

Transitioning to Good Health and Well-Being: The Essential Role of Breastfeeding

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1. Introduction

In the past few decades, there have been major improvements in the health of the citizens of most countries in our world. World infant mortality fell from 160 deaths under 12 months per 1000 live births in 1950, to 41 in 2016. There are still wide discrepancies between the regions with the highest infant mortality (West and Central Africa; 95 per 1000 live births) and the lowest (Western Europe; 4 per 1000 live births) rates (UNICEF 2017). There are also variations between countries and within the districts of countries. In the Sustainable Development Goals (SDG) 2018 progress report on SDG 3 *Ensure healthy lives and promote well-being for all at all ages*, the UN stated that, while the quality of global health is increasing, “people are still suffering needlessly from preventable diseases, both infectious and non-communicable, “and too many are dying prematurely” (United Nations Economic and Social Council 2019).

Promoting, and achieving, the World Health Organization (WHO) goals for breastfeeding is essential for achieving SDG 3. The WHO recommends “mothers worldwide to exclusively breastfeed infants for the child’s first six months to achieve optimal growth, development and health. Thereafter, they should be given nutritious complementary foods and continue breastfeeding up to the age of two years or beyond” (World Health Organization 2011). These recommendations are consistent with the historical cultural practices of all societies, and the promotion of breastfeeding is a return to a pre-commercial era.

Breastmilk provides complete nutrition for an infant, supporting optimal growth and development, for the first six months of life, and protects against some childhood diseases and some chronic disease later in life (Horta and Victora 2013). Physiologically, almost all mothers can breastfeed, and sometimes grandmothers or relatives can re-lactate to feed an infant if a mother is prevented from doing so by illness. In some lower–middle income countries (LMICs), such as the Maldives and Papua New Guinea, most all mothers initiate breastfeeding with rates of almost 100% (Binns 1976; Raheem et al. 2014). Some Scandinavian countries have

almost reached this level and, in Denmark, rates of initiation of 99% have been reported (Maastrup et al. 2019). With the help of family, the health system and society, and a supportive environment, high rates of breastfeeding are possible for all mothers. There are, of course, a few situations where breastfeeding is not possible (World Health Organization 2009). These situations include seriously ill, low birthweight infants and some maternal and infant infections. Many of these infants benefit from expressed breastmilk, or the feeding of breastmilk can be commenced later.

The aim of this review is to demonstrate the central role that the promotion of breastfeeding has to achieving the Sustainable Development Goals.

2. Materials and Methods

This review was based on a search of the English language literature using the keywords 'breastfeeding', 'sustainability' and 'infant feeding guidelines'. The Web of Science, Science Direct and PubMed databases were used with no time restrictions. All studies on the importance of breastfeeding are limited by the ethical restraints of undertaking research on infants in such a critical field (Binns et al. 2017). Most studies are, therefore, observational in nature, but the accumulation of evidence over many studies reassures of the benefits of breastfeeding for infants, their mothers and society.

3. Results: Sustainable Development Goal 3 Specific Targets

Specific targets have been set within each of the Sustainable Development Goals, including specific health targets for SDG 3 (World Health Organization 2017). The promotion of breastfeeding will contribute to most of these targets, in conjunction with other health interventions.

3.1. Reduce Global Maternal Mortality

By 2030, reduce the global maternal mortality ratio to less than 70 per 100,000 live births (World Health Organization 2017).

The global maternal mortality rate has fallen in recent years, from an estimated 451,000 maternal deaths in 2000 to 295,000 in 2017. The maternal mortality ratio is now 211 maternal deaths per 100,000 live births (World Health Organization 2019a). This is a continuing public health tragedy that means that an estimated 808 mothers are dying in childbirth every day. The global lifetime risk of maternal mortality for a 15-year-old girl in 2017 was estimated at 1 in 190. During the period 2012–2017, almost 80% of live births worldwide occurred with the assistance of skilled health personnel, up from 62% in 2000 to 2005 (United Nations 2019). Early initiation of breastfeeding, as advocated in the Baby Friendly Hospital

Initiative, raises oxytocin levels after delivery, causing the contraction of the uterus, and may reduce post-partum hemorrhage (Sentilhes et al. 2016; WHO UNICEF 2018). This would have a particular benefit in LMICs of reducing post-partum hemorrhage, which continues to be an important cause of maternal deaths, particularly where deliveries occur away from well-equipped facilities.

3.2. Reduce Neonatal Mortality

By 2030, end preventable deaths of newborns and children under 5 years of age, with all countries aiming to reduce neonatal mortality to at least as low as 12 per 1000 live births and under-5 mortality to at least as low as 25 per 1000 live births (World Health Organization 2017).

The Global Burden of Disease (GBD) project found that 6.64 million deaths of children and adolescents occurred in 2017 (GBD 2019). In 2018, worldwide, 5.3 million, 85% of deaths among children, occurred in the first five years of life and 2.5 million (47%) in the first month of life (UNICEF 2019b). While this is a reduction on previous decades, it is still a huge public health burden. Infectious diseases remain the leading cause of preventable deaths for children under the age of 5 years. Lower respiratory tract infections (15%), diarrheal diseases (8%) and malaria (5%) are the leading causes of death globally among children under the age of 5 (UNICEF 2019b; Walker et al. 2013). Infants and children with undernutrition are particularly vulnerable to infections, and nutrition-related factors contribute to about 45% of deaths in children under 5 years of age (UNICEF 2019b).

In the original WHO monograph on nutrition and infection by Scrimshaw et al., the authors described the importance of breastfeeding on infant survival: “the fate of newborn infants in many pre-industrial areas seems to depend largely on whether they are breastfed or not - either they are nursed or they die” (Scrimshaw et al. 1968). The importance of exclusive breastfeeding for six months to reduce infant mortality was demonstrated in the classic WHO Collaborative Study, which demonstrated higher odds, as high as 6.0, of death before six months of age for infants who were not breastfed (WHO Collaborative Group 2000). In a review at the beginning of the millennium for UNICEF, exclusive breastfeeding during the first 6 months of life was found to have the single largest potential impact on child mortality of any preventive intervention (Jones et al. 2003). In this review, Level One evidence found that exclusive breastfeeding prevented infant deaths from diarrheal disease, lower respiratory tract disease and neonatal sepsis (Jones et al. 2003). In the PROBIT study, a postnatal breastfeeding intervention increased breastfeeding rates and reduced gastro-intestinal infections in infants (Kramer et al. 2001). Numerous

studies and reviews have demonstrated the reduction in infectious diseases and hospital admissions of infants who are breastfed in countries at all levels of economic development (Horta and Victora 2013; Nguyen et al. 2020; U.S. Department of Health and Human Services 2011). The GBD study noted the importance of sudden infant death syndrome (SIDS), a condition for which exclusive breastfeeding offers some protection. A pooled data analysis of SIDS and breastfeeding found a reduction of 50% for infants breastfed for more than two months (Thompson et al. 2017).

Breastfeeding, according to the WHO recommendations, will result in a major reduction in the number of deaths under the age of 12 months by at least 820,000 each year (Rollins et al. 2016). It is also estimated that up to 50% of neonatal infant deaths could be averted if breastfeeding is initiated within the first hour of birth (Khan et al. 2015). In LMICs, an estimated 13% of all child deaths could be prevented if optimal breastfeeding levels are achieved (Nkoka et al. 2019).

