



# Saving lives and giving newborns the best start:

Critical nutrition interventions for mothers and infants in the perinatal period

## INTRODUCTION

*Most under-five deaths occur in the first week to month of life.<sup>1</sup> The highest mortality rates are found in Africa and South Asia. Effective delivery of nutrition and health interventions for both the mother and the newborn—during the period from birth through the first 28 days of life—can help reduce these deaths.*

*Prompt and consistent implementation of recommended nutrition practices for newborns, as part of the early essential newborn care (EENC) package, can save newborn lives and set them on a trajectory for optimum growth and development.*

## NUTRITION PRACTICES FOR THE NEWBORN

### IMMEDIATE SKIN-TO-SKIN CONTACT

Hypothermia<sup>1</sup> is a frequent, significant risk factor for neonatal death, especially for low birthweight (LBW) infants; however, hypothermia is invariably a concern for infants of all birthweights and gestational ages.<sup>2</sup> Newborns have a limited ability to regulate their body temperatures, particularly in the hours immediately after birth.<sup>3</sup> The WHO recommends that newborns, without complications, be kept in skin-to-skin contact with their mothers within the first hour after birth to prevent hypothermia and promote early initiation of breastfeeding (EIBF).

Infant hypothermia is common, regardless of where the birth takes place. Of hospital births, 32 percent to 85 percent of infants develop hypothermia at some point; 11 percent to 92 percent of infants born at home will become hypothermic.<sup>4</sup> Besides helping to regulate infant body temperature, skin-to-skin contact stabilizes the infant's heart and respiratory rates, improves the infant's oxygen saturation rates, and conserves infant energy (calories). Infants with skin-to-skin contact can more naturally latch on to the breast while breastfeeding. They also absorb beneficial bacteria from their mother's skin, boosting the immune system and helping to protect the infant from infectious diseases.<sup>5</sup> Immediate skin-to-skin contact is important after both vaginal and cesarean (C-section) deliveries, although mothers who have had C-sections will require extra assistance and adequate pain management.

*i. Infant hypothermia occurs with a core temperature less than 36.4° C (97.5° F), although cold stress at higher temperatures occurs whenever heat loss requires an increase in metabolic heat production.*

### Early essential newborn care (EENC)

- Essential newborn care practices can prevent many neonatal deaths.
- These practices focus on the quality of childbirth, newborn, and postpartum care during the first 24 hours after birth.
- They are applicable for all newborns, and are sequenced as follows:
  1. Immediate drying
  2. Immediate skin-to-skin contact
  3. Appropriately timed-clamping and cutting of the cord
  4. Early initiation of breastfeeding and exclusive breastfeeding
  5. Routine care (eye care, vitamin K, immunizations, weighing, and physical examination)

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Giacomo Pirozzi | Alive & Thrive

