

## The Effect of Late Breastfeeding Initiation on Neonatal Mortality: A Model in PROFILES for Country-Level Advocacy

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### Introduction

Malnutrition has significant negative consequences for many developing countries, particularly in terms of poor human health, lost human capital, and decreased economic productivity. Investment in nutrition was identified in 2012 by the Copenhagen Consensus (Copenhagen Consensus 2012) as a best investment for developing countries; for every US\$1 spent on nutrition, there is a US\$16 return in health and economic benefits (International Food Policy Research Institute 2015). Despite this, funding and support for nutrition programming is often lacking.

To address this urgent need for attention and commitment to reducing malnutrition, the U.S. Agency for International Development (USAID)-funded Food and Nutrition Technical Assistance III Project (FANTA) at FHI 360, supports evidence-based country-level nutrition advocacy. The approach FANTA uses engages governments and national stakeholders to develop a shared vision and promote accountability and commitment for nutrition using a tool called PROFILES. Developed to support country-level nutrition advocacy,



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**Nutrition advocacy** is a planned, systematic, and deliberate process that is defined and shaped by the specific country context. FANTA's nutrition advocacy planning process engages national stakeholders by using a participatory and consensus-building approach toward a shared national vision for nutrition. It can support a given country at any stage along the way to providing nutrition services and reducing malnutrition. A central focus of the process is to promote accountability for nutrition and strengthen nutrition governance. For example, it can serve to support the development of a nutrition policy, encourage investment of resources to strengthen and expand implementation of nutrition services, and increase greater coordination between government and nongovernmental organizations that play a role in providing nutrition services across a country. By examining the context of the nutrition situation and tailoring advocacy needs to that situation, advocacy can be more effective in igniting change and making strides toward the desired outcome.

FANTA has created a [manual](#) that provides step-by-step instructions for facilitating a country-level nutrition advocacy planning process using the PROFILES nutrition advocacy tool and nutrition costing. Based on a process FANTA developed by facilitating nutrition advocacy in developing countries, the manual includes planning guidance; session plans and handouts for workshops and meetings; presentations with notes; and templates.

PROFILES consists of a set of computer-based models that calculate consequences if malnutrition does not improve over a defined time period (e.g., 10 years) and the benefits of improved nutrition over the same time period, including lives saved, disabilities averted, human capital gains, and economic productivity gains. The estimates generated from the tool and its models are the cornerstone of the nutrition advocacy process and can be used to identify, prioritize, and advocate for evidence-based actions to reduce malnutrition. PROFILES estimates are calculated assuming there are reductions in the prevalence of country-specific nutrition indicators, such as iron deficiency anemia, low birth weight, vitamin A deficiency, iodine deficiency, suboptimal breastfeeding practices, and childhood chronic and acute malnutrition (i.e., stunting, underweight, and wasting). The country-specific information needed to calculate the estimates is discussed and agreed upon by participants during an in-country participatory PROFILES workshop.

In 2017, FANTA updated PROFILES to include a model that estimates the effect of late breastfeeding initiation on neonatal mortality. This brief explains why the model was developed, how estimates are calculated, and how the estimates can be used for nutrition advocacy.

## Why Advocate for Early Initiation of Breastfeeding?

Nearly 45 percent of all child deaths are attributable to malnutrition (Black et al. 2008). Optimal infant and young child feeding practices are a key pathway for reducing malnutrition and preventing child mortality. Early initiation of breastfeeding, which establishes breastfeeding and the breastmilk supply immediately after a child is born, is an important infant and young child feeding practice that can protect the nutritional status of infants and reduce the risk of neonatal mortality, defined as a newborn dying within the first 28 days of life. Importantly, while under-5 child mortality is a concern, there have been significant reductions in the number of child deaths among children age 1 to 59 months. In contrast, the neonatal mortality rate is improving far more slowly, if at all.