The mechanism for the effectiveness of breastmilk in protecting against infections includes the composition of breastmilk with antibodies, non-specific immune factors and cellular components. An important mechanism for the prevention of infectious disease is the establishment of the microbiome. Breastmilk contains prebiotics and probiotics, and exclusive breastfeeding results in a 'healthy' microbiome. The microbiome of exclusively breastfed infants contains a higher proportion of Bifidobacteria and Lactobacillus spp., compared to formula-fed infants. These species are protective against gastrointestinal infections (Dong and Gupta 2019). The hormonal changes of breastfeeding contribute to the beneficial effects of breastfeeding on ovarian and breast cancers, and to birth spacing (Binns et al. 2016; Smith and Harvey 2011).

Additionally, breastfeeding reduces the risk of mortality in children under 5 years of age through its effect on birth spacing. Breastfeeding exerts a natural contraceptive effect by suppressing ovulation and delaying the return of menstruation, leading to increased birth spacing and fewer children (Sundhagen 2009). The risk of stunting, anemia, and mortality is higher among the children born to women with a higher number of births and short birth intervals.

Achievement of the SDG 3.2 target would require an annual reduction of approximately 1.5 million deaths of children under 12 months of age. At least 50% of this target could be realized by feeding infants according to the WHO Guidelines (Victora et al. 2016).

3.3. End Specified Epidemics

By 2030, end the epidemics of aids, tuberculosis, malaria and neglected tropical diseases and combat hepatitis, water-borne diseases and other communicable diseases (World Health Organization 2017).

Breastfeeding offers some protection against diarrheal diseases, reducing the rates by approximately 65% (U.S. Department of Health and Human Services 2011). It is not known if breastfeeding provides any protection against AIDS, malaria and tuberculosis, but partial protection is insufficient, and other public health measures are required. The WHO recommends that mothers known to be HIV-infected should be provided with lifelong antiretroviral therapy or antiretroviral prophylaxis interventions to reduce HIV transmission through breastfeeding. Mothers known to be HIV-infected (and whose infants are HIV-uninfected or of unknown HIV status) should exclusively breastfeed their infants for the first six months of life, introducing appropriate complementary foods thereafter, and then continuing to breastfeed (similar to the general population) (World Health Organization 2019b). Partial breastfeeding in the first six months of life provides inadequate protection against the vertical transmission of HIV from mother to child (Coutsoudis and Rollins 2003). Climate change will increase the global geographic spread and the incidence of many infectious diseases (Ahdoot et al. 2015; Philipsborn and Chan 2018). In infants and children, breastfeeding is important in protecting against infections, and making populations more resilient to such changes in the longer term (Lee and Binns 2019).

3.4. Reduce Premature Mortality from Non-Communicable Diseases

By 2030, reduce by one third premature mortality from non-communicable diseases through prevention and treatment, and promote mental health and well-being (World Health Organization 2017).

Improving breastfeeding rates has a role in the long-term prevention of non-communicable diseases. Within the time frame of the SDGs, breastfeeding can reduce the rates of some non-communicable diseases (NCDs) in mothers, and, generally, the effect is proportional to the total amount of time spent breastfeeding. Breastfeeding reduces the rates of ovarian cancer, premenopausal breast cancer and Type II diabetes (Gunderson et al. 2015; Scoccianti et al. 2015; Shield et al. 2018; Su et al. 2013; Victora et al. 2016; Zhang et al. 2004). A review of six cohort studies with 273,961 mothers found that the relative risk of developing diabetes for the highest duration of breastfeeding versus the lowest was 0.68 (95% CI = 0.57–0.82), reflecting a strong association between breastfeeding duration and lower rates of diabetes

(Aune et al. 2014). Mothers who have breastfed may lose weight more rapidly after pregnancy and are less likely to be obese (Snyder et al. 2019). In a long-term follow up of overweight mothers, those who exclusively breastfed for four or more months and continued breastfeeding for 12 or more months were on average 8 kg lighter six years later compared to mothers who had not breastfed their infants (Sharma et al. 2014; Tahir et al. 2019). Breastfeeding reduces the risk of subsequent cardiovascular disease in mothers, by about 10% (Nguyen et al. 2017; Peters et al. 2017). The Women's Health Initiative Study (n = 139 681) found that a lifetime history of more than 12 months lactation resulted in a reduction of hypertension (OR = 0.88), diabetes (OR = 0.80), hyperlipidemia (Or = 0.81) and cardiovascular disease (OR = 0.91) (Schwarz et al. 2009). A follow-up of the European Investigation into Cancer and Nutrition prospective cohort (n = 322,972) found that mothers who had breastfed an infant had a reduced risk of dying over the following decade (OR = 0.92) (Merritt et al. 2015). The rate of perinatal depression is lower in mothers who continue breastfeeding (Xu et al. 2014; Yusuff et al. 2015).

The roots of non-communicable diseases lie in early life nutrition. The promotion of breastfeeding to meet the WHO guidance and appropriate nutrition during the first 1000 days of existence will result in a reduction in chronic disease later in life. Infants who are breastfed have lower rates of obesity. Other chronic diseases that are reduced by breastfeeding include diabetes (both type 1 and type 2), hypertension, cardiovascular disease, hyperlipidemia, some types of cancer and inflammatory bowel disease and related digestive system disorders (Ananthakrishnan et al. 2018; Binns et al. 2016).

The role of the human microbiome in health and disease is being increasingly recognized. Breastfeeding has an important role in establishing a healthy microbiome, and this contributes to the reduced prevalence of chronic disease through the developmental origins of health and disease process (Stiemsma and Michels 2018).

3.5. Strengthen the Prevention and Treatment of Substance Abuse

Strengthen the prevention and treatment of substance abuse, including narcotic drug abuse and harmful use of alcohol (World Health Organization 2017).

The use of alcohol, tobacco products and other drugs is contra-indicated during breastfeeding, and this advice is given in public health guidelines for infant feeding (Binns et al. 2018; National Health and Medical Research Council 2013).

3.6. *Halve Global Road Traffic Deaths and Injuries*

By 2020, halve the number of global deaths and injuries from road traffic accidents (World Health Organization 2017).

Not applicable to breastfeeding.

3.7. *Universal Access to Sexual and Reproductive Health-Care Services*

By 2030, ensure universal access to sexual and reproductive health-care services, including for family planning, information and education, and the integration of reproductive health into national strategies and programmes (World Health Organization 2017).

Appropriate birth spacing results in healthier mothers and improved breastfeeding outcomes. Teenage mothers are less likely to breastfeed and to have a shorter duration of breastfeeding than older mothers (Kanhadilok et al. 2016). Postponing the age of reproduction until adulthood will improve the health of mothers and infants, and this highlights the need to make sexual health services available to this age group.

Temporary contraception for new mothers whose monthly bleeding has not returned requires exclusive or full breastfeeding day and night of an infant less than 6 months old and may be 98–99% effective (Tucker et al. 2011; World Health Organization 2018a).

3.8. *Universal Health Coverage*

Achieve universal health coverage, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all (World Health Organization 2017).

Universal health care provides the opportunity for mothers and fathers to attend health services and obtain education needed before birth. After birth mothers need appropriate treatment and advice on the best ways to continue breastfeeding if complications occur, such as mastitis. On the 30th anniversary of the Convention of the Rights of the Child the UNICEF Special Rapporteur on the Right to Food issued a report stating that support for breastfeeding, as implied in Article 18, is consistent with the legal obligations most countries have committed to, by their ratification of the Convention, which includes obligations to protect children’s right to a healthy food environment (United Nations Children’s Fund and United Nations Special Rapporteur on the Right to Food 2018).