## DELAYED CORD CLAMPING

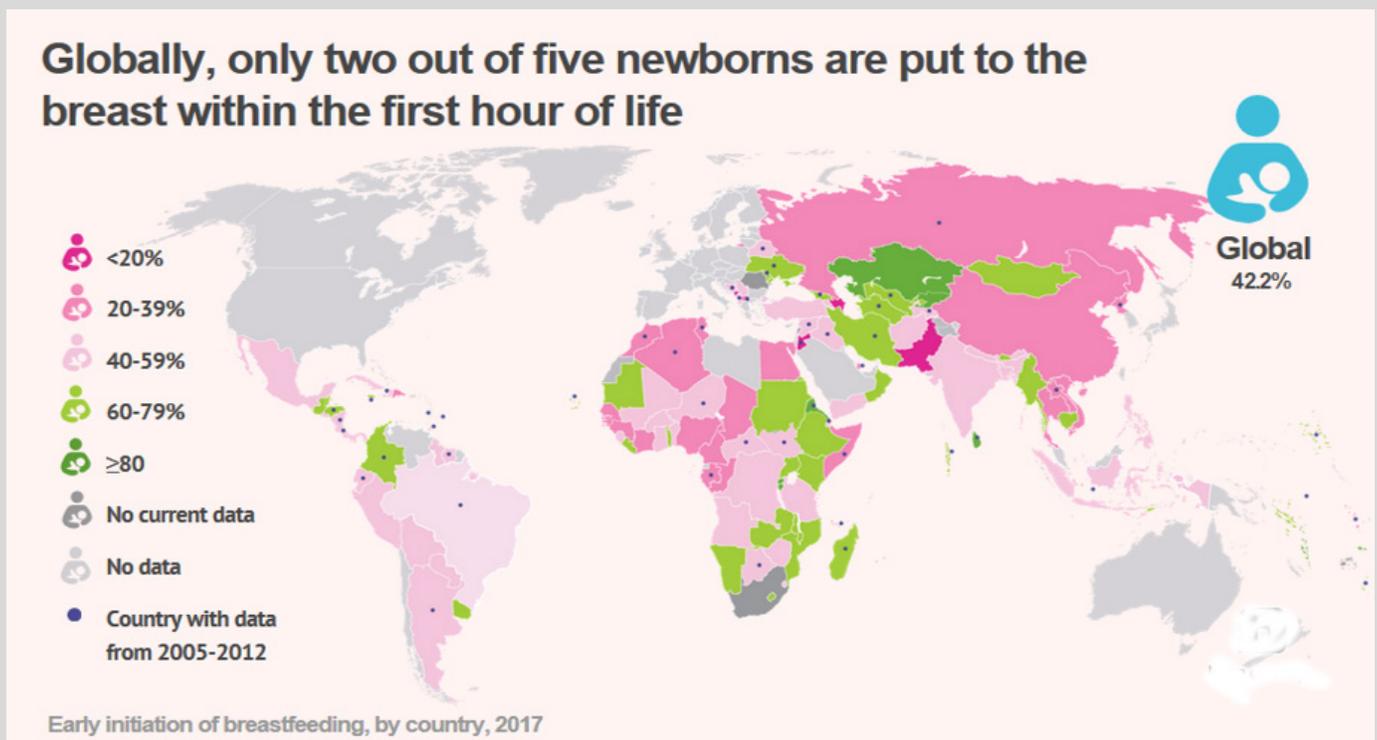
Delaying cord clamping (DCC) after delivery, for one to three minutes or until pulsations cease, provides an iron-rich placental blood flow to the infant, enough to create a reserve for the infant's first six to eight months of life. Given that it prevents or delays the development of iron deficiency<sup>6</sup>, DCC is particularly relevant for infants living in areas with increased risk for iron deficiency anemia. The World Health Organization (WHO) recommends DCC for all births while simultaneously initiating EENC practices. Currently, cord clamping typically occurs too early: within the first 60 seconds after birth.<sup>7</sup>

## EARLY INITIATIVE OF BREASTFEEDING (EIBF)

Initiating breastfeeding within one hour of birth is associate with reduced neonatal mortality. Breastmilk can be considered “personalized medicine,” providing newborns with nutrients and other ingredients that promote healthy growth and development at a time when gene expression is being programmed for life.<sup>8</sup> Early initiation of breastfeeding (EIBF) rates are just 42 percent globally. In West and Central Africa, two out of three newborns do not experience EIBF (Figure 1). All newborns, including LBW infants who can breastfeed, should be put to the chest as soon as possible after birth (when they are clinically stable).<sup>9</sup> Recent meta-analyses show that infants who started breastfeeding between two and 23 hours after birth had a 33 percent greater risk of neonatal mortality compared to infants who started breastfeeding within one hour of birth. The mortality risk was twofold greater for infants who started breastfeeding more than 24 hours after birth. Remarkably, this benefit applied to LBW as well as normal-birthweight infants.<sup>10</sup>

The benefit of initiating breastfeeding early is associated with the benefit of exclusive breast-

Figure 1: Early initiation of breastfeeding in numbers



Source: Capture the Moment, UNICEF, 2018

feeding, for which the infant receives only breastmilk and no additional foods or drinks, not even water. Avoiding early supplemental feeds and giving nutrition-rich colostrum, however, offers additive benefits. Maternal colostrum provides essential antibodies and other immune factors to the newborn, accelerating gut colonization and maturation and improving resistance to infection.<sup>11</sup> Worldwide, cultural and social practices encourage mothers to discard colostrum and use supplemental feeds such as honey, jaggery (brown sugar from sugar cane), ghee (clarified butter), cow's milk, and ghutti (herbal paste).<sup>12</sup>

Supplemental feeding for institutionally delivered infants can be common in facilities that are not actively implementing baby-friendly practices, such as early and often skin-to-skin contact, rooming in, and adhering to the International Code of Marketing of Breast-milk Substitutes (BMS) (the Code). Outdated practices, such as providing sugar water to infants, can also be a factor in supplemental feeding. Early introduction of and exclusive breastfeeding promote and protect milk production (lactogenesis). Failing to achieve EIBF is associated with an increased risk of not exclusively breastfeeding, or not breastfeeding at all, at one and three months of life.<sup>13</sup>

Hypoglycemia (abnormally low blood sugar) may be associated with poorly established breastfeeding at birth. However, the WHO, the American Academy of Pediatrics, the U.S. National Institutes of Health, and the National Childbirth Trust of the United Kingdom all conclude that:

