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The 2023 *Lancet* Series on Breastfeeding



“The marketing of commercial milk formula for use in the first 3 years of life has negatively altered the infant and young child feeding ecosystem”

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The 2023 Lancet Series on Breastfeeding · February, 2023

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Unveiling the predatory tactics of the formula milk industry



For decades, the commercial milk formula (CMF) industry has used underhand marketing strategies, designed to prey on parents' fears and concerns at a vulnerable time, to turn the feeding of young children into a multibillion-dollar business. The immense economic power accrued by CMF manufacturers is deployed politically to ensure the industry is under-regulated and services supporting breastfeeding are under-resourced. These are the stark findings of the 2023 Breastfeeding Series, published in *The Lancet* today.

The three-paper Series outlines how typical infant behaviours such as crying, fussiness, and poor night-time sleep are portrayed by the CMF industry as pathological and framed as reasons to introduce formula, when in fact these behaviours are common and developmentally appropriate. However, manufacturers claim their products can alleviate discomfort or improve night-time sleep, and also infer that formula can enhance brain development and improve intelligence—all of which are unsubstantiated. Infant feeding is further commodified by cross-promotion of infant, follow-on, toddler, and growing-up milks using the same branding and numbered progression, which aims to build brand loyalty and is a blatant attempt to circumvent legislation that prohibits advertising of infant formula.

Breastfeeding has proven health benefits across high-income and low-income settings alike: it reduces childhood infectious diseases, mortality, and malnutrition, and the risk of later obesity; mothers who breastfeed have decreased risk of breast and ovarian cancers, type 2 diabetes, and cardiovascular disease. However, less than 50% of babies worldwide are breastfed according to WHO recommendations, resulting in economic losses of nearly US\$350 billion each year. Meanwhile, the CMF industry generates revenues of about \$55 billion annually, with about \$3 billion spent on marketing activities every year.

The industry's dubious marketing practices are compounded by lobbying, often covertly via trade associations and front groups, against strengthening breastfeeding protection laws and challenging food standard regulations. In 1981, the World Health Assembly adopted the International Code of Marketing of Breast-milk Substitutes, a set of standards to prevent inappropriate marketing of formula. It includes prohibition of advertising of CMF to the public or

promotion within health-care systems; banning provision of free samples to mothers, health-care workers, and health facilities; no promotion of formula within health services; and no sponsorship of health professionals or scientific meetings by the CMF industry. However, despite repeated calls for governments to incorporate the Code's recommendations into legislation, only 32 countries have legal measures that substantially align with the Code. A further 41 countries have legislation that moderately aligns with the Code and 50 have no legal measures at all. As a result, the Code is regularly flouted without penalty.

The prioritisation of trade interests over health was brought to the forefront in 2018, when US officials threatened to enforce trade sanctions and withdraw military aid to Ecuador unless it dropped a proposed resolution at the World Health Assembly to protect and promote breastfeeding. Some CMF lobby groups have cautioned against improved parental leave. Duration of paid maternity leave is correlated with breastfeeding prevalence and duration, and absence of, or inadequate, paid leave forces many mothers to return to work soon after childbirth. Lack of safe spaces for breastfeeding or expressing milk in workplaces, or facilities to store breastmilk, mean that breastfeeding is not a viable option for many women.

Some women choose not to breastfeed, or are unable to. Perceived pressure, or inability, to breastfeed—especially if it is at odds with a mother's wishes—can have a detrimental effect on mental health, and systems should be in place to fully support all mothers in their choices. Women and families make decisions about infant feeding based on the information they receive, and a criticism of the CMF industry's predatory marketing practices should not be interpreted as a criticism of women. All information that families receive on infant feeding must be accurate and independent of industry influence to ensure informed decision making. Marketing by the CMF industry is an interconnected, multifaceted, powerful system that knowingly exploits parents' aspirations. Under the Convention of the Rights of the Child, governments have a duty to tackle misinformation—and governments need to embrace the breastfeeding Code without further delay to ensure that manufacturers making misleading claims about their products are held to account. ■ *The Lancet*



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For more on **implementation of the breastmilk substitutes Code** see <https://www.who.int/publications/i/item/9789240048799>

For more about **Ecuador's proposal** see <https://www.nytimes.com/2018/07/08/health/world-health-breastfeeding-ecuador-trump.html>

For more on **family-friendly policies** see <https://www.unicef-irc.org/family-friendly>



Stemming commercial milk formula marketing: now is the time for radical transformation to build resilience for breastfeeding

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One of the striking messages of the *Lancet* Breastfeeding Series¹⁻³ is that the consumption of commercial milk formula (CMF) by infants and young children has been normalised. More children are consuming CMF than ever before.² Only 48% of the world's infants and young children are breastfed as recommended,⁴ despite the huge body of evidence on the lifelong benefits of breastfeeding. This situation reflects the stranglehold the CMF industry has on governments, health professionals, academic institutions, and increasingly on caregivers and families through pervasive social media. CMF companies exert undue control on the infant and young child feeding discourse, and the value of CMF sales have increased year on year.² This dire situation, interventions to address it, and the economic, health, and survival benefits to society of optimal breastfeeding practices have been outlined in three previous *Lancet* Series⁵⁻⁷ since 2003. The 2023 *Lancet* breastfeeding Series underlines, yet again, inadequate progress in improving breastfeeding practices globally, with the powerful addition of quantifying the association between sales of CMF and national breastfeeding rates.² The Series provides evidence of the overwhelming influence of CMF marketing in the promotion of CMF as a positive choice and the solution to every feeding challenge, thereby eroding breastfeeding practices.¹⁻³

This *Lancet* Series recommends programmatic and policy actions to support women who want to breastfeed, including the adoption of a framework convention on the commercial marketing of foods for infants and young children.³ Although a framework convention to restrict CMF marketing could be a potentially impactful high-level action, the International Code of Marketing of Breast-milk Substitutes (hereafter referred to as the Code) that regulates the marketing of CMF has been in existence for 40 years.⁸ The Code and subsequent resolutions explicitly state that “there should be no advertising or other form of promotion to the general public” and that “manufacturers and distributors should not provide...to pregnant women, mothers or members of their families, samples of products”.⁸ Promotion through any type of sales device, including special displays, discount coupons,

and special sales, is prohibited.⁸ In terms of health-care settings, the Code and subsequent resolutions call for a total prohibition of any type of promotion of products that fall within their scope in the health services. The evidence analysis in the *Lancet* Series shows clearly how marketing has continued, irrespective of the Code. Notably, advertising expenditure by CMF manufacturers has grown by 164% during the past decade,² despite 144 (74%) of 194 WHO member states having adopted legal measures to implement the Code, which explicitly states there should be no advertising to the general public of products covered within its scope.⁹ These high-level actions are far removed from the environments where breastfeeding takes place. There is a crucial need for more attention to and increased investment in local action to support breastfeeding.

The roles of civil society, consumer empowerment, and social mobilisation in building alliances, holding CMF companies accountable, and lobbying for environments supportive of breastfeeding have a long history, starting with the 1977 boycott of Nestlé.¹⁰ One action recommended in this Series to reduce the power of CMF marketing is use of plain packaging for CMF. A groundswell of support is needed for this action to ensure that it is included by governments in national legislation. The panel highlights examples of civil society action in support of enabling environments for breastfeeding.¹⁰⁻¹⁵ Such actions are underappreciated in the much-needed responses to support breastfeeding. Yet civil society coalition building is often coordinated with insufficient or no resources in stark contrast to the financial might and technical expertise that CMF companies have at their disposal.

Change must also happen within the health professions to support breastfeeding. The research and evidence synthesis presented in this *Lancet* Series provide compelling examples of the strategies used by CMF manufacturers to influence health professionals and academia through education, research funding, marketing in scientific journals, and conference sponsorship.² These marketing strategies have medicalised usual newborn

Panel: Examples of civil society action to create enabling environments for breastfeeding

Global

- In 1977, a boycott was launched in the USA by the Infant Formula Action Coalition (INFACT) against Nestlé following increased concern over the company's marketing practices in low-income and middle-income countries (LMICs).¹⁰ The boycott soon spread across several other countries and in 1978 the US Senate held a public hearing into the promotion of breastmilk substitutes in LMICs and joined calls for a Marketing Code. The global boycott generated the political pressure that resulted in the development and adoption of the International Code of Marketing of Breast-milk Substitutes by the World Health Assembly in 1981.⁸

South Africa

- In August, 2021, a group of civil society organisations in South Africa created awareness around events that had been planned by a large commercial milk formula (CMF) manufacturer (Nestlé) by engaging with national media outlets, creating an online petition, and coordinating a social media campaign (using the hashtag #NotTodayNestle).¹¹ The company was planning to directly engage with mothers and caregivers at online events called "Free Stokvel Mom and Child Forums". The civil society action resulted in the events being cancelled.

- In November, 2021, a group of 220 academics from around the world signed a letter of concern¹² regarding a conflict of interest after the appointment of the director of the African Research University Alliance Centre of Excellence in Food Security to the Nestlé Global Board of Directors.¹³ This action led to a meeting of university medical school representatives in South Africa to discuss conflict of interest policies within academic institutions to prevent corporate influence in education and research.

Brazil

- In May, 2022, the Brazilian Institute for Consumer Protection (IDEC), supported by the Global Health Advocacy Incubator (GHA),¹⁴ filed a Public Civil Action against three CMF manufacturers (Nestlé Brazil, Danone, and Mead Johnson) for misleading cross-promotion between toddler milks and infant formulas. In July, 2022, the court determined that the similarities between the two product packages had an unequivocal harmful potential.¹⁵ The judge concluded that "the harmful potential, thus considered the power to confuse the consumer, is unequivocal", and gave an instruction to the corporations to add a warning label to their products within 60 days.¹⁵

behaviours and mothers' perceptions that breastmilk is insufficient, advancing the narrative that CMF is the solution to these so-called problems and promoting this message among health professionals.^{1,16,17} There is a need for improvements in health professional training on breastfeeding and newborn development. However, the CMF marketing that health professionals and caregivers are exposed to also needs to be stemmed. Far stronger action and regulation is needed from ministries of health, health professional associations, educational institutions, and health facilities to act ethically and in the best interests of children and halt CMF industry influence in health professional education, research, and practice. Actions that could be taken include development of position statements and codes of conduct that academic institutions,¹⁸ health professional associations,^{19,20} and medical journals²¹ could adopt to guide engagement with the CMF industry. These actions must become the norm for any public health organisation and be accompanied by monitoring and reporting mechanisms, including transparency around existing relationships with the CMF industry.

Transforming environments to be more enabling for breastfeeding globally will also support more sustainable

and resilient food systems and reduce the huge carbon footprint^{22,23} resulting from increasing CMF consumption. As the papers in the Series show, more children than ever before are fed CMF at a time when the climate and global economic crises, together with political insecurities, create repeated events that disrupt CMF supply chains. Recent examples of such disruption include flooding in the province of KwaZulu-Natal, South Africa, war in Ukraine, the COVID-19 pandemic,²⁴ and the formula contamination that led to an acute CMF shortage in the USA.²⁵ CMF companies have capitalised on these events as opportunities to make donations and garner more customers.²⁶ These challenges are only going to increase, and the solution requires radical transformation of the infant feeding landscape so that women and families can make decisions in the best interests of their children free from commercial interest, rather than being dependent on a suboptimal product that relies on fragile global supply chains that may fail or produce products of poor quality.

In the third Series paper, Phillip Baker and colleagues call on governments to recognise the value of breastfeeding and unpaid care work by women to economies and to invest appropriately.³ Corporate political activities by CMF

companies devote huge resources to lobbying against legislation to protect breastfeeding,²⁷ most notably in the USA, which remains the only high-income country without legislated paid maternity leave.¹⁷ A Mothers' Milk Tool, developed in 2022 by non-profit groups,²⁸ enables governments to quantify the volume of breastmilk and the value of breastfeeding at a national level, as well as the economic losses if environments, policies, and health-care, work, and community settings do not enable women's and children's rights to breastfeeding.

Breastfeeding should be a key public health priority for all countries as part of broader efforts to improve women's and children's health, prevent non-communicable and communicable diseases, grow economies sustainably, and decrease inequities. Now is the time for radical transformation towards a world resilient for breastfeeding. There is no alternative for the future of children, societies, and the planet.

We declare no competing interests.

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Breastfeeding 1

Breastfeeding: crucially important, but increasingly challenged in a market-driven world

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In this Series paper, we examine how mother and baby attributes at the individual level interact with breastfeeding determinants at other levels, how these interactions drive breastfeeding outcomes, and what policies and interventions are necessary to achieve optimal breastfeeding. About one in three neonates in low-income and middle-income countries receive prelacteal feeds, and only one in two neonates are put to the breast within the first hour of life. Prelacteal feeds are strongly associated with delayed initiation of breastfeeding. Self-reported insufficient milk continues to be one of the most common reasons for introducing commercial milk formula (CMF) and stopping breastfeeding. Parents and health professionals frequently misinterpret typical, unsettled baby behaviours as signs of milk insufficiency or inadequacy. In our market-driven world and in violation of the WHO International Code for Marketing of Breast-milk Substitutes, the CMF industry exploits concerns of parents about these behaviours with unfounded product claims and advertising messages. A synthesis of reviews between 2016 and 2021 and country-based case studies indicate that breastfeeding practices at a population level can be improved rapidly through multilevel and multicomponent interventions across the socioecological model and settings. Breastfeeding is not the sole responsibility of women and requires collective societal approaches that take gender inequities into consideration.

Introduction

Human infants (aged ≤ 12 months) and young children (aged 12–36 months) are most likely to survive, grow, and develop to their full potential when fed human milk from their mothers through breastfeeding¹ due to the dynamic and interactional nature of breastfeeding and the unique living properties of breastmilk.^{2,3} Breastfeeding promotes healthy brain development and is essential for preventing the triple burden of malnutrition, infectious diseases, and mortality, while also reducing the risk of obesity and chronic diseases in later life in low-income and high-income countries alike.^{4,5} Breastfeeding supports birth spacing because when the baby nurses from the breast the mother's body releases hormones that prevent ovulation, leading to lactational amenorrhoea.^{1,6} Breastfeeding also helps to protect the mother against chronic diseases, including breast and ovarian cancers, type 2 diabetes, and cardiovascular disease.^{1,6} The substantial, positive, early-life effects of breastfeeding for children, mothers, families, and wider society are sustained over the life course⁷ with strong economic benefits. An estimated US\$341.3 billion is lost globally each year from the unrealised benefits of breastfeeding to health and human development due to inadequate investment in protecting, promoting, and supporting breastfeeding.⁸

When possible, exclusively breastfeeding is recommended by WHO for the first 6 months of life, and continued breastfeeding for at least the first 2 years of life, with complementary foods being introduced at 6 months postpartum.⁹ Yet globally, many mothers who can and

wish to breastfeed face barriers at all levels of the socioecological model proposed in *The Lancet's* 2016 breastfeeding Series.⁴

Key structural barriers that undermine the breastfeeding environment¹⁰ include gender inequities; harmful sociocultural infant-feeding norms;¹¹ income growth and urbanisation;^{12,13} corporate marketing practices¹³ and political activities that weaken breastfeeding protection policies; labour markets that poorly accommodate women's reproductive rights and care work, reflecting major gender inequities; and poor health care that continues to undermine breastfeeding, including the medicalisation of birthing and infant care.¹⁴

These barriers exert a powerful influence on the main settings that influence breastfeeding: health systems, workplaces, communities, and households. Maternity care systems that do not follow the ten baby-friendly hospital initiative (BFHI) steps¹⁵ continue to undermine breastfeeding because BFHI practices have a crucial role in preparing for and supporting lactation.^{15,16} Inadequate health-system support lowers the likelihood of breastfeeding due to poor staff training and marketing practices that are in violation of WHO's International Code for the Marketing of Breast-milk Substitutes¹⁷ (hereafter referred to as the Code), such as the distribution of commercial milk formula (CMF) samples and unjustified recommendations to introduce CMFs.^{13,18–20} Absent, inadequate, or poorly enforced maternity protection policies also undermine breastfeeding among working women through poor access to paid maternity and paternity leave, flexible

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This is the first 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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See Online for appendix

Key messages

- Commercial milk formula (CMF) products and artificial formula feeding cannot emulate the living and dynamic nature of breastmilk and the human interaction between mother and baby during breastfeeding. The unique and unparalleled qualities of breastfeeding bestow short-term and long-term health and development benefits.
- Only half of newborn babies are put to the breast within the first hour of life, and about a third of babies in low-income and middle-income countries receive prelacteal feeds (mostly water and animal milk) before being put to the breast. Prelacteal feeding is strongly associated with delayed initiation of breastfeeding.
- Common infant adaptations to the post-birth environment, including crying, unsettled behaviour, and short night-time sleep durations, are often misconceived as signs of feeding problems. CMF marketing reinforces and exacerbates these misconceptions and makes unsubstantiated claims that CMFs can ameliorate these behaviours.
- Nearly half of mothers globally self-report insufficient milk (SRIM) as the primary reason for introducing CMFs in the first few months of life and for prematurely stopping breastfeeding. SRIM can generally be prevented or addressed successfully with appropriate support.
- Additional educational efforts are needed for health workers, families, and the public to inform them about normal early infant development, including common crying patterns, possetting, and short night-time sleep durations, to reduce the unnecessary introduction of CMFs and to prevent SRIM and early cessation of breastfeeding.
- Breastfeeding is not the sole responsibility of the mother. Reviews and country case studies indicate that improved breastfeeding practices at population level are achieved through a collective societal approach that includes multilevel and multicomponent interventions across the socioecological model and different settings.

scheduling to accommodate breastfeeding, or appropriate breaks and facilities for breastfeeding or milk expression.^{21,22} For instance, literature from 2021 has emphasised that women working in the informal sector in the Philippines are not protected by maternity policies²³ although this might change as a result of the resolution published by the Commission on Human Rights in early 2022.²⁴ Communities and families often do not have the economic or educational resources and capabilities to adequately support breastfeeding.^{19,25,26}

At the individual level, attributes and interactions specific to mothers and infants, such as mental health challenges, anxiety about unsettled infant behaviours, self-reported insufficient milk (SRIM), and low self-efficacy are challenges to breastfeeding that have not been adequately addressed within health systems to date.^{14,27,28}

This Series provides a new vision on how to address breastfeeding protection, promotion, and support at scale through multilevel, equitable approaches. This vision addresses breastfeeding barriers and facilitators across all levels, from the structural to the individual, building on the conceptual model of the 2016 *Lancet* breastfeeding Series (figure 1). In this Series paper, we examine how individual-level parent and baby attributes interact with breastfeeding determinants at other levels of the socioecological model, how these interactions drive outcomes, and what policies and interventions are necessary to achieve optimal breastfeeding. Structural and settings-based barriers to breastfeeding, including commercial determinants, are expanded on in the second and third papers of this Series,^{29,30} which analyse the marketing of commercial milk formula and the political economy of infant and young child feeding (figure 1).