Breastfeeding will reduce the demand on health services as infants; children and adults are less likely to require health service treatment (see above). For mothers, breastfeeding reduces the rates of a significant number of diseases, reducing overall demand and enabling expansion to unreached areas and releasing resources for promoting and supporting breastfeeding.

3.9. Reduce Death and Illness from Hazardous Chemicals, Pollution and Contamination

By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination (World Health Organization 2017).

Persistent organic pollutants (POPs) have been of environmental and health concern for more than half a century. The only two countries with long temporal trend studies are Japan and Sweden. In most cases, the trends show decreasing concentrations of POPs in mothers' milk (Fang et al. 2015). Plastic infant feeding bottles have been shown to release bisphenol A and S into infant formula (Russo et al. 2018; Walker et al. 2011). Obviously, breastfeeding is the simplest way to avoid this problem.

4. Breastfeeding and the Other SDGs

The Sustainable Development Goals are an integrated whole, and Goal 3 should be considered along with the other 16 goals. Increasing breastfeeding is essential to achieving Goal 3 of the SDGs. Breastfeeding will also make a major contribution to achieving other goals:

- **SDG 1: No Poverty.** There is a strong link between health and economic development. Gallardo-Albarran has examined progress in the 20th century and demonstrated that improving health has contributed to a narrowing of the income gap between countries (Gallardo-Albarran 2018). In a large long-term cohort study, breastfeeding was associated with improved performance in intelligence tests three decades later, and there was an association between breastfeeding and increased educational attainment and income in adulthood (Victora et al. 2015).
- **SDG 2: Zero Hunger.** Breastmilk, while providing the optimal source of nutrition for infants, and substantial benefits for mother, is also substantially cheaper than the available alternative, which is commercial infant formula. Breastmilk represents a valuable lost 'natural' resource when replaced with formula. It was estimated that, in 2012, the total potential value of breastmilk in the USA was 110

billion USD, but 2/3 of this is lost due to sub-optimal breastfeeding (Smith 2013). The total world milk formula sales grew by 40.8% from 5.5 to 7.8kg/infant/child in the period 2008–2013, and is projected to grow at the rate of 9% per annum over the next decade (Allied Market Research 2017; Baker et al. 2016).

- SDG 4: Education. There is increasing evidence that breastfeeding also confers long-term benefits to the infant, not only in health and disease, but also in the development of human capabilities (Horta 2019; Strom et al. 2019). Children who have been breastfed will have, on average, a slightly higher IQ and be healthier, including being less likely to be obese. These factors will improve education performance.
- SDG 5: End Discrimination against Women. Promoting breastfeeding should prevent 20,000 deaths of mothers from breast cancer annually (Aryeetey et al. 2018; Victora et al. 2016). As part of the strategies to enable breastfeeding, the provision of paid parental leave should be expanded (Heymann et al. 2017). Mothers are often unable to continue breastfeeding their infants after their return to work, but there are many strategies to make this easier for them (Lakati et al. 2002).
- SDG 8: Decent Work and Economic Growth. Breastfed infants had improved cognitive development (higher IQ), and this appears to be dose-related. They are also healthier, and the advantage of better health persists into adulthood. When they reach adulthood, a large cohort study documented higher incomes in breastfed infants (Straub et al. 2016; Victora et al. 2015). In situations when infants are fed formula, the cost and time spent in preparation impose significant burdens on a family (Siregar et al. 2018; Smith 2019; Walters et al. 2019).
- SDG 9: Reduced Inequality. The breastfeeding of all infants will assist in reducing inequality. Where artificial infant formula is promoted and available, poorer families may purchase cheaper varieties, over dilute the formula to reduce costs or use contaminated water supplies. In recent years, there have been instances of contamination of infant formula and shortages of supplies (Qiu et al. 2010; Xin and Stone 2008). It is difficult (but not impossible) for mothers to resume breastfeeding, and in the case of the Chinese contamination, parents spent large amounts of money buying formula that had been imported from high income countries. Food security for infants and young children is not possible without high rates of breastfeeding (Salmon 2015).
- SDG 12: Responsible Consumption and Production. The alternative to breastmilk is the use of infant formula, which is usually based on dairy milk production. The carbon footprint of milk production is high and manufacture into infant

formula requires large quantities of potable water in the order of 4000 L of water for one kg of formula milk powder (Clune et al. 2017; Hagemann et al. 2011; Karlsson et al. 2019; Rollins et al. 2016). If access to pure water is difficult, and it may become more difficult with climate change, using formula can be very dangerous. The cost of less than optimal breastfeeding is substantial, due to the increase in child and maternal morbidity and mortality (Bartick and Reinhold 2010; Bartick et al. 2013). The loss of productivity due to the lower level of cognitive development in infants who are not breastfed is estimated at 302 billion USD annually, or 0.49% of world gross national income (Rollins et al. 2016).

5. Disaster Management and Breastfeeding

The 17 Sustainable Development Goals (SDGs) include 169 targets used to monitor achievements. The United Nations Office for Disaster Risk Reduction (UNISDR) has identified 25 targets related to disaster risk reduction in 10 of the 17 SDGs (United Nations Office for Disaster Risk Reduction 2015). Unfortunately, with the effects of climate change becoming more prominent, the number and severity of natural disasters is increasing. It is important that, in any disaster situation requiring the provision of food, the breastfeeding of infants and young children receives early attention. If it is at all possible for mothers to continue to breastfeed, they should be encouraged as much as possible, in order to minimize infant morbidity. The provision of emergency supplies of infant formula in disaster situations should be carefully managed to avoid permanent changes to infant feeding patterns. Only high-quality infant formula in plain packaging should be used to avoid advertising and breaching the International Code of Marketing of Breast-Milk Substitutes (the 'BMS Code') (WHO 1981; World Health Organization 2018b). The promotion of breastfeeding and feeding mothers (water and food) will be more sustainable and provide better health outcomes than distributing infant formula (Binns et al. 2012b; Summers and Bilukha 2018).

6. Achieving Breastfeeding Goals

In historical times, breastfeeding was universal, as all infants were breastfed by their mothers or a wet nurse. Currently, the WHO/UNICEF estimates that worldwide, 44% of infants begin breastfeeding within one hour of birth (UNICEF 2019a). Exclusive breastfeeding 0–6 months is estimated at 42%, and 65% continue beyond 12 months, but these results are dependent on the method and definitions used in collecting the data (Binns et al. 2012a). Improving breastfeeding rates is one of the most important steps in achieving the targets of SDG 3

(Perez-Escamilla 2017). The Sustainable Development Goals provide an appropriate framework for supporting universal breastfeeding targets. The WHO and UNICEF have endorsed many strategies to improve breastfeeding that have been evaluated. However, the resources and the will to implement have not been forthcoming. In part, this is due to the long-term nature of public health benefits compared to the short-term political cycle, and, in part, due to the role of industry in infant formula production and promotion. Strategies to achieve optimum breastfeeding will require the involvement of family, health services, local and national governments and society in general. A global environment supportive of breastfeeding is required, which would include the following components.

6.1. A Supportive Societal Environment

Media reports, advertising and social media ideally should all portray the benefits and joys of breastfeeding, as has already been done by many mothers' groups and breastfeeding advocates. Breastfeeding needs to be regarded as the norm and specific programs of information need to be implemented to provide accurate information. While breastfeeding is an individual activity, it requires investment at a societal level (Brown 2017). In a globally connected world, countries which are large producers of infant formula have a duty to limit their exports of these products (Galtry 2013; Gribble and Smith 2014). Public places need facilities where mothers can care for their infants and feel comfortable about breastfeeding. In many economies, mothers undertake paid employment and would like to continue breastfeeding while returning to work. Maternal leave, including paid leave, has been shown to improve breastfeeding rates (Chai et al. 2018). Informal arrangements to breastfeed and return to employment are also beneficial (Lakati et al. 2002).