- EIBF and EBF practices both meet the nutritional needs of healthy term infants.
- When combined with breastfeeding, skin-to-skin contact between the mother and infant immediately after birth and continuing as much as possible, will help the infant regulate body temperature, reduce energy expenditure, and maintain normal blood glucose levels.
- Routine supplementation of healthy term infants with water, glucose water, or formula is unnecessary and may interfere with the establishment of normal breastfeeding and normal metabolic compensatory mechanisms.
- Healthy term infants do not normally develop hypoglycemia; LBW infants may be more at risk for hypoglycemia and should be monitored.<sup>14</sup>

### Exclusive breastfeeding

Exclusive breastfeeding is recommended for the first six months of life. Infants who are exclusively breastfed have only 12 percent of the risk of death in low- and middle-income countries compared to those who are not breastfed. On average, infants younger than six months who are not breastfed are three to four times more likely to die than those who received any breastmilk. Longer breastfeeding duration is also associated with reducing the likelihood of overweight and/or obesity and type 2 diabetes later in life. Mothers also benefit from breastfeeding, including maternal hypertension,<sup>15</sup> a lower risk of breast cancer, ovarian cancer, and type 2 diabetes.

## INTERVENTIONS AND SUPPORT FOR OPTIMAL NEWBORN NUTRITION PRACTICES

Optimal nutrition for the newborn during the critical first 24 hours of life—ensuring immediate skin-to-skin contact, DCC, and EIBF—is part of quality care for mothers and infants provided during labor and delivery and postpartum visits through the first month of life. Interventions and support must reach mothers where they seek/receive care and give birth, as well as in their homes and communities. Having a skilled health worker or birth attendant present at birth, and afterward for postnatal care and support, is essential for EENC and breastfeeding. Additional considerations and extra support are needed for mothers and newborns with special circumstances, such as C-section deliveries, premature infants, and LBW infants. Home- and community-based interventions to support mothers and newborns are necessary in any effort to improve neonatal mortality, morbidity, and nutrition outcomes. Advocacy is needed to ensure that policies are in place to support health workers, mothers, and families in implementing practices, and to address any policy interference—for example, inappropriate BMS marketing practices. Favorable maternity entitlement policies, such as extended paid leave for mothers and fathers, help to support establishing and sustaining breastfeeding.

## INSTITUTIONAL BIRTHS AND EARLY INITIATION OF BREASTFEEDING

Giving birth in a health facility is becoming the norm in many countries around the world, offering the opportunity to more readily promote and support EIBF (compared to home births). In a recent UNICEF study, a subset of 58 countries with trend data available for both the place of delivery and the rate of EIBF, found a greater increase in institutional deliveries (from 53 percent

in 2005 to 71 percent in 2017) than the rise in early initiation rates over the same period (from 45 percent to 51 percent).<sup>16</sup> Large increases in EIBF rates have only occurred where institutional deliveries have increased by more than 20 percent (Figure 2).

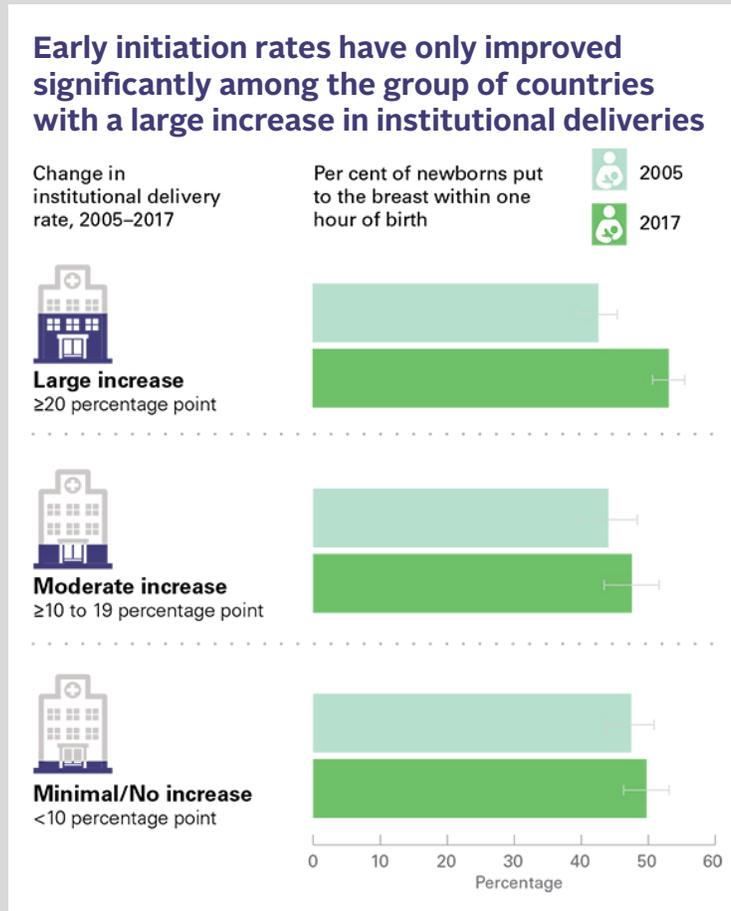
For over 25 years, the Baby-Friendly Hospital Initiative (BFHI), supported by WHO and UNICEF based on the “Ten Steps to Successful Breastfeeding,” has been the primary global strategy for improving the quality of newborn care and protecting nutrition in an institutional setting. Designed to help facilities and providers better support breastfeeding, the BFHI, when properly implemented, can significantly improve EIBF and EBF rates.<sup>17</sup> A recent systematic review demonstrated that adherence to the “Ten Steps” improved rates of EIBF, EBF, and the total duration of any breastfeeding. It also showed a dose-response relationship between the number of BFHI steps implemented and the likelihood of improved breastfeeding.<sup>18, 19</sup>

