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COMMENT

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Pumps, patriarchy, and profits: the rise of breast pumping and "human milk feeding" and why preserving "breastfeeding" is important

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Abstract

Breastfeeding is a physiologically dynamic relationship between a mother and her child that is not replicated when an infant is fed expressed breastmilk, resulting in differences in health and developmental outcomes. However, pumping breastmilk is increasingly expected and normalized in many countries. It is also increasingly common in many countries for women to exclusively pump their milk and bottle-feed their infants without any direct breastfeeding. Alongside this, changes in language are being made with "breastfeeding" being replaced by "lactating" or "human milk feeding." The trends in pumping and language marginalize the breastfeeding relationship and encourage treatment of women according to a male standard or patriarchy, to the detriment of women and children. The aim of this debate article is to discuss how lack of proper support for breastfeeding and workplaces assuming mother-infant separation encourage pumping over breastfeeding. This serves the corporate interests of breast pump manufacturers and the real or perceived corporate interests of employers, prioritizing profits ahead of the well-being of women and children. Normalization of pumping reduces expectations for proper breastfeeding support, adequate paid maternity leave, and workplace accommodations that allow for mother-infant proximity. Substituting "breastfeeding" with "lactating" or "human milk feeding" obscures the differences between breastfeeding and providing expressed breastmilk, undermining advocacy for breastfeeding support. A structural and social transformation that acknowledges the normativity of females is needed to uphold the rights and needs of women and children. This transformation values both women's important reproductive work and their contributions to the workforce and society. Changes would include providing proper breastfeeding support at birth and thereafter, providing adequate paid maternity leave, reconfiguring workplace and childcare arrangements to better enable direct breastfeeding, and regulating marketing of breast pumps and commercial milk formula. Language should recognize the primacy of breastfeeding over "human milk feeding." The normalization of pumping and "human milk feeding" is detrimental to women and children. "Breastfeeding" should be supported in practice and in language and in alignment with the human rights of women and children to breastfeed.

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Keywords Breast milk expression, Breast feeding, Women's rights, Reproductive rights, WHO International Code of Marketing of Breast-Milk Substitutes

Introduction

In her 2010 essay, "The Industrialised Breast," the Australian writer Julie Stephens laments the rise of breast pumping, as "breasts have been harnessed for industrialised purposes" [1]. Even mothers not employed outside the home are pumping their milk and feeding it to their infants using bottles, she noted, "Farewell to the tender bond between the breastfeeding mother and baby; enter the motorised breast pump." Illustrating this development, an advertisement of a breast pump company depicted a woman holding her infant with two wearable pumps protruding from her shirt. The infant stares blankly, unable to breastfeed because the pumps block the way. Alongside this rise in pumping, language is also changing with breastfeeding mothers becoming "lactating parents" who provide "human milk feeding" [2], invisibilizing breastfeeding [3]. Thus, "breastfeeding" is becoming marginalized in both practice and language.

In this debate article, we posit that by marginalizing the breastfeeding relationship, recent trends in breast pumping and language encourage treatment of women according to a male standard, that is, a patriarchy. This benefits corporate interests, allowing expanding markets for breast pumps and simplification of labor structures while ignoring the realities of female reproduction and child development. Replacing breastfeeding and nurturing with pumps and profits comes at the expense of the rights and health of women and children.

This paper will discuss the outcome differences between pumping and breastfeeding, the practice of exclusive pumping, the commercial forces encouraging pumping, and changing language of breastfeeding and the implications of these. In discussing different feeding practices and their health and developmental impacts, we are not criticizing or judging women for how they feed their babies; rather, we are examining the policy and cultural environments in which infants are fed. While we emphasize the nurturing aspect of breastfeeding, infants can be nurtured in many other ways.

Definitions

We use the terms "breastfeeding" or "direct breastfeeding" to mean an infant feeding directly at the breast. "Breast pumps" or "pumps" refer to mechanical devices used to extract breastmilk. "Expressed milk" refers to breastmilk removed from the breast either via hand-expression or a breast pump [4]. "Exclusive pumping" is where women provide their infants with their own breastmilk, expressed using a pump, without any direct breastfeeding [5]. Exclusive pumping can include supplementation of expressed breastmilk with commercial milk formula (CMF). "Exclusive breastfeeding" means an infant is fed only breastmilk [6]. "Breastmilk feeding" and "human milk feeding" both include feeding expressed milk, donor milk, and direct breastfeeding.

Differences between pumping and breastfeeding

Breastfeeding is a physiologically dynamic relationship between mother and infant which is not experienced with breast pumping. Breastmilk composition changes in response to changing infant needs and changes in the mother's or child's environment. The nutritional composition of breastmilk changes according to gestational and postnatal age [7] and time of day [8–10]. Nutrient and hormone levels in breastmilk also change during the course of each feeding [11, 12]. Several hormones are secreted into breastmilk with circadian variation, such as insulin, cortisol, and melatonin [9, 10]. Breastmilk melatonin is important to help infants establish their own circadian rhythms as their circadian rhythms are immature at birth [13] and they do not make their own melatonin in the first months [14].

Dynamic processes in breastfeeding help infants fight infection in ways not available to infants fed expressed milk. During suckling, infant saliva communicates evidence of any infant infection to the mother's immune system resulting in secretion of white blood cells and secretory IgA into her milk to help fight the infection [15]. In addition, expressed breastmilk is also often frozen which adversely affects numerous components of breast milk involved in preventing and fighting infection, including damaging white blood cells [16, 17].

Infants fed breast milk via bottle gain weight more rapidly than those who are directly breastfed [18–21], perhaps related to changes in milk composition over the course of a breastfeeding session [18–20] and/or due to the breastfed infant's greater ability to self-regulate their intake using internal satiety cues.

