, there is a need for national investment in implementation and enforcement of the Code, and the establishment of cohesive legal safeguards that ensure appropriate financial and criminal sanctions for Code violators.

International food standards

The Codex Alimentarius is a collection of international food standards, codes of practice, and guidelines to protect consumer health, harmonise food standards, and ensure fair food trade practices.¹⁴² The standards are proposed, developed, and revised by the Food and

Panel 3: The exploitation of data and the digital marketing of commercial milk formula (CMF)

Digital technology has triggered a so-called second industrial revolution¹²⁴ and made CMF marketing massively more powerful than before in three ways: by providing unparalleled access to, and information about, consumers; by integrating social and commercial influences, such as disguising marketing as objective help on social media; and, through big data and machine learning, digital technology can micro target marketing in real time and use sales, location, and activity patterns to rapidly optimise strategies.

The personal data and locations that are harvested with every keystroke on electronic devices have given the CMF industry the ability to understand consumers in meticulous detail. Digital apps record not just factual details about us, but also capture our emotions and vulnerabilities. Through credit cards and loyalty schemes they register our buying habits.¹²⁵

Making a Facebook post or internet search for folic acid supplements discloses to marketers a pregnancy; joining an online baby club provides an estimated date of delivery that anchors future marketing algorithms.^{125,126} CMF industry-sponsored pregnancy and parenting apps have chat services and 24-h helplines that initiate direct conversations with consumers and facilitate product placement,^{124,127} offer free samples or reduced price CMF, and promote online sales.¹²⁸

Social media platforms have blurred and expanded the boundaries of commercial activity so much so that it is difficult to recognise adverts or know when we are being sold to.¹²⁸

Content escapes our critical radar because it is “not recognisable as marketing or advertising...it does not look, sound, or feel like traditional advertising; it does not appear to be content created and disseminated for the purpose of selling a product. Rather it takes the form of spontaneous utterance; authentic, independent advice from trusted peers with shared values, similar experiences, some relevant expertise, or even simply celebrity that provokes aspirational sentiment in others.”¹²

Influencers, who pose as friends to the viewer, add to the aura of authenticity by sharing difficulties and challenges of breastfeeding as preludes to CMF messages.¹²⁹⁻¹³¹

A WHO-commissioned study¹² found that, on average, each CMF-branded influencer post is seen by around 400 000 people and generates action from about 2.75%, or 11 000, of them.

Yet, the potential is much greater: a celebrity influencer sponsored by one CMF brand “reached more than 2 000 000 users and generated 155 000 engagement actions with a single post”.¹²

CMF product images appear on the screens of cash machines, airport and transport hubs, and YouTube interludes.

A generation ago, when industry was suspected of using subliminal advertising, it triggered moral outrage. Vance Packard wrote *The Hidden Persuaders*¹³² and policy makers outlawed the practice. Nowadays, disguised advertising is the norm and CMF marketers are adept exponents.

Big data and artificial intelligence further increase the power of marketing by enabling precision targeting in real time.

For example, Facebook and Instagram use machine learning algorithms to collect, aggregate, and analyse data generated by users to identify their interests, content engagement, and purchasing behaviour.¹² In this way, advertisers and data companies profit from their innovations.

In Mexico, Fun Waze to Learn is an app produced by a major CMF company to target parents who “know the importance of developing their child’s abilities in all their splendor”.¹³³ The app provides GPS guidance and a running commentary of things for the child passenger to see or do en route; but the GPS guidance leads parents to the nearest brand outlet. Their objectives were to “engage children with our brand, increase affinity with their parents, and increment foot traffic to our drugstores”.¹³³

Commenting on the potential “of capturing, and tapping, customer big data in real-time”, a social media senior executive wrote “‘Mother’s Journey’ [mobile app]...gives company X the ability to leverage the context of each and every moment with these mothers, everywhere...triggering offers, promotions, and opportunities for engagement....all of company X’s actions are initiated at the right moment, and in the right context of each mother’s personal journey”.¹³⁴

These approaches are energetically used in CMF marketing. All are reliant on a robust backroom of data capture, transfer, and brokering. Personal data are transferred through trading desks with specific requirements for population characteristics defined by advertisement agencies who design and implement digital strategies on behalf of commercial clients.¹³⁵ This data industry, used to market all products, is estimated to be worth US\$200 billion per year.^{136,137}

These systems are both detached from, and unfamiliar to, the world of public health, which has been slow to react to their influence. The transnational and multilayered nature of the technology makes digital marketing difficult to monitor and regulate, and as a result CMF companies are freely implementing wide-ranging digital strategies to maximise CMF sales.^{91,130,138}

All predictions show digital marketing will continue to grow. We cannot stop it, but regulations can protect consumers and more vulnerable groups. There is an urgent need for national and international cooperation¹³⁹ to comprehensively understand the digital marketing environment for health and design relevant and effective regulatory approaches. As has been the challenge in regulating CMF marketing for more than 40 years, regulation requires the health and human rights of children and parents to be placed ahead of the trade and shareholder interests of a powerful and aggressive industry.