6.2. Maternal and Family Preparation for Breastfeeding

Giving mothers knowledge and motivation about breastfeeding is important. The best time to begin to discuss the benefits of breastfeeding is before or soon after the mother becomes pregnant (National Health and Medical Research Council 2012). Antenatal education, counselling and encouragement are important, and are of benefit. This can be achieved through formal structures, the use of volunteer health promotors or village health workers. Fathers and other close family members are important participants in infant care, and they all need knowledge and motivation (Maycock et al. 2013). The use of smartphones has become almost universal and they provide an important medium for sharing knowledge and experience, provided that this is moderated to ensure accuracy (White et al. 2019).

6.3. Health Service Support

Universal health access will mean that all health workers will need education into the benefits of breastmilk and the BMS Marketing Code so that BFHI principles can be implemented at all levels of the health service. Breastfeeding counselling and promotion during antenatal education is important. A Cochrane review on prenatal intervention found that healthcare-professional-led breastfeeding education, and non-healthcare-professional-led counselling and peer support interventions can result in some improvements in the number of women beginning to breastfeed (Balogun et al. 2016; Perez-Escamilla 2020). The Baby Friendly Hospital (and health service) Initiative needs to be implemented universally to provide a favorable environment for mothers and infants (Perez-Escamilla 2020; Spaeth et al. 2018; WHO 2019; WHO UNICEF 2018). At present, the endorsement or even accreditation of BFHI is widespread, but may not always be applied in practice (Hawkins et al. 2014; WHO UNICEF 2018). The aims of the BFHI include the early initiation of breastfeeding (early skin to skin contact), feeding colostrum and continued exclusive breastfeeding, all of which are highly effective and low-cost interventions for short and long term health of infants (Bhutta and Labbok 2011; Bhutta et al. 2014; Rollins and Doherty 2019; Rollins et al. 2016). Hospitals and other components of the health system must not promote infant formula in any way, or accept free or low-cost supplies or promotional material.

6.4. The Promotion of Breast Milk Substitutes

Recognizing the damage caused by breast milk substitutes, the World Health Assembly approved the International Code of Marketing of Breast-Milk Substitutes in 1981 (WHO 2020a). Support, in principle, for the code is extensive, but, when it comes to legislative action, it is often limited (WHO and UNICEF 2020). Very few countries have marketing restrictions on products suitable for up to three years of age, and the majority have voluntary restrictions only up to six months of age (WHO 2020a, 2020b). The Code is widely breached in many LMICs, with widespread advertising across all media, including television, print and social media (IBFAN 2018). Infant formula products designed for toddlers are widely marketed, and parents often assume that the exaggerations in the advertisements apply to infants of all ages. Many countries, particularly middle-income countries, have experienced a surge in infant formula use, as incomes increase (Neves et al. 2020; Son 2017). Vietnam is an example of an LMIC that has experienced sales growth of 12% per annum over the past decade (Whitehead 2020). The government's response has been similar to other Asian countries such as China and Japan, to encourage and support local

production of infant formula. This is despite cow milk production for infant formula having a large carbon footprint and requiring large quantities of potable water in its production (Smith 2019; Sultana et al. 2014). The use of plain label packaging has been highly successful in reducing tobacco sales, and could be beneficial in curbing the widespread promotion of infant formula (Drovandi et al. 2019; Wise 2017).

6.5. Specific Groups May Need Special Programs eg Obese Mothers, Illness

There are a small number of mothers for whom breastfeeding may be contra-indicated (World Health Organization 2009). These mothers and other mother–infant dyads in which there are physical conditions (e.g., obesity), or illnesses that impair breastfeeding, may require special counselling and support from the health system. Breastfeeding can usually be maintained using the mother’s own supply or from donor breastmilk.

6.6. The COVID-19 Pandemic

There have been reports that mothers with COVID have stopped breastfeeding their infants, and this action is being recommended in some countries, including Japan. However, the World Health Organisation recommends: “that mothers with suspected or confirmed COVID-19 should be encouraged to initiate or continue to breastfeed (World Health Organization 2020). Mothers should be counselled that the benefits of breastfeeding substantially outweigh the potential risks for transmission”. This is the position of most pediatric societies (Rozycki and Kotecha 2020).

7. Conclusions

Globally, appropriate breastfeeding practices have the potential to prevent over 800,000 deaths of children under five years of age annually. In low income countries, an estimated 13% of all child deaths could be prevented if optimal levels of breastfeeding were achieved. If breastfeeding increases, infants, children and adults will all be healthier, and contribute to achieving the SDGs. Minimizing avoidable health care costs will facilitate achieving universal health care. Promoting breastfeeding will not have any detrimental on any of the other SDGs.

The sustainability costs of breastmilk substitutes promoted by industry as alternatives to breastfeeding are massive, and from an economic perspective, the cost of not breastfeeding is into the trillions of dollars. When we add the human costs of not breastfeeding, the benefits of promoting breastfeeding, as the world works towards achieving the Sustainable Development Goals, are overwhelming. To achieve

these benefits, the combined efforts of many sectors of society and government will be required.

We summarize our chapter in the following statement:

Breastmilk is best for all babies, mother–baby dyads, for lifetime health, for sustainability, and for the environment and economy. Protect it from harm or it is gone.

Author Contributions: Each author made substantial contributions to the conception of the chapter, the acquisition, analysis, or interpretation of the literature references used in the work, and writing and revision. The final manuscript has been approved by all authors, and we agree to be personally accountable for the authors' contributions

Funding: This research received no external funding.

Conflicts of Interest: The authors declare no conflict of interest.

References

- Ahdoot, Samantha, Susan. E. Pacheco, and The Council on Environmental Health American Academy of Pediatrics. 2015. Global Climate Change and Children's Health. *Pediatrics* 136: E1468–E1484. [CrossRef] [PubMed]
- Allied Market Research. 2017. Baby Infant Formula Market Overview. Available online: <https://www.alliedmarketresearch.com/baby-infant-formula-market> (accessed on 5 October 2019).
- Ananthakrishnan, Ashwin N., Charles. N. Bernstein, Dimitros Iliopoulos, Andrew Macpherson, Markus. F. Neurath, Raja. A. R. Ali, Stephan R. Vavricka, and Claudio Fiocchi. 2018. Environmental triggers in IBD: A review of progress and evidence. *Nature Reviews Gastroenterology & Hepatology* 15: 39–49. [CrossRef]
- Aryeetey, Richmond, Amber Hromi-Fiedler, Seth Adu-Afarwuah, Esi Amoafu, Gifty Ampah, Marian Gatiba, Akosua Kwakye, Gloria Otoo, Gyikua Plange-Rhule, Isabella Sagoe-Moses, and et al. 2018. Pilot testing of the Becoming Breastfeeding Friendly toolbox in Ghana. *International Breastfeeding Journal* 13: 30. [CrossRef] [PubMed]
- Aune, Dagfinn, Teresa Norat, Pal Romundstad, and Lars. J. Vatten. 2014. Breastfeeding and the maternal risk of type 2 diabetes: a systematic review and dose-response meta-analysis of cohort studies. *Nutrition, Metabolism and Cardiovascular Diseases* 24: 107–15. [CrossRef] [PubMed]
- Baker, Phillip, Julie Smith, Libby Salmon, Sharon Friel, George Kent, Alessandro Iellamo, J P Dadhich, and Mary J Renfrew. 2016. Global trends and patterns of commercial milk-based formula sales: is an unprecedented infant and young child feeding transition underway? *Public Health Nutrition* 19: 2540–50. [CrossRef]