The potential of the BFHI to improve newborn outcomes is there, but since its conception 25 years ago, only 10 percent of infants globally are born in a hospital certified as “baby-friendly.” Expanding, monitoring, and accrediting hospitals under the BFHI would improve

breastfeeding outcomes, including EIBF, EBF and longer duration of breastfeeding. In 2015, the WHO and UNICEF began a process to re-evaluate and reinvigorate the BFHI program through extensive consultation, a global policy survey, and a series of systematic literature reviews. A revised “Ten Steps” guide was issued and distributed to inform practices for protecting, promoting, and supporting breastfeeding in facilities providing maternity and newborn services.<sup>20</sup>

Traditionally, a barrier to increasing coverage and sustainability of the “Ten Steps” has been its implementation as a vertical, standalone project not readily incorporated into existing health system structures.<sup>21</sup> Current guidance emphasizes institutionalization of the “Ten Steps” into health systems. Viet Nam is an early leader in this approach; in 2013, the Ministry of Health (MoH) integrated the BFHI into the health system by including BFHI criteria (apart from step 10) into the national hospital-quality criteria.<sup>22</sup> Health facilities (whether they are BFHI certified or not) would benefit women and children if they adhered to breastfeeding-friendly practices. Utilizing quality improvement initiatives will work toward effective implementation of these breastfeeding-supportive guidelines.

**Figure 2: Increases in early initiation**



Source: UNICEF Global databases, 2018

## Ten Steps to Successful Breastfeeding

### Critical Management Procedures

- a. Comply fully with the International Code of Marketing of Breast-milk Substitutes and relevant World Health Assembly resolutions.
  - b. Have a written infant feeding policy that is routinely communicated to staff and parents.
  - c. Establish ongoing monitoring and data-management systems.
2. Ensure that staff have sufficient knowledge, competence, and skills to support breastfeeding.

### Key Clinical Practices

3. Discuss the importance and management of breastfeeding with pregnant women and their families.
4. Facilitate immediate and uninterrupted skin-to-skin contact between mothers and their infants, and support mothers to initiate breastfeeding as soon as possible after birth.
5. Support mothers to initiate and maintain breastfeeding and manage common difficulties.
6. Do not provide breastfed newborns any food or fluids other than breastmilk, unless medically indicated.
7. Enable mothers and their infants to remain together and to practice rooming-in 24 hours a day.
8. Support mothers to recognize and respond to their infants' cues for feeding.
9. Counsel mothers on the use and risks of feeding bottles, teats, and pacifiers.
10. Coordinate discharge so that parents and their infants have timely access to ongoing support and care.

Source: WHO/UNICEF (Revised 2018)