The papers in this Series were developed with a combination of research methods: (1) analysis of national representative survey data of children younger than 2 years, (2) commissioned systematic reviews (appendix pp 1–7), and (3) commissioned case studies.

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.

Scientific advances in breastfeeding, breastmilk, and lactation

Breastfeeding is part of our species-specific biopsychosocial system that has evolved through our mammalian history to optimise the health and survival of both mothers and infants.³¹ Research published since the 2016 *Lancet* breastfeeding Series¹ has strengthened the evidence for the importance of interactions between mother and baby during breastfeeding. For example, suckling the breast releases oxytocin, prolactin, and other metabolites that foster mother–child bonding and reduce physiological stress for both.³¹ Hormones in breastmilk stimulate appropriate infant appetite and sleep development, and hormonal, physiological, and metabolic changes during breastfeeding support the mother's lifelong health in various ways. During breastfeeding, the immune systems of mothers and infants communicate with each other beyond passive immunity,³² and mothers transmit elements of their microbiota to their children through breastmilk. These good bacteria live in the gut and help fight disease, digest food, and regulate the child's evolving immune system. They are influenced by several factors, including maternal diet and genetics, delivery method, antibiotic use, geographical location, and environment.^{2,3,33} If breastfeeding is undermined, these evolutionary benefits are lost, as are the unique adaptations of breastmilk and breastfeeding to the individual mother, infant, and their circumstances.

Breastfeeding is much more than the transfer of breastmilk from mother to baby. Suckling from the mother's breast is a crucial part of the nurturing of infants. Direct breastfeeding versus feeding breastmilk with a bottle, cup, or spoon has important implications for infant health and development. In addition to influencing infant craniofacial structure and reducing risk of malocclusion,³⁴ there are newly recognised compositional differences in free amino acids and total protein in fore milk versus hind milk, and the probable retrograde flow of infants' oral microbiota into mother's milk that takes place during breastfeeding.^{35–37} The skin-to-skin contact occurring through direct breastfeeding supports maturing mechanisms, including temperature control, metabolism, and diurnal adaptation.^{16,38,39} Although the provision of expressed breastmilk in a bottle is superior to CMFs, direct breastfeeding compared with expressed breastmilk has been associated with lower rates of asthma, higher likelihood of the presence of the beneficial *Bifidobacterium*, and potentially better infant self-regulation of energy intake, thus protecting against obesity.^{36,40,41}

Breastmilk itself is a highly adaptive live food source^{11,42,43} and, because of its dynamic nature, is more than its nutrient components. Breastmilk comprises nutritive and non-nutritive bioactives (eg, hormones, immune factors, oligosaccharides, and live microbes) that collectively and through complex interactions with each other—and with the biological, social, and psychological states of both mother and infant during breastfeeding—have a crucial role in healthy infant growth and development.^{2,3} Consequently, the composition of breastmilk changes during each feeding episode and as the infant develops over time, and in response to the physical and emotional state of the mother–child dyad. That the interactions and outcomes of breastfeeding cannot be artificially replicated is clear from past and new evidence.

Understanding breastmilk and the complex biopsychosocial system of breastfeeding

Since the publication of the 2016 *Lancet* breastfeeding Series,¹ discoveries have further shown how the nutritional, microbial, and bioactive components of breastmilk engage with each other, and how the composition of breastmilk varies with mother–baby interactions during breastfeeding. CMF and formula feeding cannot replicate the complexity and benefits of human milk and breastfeeding.

The specific bacteria found in breastmilk vary between and within populations, with several maternal and delivery-related factors influencing the variations in the predominant species.⁴⁴ Some evidence shows the infant's oral microbiota might also contribute to the breastmilk microbiome, passing through the nipple into the mother's breast while breastfeeding.^{35,36} Furthermore, the breastmilk microbiome contributes to

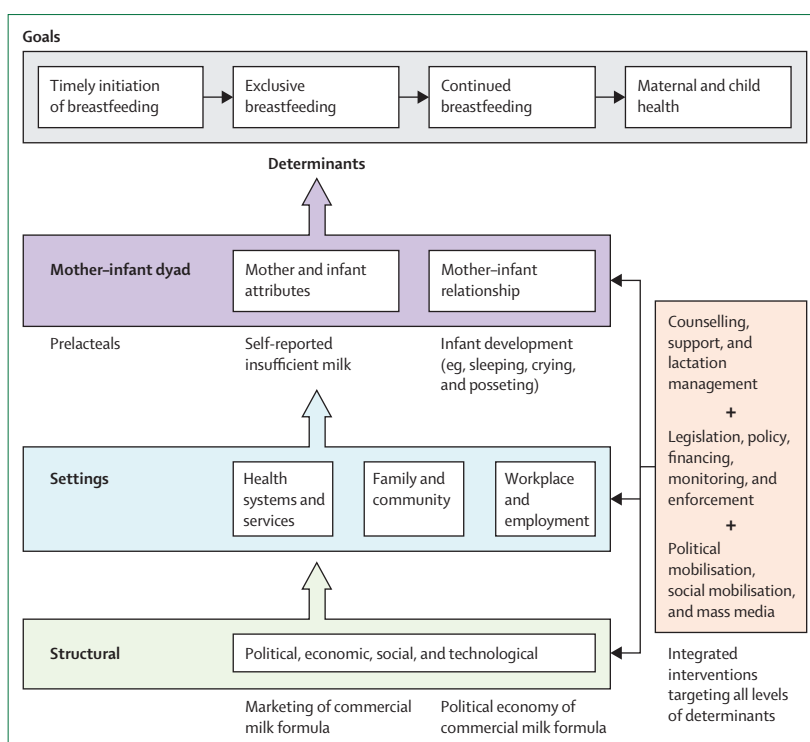


Figure 1: The 2023 *Lancet* breastfeeding Series framework

the relatively low abundance of antibiotic resistance genes, particularly among infants breastfed for at least 6 months.⁴⁵ Additional studies show that breastmilk extracellular vesicles contain at least 633 proteins that were previously not known to exist. These novel proteins appear to be involved in regulating cell growth and inflammation, and in signalling pathways that promote oral epithelial integrity.^{46,47} These extracellular vesicles also contain microRNA, which regulates gene expression that controls growth, inflammation, and the activation of T-regulatory cells, which in turn can protect against autoimmunity and necrotising enterocolitis.^{48,49}

The breastmilk microbiome and its vast array of human milk oligosaccharides have gained recognition for their interdependence and their effect on infant health; however, new findings regarding the free amino acid content of breastmilk show the multifunctionality of this previously overlooked component of the biological system. Glutamate and glutamine are the most abundant free amino acids in breastmilk, and together account for more than 70% of the free amino acids in breastmilk at any point during lactation.³⁷ Research findings from multiple geographical locations indicate that the concentrations of several free amino acids (glutamine, glutamate, glycine, serine, and alanine) increase over the first 3 months of lactation, and free glutamine concentrations probably vary by infant sex.^{37,50,51}

Free glutamate promotes the growth of intestinal epithelial cells, whereas both free glutamate and free

glutamine have immunomodulatory actions and might modify the gut microbiota.^{37,51} Furthermore, free glutamate concentrations are directly related to the rate of infant weight gain.^{52–55} Given the dynamic variation in proportions of these free amino acids even within one mother–baby dyad, the addition of multiple free amino acids to CMFs cannot replicate the free amino acid profile of breastmilk, nor its effect on infants.

Likewise, only breastfeeding provides newborn babies, infants, and young children with protective antibodies acquired by maternal vaccines and the mother's own exposure to antigens and allergens. For instance, during the SARS-CoV-2 pandemic, numerous studies reported the presence of neutralising antibodies in breastmilk following vaccination or maternal infection.^{56–58} Breastfeeding offers infants and young children their earliest form of immune protection against infectious disease.⁵⁹

Although pioneering progress has been made over the past decade in exploring the biopsychosocial system of breastfeeding, we are only beginning to understand the complex biology of this unique functional food, and the social and psychological implications of breastfeeding interaction.^{2,3} To better understand the components of breastmilk, we need to clarify the roles and interactive relationships between several other components, including hormones (leptin and ghrelin), white blood cells, antimicrobial peptides, cytokines, and chemokines. The complex, interactive, and personalised nature of the biological system of breastmilk, and the unique and beneficial features of the breastfeeding relationship, are beyond replication.

Prelacteal feeds and early breastfeeding in low-income and middle-income countries

Global trends in exclusive breastfeeding among children younger than 6 months and up to 2 years of age in low-income and middle-income countries (LMICs) were published in 2021.⁶⁰ High-income countries were not included because there is almost no nationally representative data on prelacteal feeds and early breastfeeding outcomes in these settings. However, less attention has been given to timely breastfeeding initiation (within an hour of birth) and prelacteal feeds (ie, foods other than breastmilk offered during the first 3 days after delivery^{61,62}) given to infants before the onset of lactation in LMICs. These practices influence breastfeeding success and neonatal mortality rates through complex and diverse pathways.^{63–65}

Prelacteal feeds encompass a range of substances given to newborn babies consisting of water, milk, and milk-based substances, including CMF products. In LMICs, rice or maize water, sugar water, herbal mixtures, honey, ghee, and morsels of adult staple foods are also sometimes given.⁶⁶ Some of these substances are intended to provide nourishment to a newborn baby, especially if colostrum is discarded.⁶⁷ Others, such as

honey and dates, are given as part of cultural practices and as laxatives to clear meconium.⁶⁸ Even when immediate and exclusive breastfeeding is achieved, prelacteal feeds affect the neonate's establishment of normal microbiota in the gastrointestinal tract.^{69,70} Several studies report that the administration of prelacteal feeds delays breastfeeding, adversely affects lactation, and is associated with SRIM and premature supplementation or cessation of breastfeeding;^{71,72} a relationship investigated in this Series paper.

We used data from demographic and health surveys and multiple indicator cluster surveys (obtained from the International Center for Equity in Health database) to describe the prevalence and trends in early breastfeeding initiation and prelacteal feeding between 2000 and 2019 (figure 2). A total of 103 LMICs had nationally representative data on timely initiation of breastfeeding since 2010 (appendix pp 8–11). Fewer than half (47·2%) of all children in these countries were breastfed within the first hour of life. The lowest prevalence was reported in the Middle East and north Africa, and in the south Asia regions.

For 83 countries, time trends could also be described (appendix pp 12–24). The pooled prevalence of timely initiation increased from 29·7% (95% CI 21·7–37·7) in 2000 to 50·7% (95% CI 43·5–57·8) in 2019, or 1·1 percentage points per year, on average (appendix pp 25–37). Over the same period, exclusive breastfeeding at ages 0–5 months increased by 0·7 percentage points per year (0·51–0·88; $p < 0·0001$) to reach 48·6% (95% CI 41·9–55·2) in 2019. Improvements were seen in all regions of the world except for the Middle East and north Africa, although the prevalence of exclusive breastfeeding is still far from the World Health Assembly goal of reaching at least 70% by 2030.⁶⁰

For all LMICs combined since 2010, 34·3% of children received prelacteal feeds including 12·3% who received a milk-based prelacteal feed only, 17·7% a water-based prelacteal feed, and 4·3% who received both. Milk-based prelacteal feeds were more common in higher-middle-income countries, whereas water-based prelacteal feeds were more common in low-income countries. We found a highly significant inverse correlation between early initiation of breastfeeding and use of prelacteal feeds in an ecological analysis of these data.

Unfortunately, national data on prelacteal feeding is not available for high-income countries, although numerous hospital studies report that CMF is given to breastfed newborn babies before discharge.^{73,74} For example, a study in the USA found that 62% of maternity facilities nationwide supplemented more than 20% of breastfed babies with formula during their hospital stay.⁷⁵ Likewise, almost a third of newborn babies in Australia receive in-hospital supplementation.⁷⁶

In summary, about one in three neonates in LMICs receive prelacteal feed substances during the first 3 days after birth, and only one in two neonates are breastfed within the first hour of life. The use of prelacteal

feeds is strongly associated with delayed initiation of breastfeeding and can lead to the premature cessation of breastfeeding.⁶²

Infant behaviour, SRIM, and the early introduction of CMF

Humans are born in an immature state requiring intensive caregiving and remain immature for an extended period compared with other primate species.⁷⁷ Metabolic and obstetric constraints, placental effects, and the adaptive importance of an extended period of social interaction and learning are the main explanations for these unique aspects of human development.⁷⁷ Neonates rely on closeness to caregivers for survival and physiological regulation.⁷⁷ Skin-to-skin contact and breastfeeding support maturing mechanisms, including temperature control, metabolism, and diurnal adaptation.^{16,38,39} Because of their physiological immaturity, neonates are ill-equipped to deal with many sensory and other aspects of the postnatal environment (eg, feeding and sleeping) and express their discomfort in highly adaptive infant crying, which signals the need for help and support from caring adults.