The act of breastfeeding plays a crucial role in normal craniofacial development. Bottle-fed infants are more likely to develop dental malocclusions [22]. Compared with bottled breastmilk feeding, breastfeeding is associated with a lower risk of otitis media [23], which may be related to the oropharyngeal anatomy and physiology of suckling.

Breastfeeding physiology helps to facilitate the mother-infant relationship. During a breastfeeding session, the hormone oxytocin is released, promoting maternal bonding, attachment and sensitive caregiving [24–26]. Breastfeeding requires mother-infant proximity and

breastfeeding mothers have been found to spend more time interacting with and providing comfort to their infants than similar bottle-feeding mothers [27, 28]. Mothers are more responsive to their infants after breastfeeding as compared to bottle feeding expressed breast milk [29]. The physical contact and nurturing activity may be responsible for epigenetic changes that result in more adaptive responses to stress and cortisol secretion among breastfed infants [30]. It also likely contributes to the higher rates of healthy maternal child attachment and lower rates of child behavioral problems observed in breastfed children compared to those not breastfed [24].

A higher risk of Sudden Infant Death Syndrome (SIDS) in infants who are not breastfed may be partly explained by the physiology of the breastfeeding dyad. For example, breastfed infants are shielded from pillows (a suffocation risk) as a function of the positioning required for breastfeeding [31, 32]. Additionally, early in life, breastfed infants learn how to respond to a partially occluded airway when suckling, which may help to protect them from SIDS, but airway occlusion doesn't typically occur during bottle-feeding [33].

Lactation duration is shorter for mothers who feed by exclusive pumping versus direct breastfeeding (even if they also sometimes pump) [34–37]. For example, one study shows an adjusted hazard ratio (aHR) for cessation of lactation of 3.3 compared to directly breastfeeding [35]. Another study found an aHR of 1.77 at 6 months for exclusive pumping versus breastfeeding [37]. Early cessation of lactation and breastfeeding is associated with increased maternal risk of cancer and cardiovascular disease, and early cessation of breastmilk feeding is associated with increased risk of infant mortality, infection, and some chronic diseases [30–33].

Exclusive pumping is also associated with greater supplementation with CMF than breastfeeding, with or without pumping [34, 36]. Compared to exclusive breastfeeding, mixed feeding is associated more infant morbidity, shorter duration of lactational amenorrhea, and detrimental differences in gut microbiota [6, 38].

The shorter lactation duration and increased use of CMF seen with exclusive pumping may in part be caused by lower efficiency of milk extraction with pumping compared to breastfeeding [39, 40]. A 2016 paper noted that an infant can remove 80% of available milk in 5 minutes, while an efficient pump can remove 85% of available milk in 15 minutes [40]. It is unclear if new breast pumps are more efficient or not. Decreased milk removal results in decreased milk production [41, 42].

Exclusive pumping and pumping practices

Mothers' experiences of exclusive pumping

Exclusive pumping is not easy [43]. Women describe pumping as time-consuming, tedious, and inconvenient, whereas time spent breastfeeding is often appreciated as a bonding opportunity [39]. Mothers who exclusively pump also describe feeling "unseen," and have described feeling upset that exclusive pumping is not considered a normal or available feeding option [44]. They also describe feeling judged, when for some, exclusively pumping is a challenging but worthwhile alternative to exclusive formula-feeding if they cannot directly breastfeed [44].

A qualitative review of social media sites found that mothers who exclusively pump commonly state that equating exclusive pumping with breastfeeding mitigates feelings of failure, grief, or inadequacy from being unable to breastfeed, thus serving as a coping mechanism [43]. On social media it is common to see women who exclusively pump proclaim "EPing is Breastfeeding!" or similar sentiments [43]. Mothers tend to be motivated by knowing that feeding their expressed milk is healthier than formula feeding [43]. Indeed, without the option of exclusive pumping, many women with breastfeeding difficulties would be exclusively formula feeding [43].

Pumping and exclusive pumping are now common

Purchase and use of breast pumps is high in many countries. In the United States (US) in 2005–07, 85% of women pumped milk at least some of the time [45]. A 2010 Australian study found 66% of mothers used an electric pump [46]. A 2018 Hong Kong study, saw more than 80% of new mothers procuring a pump while pregnant or during their hospitalization [36]. The prevalence women who feed by exclusive pumping has been measured at 14% in the US, 22% in parts of China, and 26% in Singapore, where it is much more common among ethnically Chinese women than Indian women [34, 47, 48]. A study of 187 largely educated ethnically Chinese women in Malaysia conducted in 2017 showed that 49% of lactating women were feeding by exclusive pumping when their infant was one month old, while just 29% were feeding directly at the breast [49]. A Hong Kong study comparing women from 2006–07 to 2011–12 found that "exclusively expressed" breastmilk feeding increased from 6.8% to 18.8% at 1 month of age [34].

Who exclusively pumps and why?

Most of what is known about the practice of exclusive pumping comes from the US and Southeast Asian settings, within which there are ethnic, regional, and/or socioeconomic variations in exclusive pumping. The most commonly stated reason for exclusive pumping is breastfeeding difficulties [34, 35, 39, 50]. This suggests to us that breastfeeding support for mothers of newborns is inadequate, or that exclusive pumping is seen as easier than solving breastfeeding challenges. Hospitals may undermine breastfeeding by failing to implement

evidence-based maternity care practices, such as those of The Baby-Friendly Hospital Initiative [51]. Difficulties may compound without subsequent access to appropriately skilled breastfeeding support [52].

In a US study of nearly 2000 women who were exclusively pumping, over 70% said they exclusively pumped because the infant would not attach well at the breast, and many also reported difficulties with milk transfer [50]. This was true for 90% of mothers whose infant was never in a Neonatal Intensive Care Unit (NICU). (Pumping is common practice in many NICUs, where it is used to support vulnerable infants who are too premature or sick to suckle). Only 8% of all women in the study reported they exclusively pumped because they "just want(ed) to."

