



**CLIMATE-SMART INFANT FEEDING PART 1
THE INTERCONNECTION
OF ENVIRONMENT,
CLIMATE CHANGE, AND
INFANT NUTRITION**

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TERMINOLOGY USED IN THIS DOCUMENT

This document uses the word 'mother' to describe parents who are breastfeeding. We acknowledge that there are breastfeeding parents who may have a gender identity other than female and may use terms other than 'mother' to describe themselves. We also know that some parents may prefer 'chest feeding' to 'breastfeeding'. We are clear that all parents should be treated with dignity and respect when accessing support. When we are asked to use pronouns, terms, and descriptors other than those in this document we will use the preferred words as part of individualised care. We also acknowledge that breastfeeding may not be possible for all mothers and infants. We emphasise that parents should discuss different infant feeding options with a healthcare professional, who can provide advice and counselling to select the best method for both mother and infant.



INTRODUCTION

Nutrition is very topic to nurses; it features constantly in their work and is inextricably linked to the health of their patients and communities. Healthy nutrition is only possible with an environmentally and socially sustainable food production system. Healthcare professionals have a pivotal role to play in many of the UN's Sustainable Development Goals, including the development of *"a food system that delivers food security and nutrition for all in such a way that the economic, social and environmental bases to generate food security and nutrition for future generations are not compromised"*.¹

Breastfeeding is considered the most environmentally sustainable form of infant feeding,^{2,3} yet it is largely absent from the global conversation on net-zero and the circular economy, as well as climate and health policy generally. More discussion is needed to highlight how developing breastfeeding-friendly communities and services can help to protect both public health and the health of our planet. Nurses and midwives have an important role in sharing this information; it will require additional education and training as environmental considerations are currently not included in breastfeeding curricula.

This resource will support healthcare professionals to learn about the impact of different forms of infant feeding on the environment and how climate change threatens the nutrition of mothers and infants.

PART 1: ENVIRONMENTAL IMPACTS ON INFANT FEEDING

THE IMPACT OF MORE FREQUENT EXTREME WEATHER EVENTS

The impact of climate change on health is severe. Even a 1.5-degree global temperature rise will see several regional changes in climate, including extreme temperatures, floods, or droughts, and increased climate-related risks to human health, livelihoods, water supply, human security, and economic growth.⁴ In Europe we have seen heatwaves,⁵ forest fires,⁶ severe flooding,⁷ exceptional storms,⁸ and other extreme weather events in 2021. For more information, see the Nurses Climate Challenge Europe resource **How does climate change affect health?**

More generally, climate change is already impacting food security, with particular risks for poor and vulnerable communities.⁹ We need strategies to build resilience, reduce food waste, and shorten supply chains. Since the 1980s, there has been an 83% increase in climate related disasters, such as floods, droughts, and storms, which increase food insecurity.¹⁰ In 2016, over 530 million children lived in countries affected by extreme-weather events and other climate-related emergencies, such as epidemics and crop failures.¹¹ Climate change is already threatening crop and livestock production in several parts of Europe, particularly Southern Europe. Changing weather conditions have led to poorer harvests and higher production costs.¹² Higher food prices will be especially harmful to low-income and vulnerable families.

These emergencies pose a significant threat especially to children - *“child mortality rates [during disasters] can increase twenty-fold in as little as two weeks, reaching up to 70 times higher than average”*,¹³ due to injuries and infections. In post-disaster situations and conflict zones infant nutrition is a common challenge for parents, healthcare services, and aid agencies.