Unsettled infant behaviours are the most frequent reasons for health consultations in the first months of life and are usually interpreted by mothers, their social networks, and frequently their health providers as signs of infant digestive problems, allergies, adverse reactions to breastmilk or a particular brand of CMF, or persistent hunger resulting from insufficient milk.^{78–80} Our systematic review of 22 studies across countries with different income levels concluded that unsettled infant behaviours, especially persistent crying, can lead parents to believe that CMF supplementation or specialised CMF formulas are needed.⁸¹

Crying, fussiness, possetting, and short night-time sleep duration are common in early infancy. They are distressing for parents and are consistently reported to undermine parental self-efficacy.⁸² For example, up to 50% of healthy infants from birth to 3 months of age have at least one episode of regurgitation per day.⁸³ A review of 28 diary studies⁸⁴ found the mean time spent fussing or crying per day in the first 6 weeks of life was around 2 h a day, varying from 1 h to 3 h. Mean duration dropped rapidly after 6 weeks of age to about 1 h by 10–12 weeks of age. Interrupted night-time sleep, possetting, and crying often

co-occur,^{85,86} partly because crying frequently accompanies both infant waking and regurgitation. Even conservative estimates indicate that fewer than 5% of infants identified

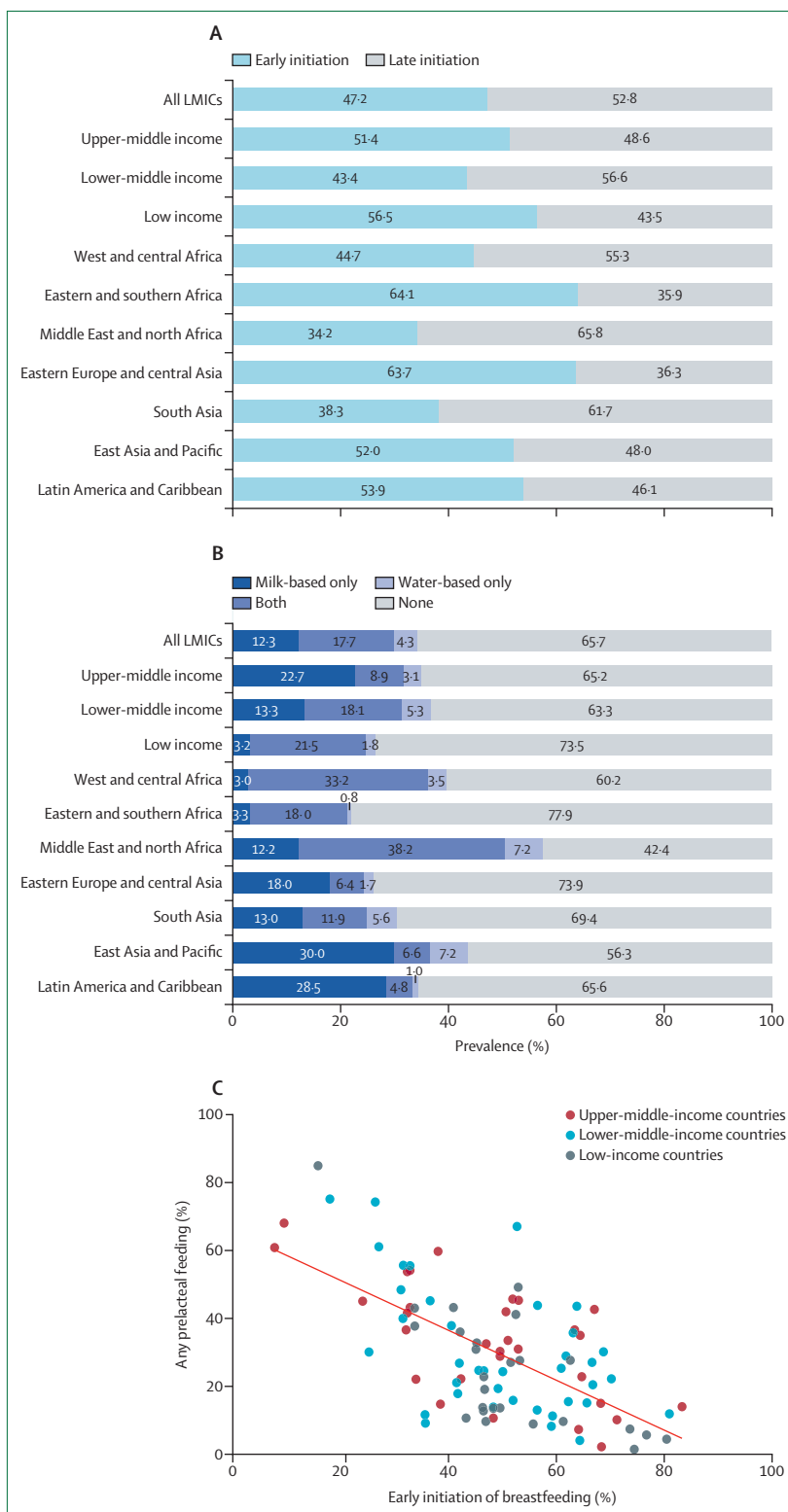


Figure 2: Prelacteal feeding and early initiation of breastfeeding in LMICs

Weighted by the number of children younger than 2 years in each country. (A) Early initiation of breastfeeding among children younger than 2 years by region.

Early initiation of breastfeeding is defined as the proportion of children who were put to the breast within the first hour after birth. (B) Use of pre-lacteal feeds in 94 LMICs by income group and world region (appendix pp 38–41). Estimates were weighted by the population size of children in each country, obtained from the World Bank population estimates. (C) Correlation between pre-lacteal feeding and early initiation of breastfeeding, by country income groups.

Pearson's $r = -0.63$ ($p < 0.0001$). LMICs = low-income and middle-income countries.

by parents as crying excessively are found to have any underlying disease or illness requiring further investigation or treatment.^{80,87} Findings are similar for sleep patterns and possetting. Reports of objective measures of these infant developmental adaptations and parental anxiety are seldom found.^{88,89}

There are many reasons why infants cry, including hunger, changing temperatures, or other discomfort. Several parental responses successfully reduce crying: attending to immediate causes, such as a wet diaper; soothing and comforting techniques, such as carrying, rocking, and massaging;^{90,91} and feeding, especially breastfeeding, which involves close body contact,⁹² and suckling reduces distress and is incompatible with crying.⁹³ However, in the absence of skilled and knowledgeable support and reassurance, many parents change their feeding from breastfeeding to CMFs; from one CMF to another; or to specialised CMFs that, in violation of the Code,¹⁷ claim without evidence to reduce allergies, help with colic, and prolong night-time sleep (in the second paper in this Series²⁹).^{94,95}

Although understudied, behavioural cues of fussiness are commonly interpreted by parents, family members, and health-care staff as an indication that breastmilk quality or quantity is inadequate to satisfy their infant.^{75,96} CMF marketing messages exploit mothers' insecurities about their milk and their ability to satisfy and calm their baby^{97–99} by framing typical baby behaviours as pathological and offering CMFs as solutions (in the second paper in this Series²⁹). Hence, it is not surprising that SRIM is the reason given by more than half of mothers globally for introducing CMFs before 6 months post partum, and by a third of mothers for stopping breastfeeding.⁶²

SRIM has been conceptualised as “a state in which a mother has or perceives that she has an inadequate supply of breastmilk to either satisfy her infant's hunger and [or] to support her infant's adequate weight gain.”¹⁰⁰ Globally, 44·8% of mothers report introducing CMF because of SRIM.⁷² The extent to which SRIM is related to perceived or actual inadequate milk supply, milk nutritional quality, or both, has not been fully elucidated.^{72,80,101} Research indicates that a mother's self-assessment of milk supply is frequently based on perceptions of infant satiety and satisfaction, signalled by infant behaviours, especially crying and fussiness.^{80,101,102} Inadequate lactation counselling and stress-management skills by health workers in the days after birth, together with misunderstanding among caregivers, family members, or health providers of the multifactorial causes of infant behaviours (eg, crying) and the marketing of CMFs as solutions to unsettled infants, can influence parents to introduce CMFs. Introducing CMFs can reduce suckling and can result in actual insufficient milk production.^{65,103,104}

Three systematic reviews found that the reasons for SRIM vary according to infant age, maternal characteristics, maternal mental health status,¹⁹ and stage of lactation¹⁰⁵ (ie, colostrum, onset of lactation,

establishment, and maintenance of lactation). In a systematic review of 120 studies,⁷² key risk factors for SRIM were multilevel and multifactorial: (1) maternal socioeconomic and psychosocial characteristics (eg, household income, maternal age, marital status, parity, education and employment status, self-efficacy or confidence in their ability to breastfeed, BMI, and weight gain during pregnancy); (2) delivery practices (eg, caesarean section delivery, prolonged stage II labour, use of pain medication or anaesthesia, and maternity hospitals that do not have good breastfeeding practices, such as putting the infant to the breast within the first hour postpartum or skin-to-skin care), (3) breastfeeding challenges (eg, absence of previous breastfeeding experience, weak breastfeeding intention during pregnancy, having no access to breastfeeding support [especially in the days after birth], low frequency of nursing, maternal beliefs, and negative experiences with breastfeeding), and (4) baby behaviours (eg, fussiness and infant feeding difficulties, which can cause nipple pain and breast engorgement due to poor latching).^{62,81}

Since both prelacteal feeds and early introduction of CMFs are negatively associated with exclusive breastfeeding and breastfeeding duration,^{61,62,71} mothers and health-care workers require better education on how to best address concerns about infants' developmental behaviours while maintaining successful breastfeeding. Infant developmental patterns and parental concerns about them need to be addressed through improved scientific study and public health practice to enhance breastfeeding guidance, starting in pregnancy and reinforced post partum.^{65,106,107} Understanding how perceptions of infant behaviour influence caregivers' infant feeding decisions⁹² and how such understanding can be used to improve breastfeeding support is important.

Globally, SRIM continues to be one of the most common reasons for introducing CMF and stopping breastfeeding.⁷² Parents and health professionals frequently misinterpret typical, unsettled baby behaviours as signs of milk insufficiency or inadequacy. In our market-driven world, and in violation of the Code,¹⁷ the CMF industry exploits parents with concerns about these behaviours with product claims and advertising messages. This marketing leads to early CMF introduction, which in turn reduces infant suckling and could also result in complete breastfeeding cessation.^{13,81,99} There are widespread, unmet needs for exclusive and continued breastfeeding support in the face of these marketing dynamics and feeding challenges (in the second paper in this Series).²⁹ With appropriate counselling support, in most cases effective breastfeeding and milk production can be increased and maintained.

Effective breastfeeding interventions to address health-care, social, and behavioural barriers

Building on evidence that breastfeeding rates can be rapidly improved by scaling up known interventions,

policies, and programmes,⁴ we assessed the reviews published between 2016 and 2021 to provide more depth and strengthen the evidence base for effective breastfeeding interventions,¹⁰⁸ many of which are needed to address the breastfeeding challenges described previously. We assessed the quality of reviews and their distribution across settings and elements of the socioecological model.

Consistent with *The Lancet's* 2016 Series' findings, research continues to focus on settings of high and upper-middle income (47 of 115 reviews, 41%), or a combination of settings with different income levels (48 of 115, 42%) that still tilts towards high-income countries even though the majority of births annually are in LMICs. Additionally, research remains primarily centred on health systems (72 of 115 reviews, 63%), followed by community and home settings (45 of 115, 39%), and the workplace (10 of 115, 9%). Few reviews (7 of 115, 8%) addressed structural interventions, a substantial gap discussed in the second and third papers in this Series.^{29,30}

In the workplace, evidence reinforces the importance of fully paid maternity leave in facilitating breastfeeding prevalence and duration, although disparities in access and utilisation persist^{109,110} and birth parents in the informal sector have little, if any, protection.²⁶ Furthermore, to achieve equitable working conditions for breastfeeding mothers, organisational and social changes need to occur.¹⁵ Workplaces could facilitate breastfeeding, especially when part of a broader set of parental support policies and practices. Written policies that describe the role of each actor (ie, managers and co-workers) in supporting breastfeeding in the workplace are particularly important.^{111,112} Given that many people in LMICs work in the informal economy or are not entitled to maternity benefits when they become unemployed, even if formerly employed in the formal sector (a situation that increased during the COVID-19 pandemic¹¹³), providing them with maternity benefits through cash transfers and other benefits is key. Research shows that this approach is feasible for middle-income countries such as Brazil, Ghana, Indonesia, Mexico, and the Philippines.^{114,115}

Within health systems, reviews have strengthened the evidence base for implementing early skin-to-skin care,^{16,116} kangaroo mother care (ie, skin-to-skin with the mother or caregiver),^{117,118} rooming in (ie, keeping the infant in the same room as the mother),¹¹⁹ and cup feeding^{120,121} at scale because these interventions consistently improved breastfeeding outcomes for both preterm and full-term infants. Implementation of the BFHI is also associated with better breastfeeding outcomes within the hospital and the community, which is not surprising given that it includes the interventions previously mentioned, allowing them to synergise with each other.^{15,122–125}

These evaluations, together with country case studies, show the importance of multilevel and multicomponent approaches to create the enabling environment needed to

effectively protect, promote, and support breastfeeding moving forward (discussed in the third paper in this Series³⁰).^{28,126} Much of the innovation in interventions in the past two decades has emerged via multicomponent programmes addressing the different domains of the socioecological model (figure 1). Robust evaluations show a greater effect on breastfeeding outcomes at scale than interventions that are not well coordinated across sectors and different levels of the socioecological model.^{127–130} For instance, BFHI can provide an important springboard for multilevel and multicomponent interventions that involve the engagement of community and individual families.^{129–132} Community-based interventions could engage health-care providers, community health workers, and family members,^{125,133} particularly fathers^{134–136} and grandmothers,^{137,138} with education and home visits that span the prenatal and postnatal periods.^{124,139,140} Evidence indicates that home visits can be effectively provided by both trained health workers and community health workers.^{141,142} Community health workers amplify networks of education and support across health-care, community, and family settings,¹³³ and might be particularly helpful in supporting historically marginalised communities¹⁴³ and in complex situations like humanitarian emergencies.¹²⁷ Additionally, multicomponent interventions were particularly effective in achieving the greatest effect on breastfeeding outcomes, suggesting that discrete interventions complement each other.^{128–130}

The complexity and challenges involved in designing, delivering, and evaluating multicomponent breastfeeding support programmes that operate across the different levels of the socioecological model is important to acknowledge.⁴ Although much more implementation science research is needed, the evidence makes clear the importance for breastfeeding interventions to be multisectoral and rooted in sound health and social policies. For instance, efforts to improve early initiation of breastfeeding in Viet Nam have been designed in the context of high rates of births by caesarean section, an obstetric practice that is common in China and Latin America and becoming more common in sub-Saharan Africa.¹⁴⁴ Despite achieving positive effects, efforts to improve exclusive breastfeeding in Viet Nam are also adversely affected by the mother's employment, especially when self-employed, which leads to feeding practices that combine breastfeeding with CMFs. This example further emphasises the importance of incorporating social policy change into efforts aiming to improve breastfeeding outcomes.¹⁴⁵

Improvements to exclusive breastfeeding over the past decade

Several countries have translated knowledge into action to improve exclusive breastfeeding outcomes.¹⁴⁶ This section synthesises the findings and conclusions from case studies in Burkina Faso, the Philippines, the USA, and Mexico, commissioned for this paper by WHO. The methods and findings have been published elsewhere.¹⁴⁶ These countries

were selected for geographical diversity (sub-Saharan Africa, Asia, North America, and Latin America), and for meeting the a priori selection criteria:¹⁴⁶ exclusive breastfeeding rates increased in the past 10 years, breastfeeding policies and programmes were documented during the timeframe when breastfeeding outcomes improved (appendix pp 42–46), and a wide range of key informants were available for interview. Following the breastfeeding gear model¹²⁶ and the Reach, Effectiveness, Adoption, Implementation, and Maintenance (RE-AIM) implementation framework¹⁴⁷ as a guide to analyses, we show the path that each country followed to improve exclusive breastfeeding practice.

Burkina Faso

Burkina Faso invested in training and programme delivery with a multilevel strategic plan (2012–25) to improve optimal infant and young child feeding practices, including at the community level, through the training of traditional leaders and the creation of mother-to-mother support groups. It has also promoted and mounted advocacy through government, UNICEF, and Alive & Thrive, including initiatives such as the Stronger with Breastmilk Only campaign to raise awareness of the importance of exclusive breastfeeding. This campaign promotes breastfeeding only, responding to the cues of the infant, and stopping the practice of giving water, other liquids, and foods in the first 6 months of life throughout west and central Africa.

The Philippines

Breastfeeding protection, promotion, and support is included in many national multicomponent policies and development strategies in the Philippines, reflecting political commitment. Additionally, there is commitment to including breastfeeding promotion, protection, and support as a part of national, cost-effective, time-bound, multicomponent packages such as early essential newborn care, an example of one of the specific investments that links the health provider with support for interpreting baby behaviour that affects early breastfeeding initiation. In addition, the Philippines has strengthened national legislation by approving and enacting the 105 day extended maternity leave law, which extends paid maternity leave from 60 days to 105 days, and the implementation of an official database of reported violations of the Code.¹⁷ These efforts have been strongly influenced by breastfeeding coalitions that have actively resisted the CMF industry's political activities (in the third paper of this Series).³⁰

The USA

Despite lacking a federally mandated paid leave, the USA has strong programme delivery coupled with regularly collected breastfeeding data reported annually by states. Local data serve as a basis for feedback to hospitals so they can implement evidence-based strategies to improve breastfeeding support. The USA continues to accredit an increasing number of baby-friendly hospitals each year.

The Special Supplemental Nutrition Program for Women, Infants, and Children, which covers half of births in the USA annually, is increasingly investing in breastfeeding counselling as it continues to change its benefits structure to support more mothers to choose breastfeeding rather than mixed feeding or CMFs.¹⁴⁸ In addition, the 2010 Affordable Care Act expanded the number of people with health insurance and the US Department of Health and Human Services required health insurers to cover lactation support services, which has also improved coverage of breastfeeding support.