Optimal breastfeeding practices—defined as the early initiation of breastfeeding within 1 hour of birth, exclusive breastfeeding for the first 6 months of life, and continued breastfeeding for up to 2 years or beyond, with appropriate complementary feeding beginning at 6 months (WHO 2001; PAHO/WHO 2002)—has numerous advantages. Globally, consistent and substantial evidence has shown that early, exclusive, and continued breastfeeding through

Every year, 2.6 million babies die before turning one month old—approximately 7,000 newborn deaths every day; yet a majority of these deaths are preventable. (UNICEF 2018a)

### Benefits of Breastfeeding

- Universal optimal breastfeeding could save the lives of more than 800,000 children per year (Black et al. 2013).
- Breastfeeding reduces morbidity and mortality from diarrhea and respiratory infections. About half of all diarrhea episodes and a third of respiratory infections could be avoided by breastfeeding (Victora et al. 2016).
- Breastfeeding is associated with higher intelligence and greater economic productivity. About US\$302 billion per year in economic losses have been associated with not breastfeeding, representing 0.49 percent of combined, worldwide gross national income (Rollins et al. 2016).
- Optimal breastfeeding can reduce the risk of overweight/obesity in childhood, with meta-analyses indicating benefits as high as a 31 percent reduced risk (Horta et al. 2015; Yan et al. 2014).
- Universal breastfeeding would prevent an estimated 20,000 annual deaths from breast cancer (Victora et al. 2016).

23 months significantly reduces neonatal and child mortality, as it protects the nutritional status of children, prevents stunting and wasting, guards against infections, and supports recovery from illness (Black et al. 2008; Lamberti et al. 2011; Debes et al. 2013). In 2016, 5.6 million children under 5 years of age died, with almost half of those deaths (46%) occurring during the neonatal period (UNICEF 2017a). As a result of the progress in reducing child deaths among children age 1 to 59 months, the proportion of neonatal deaths as a share of all under-5 child deaths, has increased over time—making neonatal mortality a

more significant problem relative to under-5 mortality, and so needing greater attention for sustained improvement (see Figure 1).

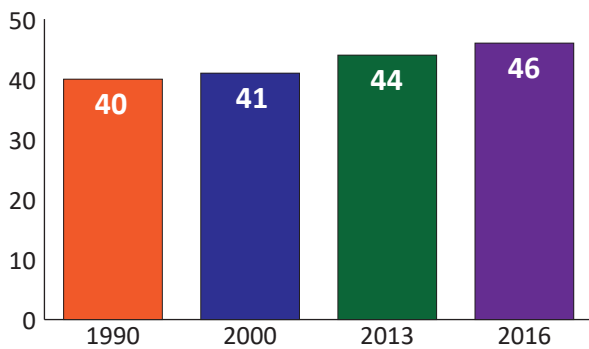
Newborn deaths disproportionately affect the poorest populations, with 99 percent of neonatal deaths occurring in low- and middle-income countries (WHO 2006). According to a 2018 UNICEF report, “More than 80 percent of newborn deaths are the result of premature birth, complications during labor and delivery, and infections such as sepsis, meningitis and pneumonia” (UNICEF 2018a) (see Figure 2). Addressing mortality during the neonatal period therefore requires a system-wide approach and cannot be solved by any single intervention. However, having access to well-trained midwives and simple interventions such as improving access to clean water and disinfectants, promoting breastfeeding within the first hour after birth, skin-to-skin contact, and good maternal nutrition can prevent many of these deaths (UNICEF 2018b).

Substantial data exist to quantify the impact early breastfeeding initiation has on reducing neonatal mortality. According to a 2016 publication by the Neovita Study Group, data analyzed from three large neonatal vitamin A trials in Ghana, India, and Tanzania found that compared with infants initiating breastfeeding within the first hour of life, neonatal

mortality was higher in infants who initiated breastfeeding after the first hour and through the remainder of the first day of life; they had a 41 percent greater risk of neonatal mortality (Neovita Study Group 2016). A 2017 meta-analysis, which updated the 2016 publication, found a similar risk of mortality and also found a clear dose-response relationship, that is, the longer it took to initiate breastfeeding, the greater the risk of neonatal mortality (Smith et al. 2017). In addition, the analysis indicates that early initiation of breastfeeding, regardless of whether the infant was then exclusively breastfed, reduces mortality—demonstrating the singular benefit of early initiation of breastfeeding to save newborn lives.