- Balogun, Olukunmi O, Elizabeth J OSullivan', Alison McFadden, Erika Ota, Anna Gavine, Christine D Garner, Mary J Renfrew, and Stephen MacGillivray. 2016. Interventions for promoting the initiation of breastfeeding. *Cochrane Database of Systematic Reviews* 11: CD001688. [CrossRef] [PubMed]
- Bartick, Melissa, and Arnold Reinhold. 2010. The Burden of Suboptimal Breastfeeding in the United States: A Pediatric Cost Analysis. *Pediatrics* 125: E1048–E1056. [CrossRef]
- Bartick, Melissa C., Alison M. Stuebe, Eleanor Bimla Schwarz, Christine Luongo, Arnold G. Reinhold, and E. Michael Foster. 2013. Cost Analysis of Maternal Disease Associated With Suboptimal Breastfeeding. *Obstetrics and Gynecology* 122: 111–19. [CrossRef]
- Bhutta, Zulfiqar A, and Miriam Labbok. 2011. Scaling up breastfeeding in developing countries. *Lancet* 378: 378–80. [CrossRef]
- Bhutta, Zulfiqar A., Jai K. Das, Rajiv Bahl, Joy E. Lawn, Rehana A. Salam, Vinod K. Paul, M. Jeeva Sankar, Hannah Blencowe, Arjumand Rizvi, Victoria B. Chou, and et al. 2014. Can available interventions end preventable deaths in mothers, newborn babies, and stillbirths, and at what cost? *The Lancet* 384: 347–70. [CrossRef]
- Binns, Colin W. 1976. Food, sickness and death in children of the highlands of Papua, New Guinea. *Journal of Tropical Pediatrics* 22: 9–11. [CrossRef] [PubMed]
- Binns, Colin, Andy Lee, Kay Sauer, and Katie Hewitt. 2012a. Reported Breastfeeding Rates in the Asia-Pacific Region. *Current Pediatric Reviews* 8: 339–45. [CrossRef]
- Binns, Colin W, Mi Kyung Lee, Li Tang, Chuan Yu, Tomiko Hokama, and Andy Lee. 2012b. Ethical issues in infant feeding after disasters. *Asia Pacific Journal of Public Health* 24: 672–80. [CrossRef] [PubMed]
- Binns, Colin W., Mi Kyung Lee, and Wah Yun Low. 2016. The Long-Term Public Health Benefits of Breastfeeding. *Asia Pacific Journal of Public Health* 28: 7–14. [CrossRef]
- Binns, Colin, Mi Kyung Lee, and Masaharu Kagawa. 2017. Ethical Challenges in Infant Feeding Research. *Nutrients*, 9. [CrossRef]
- Binns, Colin, Mi Kyung Lee, Masaharu Kagawa, Wah Yun Low, Jane Scott, Andy Lee, Alfred Zervas, Bruce Maycock, Liqian Qiu, Aza Yusuff, and et al. 2018. Infant Feeding Guidelines for the Asia Pacific Region. *Asia Pacific Journal of Public Health* 40: 1010539518809823. [CrossRef]
- Brown, Amy. 2017. Breastfeeding as a public health responsibility: A review of the evidence. *Journal of Human Nutrition and Dietetics* 30: 759–70. [CrossRef]
- Chai, Yan, Arijit Nandi, and Jody Heymann. 2018. Does extending the duration of legislated paid maternity leave improve breastfeeding practices? Evidence from 38 low-income and middle-income countries. *BMJ Global Health*, 3. [CrossRef]
- Clune, Stephen, Enda Crossin, and Karli Verghese. 2017. Systematic review of greenhouse gas emissions for different fresh food categories. *Journal of Cleaner Production* 140: 766–83. [CrossRef]

- Coutsoudis, Anna, and Nigel Rollins. 2003. Breast-feeding and HIV transmission: The jury is still out. *Journal of Pediatric Gastroenterology and Nutrition* 36: 434–42. [CrossRef]
- Dong, Tien S., and Arpana Gupta. 2019. Influence of Early Life, Diet, and the Environment on the Microbiome. *Clinical Gastroenterology and Hepatology* 17: 231–42. [CrossRef] [PubMed]
- Drovandi, Aaron, Peta-Ann Teague, Beverly Glass, and Bunmi Malau-Aduli. 2019. A systematic review of the perceptions of adolescents on graphic health warnings and plain packaging of cigarettes. *Systematic Reviews* 8: 25. [CrossRef] [PubMed]
- Fang, Johan, Elisabeth Nyberg, Ulrika Winnberg, Anders Bignert, and Ake Bergman. 2015. Spatial and temporal trends of the Stockholm Convention POPs in mothers' milk - a global review. *Environmental Science and Pollution Research* 22: 8989–9041. [CrossRef]
- Gallardo-Albarran, Daniel. 2018. Health and economic development since 1900. *Economics & Human Biology* 31: 228–37. [CrossRef]
- Galtry, Judith. A. 2013. Improving the New Zealand dairy industry's contribution to local and global wellbeing: the case of infant formula exports. *New Zealand Medical Journal* 126: 82–89. [PubMed]
- Global Burden of Diseases (GBD) 2017 Child and Adolescent Health Collaborators. 2019. Diseases, Injuries, and Risk Factors in Child and Adolescent Health, 1990 to 2017: Findings From the Global Burden of Diseases, Injuries, and Risk Factors 2017 Study. *JAMA Pediatr* 173: e190337. [CrossRef]
- Gribble, Karleen, and Julie. P. Smith. 2014. China's 'White Gold' Infant Formula Rush Comes at a Public Health Cost. Available online: <http://theconversation.com/chinas-white-gold-infant-formula-rush-comes-at-a-public-health-cost-34363> (accessed on 13 Sept 2020).
- Gunderson, Erica P., Shanta R. Hurston, Xian Ning, Joan C. Lo, Yvonne Crites, David Walton, Kathryn G. Dewey, Robert A. Azevedo, Stephen Young, Gary Fox, and et al. 2015. Lactation and Progression to Type 2 Diabetes Mellitus After Gestational Diabetes Mellitus. *Annals of Internal Medicine* 163: 889. [CrossRef] [PubMed]
- Hagemann, Martin, Torsten Hemme, Asaah Ndambi, Othman Alqaisi, and Mst Nadira Sultana. 2011. Benchmarking of greenhouse gas emissions of bovine milk production systems for 38 countries. *Animal Feed Science and Technology* 166–67: 46–58. [CrossRef]
- Hawkins, Summer Sherburne, Ariel Dora Stern, Christopher F. Baum, and Matthew W. Gillman. 2014. Compliance with the Baby-Friendly Hospital Initiative and impact on breastfeeding rates. *Archives of Disease in Childhood-Fetal and Neonatal Edition* 99: F138–F43. [CrossRef]
- Heymann, Jody, Aleta R. Sprague, Arijit Nandi, Alison Earle, Priya Batra, Adam Schickedanz, Paul J. Chung, and Amy Raub. 2017. Paid parental leave and family wellbeing in the sustainable development era. *Public Health Reviews* 38: 21. [CrossRef]
- Horta, Bernado L. 2019. Breastfeeding: Investing in the Future. *Breastfeeding Medicine* 14: S11–S12. [CrossRef] [PubMed]