With worsening climate change impacts, safe formula feeding could become increasingly more challenging in some environments, depending on geographic location, infrastructure, and socio-economic status. Families not only need the finances to purchase formula feed and equipment, but they also require access to safe drinking water and cooking facilities. Extreme weather events can disrupt water and electricity supplies.¹⁴ After severe floods in Germany in 2021, nearly 6,000 households did not have access to electricity for a prolonged time.¹⁵ Being cut off from electricity can mean that families cannot mix powdered formula or clean and sterilise bottles safely.¹⁶

Breastfeeding is often more robust and safer, as mothers can continue to feed young children despite disruptions. Without the costs of formula feed, families can purchase more nutritious food for the nursing mother and other household members.¹⁷ However, in many extreme weather situations, this requires access to proper nutrition as well as social and psychological support. Breastfeeding is not only reliable during an extreme weather event, it also improves an infant’s immune system, which is particularly important in disaster and conflicting settings.¹⁸ Infants in these circumstances have higher risks of morbidity and mortality from infectious diseases when they are not breastfed.⁹

During disasters, aid relief often focusses on donations of huge quantities of formula feed, which establishes a dependency and need for continued formula supply as breastfeeding cannot easily be resumed once interrupted. After the Great Western China earthquake in 2008, donated stocks of formula lasted for five years after the event. This contributed to an increase in prelacteal feeds within the region (formula feed given



to a new born before initiating breastfeeding), which is a major barrier to exclusive breastfeeding.¹⁹

Breastfeeding nourishes and protects not only infants; it can also be a source of nutrition for older children. Natural-term weaning can occur at any age between two and seven years²⁰ and in situations where food stability is not guaranteed, breast milk could provide an important alternative. Encouraging mothers to continue breastfeeding to the age of two and beyond, as recommended by the WHO²¹ will protect infants and children in the event of food insecurity. As it is very difficult to restart breastfeeding once weaning has occurred, it is critical to support mothers not only to establish breastfeeding after birth but also to sustain it for as long as they wish to.

HEATWAVES AND INFANT NUTRITION

Due to climate change, heatwaves are increasingly common and extreme in Europe. Studies found that exposure to heatwaves in the perinatal period may pose a threat to children's health. Paediatric diseases or conditions associated with heatwaves include renal disease, respiratory disease, electrolyte imbalance, and fever.^{2,22} Infant hospital admissions increase significantly during heatwaves. Due to their small size and high body surface area, infants have a higher risk of dehydration.²³ During heatwaves, when possible, parents should protect infants from direct sunlight,

stay in a cooler environment during the hottest hours, and regularly provide them with milk.

Heatwaves and hotter weather increase the risks of food or water-borne pathogens in water or prepared food. If infant formula is being used, caregivers must sterilise water and equipment by boiling it before preparing the formula. Additionally, already prepared formulas can spoil faster during a heatwave and can lead to diarrheal infections in infants.²⁴ Breast milk, on the other hand, can be safely fed in any circumstance and will always be fresh, no matter the surrounding temperatures.

RISING RISK FOR ZONOTIC DISEASES

Climate change and environmental degradation increase the transmission risk of zoonotic diseasesⁱ and the two issues are more connected that we perhaps realise. Even COVID-19 and climate change have *“several common causes, synergistic impacts, and shared solutions”*.²⁵ Climate change impacts the distribution of species that carry zoonotic diseases and their proximity to humans, increasing the chance of exposure.

Beyond immediate health concerns from the COVID-19 crisis, epidemics and pandemics also have short, medium, and long-term impacts on food systems, food security, and nutrition with the poorest and most vulnerable members of society affected the most.

ⁱ An infectious disease transmitted between species from animals to humans





Breast milk adapts to changing environments. If a mother is exposed to an infection, her body will generate antibodies to that infection, which can be transmitted to her baby through her breast milk, potentially providing them with protection against illness. Recently, these protective health benefits have been demonstrated by evidence showing that mothers have antibodies to COVID-19 in their breast milk after infection or vaccination.^{26, 27, 28}

THE IMPACT OF POLLUTION

Many of the activities that lead to climate change, primarily the burning of fossil fuels, also increase pollution, which poses its own risks to the health of infants and the families' capacity to provide them with nutrition.