## CESAREAN SECTIONS (C-SECTIONS) AND BREASTFEEDING

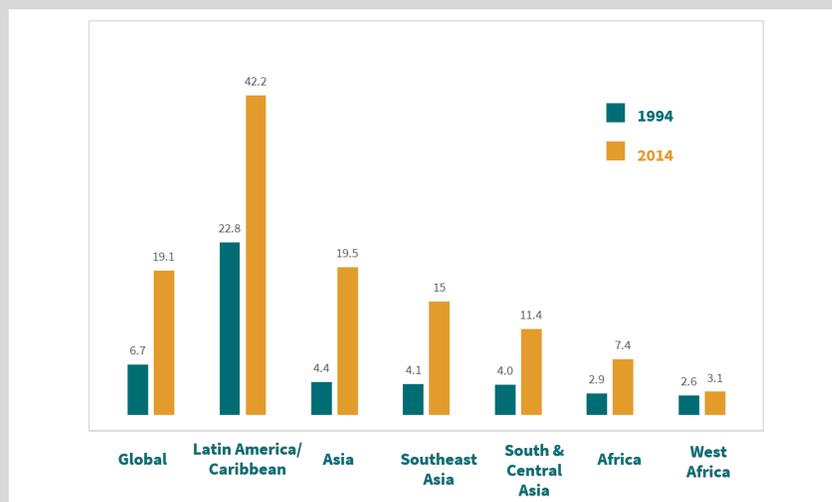
Delivery by C-section is becoming more frequent, with a doubling of the rate in some geographic areas (Figure 3). Based on data from 150 countries, currently 18.6 percent of all births occur by C-section, ranging from 6 percent to 27.2 percent in the least- and most-developed regions, respectively. Latin America and the Caribbean region has the highest C-section rates, and Africa the lowest. Some countries are experiencing extremely rapid rates of increase; for example, a recent report published by *Fistula Care* shows that in Bangladesh, C-sections increased almost tenfold between 2000 and 2014 (from 2.9 percent to 24.4 percent), despite a concurrent decrease in the number of births.

When medically justified, a C-section can effectively prevent maternal and perinatal mortality and morbidity, and access to this procedure is an essential component of obstetric care. As with any surgery, a C-section carries short- and long-term risks, and when the procedure is not required, it is not beneficial to either the mother or child.<sup>23</sup>

Delivery by C-section is associated with non-initiation or delayed initiation of breastfeeding globally, as well as in low- and middle-income countries (LMICs).<sup>24</sup> The reasons for this are uncertain, but one posited theory suggests that post-operative care interferes with infant-mother bonding. The association may be linked to a choice not to breastfeed and elective C-section. In general, increased medical intervention during labor and delivery (including regional anesthesia and C-sections) is associated with delayed initiation of breastfeeding and poorer longer-term breastfeeding outcomes.<sup>25, 26</sup>

If a mother is under general anesthesia during labor and/or delivery (a relatively uncommon event)<sup>ii</sup>, initiating breastfeeding immediately after

Figure 3: Global trends in C-section rates



Source: Boatin AA, Schlottheuber A, Betran AP, et al, *BMJ*, 2018 (based on earliest data available)

ii. Use of general anesthesia for deliveries is not common. General anesthesia is used for emergency C-section and when there is a history of heavy preeclampsia.

birth is not feasible; if localized spinal anesthesia is given, then EIBF is still possible.<sup>27</sup> After a general-anesthesia C-section, skin-to-skin and initiation of breastfeeding can begin when the mother is sufficiently alert enough to hold the infant. Mothers or infants who are medically unstable following delivery may need to delay breastfeeding initiation, but they may still be able to participate in skin-to-skin contact.<sup>28</sup> Mothers delivering by C-section should be given specific guidance on comfortable positioning for breastfeeding post-surgery.

## **HOME NEWBORN NUTRITION CARE**

Many deliveries still occur in places other than health facilities. In Nigeria and Ethiopia, only 38 percent and 26 percent of births take place in a health facility, respectively. These two statistics are in contrast to those for Cote d'Ivoire and Senegal (70 percent and 75 percent).<sup>29</sup> Similar differences exist across South and East Asian countries as well as across Pacific countries. Viet Nam continues to have high rates of institutional deliveries, reaching more than 90 percent. Laos has also recently seen improvements with 60 percent of deliveries in institutions,<sup>30</sup> while in Myanmar only one-third of deliveries occur in health facilities. There are many disadvantages to home delivery, including a potentially unsafe environment, insufficient supplies, and lack of transportation for emergencies; however, advantages such as lower rates of unnecessary medical interventions, higher proportions of births receiving skin-to-skin contact, and immediate breastfeeding within one hour of birth have been reported.<sup>31</sup>

When a birth does not occur in a health facility, improving access to skilled birth attendants (SBAs) is the route to reducing both maternal and newborn mortality and ensuring proper nutrition for the newborn. Coverage of SBAs at delivery varies widely across LMICs. In 25 of 80 countries recently studied, the national coverage was 90 percent. In contrast, 11 countries had coverage below 40 percent.<sup>32</sup> WHO guidelines and training programs for SBAs are available (for example, WHO Newborn Health and Essential Newborn Care Courses), in part to equip SBAs to promote EBF and help mothers establish successful breastfeeding. This assistance is not always provided. A review of UNICEF data shows that 78 percent of deliveries were attended by a skilled health provider, but that only 45 percent of newborns were breastfed within the first hour after birth.<sup>33</sup>