- Horta, Bernado L., and Cesar G. Victora. 2013. The Short Term Effects of Breastfeeding: A Systematic Review. Available online: http://www.who.int/maternal_child_adolescent/documents/breastfeeding_short_term_effects/en/ (accessed on 1 February 2018).
- IBFAN. 2018. *Report on the Monitoring of the Code in 11 Countries of Asia*. Georgetown: International Baby Food Action Network, Available online: <https://www.bpni.org/wp-content/uploads/2018/12/Monitoring-of-the-Code-in-11-Countries-of-Asia.pdf> (accessed on 10 July 2020).
- Jones, Gareth, Richard W. Steketee, Robert E. Black, Zulfiqar A. Bhutta, Saul S. Morris, and Bellagio Child Survival Study Group. 2003. How many child deaths can we prevent this year? *Lancet* 362: 65–71. [CrossRef]
- Kanhadilok, Supanee, Nancy L. McCain, Jacqueline M. McGrath, Nancy Jallo, Sarah K. Price, and Chantira Chiaranai. 2016. Factors Associated With Exclusive Breastfeeding Through Four Weeks Postpartum in Thai Adolescent Mothers. *The Journal of Perinatal Education* 25: 150–61. [CrossRef] [PubMed]
- Karlsson, Johan O., Tara Garnett, Nigel C. Rollins, and Elin Roos. 2019. The carbon footprint of breastmilk substitutes in comparison with breastfeeding. *Journal of Cleaner Production* 222: 436–45. [CrossRef] [PubMed]
- Khan, Jehangir, Linda Vesel, Rajiv Bahl, and José Carlos Martines. 2015. Timing of Breastfeeding Initiation and Exclusivity of Breastfeeding During the First Month of Life: Effects on Neonatal Mortality and Morbidity-A Systematic Review and Meta-analysis. *Maternal and Child Health Journal* 19: 468–79. [CrossRef]
- Kramer, Michael S., Beverley Chalmers, Ellen D. Hodnett, Zinaida Sevkovskaya, Irina Dzikovich, Stanley Shapiro, Jean-Paul Collet, Irina Vanilovich, Irina Mezen, Thierry Ducruet, and et al. 2001. Promotion of Breastfeeding Intervention Trial (PROBIT): A randomized trial in the Republic of Belarus. *JAMA* 285: 413–20. [CrossRef]
- Lakati, Alice, Colin Binns, and Mark Stevenson. 2002. Breast-feeding and the working mother in Nairobi. *Public Health Nutrition* 5: 715–18. [CrossRef]
- Lee, MiKyung, and Colin W. Binns. 2019. Breastfeeding and the Risk of Infant Illness in Asia: A Review. *International Journal of Environmental Research and Public Health* 17: 186. [CrossRef]
- Maastrup, Ragnhild, Laura N. Haiek, and Neo-BFHI Survey Group. 2019. Compliance with the “Baby-friendly Hospital Initiative for Neonatal Wards” in 36 countries. *Maternal & Child Nutrition* 15: e12690. [CrossRef]
- Maycock, Bruce, Colin W. Binns, Satvinder Dhaliwal, Jenny Tohotoa, Yvonne Hauck, Sharyn Burns, and Peter Howat. 2013. Education and support for fathers improves breastfeeding rates: A randomized controlled trial. *Journal of Human Lactation* 29: 484–90. [CrossRef]

- Merritt, Melissa A., Elio Riboli, Neil Murphy, Mai Kadi, Anne Tjonneland, Anja Olsen, Kim Overvad, Laure Dossus, Laureen Dartois, Françoise Clavel-Chapelon, and et al. 2015. Reproductive factors and risk of mortality in the European Prospective Investigation into Cancer and Nutrition; a cohort study. *BMC Medicine* 13: 252. [CrossRef] [PubMed]
- National Health and Medical Research Council. 2012. *Infant Feeding Guidelines*. Canberra: National Health and Medical Research Council.
- National Health and Medical Research Council. 2013. *Infant Feeding Guidelines for Health Workers*. Canberra: NHMRC.
- Neves, Paulo A. R., Giovanna Gatica-Dominguez, Nigel C. Rollins, Ellen Piwoz, Phillip Baker, Aluisio J. D. Barros, and Cesar G. Victora. 2020. Infant Formula Consumption Is Positively Correlated with Wealth, Within and Between Countries: A Multi-Country Study. *Journal of Nutrition* 150: 910–17. [CrossRef]
- Nguyen, Binh, Kai Jin, and Ding Ding. 2017. Breastfeeding and maternal cardiovascular risk factors and outcomes: A systematic review. *PLoS ONE* 12: e0187923. [CrossRef] [PubMed]
- Nguyen, Phung, Colin W. Binns, Anh Vo Van Ha, Tan Khac Chu, Luat Cong Nguyen, Dat Van Duong, Dung Van Do, and Andy H. Lee. 2020. Prolactal and early formula feeding increase risk of infant hospitalisation: a prospective cohort study. *Archives of Disease in Childhood* 105: 122–26. [CrossRef]
- Nkoka, Own, Peter A. M. Ntenda, Victor Kanje, Edith B. Milanzi, and Amit Arora. 2019. Determinants of timely initiation of breast milk and exclusive breastfeeding in Malawi: A population-based cross-sectional study. *International Breastfeeding Journal*, 14. [CrossRef]
- Perez-Escamilla, Rafael. 2017. Food Security and the 2015–2030 Sustainable Development Goals: From Human to Planetary Health: Perspectives and Opinions. *Current Developments in Nutrition* 1: e000513. [CrossRef] [PubMed]
- Perez-Escamilla, Rafael. 2020. Breastfeeding in the 21st century: How we can make it work. *Social Science & Medicine* 244: 112331. [CrossRef]
- Peters, Sanne A. E., Ling Yang, Yu Guo, Yiping P. Chen, Zheng Bian, Jianwei Du, Jie Yang, Shanpeng Li, Liming Li, Mark Woodward, and et al. 2017. Breastfeeding and the Risk of Maternal Cardiovascular Disease: A Prospective Study of 300 000 Chinese Women. *Journal of the American Heart Association*, 6. [CrossRef]
- Philipsborn, Rebecca P., and Kevin Chan. 2018. Climate Change and Global Child Health. *Pediatrics*, 141. [CrossRef]
- Qiu, Liqian, Colin W. Binns, Yun Zhao, Andy H. Lee, and Xing Xie. 2010. Breastfeeding practice in Zhejiang province, PR China, in the context of melamine-contaminated formula milk. *Journal of Health, Population, and Nutrition* 28: 189–98.
- Raheem, Raheema Abdul, Colin W. Binns, Hui Jun Chih, and Kay Sauer. 2014. Determinants of the introduction of prelactal feeds in the Maldives. *Breastfeeding Medicine* 9: 473–78. [CrossRef] [PubMed]