Mexico

Mexico implemented a national breastfeeding strategy (2014–18) to coordinate supportive actions. The becoming breastfeeding friendly policy toolbox^{149,150} has been applied three times since 2016 to strengthen policies and programmes to improve breastfeeding outcomes. Using this policy, the Mexican National Academy of Medicine issued its first position statement¹⁵¹ on the need to improve breastfeeding practices in Mexico. Scores were generated from the policy across eight domains: advocacy, political will, legislation, financial resources, workforce development and programme implementation, behaviour change communication campaigns, monitoring and evaluation, and coordination. Specific policy recommendations were made from the findings, including improved maternity benefits, workforce development, coverage and quality of BFHI, and decentralised coordination. Any breastfeeding, exclusive breastfeeding, and breastfeeding duration have improved since the launch of the first policy assessment.¹⁵² Breastfeeding practices are monitored through nationally representative surveys, including the Health and Nutrition National Survey, the National Survey of Demographic Dynamics, and UNICEF's Multiple Indicator Cluster Surveys.

These examples show the importance of understanding breastfeeding behaviours and barriers in their local context and responding with multicomponent policies and programmes that involve both commitment and coordination among different sectors (government, international organisations, civil society, academia, and parents). The importance of robust data for monitoring, accountability, and programme adjustments is also emphasised. Political commitment in all four countries was key for improving exclusive breastfeeding, although in Mexico and Burkina Faso the budget allocation was clearly insufficient. In Mexico, the change of government affected the prioritisation of public health issues, including breastfeeding. Laws to protect breastfeeding were insufficient in all countries, but the Philippines had the strongest breastfeeding protection legislation related to the Code¹⁷ and maternity benefits. The advocacy of international and civil society organisations, and concrete actions to enforce the Code, were evident in Burkina Faso, the Philippines, and Mexico.

Nevertheless, aggressive marketing by the CMF industry remains an enormous challenge for all four countries.

Discussion

In most cases, breastfeeding has a major positive effect on the health and wellbeing of infants and children, mothers, and society. Globally, most mothers can and are choosing to breastfeed, but many who can breastfeed cannot breastfeed for as long as recommended, even when they want to.^{153–155} Mothers and their families require support to be able to maintain breastfeeding while having the freedom and support to continue to participate in other areas of life as they choose, such as education and employment.^{156,157} We know what needs to be done to improve breastfeeding outcomes: follow an approach that should be grounded in public health principles with an equity framework^{10,158–163} and a human rights approach at its core.¹⁶⁴ To ensure all infants and young children receive the best possible nutrition and care there must be a society-wide enabling environment for breastfeeding, which is protected and sustained by political commitment, policies, and resources.^{4,126}

Discoveries in breastfeeding and breastmilk research highlight the large difference in quality between breastmilk and CMFs, leaving no doubt that breastfeeding promotes healthy and sustainable food systems.¹³ Since the 2000s, early breastfeeding initiation almost doubled globally, reaching 50% in 2019. Furthermore, over the past decade, exclusive breastfeeding among infants younger than 6 months increased by 0·7 percentage points per year, reaching 49% in 2019.⁵⁰ Despite these important improvements, there are very few countries on track to meet the World Health Assembly target of 70% of infants being exclusively breastfed by 2030, and there are still large disparities across and within countries.^{12,13,165,166} There are declining breastfeeding trends in low-income countries,⁶⁰ mainly because infant and young child feeding practices are constrained and shaped by powerful structural influences, including social and commercial determinants, at all levels of the socioecological model (in the second and third papers of this Series^{29,30}).¹¹ Clearly, an approach by the whole of society is needed for mothers to be able to meet their breastfeeding goals.

It is of great concern that more than a third of all neonates received prelacteal feeds during the first 3 days after birth because this practice is negatively associated with timely breastfeeding initiation and breastfeeding duration.^{61,71} An analysis by UNICEF and WHO¹⁶⁷ found that timely initiation rates are nearly twice as high among newborn babies who receive only breastmilk compared with newborn babies who receive milk-based supplemental feeds in the first 3 days of life. Health-system and community-based interventions are needed globally to prevent the introduction of prelacteal feeds and counteract the harmful influence of CMF marketing on health systems and communities.

At the dyadic and family levels, unsettled baby behaviours, including crying, possetting, and short nocturnal sleep duration, influence infant feeding decisions.³⁹ Although overwhelmingly an expression of normal infant developmental processes rather than clinical conditions, these behaviours can prompt cessation of exclusive breastfeeding because they are interpreted by many parents as inadequate breastmilk supply or infant pathology requiring special feeding products. The CMF industry exploits and pathologises normal patterns of infant development in ways that exacerbate parental insecurities about feeding.^{97–99,168–170}

The misconception of typical human infant behaviour as pathological, and its exploitation by the CMF industry, are important factors of SRIM, which is a key reason for the introduction of CMF and the premature termination of breastfeeding. Preventing SRIM requires effective lactation management and social support during pregnancy, along with maternity facilities that follow policies and practices conducive to initiating breastfeeding without commercial influence. Supporting breastfeeding self-efficacy and combating CMF marketing influence through evidence-based information and support is paramount to preventing SRIM, the introduction of prelacteal feeds, or early introduction of CMF, which interfere with lactation.⁶¹

For these reasons, universal access to improved breastfeeding-supportive maternity care, evidence-based breastfeeding counselling, and public and health worker education are crucial for preventing common early lactation problems, avoiding attempts to address common behaviours of infant developmental by introducing CMFs, and helping mothers improve their breastmilk production and self-efficacy.^{62,65,101,171,172}

The BFHI, community-based peer counselling, and maternity benefits for mothers working in both the formal and informal sectors are evidence-based approaches to improving breastfeeding outcomes. Protecting families from CMF marketing practices must take a comprehensive approach that addresses misleading advertisements and the CMF industry influence on health-care professionals and their societies, researchers, and the entire health-care environment (in the second paper of this Series).²⁹ In agreement with previous reviews,^{4,126} well coordinated, multicomponent, and multilevel programmes are the most promising approaches for scaling up and sustaining effective breastfeeding programmes, but more political commitment and financial investments are needed from governments.^{4,146} Increased advocacy by international, civil-society, and health-professional organisations must be translated into concrete legislative actions to implement, monitor, and enforce the Code,¹⁷ and to remove the influence of CMF industry on SRIM and misinterpretation of infant development, mothers, health systems, and society.

Maternity protection policies have improved in the past decade due to national laws informed by the

International Labour Organization standards,¹⁷³ or via initiatives to improve breastfeeding environment at the workplace, but more progress is needed. Absent, inadequate, or poorly enforced maternity protection policies undermine breastfeeding among working mothers through restricted access to paid maternity. For instance, in 2021, 649 million women of reproductive age lived in countries that do not meet the International Labour Organization standards for maternity leave (eg, a minimum period of 14 weeks paying the mother at least two-thirds of her previous earnings, covered by compulsory social insurance or public funds) and flexible scheduling to accommodate milk expression or breastfeeding.¹⁷³

In conclusion, much more is known now than previously about the biopsychosocial system of breastfeeding, and that it cannot be matched by CMF.

Panel: Recommendations

The following policy and programmatic actions are needed to support mothers who want to breastfeed:

- Investment in public awareness and education is needed so that policy makers and the global general public recognise the growing scientific evidence that breastfeeding is the evolved, appropriate feeding system for optimising both mother and infant survival, health, and wellbeing. Misconceptions about the equivalence of commercial milk formula (CMF) to breastmilk must be corrected through extensive health education programmes directed towards the public and policy makers.
- Skilled counselling and support should be provided prenatally and post partum to all mothers to prevent and address self-reported insufficient milk and avert the introduction of prelacteal feeds or CMF early on, because they are major risk factors for the premature termination of exclusive breastfeeding and any breastfeeding.
- Health professionals, mothers, families, and communities must be provided with better educational support and skill development, free from commercial influence, to understand unsettled baby behaviours as an expected phase of human development. Health-care providers should offer anticipatory guidance, starting in pregnancy and continuing postnatally, to prepare mothers and other caregivers for how to respond to unsettled baby behaviours and industry marketing that misconstrues these behaviours and violates the WHO Code.¹⁷ This help will facilitate continued, successful breastfeeding.
- Intersectoral policies (eg, health, social development, education, labour, and regulatory sectors) that address multilevel barriers to breastfeeding must be implemented to enable mothers to breastfeed their children optimally for as long as they, or their babies, desire. These policies must be grounded in equity, human rights, and public health principles, and enabled through system-wide political and societal commitment for breastfeeding.

A wealth of evidence shows how to create more enabling environments and deliver programmes to support breastfeeding at scale (panel). When direct breastfeeding is not possible, WHO guidance on infant and young child feeding should be followed to support responsive human-milk feeding and any other replacement feeding as necessary. Long-term studies of national or subnational trends in breastfeeding are essential as we look ahead to the next decade. Special attention needs to be paid to the rapidly evolving and adapting marketing of CMFs, including through toddler and maternal milks, and through products targeted at the substantial proportion of small babies (eg, preterm and babies of low birthweight) born in LMICs (20% of babies born in sub-Saharan Africa and 30% in south Asia).¹⁷⁴ These industry interventions deliberately violate the Code¹⁷ and prevent progress in improving breastfeeding outcomes globally.^{98,169} The second paper in this Series²⁹ addresses how CMF marketing operates. The political and economic forces that enable this commercial influence and undermine breastfeeding in the context of major gender inequities are presented in the third paper of this Series.³⁰

The 2023 Lancet Breastfeeding Series Group

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RP-E developed the first draft of the manuscript. All authors contributed to the design, writing, and revision of the final draft of the manuscript. The authors alone are responsible for the views expressed in this article and they do not necessarily represent the views, decisions, or policies of the institutions with which they are affiliated.

Declaration of interests

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Breastfeeding 2



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

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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.

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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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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 Series² 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 Series⁶ 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

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See Online for appendix

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.

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 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 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

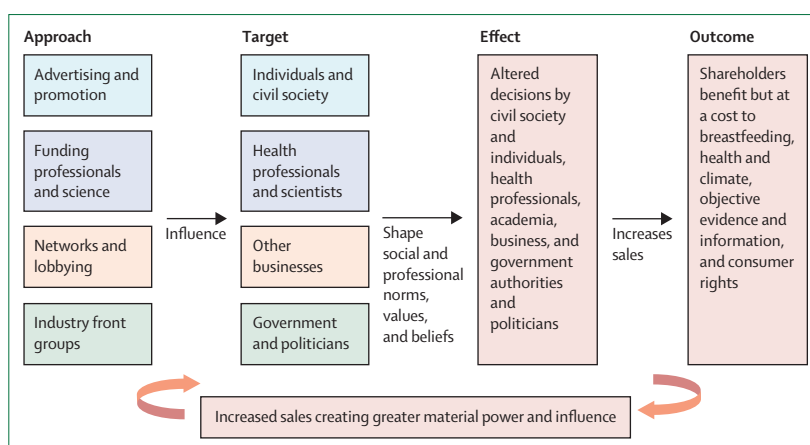


Figure 1: Conceptual framework of commercial milk formula marketing—a reinforcing system of influence

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

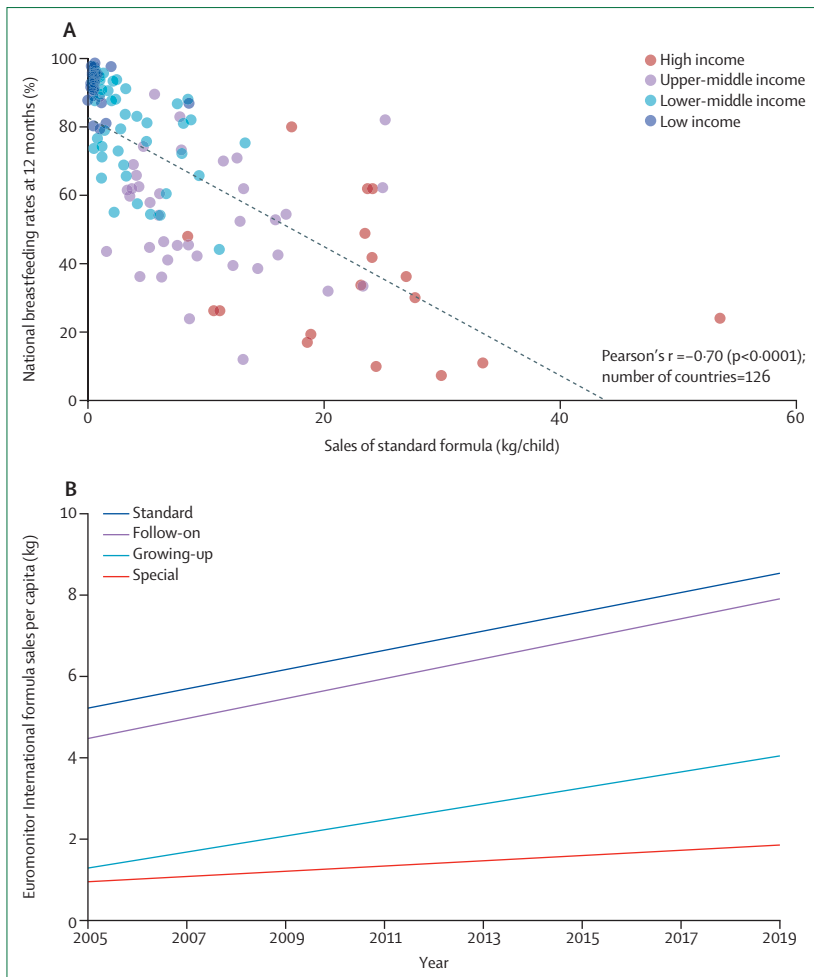


Figure 2: Rate of national breastfeeding at 12 months vs per capita sales of standard CMF by country income category and the sales of CMF per capita, 2005–19

(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.

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).¹⁷¹

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 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”⁴³ (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 advert²⁶ that challenges the importance of breastfeeding and paints breastfeeding advocacy as trivial moralising). Mention of the downsides of CMF—risks of infant mortality, maternal health, cost to family, environmental harm, and plastic waste—are avoided or misdirected.²⁶

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.

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 professionals, or politicians—must be captivated and



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

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 national policies and increasing sales. The activity examined the level of each

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

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.⁵³ Another systematic review examined the quality and potential for bias in 125 CMF comparative trials involving 23757 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 workers⁴⁹ 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 Agriculture Organization and WHO member states at the Codex Alimentarius Commission, with participation of public

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,^{12,44,127} 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.

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

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

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"⁷⁶ 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.

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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All authors contributed to the development, writing, and review of the manuscript.

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Breastfeeding 3

The political economy of infant and young child feeding: confronting corporate power, overcoming structural barriers, and accelerating progress



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Despite increasing evidence about the value and importance of breastfeeding, less than half of the world's infants and young children (aged 0–36 months) are breastfed as recommended. This Series paper examines the social, political, and economic reasons for this problem. First, this paper highlights the power of the commercial milk formula (CMF) industry to commodify the feeding of infants and young children; influence policy at both national and international levels in ways that grow and sustain CMF markets; and externalise the social, environmental, and economic costs of CMF. Second, this paper examines how breastfeeding is undermined by economic policies and systems that ignore the value of care work by women, including breastfeeding, and by the inadequacy of maternity rights protection across the world, especially for poorer women. Third, this paper presents three reasons why health systems often do not provide adequate breastfeeding protection, promotion, and support. These reasons are the gendered and biomedical power systems that deny women-centred and culturally appropriate care; the economic and ideological factors that accept, and even encourage, commercial influence and conflicts of interest; and the fiscal and economic policies that leave governments with insufficient funds to adequately protect, promote, and support breastfeeding. We outline six sets of wide-ranging social, political, and economic reforms required to overcome these deeply embedded commercial and structural barriers to breastfeeding.

Introduction

The displacement of breastfeeding and breastmilk with commercial milk formula (CMF) over the past century and a half represents a major transition in the nutrition and care of infants (aged <12 months) and young children (aged 12–36 months) worldwide.¹ Today, breastfeeding rates remain greatly reduced compared with rates practised before CMF marketing efforts intensified in the mid-20th century. The transition for infants and young children to diets that are higher in CMF has accelerated in recent decades, alongside rapid growth of ultra-processed food markets, especially in highly populated lower-middle income and upper-middle income countries.^{2–5} This dietary change raises serious concerns for human and planetary health, given the long-standing association between exposure to CMF marketing and infant malnutrition, ill health, and mortality (so-called commerciogenic malnutrition); displacement of the health, developmental, and food security benefits of breastfeeding; and the contributions of CMF supply chains to global heating and other forms of environmental degradation.^{3,6,7}

The first and second papers in this Series^{8,9} present several reasons for the global rise of CMF in human diets, including the CMF industry's exploitation of parental anxieties; ubiquitous marketing; and absent or inadequate protection and support for breastfeeding within health-care systems, work settings, and households. In this Series paper, we look further upstream and examine the root causes of low worldwide breastfeeding rates¹⁰ to understand why so many women

and families are prevented from making and implementing informed decisions about feeding and caring for infants and young children; why so many policy makers and health-care professionals are co-opted by CMF marketing and other commercial forces; and why so many countries have not prioritised and implemented policies to protect, promote, and support breastfeeding. It is important to note that 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.