The burning of fossil fuels, as well as the burning of plastic waste in industry, electricity generation, and transport causes air pollution that harms the health of exposed populations. Children and infants are especially susceptible to the negative effects of air pollution due to their immaturity and rapid growth and development. Mothers' exposure to air pollution is related to increased concentrations of pollutants found in breast milk, e.g. polycyclic aromatic hydrocarbons or heavy metals in particulate matter. The health benefits of breastfeeding, however, outweigh the risks of air pollution. Mothers should therefore always be supported to breastfeed. It should be noted though, that existing evidence suggests that breastfeeding has a protective effect on adverse outcomes of indoor and outdoor air pollution exposure in respiratory (infections, lung function, asthma symptoms) and immune (allergic, nervous and cardiovascular) systems, as well as under-five mortality in both developing and developed countries.²⁹

HEALTH IMPACTS OF PLASTIC BOTTLES

Plastic infant feeding bottles are made from fossil fuels and are inherently unsustainable. They also pose a risk to infant health. A wide array of chemical substances are used as additives in plastic food contact materials to achieve desired characteristics. Most of these plastic



additives are toxic to human health and can easily leach into the surrounding environment, including food. If you would like to learn more about additives in plastic infant feeding bottles, have a look at Health Care Without Harm Europe's Factsheet **Sustainable food contact materials in the European healthcare sector.**

Endocrine disrupting chemicals (EDCs) present in food contact materials, including bisphenols, phthalates, and PFAS, are of particular concern, as they can interfere with hormone production or function and as a consequence affect organ formation and growth, sexual maturation, stress response, and behaviour. There is no consensus on a "safe" or "tolerable" level for EDC exposure – a precautionary approach therefore dictates that these substances should not be present in food contact materials at all.^{30, 31, 32, 33} Bisphenol A (BPA), a more well-known EDC, has been banned for use in plastic baby bottles in the EU. Products labelled "BPA-free", however, can still contain alternative bisphenols such as bisphenol S or bisphenol F, which are similar in structure to BPA and can have similar negative health effects.³⁴

Exposure to hazardous chemicals at vulnerable moments of human development, i.e. unborn children, neonates, and infants, is a serious concern - these exposures can alter development with lifelong consequences. Infants and unborn children are at a much higher risk of exposure because of their lower body weight and reduced ability to metabolise chemical substances (compared to adults), as well as the ongoing development of their organs and systems, and their limited diet. Premature infants, who have a weaker immune system, a rapidly developing organ system, low birth weight, and also require many medical interventions, are at an even higher risk.

When pregnant or nursing mothers are exposed to chemicals in food contact materials, they can cross the placental barrier and end up in breast milk. It is therefore important to limit mothers' exposure for the

health of their child. Fat-rich foods increase the risk of chemical migration from packaging - milk stored and served in plastic bottles therefore poses a further exposure risk to infants. When infant milk is heated in plastic bottles, harmful chemicals can easily leach into the milk. The risk of chemical migration is also higher in the case of food products that are packaged with a high surface-to-volume ratio, e.g. small bottles of infant milk.

Infants' exposure to microplastics leaching from plastic bottles is also an issue of concern.^{27, 35, 36} Infants have 10 - 20 times more microplastics in their stool than adults and scientists are worried about the potential health effects of this exposure.³⁷ The quality of infant formula relies heavily on water quality. Water from plastic bottles can contain microplastics and toxins can leach from the bottle into the water.³⁸ There is insufficient evidence of the impact of these substances on infant health.

Food for infants, children, and nursing mothers should ideally come in food contact materials that are more stable, e.g. glass, stainless steel, and ceramic, to minimise the risk of exposure to harmful chemicals.

Plastic food contact materials should be avoided.





PART 2: IMPACT OF INFANT FEEDING ON THE ENVIRONMENT

EMISSIONS FROM INFANT FORMULA PRODUCTION

Formula milk is consumed by approximately two-thirds of infants globally. It is produced using cow's milk from the dairy industry – which is a significant contributor to global greenhouse gas (GHG) emissions.^{39, 40} If you would like to learn about the environmental impact of the dairy industry, have a look at the report **Livestock's long shadow** published by the United Nation's Food and Agricultural Organization (FAO).