Some countries are focusing on increasing SBA availability outside of health facilities to provide EENC, including breastfeeding support. However, little evidence is available on the effectiveness of SBAs in home deliveries. Where home births continue to be common, training for SBAs that includes clear guidance on nutrition-related newborn-care practices can, and should, be emphasized and supported. For settings where many births occur without the presence of a skilled health worker, strategies are needed that target pregnant women and those supporting them (such as mothers-in-law), to ensure that they are motivated and enabled to adopt nutrition and ENNC practices—DCC, skin-to-skin contact, EIBF, and not giving any supplemental feeds.

## **POSTNATAL CARE AND BREASTFEEDING SUPPORT**

Care of the newborn after the first 24 hours of life is equally important as successful EIBF. Ongoing support to ensure that breastfeeding is well established, continued exclusively, and that early problems are successfully managed is essential. In 2009, the WHO and UNICEF introduced program guidance for postnatal home-visitation programs.<sup>34</sup> Implementation of the guidelines has shown mixed results. In some studies from South Asia, postnatal care delivered at home showed declines in neonatal mortality and improvements in EIBF.<sup>35,36</sup> However, in Africa and other

areas of South Asia (Bangladesh and Uganda), postnatal home care delivered under government health services did not show significant increases in EIBF. A multi-country review of postnatal programs implemented at scale in LMICs in the last decade (delivered under routine program conditions by the ministries of health) found no program achieving a level of home-visit coverage sufficient to produce a measurable population-level impact on health outcomes.<sup>37</sup>

Regardless, early trials suggest that home visitation could be an effective strategy for improving breastfeeding and other key care practices for newborns and their mothers. Perhaps, as institutional deliveries increase and the quality of services improves, health facilities can better communicate and plan for postnatal visits to include effective breastfeeding support. For areas where the proportion of institutional births remains low, building skills for providing appropriate postnatal care, including support for breastfeeding, remains a critical objective for governments and programs.

## COMMUNITY-BASED INTERVENTIONS

Community-based interventions (including postnatal home visits) feature a range of activities such as peer-counselor support, telephone/electronic media support, health staff counselling, and community awareness campaigns. A 2015 *Cochrane* review assessed the results of studies on community-based intervention packages for reducing maternal and neonatal morbidity and mortality and improving other neonatal outcomes. It documented a 25 percent reduction overall in neonatal mortality, the primary outcome measure. This review also found that intervention packages built around community and women's support groups that disseminate education and promote awareness related to birth and newborn care preparedness (including breastfeeding) were best for reducing total and early neonatal deaths. Furthermore, a meta-analysis of the studies that reported on initiation of breastfeeding within one hour of birth showed that antepartum newborn care and breastfeeding education to mothers doubled rates of initiation of breastfeeding.<sup>38</sup>

The most-successful packages utilized social and behavior change communication (SBCC) strategies, involved family members through community support and other community mobilization efforts, connected with advocacy groups, provided care through trained community health-worker visits, and strengthened referral systems for sick mothers and newborns. These SBCC strategies all offer opportunities for promoting and supporting breastfeeding practices. The *Cochrane* review authors acknowledged that while there is limited evidence, the benefits of community-based strategies may extend across the continuum of maternal and newborn care.

### Breastfeeding: A full circle approach

A systematic review and meta-analysis of interventions aimed at improving breastfeeding outcomes documented an overall 25 percent improvement in the initiation of breastfeeding within one hour of birth as the result of all interventions—those in the health system, at home and through family, in the community, and via the policy and work environment. Focusing on the intervention delivery setting, the meta-analysis showed that early initiation of breastfeeding (EIBF) improved by 11 percent, 86 percent, and 57 percent when delivered through the health system setting, in the community environment, and concurrently through a combination of settings, respectively. No statistically significant improvements were found in interventions delivered in the home and through family; however, interventions with the greatest impact targeted home and family settings in combination with community-level interventions.

Further analysis showed that group counseling in the community, Baby-Friendly Hospital Initiative (BFHI) support, and counseling by health staff across multiple settings had the largest effects on initiating breastfeeding within the first hour. Identifying a sufficient number of mid-to-high-quality studies focusing on the impact of the home/family and community environments on breastfeeding practices is a challenge (*Acta Paediatrica*, 2015); yet there are clearly benefits to surrounding mothers with support where they live and work.