Other reasons for exclusively pumping include quantifying milk production, allowing others to feed the infant, to provide milk for a sick or preterm infant or establish a milk supply [35, 39, 43, 47, 50]. Several studies have found mothers who pump, especially those who exclusively pump, are more likely to be employed or plan to return to work while their infant is young [34, 36, 45].

Women who exclusively pump beyond the newborn period may differ demographically from those who pump in the short-term for sick infants [35, 36, 53]. In a study of 478 mothers who gave birth at a US hospital, 52% of the 33 women who exclusively pumped had preterm infants, and were on average of lower socioeconomic status, which the authors note contrasts with previous literature. In contrast, in Hong Kong, mothers exclusively pumping past 1.5 months postpartum were more likely to be of higher income and education than those who breastfed [34].

Mothers who exclusively pump for extended duration may also have different motivations than those pumping for a short period for their sick or preterm infants [34, 35, 37, 48, 50]. This regional, ethnic, and demographic heterogeneity in the practice of exclusive pumping warrants further research.

The role of public policy in breast pumping

A focus on pumping is also driven in some contexts by lack of sufficient (or any) paid maternity leave. With exception of some Scandinavian countries, national maternity leave policies throughout the world typically provide inadequate pay, may not cover all workers, and/or are shorter the 6 months recommended for exclusive breastfeeding [54]. The US is an extreme example, being the only high-income country with no national statutory paid maternity leave [55, 56]. The 2010 US Affordable Care Act (colloquially known as "Obamacare") mandates reasonable time and space for milk expression for women who are paid hourly wages [57]. The 2022 PUMP Act provides similar workplace lactation protections for salaried mothers in the US. The Affordable Care Act also requires all new health insurance policies, both public and private, cover the entire cost of a breast pump, regardless of need [57, 58]. This undoubtedly helped to drive the popularity of pumping in the US. For US women who have little choice but to return to paid employment shortly after giving birth, the workplace provision to pump milk is vital to continuing breastfeeding [57].

However, by promoting the normality of pumping and child separation among employed women, laws like the PUMP Act divert pressure away from the urgency of providing paid maternity leave and worksite arrangements that allow for direct breastfeeding [59]. The name "PUMP Act" itself reflects the prioritization of pumping over breastfeeding and keeping mothers and infants together.

Commercial forces shaping infant feeding practice

Workplaces encourage pumping and formula feeding over direct breastfeeding

Supporting direct breastfeeding for employees requires labor structure adjustments. This may include part-time work, onsite childcare, babies-at-work programs, working from home, and longer maternity leave [60]. In contrast, pumping requires only time and space to pump while CMF feeding allows women to function just like male employees.

There is a "business case for breastfeeding," although corporate leaders may be unaware of it [61]. Supporting breastfeeding employees has a significant return on investment, reducing labor costs due to better employee retention, better morale, and decreased health-related absenteeism and health costs. However, while existing evidence focuses on supporting pumping [61], similar types of cost savings are likely for supporting direct breastfeeding.

How the breast pump market drives pumping

The global market for breast pumps has more than tripled since 2011, from around US $620 million [62] to over US $2 billion in 2024 [63]. Technological advances such as the development of wearable breast pumps have also likely contributed to the rise of exclusive pumping [47]. This includes hands-free pumps that can be worn under clothing ("wearable pumps"), reducing the need for privacy and leaving women free to perform other tasks while pumping. The global market for wearable pumps is growing, and is expected to reach nearly US $900 million by 2030 [64]. Concerningly, if replacing breastfeeding, pumping is now becoming more popular in middle-income countries, evidenced by an increased sales of breast pumps in places like Vietnam [65].

The manufacture and marketing of breast pumps is largely unregulated. The World Health Assembly's (WHA) International Code of Marketing of Breast Milk

Substitutes and subsequent resolutions (the Code) prohibits the marketing of products including CMF and feeding bottles and teats [66]. However, breast pumps are outside the scope of the Code. This means producers of breast pumps market pumping as easier and more convenient than breastfeeding and allowing for discretion, providing freedom (from the infant) and solving breastfeeding problems [67]. Despite their conflict of interest, breast pump companies are unimpeded in educating health professionals about breastfeeding [68]. Health providers, educated by pump companies, may lack confidence in teaching hand expression, or may promote breast pumps as a 'quick fix' rather than addressing breastfeeding challenges [46].

The changing language on "breastfeeding"

Linguistic changes away from "breastfeeding" and towards "lactating" and "human milk feeding" are primarily occurring in wealthy industrialized English-speaking countries. Some sources use "human milk feeding" to assure that feeding pumped and donor breastmilk is included, but the main impetus appears to be a desire to be supportive of transgender and gender diverse individuals. Such individuals experience an inner sense of self, a gender identity, in conflict with their sex [69]. This population are assumed to object to the term "breastfeeding."

However, focus on "human milk" rather than on the process of breastfeeding, allows a false equivalence between breastfeeding and bottle-feeding, which can be exploited for marketing CMF and breast pumps. Breast pump marketing compares pumping to breastfeeding but ignores the social and physical losses inherent in replacing breastfeeding with feeding pumped milk [67, 70]. The CMF industry also downplays the nurturing, social, and physical aspects of breastfeeding as they cannot even attempt to argue that their products can provide this. Instead, they focus on the milk itself, and market their products as being "close to breast milk" [71].

In two of its practice guidelines, the American Academy of Pediatrics (AAP) has substituted "human milk feeding" for "breastfeeding" as if the terms are equivalent. This has resulted in recommendations that are not evidence-based. For example, AAP recommends "human milk feeding" to prevent sleep-related infant death [72], although all evidence of decreased risk is based on breastfeeding. One cannot assume those who bottle-feed breastmilk share the protective behaviors seen with breastfeeding [31]. The AAP also recommends "human milk feeding" during disasters and emergencies [73], although experts on infant feeding in emergencies specifically recommend breastfeeding and specifically advise against use of breast pumps, bottles, and teats, because these are challenging to clean without safe water sources [74].