As of 2019, there are only 40-50 formula processing plants worldwide,⁴¹ which means milk and formula need to be transported a significant distance. The emissions for transporting raw ingredients to these plants and transporting finished products to consumers worldwide are unknown, but likely to be considerable.⁴² In 2015, the dairy industry's emissions were equivalent to more than 1,700 million tonnes of CO₂e – 3.4% of total global emissions.⁴³ The FAO calculated that between 2005 - 2015, the dairy industry's GHG emissions increased by 18% as demand for milk grew.⁴⁴

As well as CO₂e emissions - industrialised dairy production is also a key driver of environmental degradation, including deforestation, desertification, and contamination of water supplies, which is further exacerbated by climate change. This poses major

challenges to sustainable development and affects the livelihoods of millions of people.⁴⁵ Increased demand and reliance on formula increases mass production from the dairy industry and its negative environmental impact.²

The dairy industry is a major polluter of freshwater systems.⁴⁶ Nitrates entering waterways from dairy farms have been linked to toxic algal blooms and fish death, as well as colon cancers in humans.⁴⁷ Dairy production also leads to habitat loss resulting from land degradation, which is one of the main causes of global species decline.⁴⁸ Ecological systems are interconnected, meaning these impacts are not just localised and will have global consequences. In line with the Sustainable Development Goal, we must reduce our reliance on unsustainable and environmentally damaging practises to “ensure sustainable consumption and production patterns” (SDG 12).⁴⁹

ENVIRONMENTAL IMPACT OF WASTE GENERATED THROUGH BOTTLE FEEDING

Formula feeding generates a lot of waste. In 2009, 550 million infant formula cans, comprising 86,000 tonnes of metal, and 364,000 tonnes of paper ended up in landfills - production from the formula industry has more than doubled since then.^{44, 50}

Infant bottles made from plastic are harming the environment due to oil and gas extraction for production, resource-intensive manufacturing, and their end-of-life.

Most plastic waste is not recycled.^{51,52} It either ends up in landfill or is incinerated, each producing different negative environmental impacts. In landfill, plastics slowly break down, polluting water, soil, and air, (as well as taking up valuable land). Incineration (including waste-to-energy), produces carbon emissions and toxic gases such as dioxins or furans and toxic ashes, polluting the air.⁵³

Alternatively, glass bottles can be used for infant feeding to reduce plastic waste. The long-term environmental impact of glass production and transport is significantly lower than plastic as it can be easily recycled or ideally reused. Importantly, glass bottles do not leak toxins into infant milk.⁵⁴



Emma - *"I decided to breastfeed my three children primarily because it seemed the most natural and healthy way to feed them, but I also loved the fact that there was so little waste involved. I have*

always hated anything wasteful and with breastfeeding there was no packaging to put in the bin, no unused milk to pour away, and no constant boiling of the kettle or cleaning of plastic bottles that would have to be discarded after they had outlived their usefulness."

ENVIRONMENTAL IMPACT AND CO-BENEFITS OF BREASTFEEDING

Breastfeeding is the most sustainable method of infant feeding and can play an important role in reducing pressure on the environment and our contribution to climate change. It should be supported and protected to optimise the health of babies and young children, and of our planet.⁵⁵ Breastfeeding does not require intensive dairy farming, extraction of freshwater, the production of plastic bottles, storage, or transport. Breastfeeding is not wasteful - supply equals demand - and it provides a source of natural protection from infection. Breastfeeding should therefore be considered as a way of safeguarding the environment to ensure the survival of the ecosystem services that humanity relies on.



Breastfeeding has a huge impact on reducing our carbon footprint. According to a 2019 study by Imperial College London,⁴⁴ "overall, breastfeeding for six months saves an estimated 95-153 kg CO₂e per baby compared with formula feeding". If all babies in the UK were breastfed for just six months, the carbon emission savings would equate to removing between 50,000 and 77,500 cars from the road for a year.³

The greater environmental cost of formula feeding compared to breastfeeding has been investigated through life cycle assessments. These calculate a full cradle to grave assessment of production, packaging, consumption, and disposal. This includes methane produced from dairy cattle, land use for cattle grazing, energy consumption, water use, transport of products, and sterilisation of equipment at the home. It also includes the rebound effects of breastfeeding, expressed breast milk storage, and the emissions from a higher calorie intake.⁵⁴ Calculated on a global scale it is clear to see the impact that even small increases in breastfeeding rates could have. However, this is related to exclusive breastfeeding, and the benefits to the environment are reduced when bottles and other feeding methods are added, so the aim of the nurse and midwife should be helping mothers to exclusively breastfeed, if they want to.