## SUPPORTING NEWBORNS AND MOTHERS WITH SPECIAL CIRCUMSTANCES

### LOW BIRTHWEIGHT (LBW) AND PREMATURE NEWBORNS

Newborns who are born under special circumstances (i.e. LBW<sup>iii</sup> and premature newborns) need the same package of early newborn care and attention as normal birthweight infants do. The WHO Guidelines (2011) on optimal feeding of LBW infants in LMICs recommend the following:

- LBW infants (under 2.5 kilograms) and infants of very low birthweight (VLBW, under 1.5 kilograms) should be fed mother's own milk.
- Infants who cannot be fed mother's own milk should be fed donor human milk, in settings where safe and affordable human milk banks (HMBs) are available or can be set up.

For a premature (or any) infant for whom the mother's own breastmilk is unavailable, HMBs offer a safe milk alternative that also promotes the value of breastfeeding and breastmilk.<sup>39</sup> The first HMB was established in Vienna, Austria over a century ago, but in recent decades Brazil has been the pioneer in this area.<sup>40</sup> Of the over 650 milk banks globally, one third are in Brazil and another third operate across Europe; South Africa has established over 60 HMBs, and India is rapidly expanding its HMB network.<sup>41</sup> Other countries are also making strides in this area.

Kangaroo Mother Care (KMC), originally designed to allow for early or earlier discharge of infants from a neonatal intensive care unit (NICU), is now recommended routine care for newborns weighing no more than 2 kilograms at birth. This approach maximizes physical contact between mother and newborn, and keeps the infant skin-to-skin as much as possible against the mother (or father or other caregiver). KMC also emphasizes frequent and EBF, or near-EBF. The benefits of KMC for newborn outcomes are well established. A Cochrane review found that KMC reduced mortality and morbidity; increased weight, head circumference, and length gain; and improved breastfeeding practices.<sup>42</sup> Other reviews confirm that KMC decreases mortality among LBW newborns and increases the likelihood of EBF up to four months.<sup>43</sup>

Country-level adoption and implementation of KMC has been limited; only a small proportion of newborns who could benefit from KMC receive it. Barriers to KMC include inadequate knowledge and skills among health workers and birth attendants, misperceptions that KMC is a “second-best” alternative to incubator care, cultural norms that make practicing skin-to-skin contact difficult, and a lack of policy and professional support for KMC.<sup>44</sup>

### OVERWEIGHT AND OBESE MOTHERS

In many low-income settings, the incidence of overweight women (with a body mass index [BMI] >25) entering pregnancy is now even more common than for underweight women.<sup>45</sup> Compared to mothers with normal BMIs, overweight mothers are at higher risk of developing gestational diabetes; thereby putting the infant at risk for such things as macrosomia (a large infant body size) and macrocephaly (a large infant head size) at birth, and pregnancy-induced hypertension/preeclampsia.<sup>46</sup> Maternal overweight is also associated with preterm delivery.<sup>47</sup> Infants with macrosomia are at higher risk of long-term health consequences into childhood and adulthood, including obesity and diabetes.<sup>48</sup> In the postpartum period, complete failure or delay of breastfeeding initiation is often seen in obese mothers; these complications are primarily due to difficulty with correct positioning and attachment of the infant, as well as delayed lactation due to having a greater chance of C-section delivery.<sup>49</sup> To date, global health and nutrition program efforts in low-income countries have given relatively little attention to maternal overweight and obesity. This rapidly growing problem warrants additional research to guide policies and programs. Overweight and obesity among pregnant and childbearing women, like undernutrition, has both immediate and long-term effects—and even multi-generational effects.

*iii. Good maternal health and nutrition (sufficient weight gain during pregnancy, use of IFA/MMN, no smoking, etc.) can help reduce risk of LBW.*

## **ADOLESCENT PREGNANCY**

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Childbirth during adolescence is associated with low pre-pregnancy BMI, intrauterine growth restriction,<sup>50</sup> prematurity,<sup>51</sup> iron-deficiency anemia,<sup>52</sup> suboptimal nutrition during pregnancy, exposure to social risks, and (depending on setting) inadequate social support throughout the pregnancy and after childbirth. Additionally, very young adolescents (no older than 15 years of age) are at a markedly higher risk of poorer pregnancy outcomes, including preterm birth and having a LBW infant.<sup>53</sup> The infants of adolescent mothers (especially those of very young adolescents) are at high risk for poor nutritional outcomes. Furthermore, adolescent pregnancy is a marker of social risk/disadvantage (although this varies markedly by sociocultural setting) and can contribute to further marginalization (e.g. when it results in girls terminating their education, undermining future economic prospects). Given that adolescence is already a time of growth and increased nutrient needs, the added burden of pregnancy can impact linear growth of the adolescent as well as limit fetal growth and development. Research is needed to better understand how to effectively, positively impact girls' environments, including the social and other changes needed to protect them from adolescent pregnancy, if desired.