We adopt a political economy approach (figure 1 and panel 1) that examines the role of actors, interests, and systems of power in shaping infant and young child feeding patterns and outcomes across three domains of society. The first domain is commerce, which focuses especially on the power of the CMF industry and the commercial determinants of infant and young child feeding. The second domain is care and work, which focuses on gendered power systems, women's social roles and rights, and how society values breastfeeding and other forms of care work. The third domain is health systems, which focuses on the reasons why breastfeeding protection, promotion, and support is often inadequate. Throughout, we recognise breastfeeding and the capability to breastfeed as vital contributions to the realisation of human rights for women and children, including the right to the highest attainable standard of health and nutrition, and the right to life.^{10,33}

The commercial determinants of infant and young child feeding

The global expansion of the CMF industry has transformed infant and young child feeding into an object of commerce and trade by displacing breastfeeding, as a biopsychosocial system of nutrition and nurture, with commercial supply chains across ever-widening populations of women and infants and young children.^{34–36} Commencing in the 1860s with the invention of CMF, this commodification has played out along two main axes.

The first axis is through globalisation, and the expanding geographical reach of the CMF industry and its marketing practices. Corporations from Europe and the USA first expanded in the markets of their home countries and of their colonies, and then from the mid-20th century onwards, more intensively in low-income and middle-income countries (LMICs).^{35,37,38} Within countries, CMF markets generally spread first among wealthier consumers in urban centres, before expanding to more socioeconomically disadvantaged consumers and areas.³⁹ In the past four decades, structural transformations in the global economy, including an explosion of trade and investment agreements, have constrained the power of governments to regulate domestic markets, while enabling the CMF industry to globalise their supply chains and marketing.^{34,40} The increasing power of financial actors in the global economy, resulting from deregulation and increased private financial flows, has further empowered corporations to globalise, and it has driven more aggressive modes of profit-seeking and wealth accumulation.^{41–43}

Such profit-seeking is reflected in the second axis of expansion, whereby the CMF industry has widened the boundaries of CMF markets and infant and young child populations subject to commodification.^{2,3,44} Product ranges expanded from mainly a single infant formula category (from birth onwards) before the 1980s, to include products for younger infants (aged 0–6 months), follow-up formulas for older infants (6 months or older), toddler and growing-up milks for young children (12 months or older), and products for pregnant and lactating women.^{34,44,45} This diversification allowed corporations to rename products, with the intention of circumventing marketing regulations that they interpreted as applying to infant formula only, and to cross-promote entire product ranges by using near-identical branding and packaging.^{8,9,44,46,47} Expansion further involved widening perceptions about the boundaries of diet-related infant and young child illness, through industry-driven over-diagnosis of medical conditions such as cows-milk protein allergy,^{48–50} and by pathologising typical infant and young child behaviours such as fussiness, gas, and crying to induce demand for so-called specialised formulas that were claimed to deliver treatments.^{44,51}

Key messages

- Less than half the world's infants and young children are breastfed as recommended, despite evidence of the importance of breastfeeding and knowledge about how breastfeeding can be effectively protected, promoted, and supported. Political economy research helps to understand the social, political, and economic reasons for the low rates of breastfeeding worldwide.
- The substantial power of corporate and financial actors with interests in expanding commercial milk formula markets, underpinned by global trade, investment, and financial institutions, is deployed in various ways to block more effective commercial milk formula marketing regulation and breastfeeding protection.
- In addition to causing health harms, new analyses show the extractive nature of the commercial milk formula industry, and how it also contributes to widening socioeconomic inequalities and considerable environmental harms.
- The inadequacy of governments and economic systems in recognising the value of breastfeeding and care work (predominantly done by women), and insufficient investments in maternity protection are also factors underpinning the growth of commercial milk formula markets. Half a billion women worldwide are denied adequate maternity protection, most of whom are in underpaid, precarious, or informal work.
- Several structural drivers contribute to the widespread inadequacy of breastfeeding promotion, protection, and support within health-care systems. These drivers include gendered and biomedical power systems that undermine culturally appropriate and women-centred maternity care; ideological factors that accept and encourage corporate influence within health systems; and economic policies that constrain public budgets.
- Overcoming structural barriers to breastfeeding requires determined and wide-ranging reforms that extend beyond the health sector. These reforms include actions aimed at social and political mobilisation, and curtailing corporate and financial power. Furthermore, reforms to protect and uphold the rights of women and children and to eliminate deeply embedded gender biases within the economy are required.

The CMF industry and the state-industrial complex

Despite the adoption of the International Code of Marketing of Breast-milk Substitutes in 1981 and of subsequent resolutions (hereafter referred to as the Code),⁵² global CMF sales grew 37-fold between 1978 and 2019, from US\$1.5 billion to \$55.6 billion annually.³⁴ Nestlé, Danone, Reckitt, Mead Johnson, Abbott, Friesland Campina, and Feihe dominate today's global market, collectively controlling 60% of CMF sales in 2021 (appendix p 4). As markets have grown, these corporations have accumulated substantial material resources, enabling their

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See Online for appendix

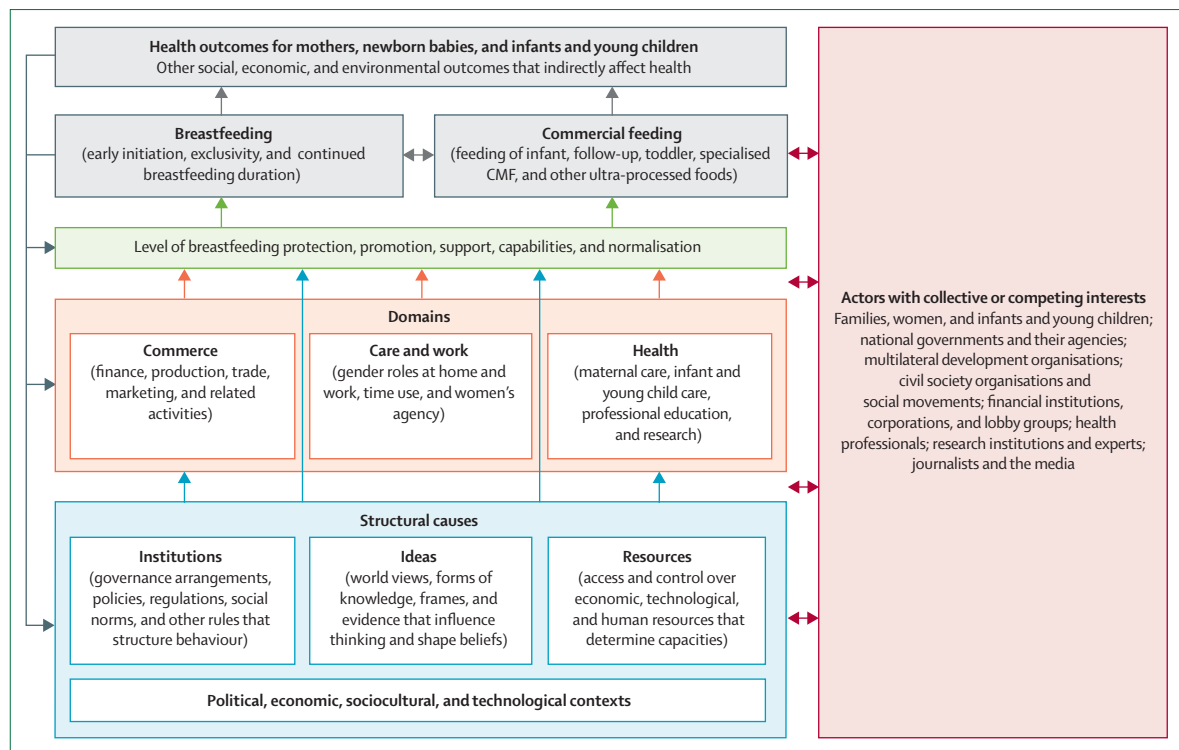


Figure 1: Framework for investigating the political economy of infant and young child feeding

This framework is conceptual only and not intended as a complete representation of infant and young child feeding systems; we acknowledge infant and young child feeding practices other than either breastfeeding and commercial feeding, including for example, feeding one's own or another woman's breastmilk from a cup or bottle, breastfeeding by a person other than the mother, feeding other liquid or home-prepared complementary (solid) foods, and mixed CMF and breastfeeding. We use the term breastfeeding women, acknowledging that lactating women besides the mother (eg, family members) also breastfeed infants and young children, except in instances where we cite studies that specifically use the term mothers. CMF=commercial milk formula.

acquisition of competitors, large investments in marketing, and implementation of globally coordinated political activities to protect their interests.^{34,53} This growing material power manifests in oligopolistic markets, with three or fewer corporations dominating in most countries.³⁴ These oligopolistic markets parallel increased consolidation in the food sector more generally, reflecting lax anti-trust and competition laws, and the growing power of transnational corporations to gain policy and fiscal concessions from national governments in a globalised economy.^{54,55}

The interests of CMF manufacturers intertwine with other corporate actors and sectors. For example, manufacturers employ global advertising agencies to implement their marketing strategies, which are now enabled by digital surveillance technologies.^{53,56} Nestlé alone spent approximately \$9.9 billion on consumer facing advertising in 2016 (for all products), making them the third highest spender among all corporations worldwide.^{9,34} The dairy industry also has a vested interest in expanding CMF markets, evidenced by its aggressive lobbying against CMF-related regulations.³⁴

To help promote market expansion, major dairy and CMF producing countries—especially the USA, Australia, the EU, and New Zealand—have advocated on behalf of these industries in international fora. These

states, and sometimes the dairy and CMF industries themselves, have sought to influence infant and young child feeding policies and food regulatory standards at WHO and the Codex Alimentarius Commission, and used World Trade Organization (WTO) and bilateral processes to challenge, and ultimately weaken, breastfeeding protection laws in other member states (panel 2).

The CMF industry's political strategies

The ability of CMF corporations to expand and sustain their marketing practices worldwide^{8,9} is only possible because of their large investments in corporate political activities aimed at fostering policy, regulatory, and knowledge environments conducive to such marketing.^{34,70–72} These activities closely mirror those of the tobacco, alcohol, and ultra-processed food industries.^{73–75} Together, these activities represent two faces of corporate power: a covert one intended to constrain critical discourse, co-opt opponents, and curtail regulation; and a public-facing one that projects an image of benevolence and corporate social responsibility.^{34,60} The CMF industry has established a global influence network of trade associations and front groups that lobby, often covertly, against strengthening and implementing the Code and

Panel 1: A political economy approach to infant and young child feeding

Political economy research typically involves examining complex, multifactorial, and context-dependent phenomena. Hence, we adopted a multidisciplinary and interpretive approach, involving the synthesis of diverse data sources, collected in two steps. First, extensive branching searches of scholarly databases and organisational websites to source documentary evidence. Second, key informant interviews with 86 participants, including those from multilateral development agencies, national governments, international and national civil society organisations, and research institutions. These data informed the overall paper, plus the development of an international case study, and country case studies, on the corporate political activities of the CMF industry (appendix pp 1–3).

By adopting a political economy approach, we emphasise how political, economic, and social factors combine to structure infant and young child feeding patterns and outcomes at the population level (figure 1).^{11–13} This approach follows UNICEF's conceptual framework, which identifies "economic structures and political and ideological factors that control and distribute resources across society", as the basic causes of child malnutrition and mortality.^{14,15} We focus especially on the distribution of power and resources between different actors and interests in society, and the processes that sustain and transform these distributions over time.¹⁶ We consider how specific knowledge systems, discourses, and beliefs (ie, ideas) influence thinking and action in society;^{17–20} how economic arrangements, policies, regulations, and social norms (ie, institutions) structure behaviour and decision making;^{21–23} and how the distribution of financial power and other resources determine the capacities of different actors to meet their needs and pursue their interests.^{24–26}

Political economy research is typically critical in its orientation, recognising that overly technocratic and compartmentalised problem-solving approaches, or those that ignore the role of actors, interests, and power,²⁷

are inadequate to address the scale and complexity of the challenge of improving worldwide infant and young child feeding patterns and outcomes.^{28,29} We examined the interactions between actors with interests in the promotion and expansion of CMF markets, and those with obligations and interests in realising the rights of women, infants, and young children to the best possible nutrition, food security, and health breastfeeding provides.³⁰ And we questioned why—40 years after the WHA adopted the International Code of Marketing of Breast-milk Substitutes—so few countries have fully implemented its provisions, or those of subsequent WHA resolutions, into national law.

Political economy research also investigates how different actors acquire and deploy power and resources to further their interests and agendas. This research includes highlighting the structural factors that determine distributions of power and resources between governments, corporations, and civil society within a globalised economy; between men and women, and adults and children; and between various actors and models of care within health systems. Different forms of power are available to different actors: the power of states to make and enforce laws in support of the progressive universal realisation of human rights; the material power of financiers and corporations to grow and sustain CMF markets; the moral power of civil society actors to hold governments, corporations, and health professionals to account; the epistemic power of scientists and health professionals to generate evidence and knowledge; and crucially, the agency of women and families and their capabilities to pursue the infant and young child feeding options that they value most.^{31,32}

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. CMF=commercial milk formula. WHA=World Health Assembly.

other breastfeeding protection measures at international (panel 2) and national (panel 3) levels.³⁴ This network is a major impediment to worldwide implementation of the Code. Such lobbying contradicts the corporation's public-facing corporate social responsibility initiatives, and stated commitments to breastfeeding. Although Nestlé, Danone, Reckitt, and Abbott have corporate policies to interact responsibly with public authorities, they outsource much of their lobbying to a diverse range of front groups, many of which they have co-established and coordinate.³⁴

The first such group, the International Council of Infant Food Industries, was established in 1975 under Nestlé's leadership to enable third-party rebuttals against breastfeeding advocates.⁸⁸ Since then, other international peak bodies have been established and disbanded. Core to this influence network today is the International Special

Dietary Foods Industries and its 20 member associations spanning six continents, who lobby specifically in relation to CMF marketing and other baby food regulations.³⁴ Some have authoritative names akin to professional bodies, for example the Infant and Pediatric Nutrition Association of the Philippines.⁷⁰ Other industry groups—including advertising associations, food manufacturing associations, dairy associations, and science communications organisations—lobby against market regulations, promote voluntary self-regulation, and disseminate corporate-funded science.³⁴

CMF manufacturers promote self-regulation through corporate policies on responsible marketing, as a strategy of policy substitution to delay or replace state regulation, alongside corporate social responsibility activities projecting an image of ethical and sustainable conduct (appendix pp 5–6). Although the Code requests that

Panel 2: Political activities of the CMF industry and allied governments at the international level

The CMF industry, and the governments of dairy-producing and CMF producing nations, have created substantial tensions between WHO and other global health actors seeking to protect, promote, and support breastfeeding, and those pursuing the harmonisation of international food standards in the Codex Alimentarius Commission, and trade and investment liberalisation in the WTO.⁵⁷

In particular, WHO has faced repeated challenges from commercial interests. Although the WHA, as WHO's main governing body, has the power to establish binding international treaties, it adopted the International Code of Marketing of Breast-milk Substitutes in 1981 (hereafter referred to as the Code)⁵² as a set of non-binding recommendations to appease opposition from the USA and dairy-producing member states at the time. Industry representatives lobbied WHO staff and member states, attempting to weaken the strength and scope of the Code's provisions.^{58,59}

Since then, the CMF industry has contested WHO technical guidance and WHA resolutions intended to strengthen and update the Code. In 2016, for example, lobbyists opposed WHA Resolution 69.9 that urged member states to adopt technical guidance calling for an end to the inappropriate promotion (including cross-promotion) of foods for infants and young children. This resolution affirmed that the Code covers products for infants and young children aged 0–36 months, including follow-up formula and toddler milk products, which the CMF industry has long argued are outside of scope.⁶⁰ Two CMF industry lobby groups issued a statement to the WHO Executive Board opposing the guidance. A dairy lobby group endorsed their position, and further called on US officials to work aggressively toward improving the WHO's procedures. Despite a strongly worded resolution urging member states to implement the guidance, Nestlé insisted member states were not obligated to do so, because it used the wording "welcomes with appreciation", rather than "adopted" or "approved" the guidance.⁶⁰ An analysis of corporate lobbying in relation to US government positions to WHO found parties connected with the CMF industry or listing CMF-related concerns in their disclosures spent almost US\$7 million on WHO-related lobbying activities in 2016.⁶¹

In 2018, US officials opposed Resolution 71.9, which addressed among other things, worldwide progress on implementing WHA Resolution 69.9, and conflicts of interest in nutrition programming. US officials called for changes to multiple provisions and threatened to enact trade measures and retract military support for Ecuador, the resolution's proponent. This response had a chilling effect, with some other member states declining to support the resolution, although it was eventually adopted.^{62,63} In 2000, a CMF industry lobby group requested WHO delay the adoption of new technical guidance, and hence

the subsequent WHA Resolution, that would extend the recommended duration of exclusive breastfeeding from 4–6 months to approximately 6 months. This lobbying occurred across WHO's six regional committee meetings that year, and the Executive Board meeting and WHA the following year, indicating transnational coordination.⁶⁴

The Codex Alimentarius Commission is the UN's food standard-setting body, jointly administered under the WHO and Food and Agricultural Organization food standards programme, which is responsible for establishing international food standards. This body spans the global health and trade regimes, with a dual mandate to protect public health, and to harmonise international food standards and facilitate trade. Codex Alimentarius standards provide minimum benchmarks for national food policies and standards, including on the safety, composition, packaging, and labelling of CMF and other baby foods. Some WTO agreements recognise the Codex Alimentarius Commission and its standards, meaning countries intending to establish more stringent regulations could be challenged by other member states (where industry has strong interests and influence) in WTO fora.