Breastfeeding, feminism, and gender equality

Feminism has largely avoided addressing the problem of breastfeeding. A 'feminist silence on suckling' was noted nearly three decades ago [75]. This silence arose in the context of an economic view of women's oppression, which saw increasing women's employment participation as a solution to reducing dependence and vulnerability, but without challenging existing structural biases in social and economic institutions [60].

It has been argued that sex neutrality can assist in emancipating women from an unequal unpaid burden of "care work" (looking after others) by encouraging men to view domestic work and childcare as their equal responsibility [76, 77]. Yet, breastfeeding and the care of infants and young children is fundamentally "sexed care work" [60]. As Julie Stephens also wrote a decade and a half ago, a sex-neutral approach to care work has drawbacks: "there are problems with presenting care as a transferable or marketable commodity … [It] taps into a productivist ethos," and a feminism which promotes sex neutrality (in the name of equality) and "denies the bodily experience of women after they have given birth" [1]. Most fundamentally, this approach "fails to challenge work practices that demand impossibly long working hours, and measurement of performance that ultimately devalue children and caring responsibilities" [60]. Rather than assisting women, it assists in maintaining a market-focused society in which the bodies, physiology, and unpaid care work of women are invisibilized and ignored [60].

When pumping and breastfeeding are treated as if they are equivalent, pumping may be prioritized over breastfeeding because it is generally simpler than supporting breastfeeding. When pumping is framed as an equivalent alternative to breastfeeding, we posit that there is little need for health services to improve support to birthing mothers so that they are able to directly breastfeed and not just pump. There is no need for workplace maternity protections that keep mothers and infants proximate and permit breastfeeding. Prioritizing pumping over breastfeeding in the workplace also promotes separation of women and infants, which is known to contribute to early cessation of breastfeeding/lactation [78, 79], and this ultimately harms the health and welfare of both women and children [80–83]. Finally, an equivalence between pumping and breastfeeding contributes to the grief and loss felt by mothers who wanted to breastfeed rather than pump and feed expressed milk [43].

Solutions: a path forward

Women and children hold rights in relation to breastfeeding including the right to breastfeed, the right to breastfeeding support, the right to maternity protection, and the right to protection from exploitative marketing and misinformation [84–86]. In order for these rights to

be realized, societies must reject the patriarchal norm, and move towards accepting women as also normative by recognizing and accounting for the value of women and their reproductive work as well as their value to the workforce.

- Fully paid maternity leave should be provided for at least 6 and preferably 12 months, including for mothers in the informal workforce, as recommended by the Academy of Breastfeeding Medicine [54]. The United Nations' International Labour Organization (ILO) has shown that a minimum of 14 weeks' maternity leave, paid at two-thirds of previous earnings, covered by compulsory social insurance or public funds, is feasible in all country settings [87]. Countries with at least 6 months paid maternity leave include middle income nations such as Vietnam and India, and The Gambia which is a low-income country [88, 89]. In 2022, there were 25 countries with at least 12 months paid maternity leave [88].
- Separation and pumping should not be the only option for working women. Rather onsite child care, working from home, and allowing infants to accompany their mothers to work should be normalized [60]. The ILO recommends governments assure access to onsite or near site childcare so that mothers can directly breastfeed [87]. Legislation requiring this exists in Columbia, Costa Rica, the Netherlands, Belgium, Nicaragua, and Niger [90]. Some women may have employment not conducive to child proximity (e.g., deployed soldiers, pilots, bus drivers) in which case generous paid maternity leave is even more important but options such as temporary reassignment can also manage this difficulty. Part-time work for mothers, with ongoing professional development and a recognized part-time career track, can also help to mitigate against economic and career disadvantage for women who are mothers [60].
- Better wages and shorter working hours for men increases their contributions to unpaid work, including care of children and housework [91]. Flexible or part-time work for fathers may also result in greater support for women, such as bringing the baby to a mother's workplace for feeding. Breastfeeding promotion should acknowledge that partners play an important role in supporting breastfeeding [60].
- All maternity units should implement the World Health Organization/UNICEF Baby Friendly Hospital Initiative [51]. Practices such as immediate skin-to-skin after birth [92], early initiation of breastfeeding and rooming-in should be prioritized for all mothers in recognition of how they facilitate breastfeeding and help avoid breastfeeding problems [51]. All women should be taught how to hand express their milk, supporting their self-reliance [93]; hand expression can be efficient and be used by working mothers [46]. Mothers experiencing breastfeeding difficulties should have access to skilled breastfeeding support in hospital and post-discharge. All mothers should be referred to ongoing mother-to-mother breastfeeding support and breastfeeding counselling as recommended by the World Health Organization (WHO) [51].
- Breast pumps should be included in the scope of the Code and their direct marketing to the public and the education of health professionals by pump companies prohibited.
- The importance of breastfeeding, not only the importance of human milk, should be clearly communicated to women and the public. Terms such as 'human milk feeding' should not be routinely substituted for "breastfeeding" in general communications. Tailored communications can be used for the transgender and gender diverse population and individuals.
- Societies must measure, recognize, and support women's reproductive work in breastfeeding and caring for their infants and young children. This starts with quantifying and highlighting this work through national time use surveys focused on unpaid care work [94], and through including measures of breastfeeding in food production statistics so that expansion of markets in breast pumps and CMF is not prioritized in fiscal decision making [60, 95].
- Finally, women have the right to accurate information on infant feeding, including on the many differences between pumping and breastfeeding, particularly in the prenatal and immediate postpartum period. In these contexts, it is detrimental to women and children to misrepresent exclusive pumping as equivalent to breastfeeding or to stay silent when misinformation is shared. However, women who exclusively pump deserve compassion and understanding, and if some equate exclusive pumping with breastfeeding, their views should be respected as a coping strategy. Such women should be supported to continue to provide breast milk to their children, and if desired, assistance to transition to direct breastfeeding. Women who tried and were unable to establish breastfeeding have been failed by a system that does not value women or breastfeeding. This needs to change.