Rebecca - *"I care deeply about trying to live sustainably and minimise environmental impact where I can. Breastfeeding for me was a way I could greatly reduce my impact on the planet*

across many levels. There are few environmental adjustments I have made to my life that could match this!"

Increased breastfeeding reduces demand for formula and therefore presents significant opportunities to reduce the impacts of intense environmental impacts across the production and supply chains of formula, including emissions and waste.


In the EU, around 88 million tonnes of food waste are generated annually with associated costs estimated at 143 billion Euros. While an estimated 20% of the total food produced is lost or wasted, 33 million people in the EU cannot afford a quality meal every second day.⁵⁶ Wasting food is not only an ethical and economic issue but it also depletes the environment of limited natural resources.

Parents can avoid a lot of food waste from infant feeding by breastfeeding instead of using infant formula. Typically, no breast milk is wasted - a breastfeeding mother naturally produces the right amount- and it does not create any packaging that needs to be discarded. When mothers express breast milk, expressed breast milk (EBM) may be wasted if not stored correctly or used within the safe time frame, and the mother will need to use containers for storing EBM. Nurses and midwives can teach others about correct storage for EBM and the option of freezing it to reduce wastage. EBM is often stored in single use plastic bags, but reusable alternatives are available.

INDIVIDUAL AND FINANCIAL BENEFITS OF BREASTFEEDING

The WHO recommends exclusively breastfeeding for six months and then combined with other foods for two years and beyond.⁵⁷





Breastfeeding has many health benefits; breastfeeding protects babies and children from a range of illnesses, including infection, diabetes, asthma, heart disease, and obesity⁵⁸, as well as cot death (Sudden Infant Death Syndrome).⁵⁹ It also protects mothers from breast and ovarian cancers and heart disease.⁶⁰ The benefits extend beyond physical health, as breastfeeding supports the mother-baby relationship and the mental health of both baby and mother.⁶¹ ⁶² Preventing illness and medical complications also plays an important role in reducing healthcare emissions.⁶³

The benefits of breastfeeding are seen in both high- and low-income countries. The Lancet reported in 2016 that increasing breastfeeding rates around the world to near-universal levels could prevent 823,000 annual deaths in children younger than five years and 20,000 annual maternal deaths from breast cancer.⁶⁴

There are also financial gains from increasing breastfeeding rates. Breastfeeding contributes to significant savings to health services, with initial investments paying off within just a few years. A costing report by the United Kingdom (UK) National Institute for Health and Care Excellence (NICE)^{65, 66} estimates that Baby Friendly accreditation will start to save a facility money after three years, owing to a reduction in the incidence of certain childhood illnesses. Baby Friendly's report, *Preventing disease and saving resources*,⁶² found that moderate increases in breastfeeding would translate into cost savings for the UK National Health Service (NHS) of many millions of pounds, and tens of thousands of fewer hospital admissions and general practitioner consultations. Calculations based on a small number of illnesses where breastfeeding is thought to have a protective effect revealed potential annual savings to the UK NHS of approximately £40 million per year with just a moderate increase in breastfeeding rates.⁶² The true

cost savings are likely to be much higher as avoiding illness will also mean a decrease in healthcare-related emissions.

CONCLUSION

Expectant and new parents are making important decisions for the health and safety of their children when they choose their preferred nutrition and infant feeding method. Although there are medical reasons why some mothers are not able to breastfeed or the neonate is not able to be breastfed, this decision is also influenced by culture, habits, information from media and advertising, as well as advice from trusted sources. One of the most trusted sources is the midwife or nurse who supports the new parents in caring for their baby.

By being aware of all the pros and cons of different feeding methods, including their impact on climate change and the environment, nurses can help families make a fully informed decision. To learn more about what practical steps nurses can take to ensure that infant feeding is both climate-smart and climate-resilient, consult our resource *Climate-smart infant feeding [Part 2] What individual nurses can do to support climate-smart infant feeding*.

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