Subsequently, Codex Alimentarius Commission standard-setting processes have become highly politicised, and saturated with industry representatives.^{57,65} Between 2005 and 2019, the CMF, dairy, and other industry representatives not only comprised 70% of non-state observers (without voting rights) in the Codex Alimentarius Commission Committee on Nutrition and Foods for Special Dietary Uses, but also 28% of the member state delegations (with voting rights), greatly outnumbering those from civil society groups representing the interests of women and infants and young children. Pro-industry positions concerning the Codex Alimentarius Commission Standard for Follow-Up Formula claimed that external references, including the Code and subsequent WHA resolutions, should not be cited; that CMF products for ages 12–36 months are not breastmilk substitutes, contrary to the aforementioned WHO technical guidance; that additives with sweet taste, types of sweeteners, and sugar content should not be restricted; and that the marketing technique of cross-promotion be excluded.^{57,66}

The WTO is the main member-state organisation for negotiating and enforcing rules governing international trade and investment. Although implementation of the Code provisions into national law is compatible with WTO law, and no formal legal disputes concerning this have occurred,⁶⁷ industry lobbyists have invoked legal arguments anchored in international trade and investment agreements to counter governments attempting to strengthen national breastfeeding protection laws.³⁴ Large dairy-exporting and CMF-exporting member states have frequently used WTO processes to challenge proposed or existing regulations of other member states. Between 1995 and

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(Panel 2 continued from previous page)

2019, there were 245 interventions made in the WTO concerning CMF marketing, labelling, or safety testing regulations of another member state.⁵⁷ These interventions did not occur as formal legal disputes, but as interventions during sub-arbitration processes, the majority in the Technical Barriers to Trade Committee, and often challenging national regulations for allegedly being more restrictive than Codex Alimentarius Commission standards.

Interventions also occurred during periodic trade policy reviews of member states' compliance with WTO agreements, and screening of non-member states seeking accession to the WTO.⁵⁷

These interventions are inconsistent with the same member state commitments on breastfeeding and are a major barrier to strengthening national breastfeeding protection laws, including through their strong chilling effect on government regulators.^{68,69} The case of Thailand (panel 3) illustrates how such interventions substantially weakened the country's attempt to strengthen such a law.

CMF=commercial milk formula. WHA=World Health Assembly. WTO=World Trade Organization.

companies comply with its provisions, their self-regulation falls far short of compliance,^{34,89} and violations have continued.^{90,91} Some global health actors have assumed the strategy of trying to persuade companies to voluntarily adopt desired practices; however, this has not generated meaningful change. For example, no global market leading company responded to the Breastmilk Substitutes Call to Action. This Call to Action was issued by WHO, UNICEF, and leading non-governmental organisations (NGOs) in 2020 and called for commitments to full compliance to the Code by 2030.^{89,92} Ethical investment approaches have also not established full compliance. For example, Nestlé qualified to join the FTSE4Good ethical investment index but only after its Breastmilk Substitute Marketing Criteria were watered down to align with Nestlé's own policy. Other companies viewed the FTSE4Good criteria as unrealistic because they would limit their ability to market.^{34,60}

The CMF industry also uses corporate-funded science to portray products to consumers, policy makers, and health professionals as safe, scientific, and medically endorsed, with a vast research infrastructure to support this.^{34,71,72} For example, the Nestlé Nutrition Institute (a not-for-profit established by Nestlé) is the "world's largest private food and nutrition research organisation".⁹³ The Nestlé Nutrition Institute employs approximately 5000 staff across 30 facilities worldwide, generating approximately 200 research articles annually, disseminated through an e-learning platform, which engages 300 000 health professional members worldwide.^{93,94} Such research promotes a biomedical and nutrient-centric, rather than socially determined, interpretation of infant and young child nutrition, often focusing on product fortification (eg, added micronutrients), reformulation (eg, reduced lactose), and functionalisation with novel ingredients (eg, human-milk oligosaccharides).^{34,95,96}

Evaluating CMF industry claims about its social, environmental, and economic value

The CMF industry's public relations messaging often emphasises the jobs, investments, and other socioeconomic benefits it provides to countries and warns against the adverse consequences of state-imposed

regulation (eg, in the Philippines and Thailand; panel 3). However, these claims must be considered against the substantial negative externalities that the industry generates (panel 4). These negative externalities include adverse health outcomes for women and infants and young children; the related economic burden of higher health-care costs, reduced cognition, and workforce productivity; the diversion of household expenditure from basic foods, medicines, and health care; and the environmental harms associated with dairy production, CMF manufacturing, and packaging waste.

Furthermore, new economic analysis shows how the CMF industry contributes to the maldistribution of wealth and income across society in ways that hinder sustainable development.¹¹³ Although CMF sales and profits have grown markedly in the past few decades, the industry's effective tax rate has fallen (figure 2), reflecting an international tax regime characterised by low corporate tax rates and tax concessions, and an international banking and accounting system that provides various avenues for tax avoidance.^{119,120} Although the health, economic, and environmental burden of growing CMF markets is most prominent in LMICs, the wealth and income that these markets generate accrue almost exclusively to shareholders in high-income countries.

The CMF industry thereby actively contributes to the inadequate and shrinking fiscal space available to governments to mitigate the harms of CMF marketing, and to resource policies and services that protect, promote, and support breastfeeding.

Women, care, and work

In this section, we examine how gendered power systems shape breastfeeding patterns by influencing women's access to economic resources of time and money, while fostering dependence on CMF.^{121,122} We describe the gender inequity of invisible, unfairly distributed, and under-resourced care work burdens.¹²³ In doing so, we reject the framing of breastfeeding as a free or costless activity, or as a lifestyle choice, which enables governments and other actors to minimise their own responsibilities for population nutrition and health, while encouraging the attribution of blame to women and families.^{124–126} We

Panel 3: Country case studies on the corporate political activity of the CMF industry

Corporate political activity refers to the strategies and techniques used by corporations and their lobby groups to shape policies, regulations, and knowledge environments in their interests.^{73,76,77} Here we present case studies of the CMF industry's corporate political activities in four countries.

The Philippines has a world-leading breastfeeding protection law (the Milk Code), which it has continuously strengthened in the face of industry opposition. Political commitment for a national infant and young child feeding policy framework resulted from the collective mobilisation of breastfeeding coalitions, civil society organisations, and women's groups.⁷⁰ In 2006, when the government moved to strengthen the Milk Code, a lobby group representing US CMF manufacturers appealed to the Supreme Court to rescind the regulations, resulting in a 398-day delay to adoption. Lobbying targeted the President; members of Congress; officials in the health, trade, and industry sectors; the US Philippine Embassy; and UNICEF's international and regional headquarters. In a letter to the President, the US Chamber of Commerce claimed "the country's reputation as a stable and viable destination for investments is at risk".⁷⁰ In 2007, a new lobby group was established representing European and US CMF manufacturers. Led by a former Congressman, the group operated more covertly. This new lobby group pursued partnerships with government agencies, lobbied against new Milk Code regulations, and supported proposed legislation that would weaken the country's infant and young child feeding policy framework. Messaging emphasised the industry's supposed contribution to jobs and the economy, CMF marketing as empowering women by supporting informed choice, and the country's obligations under the WTO's Agreement on Technical Barriers to Trade and the Agreement on Trade-Related Aspects of Intellectual Property Rights.⁷⁰

Responding to WHA resolutions calling on countries to strengthen implementation of the WHO International Code of Marketing of Breast-milk Substitutes in 1981 (hereafter referred to as the Code),⁵² Thailand began drafting a revised version of its own Milk Code in 2015. The proposed law introduced new provisions restricting educational, promotional, and marketing activities, including the use of trademarked brand names, packaging, and symbols, established criminal penalties for violators, and expanded product coverage from 0–12 months to 0–36 months.^{57,78} Between 2015 and 2018, the Thai Government had repeated interventions in the WTO from the USA, New Zealand, the EU, Australia, and Canada, mainly in the Technical Barriers to Trade Committee.⁵⁷ In 2017, the US Trade Representative reported "seeking to ensure that Thailand's final measure takes into account appropriate scientific and technical information", and that it had engaged the Thai Government throughout the period "bilaterally and at the WTO and continues to monitor developments, particularly any potential regulations relating to restrictions on products for young children".³⁴ Evidence

suggests CMF industry lobbyists met with senior government officials in the National Legislative Assembly and National Economic and Social Development Council, members of the press, and health professional associations. Lobbyists stressed the industry's supposed economic importance, including the jobs and livelihoods of dairy farmers.⁷⁸ In 2017, the Thai National Legislative Assembly passed the revised Milk Code; however, the extended product coverage for ages 12–36 months and criminal penalties had been removed.⁵⁷

In 2012, South Africa passed new national legislation (Regulation 991) to implement the Code, replacing the country's earlier voluntary and unenforceable code of practice.^{79,80} This followed the high-level Tshwane Declaration of Support for Breastfeeding in 2011, which declared South Africa as a country that actively promotes, protects, and supports breastfeeding. However, achieving Regulation 991 took 9 years, with many setbacks resulting from CMF industry lobbying. CMF manufacturers, led by Nestlé, formed a new lobby group, the Infant Feeding Association, which applied pressure for amendments to the regulations. Lobbyists raised concerns with the National Department of Health during the drafting process, which required detailed responses and legal advice, thereby creating a substantial work burden for health officials and time delays. The industry argued that the new regulations exceeded and differed from the Code and Codex Alimentarius Commission requirements, restricted the right of freedom of expression and mothers' rights to information, were unconstitutional, and exceeded the authority of the Minister and Department. During this time, Nestlé recruited a consulting firm to conduct a stakeholder mapping exercise, to identify key government officials, intergovernmental organisations, civil society leaders, and academics to target through its lobbying activities.^{80,81}

The USA is one of the only two UN member state not to have ratified the Convention on the Rights of the Child. The USA is among the few countries without a national breastfeeding protection law, and the only high-income country without legislated paid maternity leave. Despite being among the largest contributors of overseas development assistance for breastfeeding, the US Government has been a remarkable force against worldwide implementation of the Code (panel 2). This dichotomy reflects the powerful influence of US dairy industry and CMF industry lobby groups. Between 2007 and 2018, the largest six US CMF manufacturers together spent US\$184.2 million on lobbying the US Government, of which \$55.1 million (30.0%) was declared as CMF-related, and of which \$43.8 million (79.4%) was spent by Abbott alone.^{34,82} Lobbying has targeted the House of Representatives, the Senate, the US Food and Drug Administration, the State Department, the US Trade Representative, the White House, and the US Department of Agriculture.^{61,82} Dairy, food, and beverage industry groups, and the Infant Nutrition Council of America, also reported

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(Panel 3 continued from previous page)

substantial CMF-related lobbying expenditures. Of Abbott's expenditure, \$20.0 million (45.8%), was dedicated to trade-related concerns,⁸² frequently targeting the State Department and US Trade Representative. The influence of this lobbying expenditure is most likely reflected in actions taken by the US Government on behalf of the industry to oppose marketing regulations in Hong Kong, Thailand, Malaysia, and Indonesia in the WTO, and through direct bilateral engagements with governments seeking to implement national breastfeeding protection laws.^{83,84} Lobbying often targeted the US

Department of Agriculture, most likely because it administers the Special Supplemental Nutrition Program for Women, Infants, and Children, through which the government purchases over half of all CMF sold in the country.⁸⁵⁻⁸⁷ In 2014, Nestlé alone spent an estimated \$160 000 on lobbying related to the Special Supplemental Nutrition Program for Women, Infants, and Children.⁷²

CMF=commercial milk formula. WHA=World Health Assembly. WTO=World Trade Organization.

highlight the need to recognise, reduce, and redistribute the unequal sharing of unpaid care work between men and women, and across society as a whole,^{127,128} and describe how actions to integrate unpaid work into macro-economic policies can improve breastfeeding and health.

Recognising and valuing breastfeeding as care work

Breastfeeding is archetypal of care work.¹²³ Women's unpaid care work in households is unmeasured, unrecognised, and unvalued by global economic institutions.¹²⁹ Not recognising this work in economic statistics generates gender inequity and distorts fiscal priorities, and has been condemned by feminist economists as applied patriarchy.^{130,131}

Care work consists of activities and relations needed to fulfil the physical, psychological, and emotional needs of all humans including infants and young children, older people, people living with disabilities, and people who are sick or ill.¹³² According to the International Labour Organization (ILO), "care work is at the heart of humanity, as all human beings are dependent on care to survive and thrive".¹³² Caring activities can be direct (eg, infant and young child feeding or nursing a person who is sick) or indirect (eg, cleaning, cooking, or collecting water). Survey data from 64 countries show that women perform 76% of all unpaid care work, which is three times more than the unpaid care work performed by men, adding to women's work burdens, time poverty, stress levels, and opportunities for recreation.¹³² The attributable economic value of this work is immense. In China, for example, the estimated value of care work in 2008 was equivalent to 25–32% of gross domestic product (GDP), with women's total work time averaging 7–11 hours more per week than men.^{133,134}

Yet this productivity is excluded from key measures of countries' economic performance, largely because international rules on measuring GDP generally exclude non-monetarised forms of production and exchange, which means that although greater CMF production and sales increase GDP, more breastfeeding does not.^{135,136} These rules shape perceptions about the economic value of women's work,^{137,138} shifting policy priorities and resources away from unpaid care.¹³⁹ Increasing women's

paid workforce participation in pursuit of higher GDP without accounting for their unpaid work burdens, risks exacerbating gender inequity while undermining breastfeeding. The methods used to measure national economic performance need to be reformed so that women's unpaid work burdens and the value of breastfeeding are factored into policy making (panel 5).

Reducing and redistributing women's work burdens to enable breastfeeding

To breastfeed or CMF feed is not a genuine choice if breastfeeding means that women and families must forego employment and secure livelihoods. Breastfeeding is time consuming for women, which takes away from time that could be spent on income-earning activities.¹⁵⁶ Work is one of the top reasons cited for not breastfeeding,¹⁵⁷ highlighting the importance of reducing and redistributing the unfair and heavy unpaid work burdens of women.¹⁵⁸⁻¹⁶¹

Time pressures hinder or prevent optimal breastfeeding, with many women juggling multiple care and income-earning responsibilities.^{162,163} Long-standing evidence from LMICs shows the importance of considering mothers' time in developing and implementing infant and young child health and nutrition policies.^{164,165} This consideration is especially important in the context of labour market deregulation, which has worsened working conditions in many countries and especially in LMICs, where a high proportion of work is in the informal sector, or in sectors where even paid work is precarious, underpaid, and unprotected.^{166,167} A disproportionate number of informal and insecurely employed workers are women.¹⁶⁸ Low wages and excessive work hours increase time pressures on families, and might affect how unpaid work burdens are distributed between men and women,^{169,170} including by reinforcing patriarchal norms and customs that over-delegate domestic care work to women.