Conclusion

Replacing the practice of breastfeeding with breast pumping and the language of breastfeeding with "human milk feeding" may appear to promote equality for women and be more inclusive. In fact, they marginalize the needs of women and children and have adverse implications for population health. In order to uphold women and children's rights, women must be provided with proper support to breastfeed and the workplace transformed to normalize mothers as workers who breastfeed and care for their babies. Only with this can women's full participation in society be enabled. In such a paradigm for equality, pumping would become largely unnecessary. For this reason, "breastfeeding" should be supported in practice and in language and in alignment with the human rights of women and children to breastfeed.

Abbreviations

AAP	American Academy of Pediatrics
CMF	Commercial milk formula
EEG	Electroencephalogram/electroencephalographic
EP	Exclusive pumping
ILO	International Labour Organization
NICU	Neonatal Intensive Care Unit
SIDS	Sudden Infant Death Syndrome
UNICEF	United Nations International Children's Emergency Fund
US	United States
WHO	World Health Organization

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Not applicable.

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We give consent for publication.

Competing interests

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References

1. Stephens J. The industrialised breast. 2010. Available from: https://overland.org.au/2010/12/the-industrialised-breast/. Last accessed 4 Jan 2025.
2. Gribble KD, Bewley S, Bartick MC, et al. Effective communication about pregnancy, birth, lactation, breastfeeding and newborn care: the importance of sexed language. Front Glob Womens Health. 2022;3:818856. https://doi.org/10.3389/fgwh.2022.818856.
3. Bartick M. Losing women, losing breastfeeding: a crisis of words. Breastfeed Med. 2024;19(5):313–15. https://doi.org/10.1089/bfm.2024.0102.
4. Johns HM, Forster DA, Amir LH, et al. Prevalence and outcomes of breast milk expressing in women with healthy term infants: a systematic review. BMC Pregnancy Childbirth. 2013;13:212. https://doi.org/10.1186/1471-2393-13-212.
5. Shealy KR, Scanlon KS, Labiner-Wolfe J, et al. Characteristics of breastfeeding practices among US mothers. Pediatrics. 2008;122(Suppl. 2):S50–55. https://doi.org/10.1542/peds.2008-1315f.
6. Meek JY, Noble L. Technical report: breastfeeding and the use of human milk. Pediatrics. 2022;150(1):e2022057989. https://doi.org/10.1542/peds.2022-057989.
7. Gidrewicz DA, Fenton TR. A systematic review and meta-analysis of the nutrient content of preterm and term breast milk. BMC Pediatr. 2014;14(1):216. https://doi.org/10.1186/1471-2431-14-216.
8. Czosnykowska-Łukacka M, Królak-Olejnik B, Orczyk-Pawiłowicz M. Breast milk macronutrient components in prolonged lactation. Nutrients. 2018;10(12):1893. https://doi.org/10.3390/nu10121893.
9. Hahn-Holbrook J, Saxbe D, Bixby C, et al. Human milk as "chrononutrition": implications for child health and development. Pediatr Res. 2019;85(7):936–42. https://doi.org/10.1038/s41390-019-0368-x.
10. Suwaydi MA, Lai CT, Rea A, et al. Circadian variation in human milk hormones and macronutrients. Nutrients. 2023;15(17):3729. https://doi.org/10.3390/nu15173729.
11. Karatas Z, Durmus Aydogdu S, Dinleyici EC, et al. Breastmilk ghrelin, leptin, and fat levels changing foremilk to hindmilk: is that important for self-control of feeding? Eur J Pediatr. 2011;170(10):1273–80. https://doi.org/10.1007/s00431-011-1438-1.
12. Van Sadelhoff JHJ, Mastorakou D, Weenen H, et al. Short communication: differences in levels of free amino acids and total protein in human foremilk and hindmilk. Nutrients. 2018;10(12):1828. https://doi.org/10.3390/nu10121828.
13. Rivkees SA. Developing circadian rhythmicity in infants. Pediatrics. 2003;112(2):373–81. https://doi.org/10.1542/peds.112.2.373.
14. Paditz E. Melatonin in infants-physiology, pathophysiology and intervention options. Somnologie. 2024;28(2):103–09. https://doi.org/10.1007/s11818-024-00456-5.
15. Hassiotou F, Hepworth AR, Metzger P, et al. Maternal and infant infections stimulate a rapid leukocyte response in breastmilk. Clin Transl Immunol. 2013;2(4):e3. https://doi.org/10.1038/cti.2013.1.
16. Putri DK, Syaidah R, Jusuf AA. The effects of different storage conditions on leukocytes in human breast milk. Sultan Qaboos Univ Med J. 2024;24(1):91–98. https://doi.org/10.18295/squmj.12.2023.084.
17. Pham Q, Patel P, Baban B, et al. Factors affecting the composition of expressed fresh human milk. Breastfeed Med. 2020;15(9):551–58. https://doi.org/10.1089/bfm.2020.0195.
18. Azad MB, Vehling L, Chan D, et al. Infant feeding and weight gain: separating breast milk from breastfeeding and formula from food. Pediatrics. 2018;142(4):e20181092. https://doi.org/10.1542/peds.2018-1092.
19. Slater CN, Juntereal NA, Kral TVE, et al. Comparison of the effect of direct breastfeeding, expressed human milk, and infant formula feeding on infant weight trajectories: a systematic review. Breastfeed Med. 2024;19(4):235–47. https://doi.org/10.1089/bfm.2023.0149.
20. Magadia J. Risk of bottle-feeding for rapid weight gain during the first year of life. Arch Pediatr Adolesc Med. 2012;166(5):431. https://doi.org/10.1001/archpediatrics.2011.1665.
21. Keim SA, Sullivan JA, Sheppard K, et al. Feeding infants at the breast or feeding expressed human milk: long-term cognitive, executive function, and eating behavior outcomes at age 6 years. J Sport Hist Pediatrics. 2021;233:66–73.e1. https://doi.org/10.1016/j.jpeds.2021.02.025.
22. Karadimitriou M-D, Kagioglou N, Trimeridou AS, et al. Feeding practices and jaw development: a comprehensive literature review of their interconnected dynamics. Dent Res Oral Health. 2025;27–37. https://doi.org/10.26502/droh.0088.