Agriculture Organization and WHO member states at the Codex Alimentarius Commission, with participation of public health and industry stakeholders. Codex Alimentarius defines food products and sets composition and labelling requirements; however, CMF product definitions are not necessarily consistent with the Code.^{96,143}

In theory, adherence to Codex Alimentarius standards is voluntary and intended as a regulatory minimum for national governments to adopt. However, since 1995, certain WTO agreements have recognised Codex Alimentarius standards, or the Codex Alimentarius Commission as a standard-setting body, meaning governments intending to adopt more stringent standards could potentially face legal challenges in the WTO. Codex

Alimentarius standards now function as a regulatory ceiling for national governments and, subsequently, standard-setting processes have become increasingly politicised.¹⁴⁴ Accusations of deviations from Codex Alimentarius texts are levied by CMF and dairy-exporting countries to pressure countries attempting to strengthen CMF marketing regulations, with the implicit threat of trade disputes and punitive tariffs.⁹⁶ However, there has never been a formal litigation concerning domestic implementation of the Code under an international trade agreement.¹⁴⁵ Given its function and importance nationally and worldwide, public health advocates, and some member states advocate for greater alignment of Codex Alimentarius texts with the Code (in the third paper in this Series).⁷

Panel 4: The use of gender in commercial milk formula (CMF) marketing

The bearing and rearing of children, including creating an environment that fully enables breastfeeding, is a collective responsibility. Yet, women face continued barriers to breastfeeding (the first and third papers in this Series).^{6,7} These barriers are often compounded by public health messaging that frames breastfeeding as a matter of individual responsibility and, in particular, women's responsibility alone. Although such messaging has been critiqued,¹⁵⁷ exactly how CMF marketing uses gender norms to sell its products, exploiting gaps in collective support by governments and society, has not been adequately examined.

CMF marketing has historically associated formula milk with upward mobility, modernity, and later with women's liberation.^{17,158–162} Women's participation in the labour force is central to this marketing effort. The idea that breastfeeding is anti-work and antifeminist is repeated in popular blogs, media, and academic publications, especially in high-income countries.^{157,163} CMF marketing depicts CMF as a convenient solution that addresses working conditions that could limit breastfeeding.⁴³ Much evidence shows that paid family leave and creating breastfeeding-friendly work and childcare environments facilitates both women's work and breastfeeding.^{151,153,155,164} However, the importance of these maternity protection policies—enshrined in International Labour Organization standards¹⁶⁵—are not part of CMF messaging.

CMF marketing portrays breastfeeding, and thereby women's bodies, as inherently difficult, unreliable, and inconvenient. This portrayal is exemplified in messaging that offers CMF as a solution for mothers with insufficient milk (also in the first paper in this Series).⁶ Marketing presents CMF as a lifestyle choice and a solution to all challenges related to infant behaviour and care, with products that are equivalent to breastmilk and a scientifically endorsed replacement for the entire process of breastfeeding.⁴³ CMF marketing reframes and bends public health messaging to further promote its products: for example, capitalising on the WHO recommendation to exclusively breastfeed for 6 months to

suggest that CMF is necessary after this age, rather than continuing breastfeeding with complementary foods, because breastmilk alone is purportedly insufficient. This false message undermines women's confidence in their own bodies and their ability to make informed decisions about continued breastfeeding.

The CMF industry and its marketing frames breastfeeding advocacy as a harmful moral judgement that is damaging to women, causing them to feel guilty. For instance, in a popular US multimedia campaign,⁷⁶ breastfeeding mothers are portrayed as judgemental about formula feeding and breastfeeding itself as divisive among women. The marketing campaign aims to build trust with women and give the impression that the CMF industry is on their side. The industry uses messages about reducing judgement and supporting the inner strength of women to sell its products. One story declares that “moms achieve so much without thinking about their own limitations”⁷⁷ juxtaposing a message about mothers' strength with one about inherent weakness regarding infant feeding. Furthermore, promoting concepts such as the so-called mommy wars and guilt helps sell formula products at inflated premium prices, with expensive products promoted as solutions to complex work or household circumstances.

CMF marketing obscures the root causes of mothers who struggle to breastfeed, which are largely structural rather than individual, while ignoring potentially harmful effects on women's health, children's health, and health equity.^{43,157,163,166} This obfuscation polarises women and frames the rights of women to be at odds with the rights of their children. To address these issues, regulations on industry behaviour must be coupled with broader structural and social transformation, and non-stigmatising public health campaigns that focus on supporting and enabling all women and babies to breastfeed. By fully and equitably supporting women's and children's rights at home, in health-care settings, in work settings, and in communities, we can simultaneously enable breastfeeding and create an environment that is beneficial for all.