One key cause of time pressure is that governments have not enacted or funded maternity protection, and have not enabled family-friendly work environments and child-care environments. Maternity protection is crucial to reducing time stresses on women and families (panel 6).¹⁶³ Evidence shows a dose-dependent relationship between maternity

Panel 4: A critical examination of the CMF industry's claimed social and economic benefits

Lobbyists often claim that the CMF industry contributes investment, jobs, and growth for national economies, whereas their corporate social responsibility strategies portray a positive image of its role in sustainable development. However, we provide a novel analysis showing how the CMF industry creates and perpetuates a double burden of maldistribution,^{97,98} whereby disadvantaged populations and future generations are not only disproportionately negatively affected by the social, economic, and environmental harms associated with CMF, but also by how the industry distributes the wealth and income it generates.⁹⁹

First, from a distributive perspective, negative externalities occur when corporations are not held financially accountable for the harms they create, representing value extracted from those who bear the burden of those externalities (ie, society, the environment, and future generations). Not breastfeeding increases the risk of infant and young child mortality, infections and malocclusion, and potentially obesity and diabetes; and for women, breast cancer and potentially ovarian cancer and type 2 diabetes.¹⁷ Not breastfeeding contributes to estimated economic losses of US\$341.3 billion (0.7% of world gross national income) annually, from increased health-care costs, reduced cognition of children who are not breastfed, and reduced workforce productivity associated with not breastfeeding.¹⁰⁰ By de-normalising breastfeeding and fostering dependency on commercial supply chains, CMF marketing undermines infant and young child food security in the context of major disruptions to supply chains (as in the US CMF supply shortage in 2022), affordability, and capacity to utilise, especially during economic crises and natural disasters.¹⁰¹⁻¹⁰³

Second, the environmental harms associated with CMF are substantial, far exceeding those associated with moderate increases in the caloric and water needs of breastfeeding mothers. These harms include greenhouse gas emissions, water use and pollution, and packaging waste from CMF supply chains, resulting mainly from dairy production of milk powder and the manufacturing and disposal of CMF packaging, bottles, and teats.¹⁰⁴⁻¹⁰⁸ In 2020, the baby food industry sold 2.0 million tonnes of powdered CMF worldwide (for infants and young children aged 0–36 months), equivalent to 2.4 billion 850 g packaged tins. Follow-up formulas and toddler milks are especially problematic because, according to WHO, they are unnecessary for a nutritious infant and young child diet,¹⁰⁹ and yet in 2020, follow-up formulas and toddler milks comprised 69% of the world's total powdered CMF sales by volume, equivalent to 1.4 million tonnes or 1.7 billion 850 g packaged tins.¹⁰⁴ Hence most CMF sales are superfluous to human need, unnecessarily use scarce natural resources, and cause otherwise avoidable environmental harm.¹¹⁰

Third, as with other ultra-processed food markets,^{111,112} the brand power of dominant CMF firms plays a key role in extracting value from consumers. This brand power is reflected by the considerable gap between retail sales prices of branded CMF products and the costs of production;⁴⁴ resulting in high profit margins and the enormous brand values of major CMF

manufacturers. These brand values are evident in pricing strategies, whereby the same CMF product can be up to four times more expensive in some markets than in others, and prices of premium brands with health claims can be more than four times more expensive than economy brands, despite the minimum nutritional composition of all CMF products being highly regulated.⁴⁴ This value extracted from families and households represents money that can no longer be used to purchase essential household items and services, such as food, medicines, and health care. In Indonesia, for example, the cost of purchasing an economy CMF brand equates to 15% of a working parent's average monthly salary,⁴⁴ excluding costs of bottles and teats, and energy used for cleaning and sterilisation.

Fourth, since the early 1990s, the CMF industry has increased profits by reducing its income tax payments to governments relative to its total pre-tax income.¹¹³ This reduction in income tax payments contributes to the reduced fiscal capacities of governments to not only address CMF industry-related harms, but also to deliver essential public services, including paid maternity protection; breastfeeding protection, promotion, and support in health systems; and implementation and enforcement of the International Code of Marketing of Breast-milk Substitutes and subsequent resolutions. Major CMF manufacturers have most likely, to varying degrees, used tax minimisation and avoidance strategies to increase profits, including by reducing their effective tax rate (figure 2). For example, Mead Johnson stated in its 2016 annual report that it had markedly reduced its global effective tax rate, by taking advantage of foreign tax rulings, including tax credits from the repatriation of some foreign earnings.¹¹⁴

Finally, the CMF industry has increasingly distributed a greater share of income and wealth to shareholders located almost exclusively in high-income countries. Although 97% of the industry's traded share value is owned by high-income country shareholders, the harms associated with CMF concentrate in low-income and middle-income countries, representing a form of wealth extraction.^{3,103} A smaller share of income and wealth has gone to long-term investments in capital expenditure for job creation and enhanced productivity.¹¹⁵ These trends reflect the financialisation of the industry, both through increasing ownership across the industry by large financial institutions (ie, common ownership), and by the industry's increasing pursuit of maximising shareholder value. In the past 10 years, common ownership across the CMF industry by the world's largest financial institutions substantially increased. As of mid-2021, approximately US \$176 billion of the industry's tradeable equity was held by the world's ten largest institutional investors, which is a near 250% increase since 2010. Concerns have been raised about how such common ownership drives the corporate pursuit of maximising shareholder value over other the interests of other stakeholders and society at large.¹¹⁶⁻¹¹⁸

CMF=commercial milk formula.

protection measures and breastfeeding prevalence and duration.^{157,183,200} This means that mothers spending more time with their infants and young children results in more breastfeeding.^{157,200} Conversely, reducing the amount of this time shortens the duration of breastfeeding, with the absence of paid maternity leave creating a reliance on, and expanding markets for, CMF.¹⁸³ The ILO's Maternity Protection Convention (MPC) establishes the right of women to a minimum of 14 weeks of maternity leave, paid at two-thirds of previous earnings and covered by compulsory social insurance or public funds, and the right to paid lactation breaks and appropriate nursing facilities upon return to work,²⁰¹ with a further recommendation to extend this to 18 weeks at full previous earnings.²⁰² Regrettably, just half of countries have enacted laws that meet the minimum MPC standard,¹⁹² and the standard itself is currently below WHO's recommended 26-week duration of exclusive breastfeeding.

Resourcing investments in the unpaid economy: fiscal policy and gender responsive budgeting

There are widening calls for transformative investments in the care economy, in response to an escalating global crisis of care.²⁰³ However, despite many calls to invest in breastfeeding,^{1,204} governments rarely allocate necessary budgets.^{156,205} Instead, superficial campaigns with slogans such as "breast is best" substitute for more difficult and costly measures addressing the sociocultural, economic, and commercial determinants of infant and young child feeding.²⁰⁶ Without substantive societal investments to enable breastfeeding, women's choices are open to manipulation by exploitative CMF marketing.

Fiscal policies influence breastfeeding in three ways. First, through social security or insurance, or through tax-transfer systems that provide income security and ameliorate poverty. Although tax and welfare systems seem to treat men and women equally, this is not true because of their different situations in the economy.^{207–210} Welfare regimes are invariably poorly designed for women because they have traditionally been designed to focus on men as paid workers. Instead, women's economic vulnerability lies particularly within family and care responsibilities. Social security financed by progressive taxation can directly address the resulting financial pressures that force some women to forego breastfeeding.^{210,211} Suitable social protections are crucial to address the gender-specific pathways that force women into work circumstances that harm maternal and child health and undermine breastfeeding.²¹² UN Women recently called for universal social protection systems to reduce poverty among women at a time in the lifecycle when families face increased expenses and loss of earnings.¹²¹

Second, fiscal policies affect breastfeeding by financing accessible public services such as child care and health care;^{213,214} or infrastructure such as electricity, water, transport, and communications,^{139,215} which help women



Figure 2: Ratio of wealth transfers to shareholders relative to capital expenditure (blue line), and effective tax rates (red line), of the global CMF industry (excluding east Asian firms), 1990–2020

CMF=commercial milk formula. *Calculated as total value of dividends and share repurchases relative to capital expenditure; data sourced from Compustat via Wharton Data Research Services; east Asian firms were excluded due to limited data, including those headquartered in China, Japan, Viet Nam, and South Korea. †The effective tax rate was calculated as total income tax divided by pre-tax income; domestic and foreign taxes were aggregated.

balance multiple demands on their time. For example, expanding women's economic opportunities might require time-saving investments in water and electricity for households, and access to household technologies such as cooking stoves. Increased maternal labour force participation for this demographic implies large government expenditures on quality child-care services,^{213,214} which provide environments that protect exclusive and continued breastfeeding.^{216–218}

Third, fiscal policies also shape financial incentives, such as lowering the cost of goods or services that support or undermine breastfeeding.²¹⁹ For example, some countries tax lactation aids or breast pumps, or provide free or subsidised CMF.²²⁰ Other countries subsidise CMF marketing, or welfare programmes that provision free CMF, and encourage women to return to work soon after childbirth.^{43,221–223} In the USA, a policy of mandating health insurance coverage of breast pumps and lactation support has arguably cleared the US government of the responsibility to ensure that paid maternity leave is provided for all working women.^{124,203–225}

Such policies manipulate women's choices and undermine their autonomy on breastfeeding and child care. Health-care financing arrangements and budget constraints also incentivise health-care facilities against providing breastfeeding support and towards accepting gifts, donations, or sponsorship from CMF companies.⁴³

Governments have obligations to use maximum available resources for progressively fulfilling rights. Fiscal retrenchment policies leave families, mainly women,^{226–228} responsible for providing the investments required for infants and young children to grow and develop with little, if any, support.^{195,229–233} Governments can expand available resources to progress the rights of women and infants and

Panel 5: Recognising the economic value of breastfeeding as women's care work

There is growing recognition that production in the non-market household sector, including breastfeeding and other forms of unpaid care work, is too important to ignore in economic policy making. In Organisation for Economic Co-operation and Development member countries, the economic value of such production ranges from 20% to 40% of GDP.¹⁴⁰ Economic GDP growth rates could be overstated, because market sector replacement of unpaid child care provided by households is not accounted for in GDP growth accounting.¹⁴¹

Breastfeeding epitomises the effects of public policy ignoring the productivity of women in care work.¹²³ International rules for measuring GDP exclude breastfeeding because it is defined as an unpaid service by the SNA, the UN's internationally agreed standard set of recommendations on how to measure economic activity. However, the SNA provides for breastmilk to be counted as a home-produced good, following 2003 revisions that defined such non-market food production as a core GDP activity.¹³⁶ In 2009, a Commission, led by Nobel prize winning economists Joseph Stiglitz and Amartya Sen, conducted a review of the SNA that cited breastfeeding as an example of how existing rules for measuring GDP biased measurement and distorted policy making. It stated that the value of breastmilk was "a serious omission in the valuation of home-produced goods" and that breastmilk is "clearly within the [SNA] production boundary" and "quantitatively non-trivial" with important implications for public policy and child and maternal health.¹⁴²

Importantly for the SNA reform agenda on measuring human capital, breastfeeding also provides substantial but previously unmeasured contributions to human capital formation, including through the effects of maternal-infant bonding and early nutrition on cognition, and future labour market outcomes.^{100,143-145} Despite renewed promises of SNA reforms, there has been little progress.^{131,146} Likewise, no countries have implemented the practice of measuring breastmilk production in GDP. Arguments, such as disruption to statistical collections, or the priority focus of macroeconomic policy being the market sector,¹⁴⁷ have been made against doing so.¹⁴⁸ The scarcity of political priority given to documenting women's care work is further illustrated by the shortage of timely and accurate data on breastfeeding practices, especially in high-income countries, and of time-use surveys documenting the intense demands of infant

and young child care.^{149,150} Addressing such long-standing gender biases in statistical systems would make the economic gains from breastfeeding more visible, and the implications for women's wellbeing more evident to policy makers.¹⁴⁹

Recognising and strengthening self-determination of women as food producers is also an important lever for achieving sustainable food systems and development.¹²² Breastfeeding women represent a globally distributed food production, nurture, and care system, provisioning breastmilk as a basic food for infants and young children in all countries.¹⁵¹ Using UNICEF data on livebirths and breastfeeding rates, and drawing on available evidence about breastmilk intake and the extra nutritional needs of lactating women, the annual volume of milk produced by women for infants and young children (aged 0–24 months) in low-income and middle-income countries was estimated at 23.3 billion litres in 2010.¹⁵² If 95% of breastfeeding women with infants and young children were enabled to breastfeed, the total amount of breastmilk produced per year would be 40% higher. Estimates for high-income countries such as Australia and the USA show that where optimal breastfeeding is not well supported, more than half the potential production of this uniquely valuable food is lost.¹⁵³ The Mothers Milk Tool estimated the global monetary value of women's milk production for infants and young children (aged 0–36 months) was approximately US\$ 3.6 trillion in 2020.¹⁵⁴

Breastfeeding is also an under-recognised element of food policy and planning. With the exception of Norway,¹⁵⁵ breastmilk production is excluded from international and national food monitoring systems. A study¹⁵⁵ of Norway showed the importance of breastmilk production as a food source, and as a contributor to national food security. Estimated total milk production by Norwegian women with infants and young children (aged 0–24 months) increased from 8.2 to 10.1 million L per year, or 69.0 to 91.0 L per capita, between 1993 and 2019.^{101,155} Recognising breastfeeding as an economically valuable form of global food production could help raise the importance of breastfeeding protection as an issue in international trade decision-making fora including the Codex Alimentarius Commission and World Trade Organization, relative to global commercial milk formula trade promotion.⁴³

GDP=gross domestic product. SNA=System of National Accounts.

young children by considering options such as expansionary monetary policy, gender-sensitive development assistance, or debt and deficit financing.^{234,235} Gender-responsive budgeting is increasingly seen as a useful strategy for assessing how governments' fiscal policies contribute to achieving gender equity.^{236,237} This approach scrutinises the divergent effects on men and women of budgets and the frequent non-recognition of unpaid work.^{149,238,239} An international NGO coalition has proposed a Gender Budget for Breastfeeding centred on

implementing WHO's Global Strategy on infant and young child feeding, and has called for a dialogue between gender budget analysts and breastfeeding advocates.²⁴⁰

The health sector

Health systems and health-care professionals play a major role in shaping infant and young child feeding practices through the provision of maternal and infant and young child care, scientific evidence, public information, and policy advocacy. However, health systems worldwide show

Panel 6: Maternity protection policies for reducing and redistributing care work burdens

Paid maternity leave improves a range of maternal and child health outcomes, including breastfeeding.¹⁷¹ Every additional month of paid maternity leave entitlement reduces infant mortality by an estimated 8 per 1000 livebirths in LMICs,¹⁷² and improves maternal mental and physical health, including by enabling women to breastfeed.¹⁷³⁻¹⁷⁶

A systematic review¹⁷⁷ of studies spanning the Americas, Asia, Africa, Europe, Oceania, and southeast Asia, found that women with 3 months' maternity leave, paid or unpaid, were at least 50% more likely to continue breastfeeding compared with women returning to work before this time, and those with 6 months or more were 30% more likely to maintain 6 months of breastfeeding. An analysis of data from 38 LMICs found a 1-month increase in legislated maternity leave associated with a 7.4% increase in breastfeeding initiation, a 5.9% increase in exclusive breastfeeding, and a 2.2 month increase in duration.¹⁵⁷

Among high-income countries, several studies indicate paid maternity leave increases breastfeeding prevalence, exclusivity, and duration. In Canada, expanding paid maternity leave from 6 months to 12 months increased the proportion of mothers exclusively breastfeeding to 6 months by almost 40%, and duration increased by 1 month from 5 months to 6 months.¹⁷⁸ The introduction of paid parental leave in California, USA, was found to increase exclusive and any breastfeeding at 3, 6, and 9 months,¹⁷⁹ and in Germany and Australia to increase breastfeeding duration but not initiation.^{180,181}

Conversely, in China, from 1988 to 2008, fiscal and market-oriented economic reform policies widened gaps in men and women's work burdens and incomes.¹⁸² These policies also reduced paid maternity leave, with the average length of paid leave decreasing by 23 days among least educated mothers, reducing their likelihood of breastfeeding for at least six months by 9%.¹⁸³ Similarly, welfare reforms in the USA encouraging new mothers' return to work within 12 weeks led to a 16–18% reduction in breastfeeding initiation, and a 4–6-week shorter breastfeeding duration.¹⁸⁴ In 2022, the Norwegian Labour Directorate found that increasing paternity leave alongside shortening the paid maternity leave available to mothers, saw an increased proportion of mothers taking unpaid leave to stay at home longer, and to breastfeed.¹⁸⁵