23. Boone KM, Geraghty SR, Keim SA. Feeding at the breast and expressed milk feeding: associations with otitis media and diarrhea in infants. J Sport Hist Pediatrics. 2016;174:118–25. https://doi.org/10.1016/j.jpeds.2016.04.006.
24. Gribble K. Supporting vulnerable women in mothering through skin-to-skin contact, proximity, and breastfeeding: part 1 researc. Breastfeed Rev. n.d;32(2):6–18.
25. Strathearn L. Maternal neglect: Oxytocin, dopamine and the neurobiology of attachment. J Neuroendocrinol. 2011;23(11):1054–65. https://doi.org/10.1111/j.1365-2826.2011.02228.x.
26. Uvnäs Moberg K, Prime DK. Oxytocin effects in mothers and infants during breastfeeding. Infant. 2013;9(6):201–06.
27. Smith JP, Ellwood M. Feeding patterns and emotional care in breastfed infants. Soc Indic Res. 2011;101(2):227–31. https://doi.org/10.1007/s11205-010-9657-9.
28. Smith JP, Forrester R. Maternal time use and nurturing: analysis of the association between breastfeeding practice and time spent interacting with baby. Breastfeed Med. 2017;12(5):269–78. https://doi.org/10.1089/bfm.2016.0118.
29. Hahn-Holbrook J, Little EE, Abbott M. Mothers are more sensitive to infant cues after breastfeeding compared to bottle-feeding with human milk. Horm Behav. 2021;136:105047. https://doi.org/10.1016/j.yhbeh.2021.105047.
30. Lester BM, Conradt E, LaGasse LL, et al. Epigenetic programming by maternal behavior in the human infant. Pediatrics. 2018;142(4):e20180194. https://doi.org/10.1542/peds.2017-1890.
31. Bartick M, Young M, Louis-Jacques A, et al. Bedsharing may partially explain the reduced risk of sleep-related death in breastfed infants. Front Pedatr Sec Gener Pediatrics Pediatr Emerg Care. 2022. https://doi.org/10.3389/fped.2022.1.
32. Ball HL. Parent-infant bed-sharing behavior: effects of feeding type and presence of father. Hum Nat. 2006;17(3):301–18. https://doi.org/10.1007/s12110-006-1011-1.
33. Renz-Polster H, Blair PS, Ball HL, et al. Death from failed protection? An evolutionary-developmental theory of Sudden infant death syndrome. Hum Nat. 2024;35(2):153–96. https://doi.org/10.1007/s12110-024-09474-6.
34. Bai DL, Fong DYT, Lok KYW, et al. Practices, predictors and consequences of expressed breast-milk feeding in healthy full-term infants. Public Health Nutr. 2017;20(3):492–503. https://doi.org/10.1017/S136898001600241X.
35. Keim SA, Boone KM, Oza-Frank R, et al. Pumping milk without ever feeding at the breast in the Moms2Moms study. Breastfeed Med. 2017;12(7):422–29. https://doi.org/10.1089/bfm.2017.0025.
36. Fan HSL, Fong DYT, Lok KYW, et al. Association between expressed breast milk feeding and breastfeeding duration in Hong Kong mothers. Women Birth. 2022;35(3):e286–93. https://doi.org/10.1016/j.wombi.2021.06.007.
37. Jiang B, Hua J, Wang Y, et al. Evaluation of the impact of breast milk expression in early postpartum period on breastfeeding duration: a prospective cohort study. BMC Pregnancy Childbirth. 2015;15(1):268. https://doi.org/10.1186/s12884-015-0698-6.
38. Ho NT, Li F, Lee-Sarwar KA, et al. Meta-analysis of effects of exclusive breastfeeding on infant gut microbiota across populations. Nat Commun. 2018;9(1):4169. https://doi.org/10.1038/s41467-018-06473-x.
39. Felice JP, Geraghty SR, Quaglieri CW, et al. "Breastfeeding" without baby: a longitudinal, qualitative investigation of how mothers perceive, feel about, and practice human milk expression. Matern Child Nutr. 2017;13(3). https://doi.org/10.1111/mcn.12426.
40. Meier PP, Patel AL, Hoban R, et al. Which breast pump for which mother: an evidence-based approach to individualizing breast pump technology. J Perinatol. 2016;36(7):493–99. https://doi.org/10.1038/jp.2016.14.
41. Daly SEJ, Hartmann PE. Infant Demand and milk Supply. Part, 2: the short-term control of milk synthesis in lactating women. J Hum Lact. 1995;11(1):27–37. https://doi.org/10.1177/089033449501100120.
42. Daly SEJ, Hartmann PE. Infant Demand and milk supply. Part, 1: infant Demand and milk production in lactating women. J Hum Lact. 1995;11(1):21–26. https://doi.org/10.1177/089033449501100119.
43. Coffey-Glover L. Discourses of breastfeeding in 'exclusive pumping' blogs. Discourse Context Media. 2020;38(2020):1–10.
44. Anders LA, Robinson K, Ohlendorf JM, et al. Unseen, unheard: a qualitative analysis of women's experiences of exclusively expressing breast milk. BMC Pregnancy Childbirth. 2022;22(1):58. https://doi.org/10.1186/s12884-022-04388-6.
45. Labiner-Wolfe J, Fein SB, Shealy KR, et al. Prevalence of breast milk expression and associated factors. Pediatrics. 2008;122(2):S63–8. https://doi.org/10.1542/peds.2008-1315h.