- Rollins, Nigel, and Tanya Doherty. 2019. Improving breastfeeding practices at scale. *Lancet Global Health* 7: E292–E293. [CrossRef]
- Rollins, Nigel C., Nita Bhandari, Nemat Hajeebhoy, Susan Horton, Chessa K. Lutter, Jose C. Martines, Ellen G. Piwoz, Linda M. Richter, Cesar G. Victora, and Group Lancet Breastfeeding Series. 2016. Why invest, and what it will take to improve breastfeeding practices? *Lancet* 387: 491–504. [CrossRef]
- Rozycki, Henry J., and Sailesh Kotecha. 2020. Covid-19 in pregnant women and babies: What pediatricians need to know. *Paediatric Respiratory Reviews*. [CrossRef]
- Russo, Giacomo, Francesco Barbato, Eleonora Cardone, Margherita Fattore, Stefania Albrizio, and Lucia Grumetto. 2018. Bisphenol A and Bisphenol S release in milk under household conditions from baby bottles marketed in Italy. *Journal of Environmental Science and Health Part B-Pesticides Food Contaminants and Agricultural Wastes* 53: 116–20. [CrossRef]
- Salmon, Libby. 2015. Food security for infants and young children: An opportunity for breastfeeding policy? *International Breastfeeding Journal*. [CrossRef]
- Schwarz, Eleanor Bimla, Roberta M. Ray, Alison M. Stuebe, Matthew A. Allison, Roberta B. Ness, Matthew S. Freiberg, and Jane A. Cauley. 2009. Duration of lactation and risk factors for maternal cardiovascular disease. *Obstet Gynecol* 113: 974–82. [CrossRef]
- Scoccianti, Chiara, Timothy J. Key, Annie S. Anderson, Paola Armaroli, Franco Berrino, Michele Cecchini, Marie-Christine Boutron-Ruault, Mchael Leitzmann, Teresa Norat, Hilary Powers, and et al. 2015. European Code against Cancer 4th Edition: Breastfeeding and cancer. *Cancer Epidemiology* 39: S101–S106. [CrossRef]
- Scrimshaw, Nevin Stewart, Carl Ernest Taylor, and John Everett Gordon. 1968. Interactions of nutrition and infection. *Monograph Series World Health Organ* 57: 3–329.
- Sentilhes, Loïc, Benjamin Merlot, Hugo Madar, François Sztark, Stéphanie Brun, and Catherine Deneux-Tharoux. 2016. Postpartum haemorrhage: prevention and treatment. *Expert Review of Hematology* 9: 1043–61. [CrossRef]
- Sharma, Andrea J., Dborah L. Dee, and Samantha M. Harden. 2014. Adherence to breastfeeding guidelines and maternal weight 6 years after delivery. *Pediatrics* 134: S42–S49. [CrossRef]
- Shield, Kevin D., Laure Dossus, Agnès Fournier, Claire M. Micallef, Sabina Rinaldi, Agnès Rogel, Isabelle Heard, Sophie Pilleron, Freddie Bray, and Isabelle Soerjomataram. 2018. The impact of historical breastfeeding practices on the incidence of cancer in France in 2015. *Cancer Causes & Control* 29: 325–32. [CrossRef]
- Siregar, Adiatma Y. M., Pipit Pitriyan, and Dylan Walters. 2018. The annual cost of not breastfeeding in Indonesia: the economic burden of treating diarrhea and respiratory disease among children (<24mo) due to not breastfeeding according to recommendation. *International Breastfeeding Journal*, 13. [CrossRef]
- Smith, Julie P. 2013. “Lost Milk?” Counting the Economic Value of Breast Milk in Gross Domestic Product. *Journal of Human Lactation* 29: 537–46. [CrossRef] [PubMed]

- Smith, Julie P. 2019. A commentary on the carbon footprint of milk formula: harms to planetary health and policy implications. *International Breastfeeding Journal* 14: 49. [CrossRef]
- Smith, Julie. P., and Peta. J. Harvey. 2011. Chronic disease and infant nutrition: Is it significant to public health? *Public Health Nutrition* 14: 279–89. [CrossRef]
- Snyder, Gabrielle G., Claudia Holzman, Tao Sun, Bertha L. Bullen, Marianne Bertolet, and Janet M. Catov. 2019. Breastfeeding Greater Than 6 Months Is Associated with Smaller Maternal Waist Circumference Up To One Decade After Delivery. *Journal of Womens Health* 28: 462–72. [CrossRef]
- Son, Minh. 2017. Vietnam's appetite for foreign baby formula is making US giants rich. *VN Express*, May 26.
- Spaeth, Anna, Elisabeth Zemp, Sonja Merten, and Julia Dratva. 2018. Baby-Friendly Hospital designation has a sustained impact on continued breastfeeding. *Maternal and Child Nutrition*, 14. [CrossRef]
- Stiemsma, Leah T., and Karin B. Michels. 2018. The Role of the Microbiome in the Developmental Origins of Health and Disease. *Pediatrics*, 141. [CrossRef] [PubMed]
- Straub, Niels, Philipp Grunert, Kate Northstone, and Pauline Emmett. 2016. Economic impact of breast-feeding-associated improvements of childhood cognitive development, based on data from the ALSPAC. *British Journal of Nutrition*, 1–6. [CrossRef]
- Strom, Marin, Erik Lykke Mortensen, Ulrik Schiøler Kesmodel, Thorhallur Halldorsson, Jørn Olsen, and Sjurður F. Olsen. 2019. Is breast feeding associated with offspring IQ at age 5? Findings from prospective cohort: Lifestyle During Pregnancy Study. *BMJ Open*, 9. [CrossRef] [PubMed]
- Su, Dada, Maria Pasalich, Andy H. Lee, and Colin W. Binns. 2013. Ovarian cancer risk is reduced by prolonged lactation: A case-control study in southern China. *The American Journal of Clinical Nutrition* 97: 354–59. [CrossRef] [PubMed]
- Sultana, Madira, Mohammad Mohi Uddin, Bradley G. Ridoutt, and Kurt J. Peters. 2014. Comparison of water use in global milk production for different typical farms. *Agricultural Systems* 129: 9–21. [CrossRef]
- Summers, Aimee, and Oleg O. Bilukha. 2018. Suboptimal infant and young child feeding practices among internally displaced persons during conflict in eastern Ukraine. *Public Health Nutrition* 21: 917–26. [CrossRef]
- Sundhagen, Rebecca. 2009. Breastfeeding and Child Spacing. In *Childbirth Across Cultures: Ideas and Practices of Pregnancy, Childbirth and the Postpartum*. Edited by H. Selin. Dordrecht: Springer Netherlands, pp. 23–32.
- Tahir, Muna J., Jacob L. Haapala, Laurie P. Foster, Katy M. Duncan, April M. Teague, Elyse O. Kharbanda, Patricia M. McGovern, Kara M. Whitaker, Kathleen M. Rasmussen, David A. Fields, and et al. 2019. Association of Full Breastfeeding Duration with Postpartum Weight Retention in a Cohort of Predominantly Breastfeeding Women. *Nutrients* 11: 938. [CrossRef]