Maternity protection

The International Labour Organization has standards for maternity protection (Convention number 183 and R-191)¹⁴⁶ that aim to promote equality of all women in the workforce and protect the health and safety of mothers and their children while at work. These standards are discussed further in the third paper in this Series,⁷ but noted here because women's need to work is one of the most frequently cited barriers to breastfeeding.² Paid maternity leave, breastfeeding breaks, and facilities at work are associated with improved breastfeeding practices,^{147–151} lower infant mortality,^{152–154} and improved maternal physical^{118,126} and mental health.^{147,153,155}

Despite these benefits of paid leave, marketing narratives present CMF as the solution for working families and some industry lobby groups have cautioned against maternity protection reforms.¹⁵⁶ The manipulation of gender issues in CMF marketing has been extensively described (panel 4).

Conclusions and recommendations

How we feed and care for our young has a lifelong effect on individual, societal, and environmental wellbeing. The CMF industry deploys a sophisticated and highly effective marketing playbook to turn the care and concern of parents and caregivers into business opportunities. Although CMF is a commodity that serves a purpose for some families, it does not come close to breastfeeding and breastmilk in terms of composition, immune properties, and contribution to health and development (in the first paper in this Series⁶).¹

Marketing is not inherently bad or unethical. However, CMF marketing strategies, also used in other industries,^{34–36,167} systematically distort science, capture health-care providers and parents, alter public opinion, and influence policy makers. Through these divisive practices, CMF marketing impinges on the human rights of women and children, harms their health, and adversely affects society. The evidence affirms that past efforts to have the CMF industry adhere to the Code have not been sufficiently successful. Citizens desire—and have a right to—objective information and policies that are free from commercial influence. A concerted effort is needed to attain this adherence to the Code. However, addressing CMF marketing is insufficient on its own. Policies must remove structural barriers and society must fully enable and support women who choose to breastfeed.

To achieve a world where parents and families are genuinely supported in the care of infants, and for breastfeeding to be robustly promoted, protected, and supported, we call for: (1) high-level political commitment, increased financial investment, and concerted support from civil society for mothers and families so that breastfeeding becomes a collective responsibility. Breastfeeding rates and support measures should be tracked as metrics for an all-of-government (health, labour, trade, justice, etc) commitment to infants and

young children. The Global Breastfeeding Scorecard,¹⁶⁸ updated annually, offers guidance on how this tracking can be accomplished. (2) All CMF marketing and industry interference in national and international policy processes should end. Voluntary compliance with minimal marketing restrictions has proven ineffective and digital marketing circumvents regulations entirely. A framework convention on the commercial marketing of food products for and to children younger than 3 years old is needed to safeguard the health and wellbeing of mothers and families. This framework should contain a clause similar to article 5.3 of the Framework Convention on Tobacco Control, which protects policy making and implementation from industry influence. A Framework Convention would appropriately regulate the CMF industry while not restricting the sale of CMF products to those who need or want them.

As staging posts towards these outcomes, we recommend: (1) that scientific research and standards for CMF products should be regulated with the same rigour as pharmaceuticals. The evidence base for purportedly improved health outcomes, including brain development, immunity, growth, and sleep, and absence of harms, should be assessed by an independent scientific body. Ingredients found to be beneficial should be mandatory in all formula products. Plain packaging with accurate messages determined by national authorities would convert packaging from a marketing tool to a public health platform. (2) Health providers, researchers, journals, and professional societies should not accept funding or any material support from the CMF industry. Health-professional associations should establish robust standards and insist on independent sources of funding for research and conferences. Sponsorship by the CMF industry should not be permitted. These changes must be accompanied by sustained investment in making education and skills development on infant feeding a priority in health provider training. (3) Industry spending on CMF marketing, including advertising, lobbying, sponsorship, and corporate philanthropy should be publicly disclosed. (4) All countries should fully adopt the Code into national law, with effective monitoring and enforcement sufficiently funded and implemented by governing bodies that are free from commercial influence. Full implementation of policies supporting women's and children's rights, including maternity protection, will further protect breastfeeding. (5) CMF marketing across the entire digital environment needs to be comprehensively reviewed. An approach to regulation that cuts across all levels of data capture and use must be agreed on by governments and transnational bodies. (6) Use of the Codex Alimentarius Commission and the WTO by the CMF industry to undermine the Code must end. Corporate behaviours, such as lobbyists seeking to interfere with decisions on international food standards and to halt progressive national maternity protection legislation, described earlier in this paper, are examples of

corporate subversion of public health and consumer protection policies.¹⁶⁷ Actions related to this step are discussed further in the third paper in this Series.⁷

These measures are commensurate with the importance and scale of the problem, namely the negative effect of CMF marketing strategies on breastfeeding practices and the health and rights of parents and children. Structural and policy interventions are needed in all settings to enable, empower, and support women and families. Breastfeeding success is a collective responsibility that depends on multifaceted policy and societal responses. Fact-based information on feeding infants and young children that is free from commercial influence is a human right that must be made available to all. The vital human process of feeding infants and young children should be off limits to commercial marketing.

The 2023 Lancet Breastfeeding Series Group

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