Workplace policies and programmes such as breastfeeding breaks and flexi-time, convenient creches and facilities for breastfeeding and breastmilk expression and storage, and promoting support from work colleagues, can help mothers maintain breastfeeding if their employment separates them from their child.^{171,186} An analysis of data from 182 countries found breastfeeding was approximately 9% higher in the 71% of countries guaranteeing rights to paid breastfeeding breaks.¹⁸⁷ Even simple measures, such as requiring the availability of a workplace refrigerator to store breastmilk, can support employees to continue breastfeeding.¹⁸⁸ Breastfeeding-friendly workplaces can enable mothers to practise exclusive breastfeeding for longer,¹⁸⁹ and reduce maternal absenteeism.¹⁹⁰

Several global instruments provide minimum standards relevant to working women, children, and breastfeeding including the MPC, the Convention on the Rights of the Child, and the Convention on the Elimination of All Forms of Discrimination Against Women.¹⁹¹ Governments ratifying such instruments accept responsibility for applying maximum available resources to progressively fulfil such rights. However, just 65% of potential mothers live in countries fully aligned with the MPC's minimum standard of 14 weeks' maternity leave, paid at two-thirds of previous earnings, covered by compulsory social insurance or public funds.¹⁹² This coverage by the full MPC minimum standard ranges from 92% in Europe and central Asia, to 35% in the Americas, and none in Arab states. There are 82 countries that do not meet any MPC requirements, leaving 649 million potential mothers without adequate maternity protection.¹⁹²

Worldwide in 2021, the average duration of maternity leave paid at two-thirds previous earnings was 18 weeks, but in 64 countries it was under 14 weeks, which means three in ten potential mothers do not have adequate entitlements to sufficient time off to rest, recover, and care for their infant following birth.¹⁹² Even where legislated, maternity protection is often unavailable or unenforced particularly among the informal workforce, and especially in China, Latin America and sub-Saharan Africa, where almost half of all informal workers are women. Alongside the right to breastfeed at work, and availability of nursing facilities, the International Labour Organization also emphasises adequate frequency and duration of nursing breaks. Worldwide, 14% of potential mothers live in countries with no entitlement to nursing breaks; 52% live in countries where nursing breaks are 1 h or shorter; and 61% live in countries without mandated workplace nursing facilities.¹⁹²

The International Labour Organization estimates that addressing these care policy gaps with comprehensive maternity protection measures that extend adequately paid maternity and parental leave, and provide breastfeeding breaks at minimum standards, would have a global cost in 2030 of US\$269 billion or 0.25% of GDP.¹⁹³ Even in countries with the least generous or no paid maternity leave, or where the informal sector is large or wages relatively high, these measures would cost no more than 0.50% of GDP.¹⁹² Collective financing of breastfeeding breaks at International Labour Organization minimum standards would cost \$31 billion or 0.03% of GDP.⁶⁶ This cost estimate includes comprehensive measures covering the informal sector where detailed studies in diverse country settings, including Brazil, Ghana, the Philippines, Indonesia, and Mexico, show such measures to be both feasible and affordable.^{170,194-199}

GDP=gross domestic product. LMICs=low-income and middle-income countries. MPC=Maternal Protection Convention.

many shortcomings in their responsibilities to protect, promote, and support breastfeeding.²⁸ For example, national surveys from 32 countries show that under half of women giving birth receive breastfeeding counselling²⁴¹ and just 10% of births occur in facilities accredited by the Baby-friendly Hospital Initiative (BFHI), a worldwide effort launched by WHO and UNICEF in 1991.^{242,243} We highlight three inter-connected sets of reasons for why health systems shortcomings are so prevalent.

The first set of reasons concern the dominance of patriarchal and biomedical cultures. Despite women constituting over 70% of the health workforce worldwide,²⁴⁴ biases and prejudices against women are common and produce poor maternity care experiences, including women being subjected to incidences of obstetric violence and mistreatment.^{245,246} Satisfaction with maternity care and breastfeeding outcomes improve when health systems enable woman-centred, culturally appropriate, and midwife-led models of care that actively empower women and enable skilled, knowledgeable, and experienced peers to support women during pregnancy, childbirth, and postnatally.^{247–250} Attitudes, norms, and beliefs that privilege biomedical and curative care, and those that stress individual choice and responsibility, detract attention away from the sociocultural and economic factors undermining breastfeeding, especially among marginalised and disadvantaged groups.^{251,252}

Globally, only 12% of estimated recurrent health-care spending is directed at preventive services, compared to 70% for curative care.²⁵³ This curative bias not only contributes to the under-resourcing of breastfeeding support and counselling, but also to the over-medicalisation and overuse of harmful interventionist practices.²⁵⁴ High rates of caesarean sections and the routine separation of newborn babies from mothers, for example, disrupt normal lactogenesis and undermine breastfeeding initiation. Women need substantive additional time and support to recover following birth by caesarean section, complicating both their physical and mental health, and capabilities to care for and breastfeed their infant.^{255,256} Inadequate attention to quality maternal and infant and young child health care is further seen in the insufficient recognition of infant and young child feeding and breastfeeding support as key elements of good health professional education and training.^{257–260} Even when health professionals agree that breastfeeding is optimal, these professionals often do not have the skills, knowledge, and experience to support women and families. Multi-country assessments report health professionals, and especially physicians, commonly have insufficient pre-service education and in-service training on breastfeeding and early-life nutrition.^{242,243,261,262} This educational deficit affords CMF companies the opportunity to provide health professional education aligned to their marketing strategies.³⁴

The second set of reasons relate to the tolerance and acceptance of the CMF industry's influence in health-care

systems, especially in paediatric nutrition policy, practice, and research. Companies have continued to provide financial and other incentives to health professionals; fund academic research and the development of clinical guidelines; sponsor meetings, conferences, and scholarships for health-care professionals; and directly provide paediatric nutrition education.^{50,80,263–265} Only five countries completely prohibit the donation of equipment or services by manufacturers or distributors of products within the scope of the Code.²⁶⁶ Such practices create clear commercial conflicts of interest, while enhancing the legitimacy of the CMF industry with health professionals, administrators, and policy makers. These activities are enabled by incomplete implementation of the BFHI and its ten steps to successful breastfeeding, which requires health facilities to be fully compliant with the Code. Evaluations show that BFHI is effectively implemented when resourced and fully supported at the health-system level, rather than when costs and responsibilities are imposed upon individual facilities.^{242,267–271}

The CMF industry's influence within health systems also reflects a broader shift in norms and attitudes about the acceptability of corporate actor involvement in public policy and service provision. A neoliberal policy paradigm, which has become increasingly dominant since the 1990s, has seen greater outsourcing of public services to corporate providers, fostered preferences for mixed public-private models of governance,^{272–276} and emphasised market competition to improve the efficiency and quality of public services.²⁷⁷ Deregulation of the financial sector has encouraged more aggressive modes of profit-seeking, generating pressures on policy makers to open up public spaces and services to private investors, including in the health sector.^{278,279} The growing acceptance of commercial actors and market forces in health systems drives over-medicalisation, through the promotion of technological solutions conducive to profit. This overmedicalisation is illustrated by the industry-driven overdiagnosis of cow's-milk protein allergy, and high levels of unnecessary expenditure on specialised CMF.^{48–50,280} In contrast, proven non-commercial interventions for improving neonatal survival and breastfeeding rates, such as kangaroo mother care (which involves infants being carried, usually by the mother, with skin-to-skin contact), have been neglected.²⁸¹

The third set of reasons are the political and economic determinants of under-resourced public services. Many health systems require increased funding to adequately resource effective breastfeeding promotion, protection, and support, especially for vulnerable families and population groups. Moreover, in many places, health promotion and disease prevention services are precarious and vulnerable to disruptions arising from conflict, economic crises and environmental disasters, as evident during the COVID-19 pandemic.^{282,283} There are many reasons why public finance and budgets for health promotion and disease prevention are inadequate.^{284,285} An overall lack of public investment in preventive health care

was highlighted in 2021 by the WHO Council on the Economics of Health for All, established to understand why so many countries have not mitigated the direct and indirect health effects of COVID-19.^{286,287} Health-care expenditure is also still frequently viewed as a cost by Ministries of Finance rather than an investment for social and economic development, thereby forfeiting the social and economic benefits that breastfeeding delivers and the health-care cost savings from improved breastfeeding practices, which numerous studies have shown.^{1,100,288}

Crucially, the WHO Council argued that raising greater amounts of public revenue for public goods and services through prevention of tax avoidance and evasion, and the removal of unnecessary fiscal policy limitations to public budgets could be done without causing macroeconomic instability. According to one report, over \$1 trillion of global public revenue is lost every year from tax competition, avoidance, and evasion.²⁸⁹ The equivalent of 34 million nurse's salaries are estimated to be lost to tax havens each year, and lower-income countries are, on average, losing tax equivalent to approximately 52% of their health budgets.²⁸⁹ The WHO Council also argued for improved governance and regulation of the financial sector so that private finance can be prevented from causing social harm, and instead be harnessed to better serve the common good.

Conclusions and recommendations

Less than half the world's infants and young children are breastfed as recommended, despite decades of effort to protect, promote, and support breastfeeding. The low rate of worldwide breastfeeding is deeply disturbing given improved scientific knowledge of breastfeeding's importance (as outlined in the first paper of this Series),⁸ long-standing guidance on how to increase breastfeeding practices, and stated commitments for its promotion. Although calls for the universal adoption of evidence-based interventions to improve breastfeeding rates should be repeated, this Series paper aims to identify the actions required to remove political and economic barriers to their implementation.

Key among these barriers is the power of the CMF industry to grow CMF markets well beyond human need, enabled by processes of globalisation, financialisation, and the expanding commodification of infant and young child feeding. The industry's globally coordinated marketing and political activities create conflicts of interest and policy gaps, foster maternal vulnerabilities, and create new CMF markets that are harmful to human and planetary health. Interventions by dairy and CMF producing states in the WTO, Codex Alimentarius Commission, and other fora strongly impede worldwide implementation of the Code, and contradict their stated commitments on breastfeeding.

Our findings call into question the CMF industry's claims about playing a positive role in sustainable development. We show how the CMF industry extracts income and wealth, while externalising the health, environmental,

and economic costs. These harms are borne by society at large, but especially by populations in LMICs, whereas the wealth generated by the industry flows almost exclusively to shareholders in high-income countries. When the environmental costs of excessive and unnecessary CMF production are fully considered, the promotion of CMF, and especially of follow-up milks and toddler milks, is clearly incompatible with the need to prevent the crises posed by global heating and ecological decline.

There is a pressing need to reverse unfair work burdens placed on women, to make visible the economic value of breastfeeding and other unpaid work within mainstream economics, and to recognise breastfeeding as a globally distributed form of food production within food surveillance systems. Data collection on breastfeeding is particularly poor in high-income countries, allowing governments to avoid their responsibilities for progressing the rights of women and infants and young children everywhere. Data to accurately account for women's work burdens is essential and should be accompanied by the adoption of an economic paradigm that views expenditure on breastfeeding protection, promotion, and support as an investment with positive social, economic, and environmental returns, and not as a cost. Job insecurity and limited maternity protection for women employed in both the informal and formal sectors also represents a social policy deficit and perversely creates an environment in which CMF is marketed as a means of empowering women.

Structural barriers also prevent health systems from adequately protecting, promoting, and supporting breastfeeding. Overcoming these barriers means tackling the reasons for the inadequate public funding of maternity and breastfeeding support services, the normalisation of corporate influence and conflicts of interest within health systems, and the existence of views and attitudes that privilege commercial technologies and biomedical interventions over women-centred and culturally appropriate care.

Importantly, the analyses presented in this Series paper point to recommendations and actions that extend beyond the issue of breastfeeding and the health sector to include structural reforms that cut across society, and that are political and economic in nature. We propose a set of six high-level recommendations that complement those of the first and second papers of this Series.^{8,9}

Recommendation one: curtail the power and political activities of the CMF industry

We affirm all recommendations aimed at curtailing the CMF industry's marketing activities, including the adoption of a framework convention on the commercial marketing of foods for infants and young children. Such a convention would obligate governments to fully legislate the Code provisions into national law, strengthen accountability systems for infant and young child nutrition, and act as a stronger reference standard in international trade and food standards fora. In addition, we call for

regulations to curtail the CMF industry's power and political activities.^{290,291} These regulations include adopting public registries of corporate lobbying activities; obligations for senior public officials to disclose meetings with lobbyists and receipt of gifts or other inducements; requirements for research institutions, think tanks, professional organisations, and NGOs to disclose funding sources; and public disclosure of expert advisory groups. We call for the adoption of robust anti-trust policies to curtail the oligopolistic power of CMF corporations, and for legally binding instruments to regulate, in international human rights law, the activities of transnational corporations and other commercial actors.²⁹²

Recommendation two: end state practices that do not uphold, or that violate, the rights of women and children

Existing human rights treaties and conventions place duties and obligations upon society, and governments in particular, to achieve the progressive realisation of human rights.²⁹³ These human rights include the right that every infant and young child has to the highest attainable standard of health and best possible nutrition; and the rights of women to appropriate maternity protection, care, and accurate information for informed decision making. We call on governments of dairy and CMF producing nations to end the practice of challenging legitimate measures by other governments to protect breastfeeding in the WTO, Codex Alimentarius Commission, and other multilateral and bilateral fora, and to regulate against the extra-territorial harms generated by corporations registered in their jurisdictions.²⁹⁴ We ask the Committee on the Rights of the Child, the Commission on the Status of Women, and other relevant bodies to monitor and report on member state activities that violate children's and women's rights in the WTO and Codex Alimentarius Commission.

Recommendation three: recognise, resource, and redistribute women's care work burdens in support of breastfeeding

To address the care policy and resourcing deficits, and excessive work burdens for women that currently undermine breastfeeding, we call on governments to adopt gender-sensitive fiscal reforms and gender budgeting principles and practices, and to eliminate current biases and short-sighted perspectives in economic accounting systems. Such action would include adopting new or strengthened national data collections and analytical approaches such as time-use accounting for unpaid work, and incorporating breastfeeding and breastmilk production into national accounting systems. We also call on governments to fully resource comprehensive maternity rights protection, and to adopt and enforce legislation prohibiting discrimination against women during maternity. To support this, member states should call on the ILO to more frequently report country-level progress on adoption of the MPC and to extend the

current standard on paid maternity leave duration to align with the WHO-recommended duration of 6 months of exclusive breastfeeding. We also call for breastfeeding and breastmilk production to be recognised in international and national food surveillance systems, and for greater attention to breastfeeding in sustainable food systems dialogue and action.

Recommendation four: address structural deficiencies and commercial conflicts of interest in health systems

To enable adequately resourced and effective models of maternity and infant and young child care, we call on governments, donor organisations, and health professionals to promote culturally appropriate and women-centred care, and reverse over-medicalised maternity care that undermines breastfeeding. We also call for rigorous protocols to prohibit inappropriate commercial conflicts of interest in health policy making, professional education, and research. We further call for a marked expansion in health professional training on breastfeeding and infant and young child nutrition, including curricula on ensuring compliance with the Code, and preventing commercial conflicts of interest.

Recommendation five: increase public finance and correct the misalignment between private and public interests

We call on governments and institutions with responsibility for financial and economic governance, including the International Monetary Fund and World Bank, to adopt sensible and feasible economic policies that will generate the public revenue required to fund the recommendations made in all three papers of this Series.^{8,9} Increasing public financing is feasible and can be done in ways that are fiscally and economically responsible, which has been noted by many experts.^{295,296} Recommendations for doing so include reversing the prevailing austerity approach to public administration and finance; using fiscal policy to channel larger volumes of investments into maternal, infant, and young child health and nutrition; and preventing public revenue losses from international tax competition, avoidance, and evasion. Public subsidies to the CMF industry and large-scale public procurement of CMF should also be questioned, so that these funds might instead be redirected towards maternity care and breastfeeding support services.

Recommendation six: mobilise and resource advocacy coalitions to generate political commitment for breastfeeding

Implementing the recommendations listed above will require the resourcing and mobilisation of broad-based advocacy coalitions working across a diverse agenda of society-wide political and economic reforms, and across focused interventions aimed at the marketing and political activities of the CMF industry. Specifically, we call for those working separately on breastfeeding, women's health, health systems strengthening, sustainable food

systems, and child nutrition—across civil society, academia, and health systems—to strengthen their links and campaign more effectively together on shared social, political, and economic goals. We also call for greater attention to the social, economic, and environmental harms of CMF production and consumption, and for those working on environmental protection, tax justice, and social inequality to incorporate the global breastfeeding advancement agenda into their work.

The 2023 *Lancet* Breastfeeding Series Group

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All authors contributed to the design, writing, and revision of the final version of the manuscript.

Declaration of interests

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