- Thompson, John M. D., Kawai Tanabe, Rachel Y. Moon, Edwin A. Mitchell, Cliona McGarvey, David Tappin, Peter S. Blair, and Fern R. Hauck. 2017. Duration of Breastfeeding and Risk of SIDS: An Individual Participant Data Meta-analysis. *Pediatrics*, 140. [CrossRef] [PubMed]
- Tucker, Christine M., Ellen K. Wilson, and Ghazaleh Samandari. 2011. Infant feeding experiences among teen mothers in North Carolina: Findings from a mixed-methods study. *International Breastfeeding Journal* 6: 14. [CrossRef]
- U.S. Department of Health and Human Services. 2011. *The Surgeon General's Call to Action to Support Breastfeeding*. Washington, DC: Department of Health and Human Services Office of the Surgeon General.
- UNICEF. 2017. *State of the World's Children 2017*. New York: Communications Division UNICEF.
- UNICEF. 2019a. *State of the World's Children 2019*. New York: Communications Division UNICEF.
- UNICEF. 2019b. *Levels & Trends in Child Mortality 2019 Estimates Developed by the UN Inter-Agency Group for Child Mortality Estimation*. New York: UNICEF.
- United Nations. 2019. *The Sustainable Development Goals Report 2019*. New York: UN.
- United Nations Children's Fund and United Nations Special Rapporteur on the Right to Food. 2018. *Protecting Children's Right to a Healthy Food Environment*. Geneva: UNICEF and United Nations Human Rights Council.
- United Nations Economic and Social Council. 2019. *Progress towards the Sustainable Development Goals Report of the Secretary-General E/2019/68*. New York: United Nations.
- United Nations Office for Disaster Risk Reduction. 2015. *Disaster Risk Reduction and Resilience in the 2030 Agenda for Sustainable Development*. New York: UNISDR, Available online: https://www.preventionweb.net/files/46052_disasterriskreductioninthe2030agenda.pdf (accessed on 25 September 2019).
- Victora, Cesar G., Bernardo Lessa Horta, Christian Lorette Mola, Luciana Quevedo, Ricardo Tavares Pinheiro, Denise P. Gigante, Helen Gonçalves, and Fernando C. Barros. 2015. Association between breastfeeding and intelligence, educational attainment, and income at 30 years of age: A prospective birth cohort study from Brazil. *Lancet Global Health* 3: e199–e205. [CrossRef]
- Victora, Cesar G., Rajiv Bahl, Aluísio J. D. Barros, Giovanni V. A. Franca, Susan Horton, Julia Krasevec, Simon Murch, Mari Jeeva Sankar, Neff Walker, Nigel C. Rollins, and et al. 2016. Breastfeeding in the 21st century: Epidemiology, mechanisms, and lifelong effect. *The Lancet* 387: 475–90. [CrossRef]
- Walker, Susan P., Theodore D. Wachs, Sally Grantham-McGregor, Maureen M. Black, Charles A. Nelson, Sandra L. Huffman, Helen Baker-Henningham, Susan M. Chang, Jena D. Hamadani, Betsy Lozoff, and et al. 2011. Child Development 1 Inequality in early childhood: risk and protective factors for early child development. *The Lancet* 378: 1325–38. [CrossRef]

- Walker, Christa L., Igor Rudan, Li Liu, Harish Nair, Evropi Theodoratou, Zulfiqar A. Bhutta, Katherine L. O'Brien, Harry Campbell, and Robert E. Black. 2013. Global burden of childhood pneumonia and diarrhoea. *The Lancet* 381: 1405–16. [CrossRef]
- Walters, Dylan D., Linh T. H. Phan, and Roger Mathisen. 2019. The cost of not breastfeeding: global results from a new tool. *Health Policy and Planning* 34: 407–17. [CrossRef] [PubMed]
- White, Becky, Roslyn C. Giglia, James A. White, Satvinder Dhaliwal, Sharyn K. Burns, and Jane A. Scott. 2019. Gamifying Breastfeeding for Fathers: Process Evaluation of the Milk Man Mobile App. *JMIR Pediatr Parent* 2: e12157. [CrossRef]
- Whitehead, Richard. 2020. Dairy Majors investing in Vietnam. Available online: <https://www.dairyreporter.com/Article/2020/01/08/Dairy-majors-investing-as-Vietnam-ramps-up-milk-production> (accessed on 25 May 2020).
- WHO. 1981. *International Code of Marketing of Breast-milk Substitutes*. Geneva: WHO.
- WHO. 2019. *Protecting, Promoting and Supporting Breastfeeding in Facilities Providing Maternity and Newborn Services*. Geneva: World Health Organization, Available online: https://www.who.int/elena/titles/full_recommendations/breastfeeding-support/en/ (accessed on 5 June 2020).
- WHO. 2020a. *Marketing of Breast-Milk Substitutes: National Implementation of the International Code, Status Report 2020*. Geneva: World Health Organization.
- WHO. 2020b. *The International Code of Marketing of Breast-Milk Substitutes: Frequently Asked Questions on the Roles and Responsibilities of Health Workers*. Geneva: World Health Organization.
- WHO and UNICEF. 2020. *WHO Policy Brief on International Trade Agreements and Implementation of the International Code of Marketing of Breast-Milk Substitutes*. Geneva: World Health Organization and the United Nations Children's Fund.
- WHO Collaborative Group. 2000. Effect of breastfeeding on infant and child mortality due to infectious diseases in less developed countries: A pooled analysis. WHO Collaborative Study Team on the Role of Breastfeeding on the Prevention of Infant Mortality. *The Lancet* 355: 451–55. [CrossRef]
- WHO UNICEF. 2018. *Implementation Guidance: Protecting, Promoting and Supporting Breastfeeding in Facilities Providing Maternity and Newborn Services—the Revised Baby Friendly Hospital Initiative*. Licence: CC BY-NC-SA 3.0 IGO. Geneva: Geneva: World Health Organization.
- Wise, Jacqui. 2017. Plain cigarette packs may cut number of smokers, evidence review finds. *BMJ* 357: j2068. [CrossRef]
- World Health Organization. 2009. *Acceptable Medical Reasons for Use of Breastmilk Substitutes*. Geneva: WHO, Available online: https://www.who.int/nutrition/publications/infantfeeding/WHO_NMH_NHD_09.01/en/ (accessed on 29 November 2019).
- World Health Organization. 2011. *Exclusive Breastfeeding for Six Months Best for Babies Everywhere*. Geneva: WHO, Available online: https://www.who.int/mediacentre/news/statements/2011/breastfeeding_20110115/en/ (accessed on 21 September 2019).

- World Health Organization. 2017. *The Goals within a Goal: Health Targets for SDG 3*. Geneva: WHO, Available online: <https://www.who.int/sdg/targets/en/> (accessed on 16 September 2019).
- World Health Organization. 2018a. Family Planning and Contraception. Available online: <https://www.who.int/news-room/fact-sheets/detail/family-planning-contraception> (accessed on 4 October 2019).
- World Health Organization. 2018b. *International Code of Marketing of Breast-Milk Substitutes 1981 with Updates to 2018*. Geneva: WHO, Available online: <https://www.who.int/nutrition/netcode/resolutions/en/> (accessed on 8 September 2020).
- World Health Organization. 2019a. *Trends in Maternal mortality 2000 to 2017: Estimates by WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division*. Geneva: WHO.
- World Health Organization. 2019b. *Infant Feeding for the Prevention of Mother-to-Child Transmission of HIV*. Geneva: WHO, Available online: https://www.who.int/elena/titles/hiv_infant_feeding/en/ (accessed on 24 September 2019).
- World Health Organization. 2020. *Breastfeeding and COVID-19 Scientific Brief*. Geneva: WHO, Available online: <https://www.who.int/news-room/commentaries/detail/breastfeeding-and-covid-19> (accessed on 11 July 2020).
- Xin, Hao, and Richard Stone. 2008. TAINTED MILK SCANDAL Chinese Probe Unmasks High-Tech Adulteration With Melamine. *Science* 322: 1310–11. [CrossRef]
- Xu, Fenglian, Zhuoyang Li, Colin Binns, Michelle Bonello, Marie-Paule Austin, and Elizabeth Sullivan. 2014. Does infant feeding method impact on maternal mental health? *Breastfeeding Medicine* 9: 215–21. [CrossRef]
- Yusuff, Aza Sherin, Li Tang, Colin W. Binns, and Andy H. Lee. 2015. Prevalence and risk factors for postnatal depression in Sabah, Malaysia: A cohort study. *Women and Birth* 28: 25–29. [CrossRef]
- Zhang, Min, Xi Xie, Andy H. Lee, and Colin W Binns. 2004. Prolonged lactation reduces ovarian cancer risk in Chinese women. *European Journal of Cancer Prevention* 13: 499–502. [CrossRef]