46. Clemons SN, Amir LH. Breastfeeding women's experience of expressing: a descriptive study. J Hum Lact. 2010;26(3):258–65. https://doi.org/10.1177/0890334410371209.
47. Rosenbaum KA. Exclusive breastmilk pumping: a concept analysis. Nurs Forum. 2022;57(5):946–53. https://doi.org/10.1111/nuf.12766.
48. Thorley V. Embodied mothering: valuing breastfeeding in a neoliberal age. Breastfeed Rev. 2021;29(1).
49. Foong SC, Tan ML, Foong WC, et al. Comparing breastfeeding experiences between mothers spending the traditional Chinese confinement period in a confinement centre and those staying at home: a cohort study. Int Breastfeed J. 2021;16(1):4. https://doi.org/10.1186/s13006-020-00353-1.
50. Jardine FM. Breastfeeding without nursing: the lived experiences of exclusive pumping. 2020. Dissertation. University of Maryland: College Park.
51. World Health Organization. Guideline: protecting, promoting, and supporting breastfeeding in facilities: providing maternity and newborn Services. Geneva: World Health Organization; 2017.
52. D'Hollander CJ, McCredie VA, Uleryk EM, et al. Breastfeeding support provided by lactation consultants: a systematic review and meta-analysis. JAMA Pediatr. 2025;179(5):508. https://doi.org/10.1001/jamapediatrics.2024.6810.
53. March of Dimes. Preterm birth rate: United States, 2023. 2023.
54. Bettinelli ME, Smith JP, Haider R, et al. ABM Position Statement: paid maternity leave-importance to society, breastfeeding, and sustainable development. Breastfeed Med. 2024;19(3):141–51. https://doi.org/10.1089/bfm.2024.29266.meb.
55. World Population Review. Countries with birthright citizenship 2023. 2023.
56. Canaan S, Lassen AS, Rosenbaum P, et al. Maternity leave and Paternity leave: evidence on the economic impact of legislative changes in high income countries. Bonn: IZA Institute of Labor Economics; 2022.
57. Hawkins SS, Dow-Fleisner S, Noble A. Breastfeeding and the Affordable care Act. Pediatr Clinics N Am. 2015;62(5):1071–91. https://doi.org/10.1016/j.pcl.2015.05.002.
58. HealthCare.gov. Breastfeeding benefits. 2025. Available from: https://www.healthcare.gov/coverage/breast-feeding-benefits/. Last accessed 1 Aug 2025.
59. Baker P, Smith JP, Garde A, et al. The political economy of infant and young child feeding: confronting corporate power, overcoming structural barriers, and accelerating progress. Lancet. 2023;401(10375):503–24. https://doi.org/10.1016/S0140-6736(22)01933-X.
60. Gribble KD, Smith JP, Gammeltoft T, et al. Breastfeeding and infant care as 'sexed' care work: reconsideration of the three Rs to enable women's rights, economic empowerment, nutrition and health. Front Public Health. 2023;11:1181229. https://doi.org/10.3389/fpubh.2023.1181229.
61. US Health Resources and Services Administration. Office on Women's Health. The Business case for breastfeeding. Washington, DC; 2025.
62. Persistence Market Research. Rise and growth of the global breast pumps market. 2024. Available from: https://www.persistencemarketresearch.com/blog/breast-pumps-market-growth.asp#:%7E:text=In%202011%2C%20the%20global%20breast%20pumps%20market%20was,pump%20market%2C%20driven%20largely%20by%20convenience%20and%20effectiveness. Last accessed 21 Dec 2025.
63. Fortune Business Insights. Breast pump market Size, share & industry analysis, by type (wearable and non-wearable), by application (Hospital Grade {manual and Automatic} and consumer Grade {manual and Automatic}), by end user (hospitals, maternity Clinics, homecare settings, and others), and regional forecast, 2025-2032. 2025. Available from: https://www.fortunebusinessinsights.com/breast-pump-market-107054 Last accessed 2 Nov 2025.
64. Polaris Market Research. Wearable breast pumps market Size worth $897.33 million by 2030 | CAGR: 6.9%. 2022. Available from: https://www.polarismarketresearch.com/press-releases/wearable-breast-pumps-market Last accessed 1 Aug 2025.
65. Bajaal S. Vietnam breast pump market. 2025. Available from: https://www.techsciresearch.com/report/vietnam-breast-pump-market/27077.html Last accessed 3 Aug 2025.
66. World Health Organization. Code and subsequent resolutions. 2025. Available from: https://www.who.int/teams/nutrition-and-food-safety/food-and-nutrition-actions-in-health-systems/code-and-subsequent-resolutions Last accessed 3 Aug 2025.
67. Sheehan A, Bowcher WL. Messages to new mothers: an analysis of breast pump advertisements. Matern Child Nutr. 2017;13(2):e12313. https://doi.org/10.1111/mcn.12313.
68. Medela. 2025. Available from: https://www.medela.com/en-us/lactation-professionals/professional-education Last accessed 3 Aug 2025.