## **MATERNAL DEPRESSION**

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Maternal depression refers to a spectrum of depressive conditions that can affect mothers-to-be (perinatal) and mothers up to 12 months postpartum. In low- and middle-income countries, 19 percent to 25 percent of women are affected by perinatal depression, and about 20 percent of women experience postpartum depression.<sup>54</sup> Perinatal depression has been linked to negative health-related behaviors and adverse outcomes, including poor nutrition, increased substance use, inadequate prenatal care, preeclampsia, LBW infants, preterm delivery, postpartum depression, and suicide. Women who experience perinatal depression often continue to experience depressive symptoms into the postpartum period, with more than 54 percent of those with postpartum depression reporting depressive episodes before or during pregnancy. In addition to childhood abuse and abuse by an intimate partner, maternal low educational attainment, low socioeconomic status at the time of pregnancy, lack of social support, and a history of mental illness have been consistently identified as risk factors of antepartum and postpartum depression.<sup>55</sup>

The impact of depression on both the mother and infant is profound and can last throughout generations. Maternal depression predicts poorer growth and higher risk for preterm birth, infant LBW, child undernutrition and stunting, and poorer cognitive development. A meta-analysis of 11 low- and middle-income countries (conducted during the postpartum period) showed that children of mothers with depression or depressive symptoms were 1.5 times as likely to be underweight or stunted compared to children of non-depressed mothers.<sup>56</sup> In low-income settings, maternal depression has been linked directly to LBW and undernutrition during a child's first year of life, as well as to higher rates of diarrheal diseases, incomplete immunization, and poor cognitive development in young children. The quality of mother-newborn interaction is endangered if the mother's own well-being is compromised by mental-health problems (such as postpartum depression)<sup>57</sup> or an unsupportive or threatening social situation (like intimate partner violence).<sup>58</sup>

Observations of depression during the postpartum period and impaired postnatal infant growth have been attributed to differences in breastfeeding practices and insecure infant-mother attachments among depressed and non-depressed mothers. Research has reported that depressed mothers are more likely to stop breastfeeding earlier than non-depressed mothers will.<sup>59</sup> Despite its enormous burden, maternal depression in low- and middle-income countries remains underrecognized and undertreated. The WHO's Mental Health Gap Action Programme

(mhGAP) recently produced guidelines for treating depression in primary health care settings, including during pregnancy and the postpartum period.<sup>60</sup> Integrating a mental health component into maternal health policies, plans, and activities is recommended. Simple tools are available to recognize mental health issues during pregnancy and after birth, and health care workers can be trained to develop skills in counseling about stress and to provide psychological support.<sup>61</sup> Strategies to address maternal depression need also to address the contributing factors of poverty and domestic violence.<sup>62</sup> Developing protocols for the early identification, treatment, and prevention of the damaging effects of maternal depression in low- and middle-income countries is needed.

## **POLICY-LEVEL ACTIONS**

To achieve optimal nutrition for the newborn, enabling interventions that remove structural and societal barriers that interfere with a woman's ability to provide recommended nutrition-related newborn care are necessary. These include policies that control inappropriate marketing of BMS, health insurance or other financing mechanisms that cover the costs of lactation support and newborn care policies, and quality improvement initiatives for health care facilities that integrate the "Ten Steps." Legislation and accountability mechanisms should ensure that maternity protection and workplace interventions that support breastfeeding are implemented. All maternity health services should comply with the Code and implement the "Ten Steps." Marketing practices of the multibillion-dollar BMS industry undermine breastfeeding as the optimal feeding practice in early life. The Code can be an effective regulatory tool, if the political commitment and investment is there to enact and enforce the relevant, comprehensive legislation, and to ensure implementation and accountability.

## **CONCLUSION**

The future should be bright for all mothers and their newborns. We know what it takes for women and infants to have successful birth experiences, and to start their infants on a path toward reaching their full growth potentials. More women and infants are being reached by effective nutrition and other newborn care interventions; however, additional resources and a sustained commitment are needed to bring optimal nutrition care and support to all newborns and their mothers. There are significant gaps in our understanding of how to reach and support mothers facing special circumstances—such as adolescents, obese women, women suffering maternal depression, and those with limited to no access to quality health care. Implementation and other research is needed to fill those gaps. In the meantime, ensuring implementation of the EENC package, and the critical nutrition interventions within (especially where institutional platforms exist), could lead to significant gains for women and their newborns.

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