69. Bartick M, Dahlen H, Gamble J, et al. Reconsidering "inclusive language": consequences for healthcare and equitableness of a growing linguistic movement to address gender identity with a path forward. Sexual Reprod Healthcare. 2025;44:101088. https://doi.org/10.1016/j.srhc.2025.101088.
70. McInnes RJ, Arbuckle A, Hoddinott P. How UK internet websites portray breast milk expression and breast pumps: a qualitative study of content. BMC Pregnancy Childbirth. 2015;15(1):81. https://doi.org/10.1186/s12884-015-0509-0.
71. Enfamil For Exceptional Nutrition Right from the Start. n.d. Available from: https://www.enfamil.com/enfamil-optimum/?gad_source=1%26gad_campaignid=2078077151%26gbraid=0AAAADcl4VxoVrYdc9a60A29te9YNrsLv%26gclid=CjwKCAjw6s7CBhACEiwAuHQckv-5u0s1sOGOqBaGnS_E5ntL-wtJymqM4HIHTFLd5GfUyEZTXHAVtRoCKVMQAvD_BwE%26gclsrc=aw.ds. Last accessed 21 Oct 2025.
72. Moon RY, Carlin RF, Hand I, et al. Sleep-related infant deaths: updated 2022 recommendations for reducing infant deaths in the sleep environment. Pediatrics. 2022;150(1):e2022057990. https://doi.org/10.1542/peds.2022-057990.
73. American Academy of Pediatrics. Infant feeding in disasters and Emergencies: breastfeeding and other options. Itasca, IL; 2020.
74. IFE Core Group. Infant and young child feeding in Emergencies: operational guidance for Emergency relief staff and programme managers. Kidlington, UK: ENN; 2017.
75. Galtry J. Suckling and silence in the USA: the costs and benefits of breastfeeding. Feminist Econ. 1997;3(3):1–24. https://doi.org/10.1080/135457097338636.
76. Schoenbaum N. Unsexing breastfeeding. Minn Law Rev. 2022;107:139–244.
77. Smith JP. Baby care needs nurturing. Sydney Morning Herald; 2014.
78. Cunningham S, Penning J, Barboza S, et al. Breastfeeding in US working mothers: a systematic review. WOR. 2024;78(4):851–71. https://doi.org/10.3233/WOR-220645.
79. Skafida V. Juggling work and motherhood: the impact of employment and maternity leave on breastfeeding duration: a survival analysis on growing up in Scotland data. Matern Child Health J. 2012;16(2):519–27. https://doi.org/10.1007/s10995-011-0743-7.
80. Rollins NC, Bhandari N, Hajeebhoy N, et al. Why invest, and what it will take to improve breastfeeding practices? Lancet. 2016;387(10017):491–504. https://doi.org/10.1016/S0140-6736(15)01044-2.
81. Victora CG, Bahl R, Barros AJ, et al. Breastfeeding in the 21st century: epidemiology, mechanisms, and lifelong effect. Lancet. 2016;387(10017):475–90. https://doi.org/10.1016/S0140-6736(15)01024-7.
82. Bartick MC, Schwarz EB, Green BD, et al. Suboptimal breastfeeding in the United States: maternal and pediatric health outcomes and costs. Matern Child Nutr. 2017;13(1):e12366. https://doi.org/10.1111/mcn.12366.
83. Patnode CD, Henrikson NB, Webber EM, et al. Breastfeeding and health outcomes for infants and children: a systematic review. Pediatrics. 2025;156(1):e2025071516. https://doi.org/10.1542/peds.2025-071516.
84. United Nations Human Rights Office of the Commissioner. Joint Statement by the UN special Rapporteurs on the right to food, right to Health, the working group on discrimination against women in Law and in practice, and the committee on the rights of the child in support of increased efforts to promote, support and protect breast-feeding. Geneva; 2016.
85. Feldman-Winter L, Van T, Varadi D, et al. Academy of breastfeeding Medicine Position Statement: breastfeeding as a basic human right. Breastfeed Med. 2022;17(8):633–34. https://doi.org/10.1089/bfm.2022.29216.abm.
86. Gribble KD, Gallagher M. Rights of children in relation to breastfeeding in child protection cases. Br J Soc Work. 2014;44(2):434–50. https://doi.org/10.1093/bjsw/bcu004.
87. International Labour Organisation. Care at work: investing in care leave and Services for a more gender equal World of work, executive summary. Geneva; 2022.
88. Addati L, Cattaneo U, Pozzan E, et al. Care at work: investing in care leave and services for a more gender equal world of work. ILO: Geneva; 2022. https://doi.org/10.54394/AQOF1491.
89. Vietnam Social Security. Maternity benefit. Vietnam ministry of Finance: Hanoi. 2017. Available from: https://vss.gov.vn/english/thebenefits/Pages/maternity.aspx?CateID=192%26ItemID=8469. Last accessed 5 Feb 2026.
90. Addati L, Cassirer N, Gilchrist K. Maternity. And Paternity at work: law and practice across the World. Geneva: International Labour Organization; 2014.
91. Craig L, Brown JE. Feeling rushed: gendered time quality, work hours, nonstandard work schedules, and spousal crossover. J Marriage Fam. 2017;79(1):225–42. https://doi.org/10.1111/jomf.12320.
92. Moore ER, Brimdyr K, Blair A, et al. Immediate or early skin-to-skin contact for mothers and their healthy newborn infants. Cochrane central editorial Service, editors. Cochrane Database Systematic Rev. 2025;2025(10). https://doi.org/10.1002/14651858.CD003519.pub5.
93. Bartick M, Zimmerman DR, Sulaiman Z, et al. Academy of breastfeeding Medicine Position Statement: breastfeeding in Emergencies. Breastfeed Med. 2024;19(9):666–82. https://doi.org/10.1089/bfm.2024.84219.bess.
94. WHO Council on the Economics of Health for All. Time-use data can clarify crucial inputs to Health for all. Geneva; 2022.
95. Smith JP, Borg B, Nguyen TT, et al. Estimating carbon and water footprints associated with commercial milk formula production and use: development and implications of the Green feeding climate action tool. Front Nutr. 2024;11:1371036. https://doi.org/10.3389/fnut.2024.1371036.

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