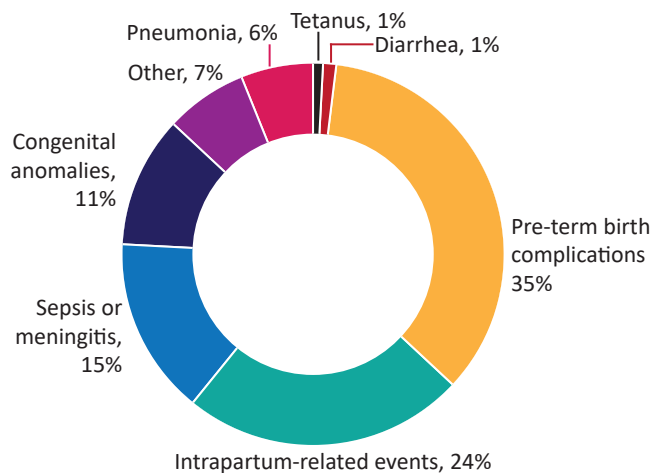
There is a strong biological basis for how early initiation of breastfeeding reduces the risk of neonatal mortality, both directly and indirectly. Early breastfeeding initiation provides the infant with colostrum, often called the “first immunization,” which provides immunity factors such as anti-microbial and anti-inflammatory agents (Begum and Dewey 2010). In addition, early and exclusive breastfeeding during the neonatal period protects infants from exposure to pathogens that are often introduced through prelacteal feeds (e.g., water and ritual foods). Given that neonatal deaths are commonly attributed to infection (sepsis, pneumonia, and meningitis),

**Figure 1. Proportion of Child Deaths Occurring During the Neonatal Period Between 1990 and 2016**



Sources: 1990, 2000, 2016: UNICEF 2017b; 2013: UNICEF 2014.

**Figure 2. Causes of Neonatal Deaths (2016)**



Note: Estimates are rounded and therefore may not add up to 100 percent. Preterm birth complications refer to complications occurring before the time of birth; intrapartum related events are complications occurring during the birth process.

Source: WHO and Maternal and Child Epidemiology Estimation Group (MCEE) 2018. Estimates for child causes of death 2000-2016 as cited in UNICEF 2017a.

early and exclusive breastfeeding plays a large role in preventing infection-related mortality (UNICEF 2018a). Early breastmilk intake also promotes the maturation of the intestines and immune system, and plays an important role in the development of the infant's microbiome (Victora et al. 2016; Begum and Dewey 2010). In addition, early breastfeeding, which requires skin-to-skin contact, fosters mother-to-infant bonding and may reduce the risk of hypothermia. This skin-to-skin contact, as demonstrated by the efficacy of Kangaroo mother care (an intervention that promotes skin-to-skin contact) to significantly reduce hypothermia and early mortality, may be another mechanism by which early initiation of breastfeeding reduces mortality risk (Smith et al. 2017). The early initiation of breastfeeding also facilitates continued breastfeeding, as early suckling is associated with successful establishment and maintenance of breastfeeding and is important for stimulating milk production and establishing maternal breastmilk supply, which is critical to reducing mortality risk throughout the neonatal period and beyond (Begum and Dewey 2010; WHO 2018).

Despite significant evidence demonstrating the many benefits of early breastfeeding initiation, there has been little global improvement in its adoption. A review of data from the UNICEF 2017 State of the World's Children report (UNICEF 2017b) indicates that less than half of infants are breastfed within an hour of birth (45%), with only marginal global improvement since 2003–2008, when 39 percent of infants were breastfed within an hour of birth (UNICEF 2010). Similarly, early breastfeeding practices are not optimal globally across regions. In sub-Saharan Africa, early initiation of breastfeeding improved slightly, from 46 percent in 2003–2008 to 51 percent in 2011–2016. Early initiation of breastfeeding fell by 3 percentage points in East Asia and the Pacific between 2003–2008 and in 2011–2016 from 46 percent to 43 percent. South Asia has seen more promising improvement, but is still far from optimal, with the prevalence improving from 27 percent in 2003–2008 to 39 percent in 2011–2016 (UNICEF 2010; UNICEF 2017b). As these data indicate, with less than half of infants receiving early breastfeeding globally, there is significant room for improvement, highlighting a missed opportunity to promote a one-time intervention that could significantly reduce neonatal mortality specifically, and child mortality overall, in addition to the health and other benefits afforded to both mother and child from early and optimal breastfeeding practices.

To support evidence-based country-level nutrition advocacy, FANTA developed a model that estimates the number of newborn lives lost to late initiation of breastfeeding and consequently, the number of newborn lives saved related to improved early initiation of breastfeeding.

### Why Is the New PROFILES Model Relevant?

The PROFILES model for estimating the effect of late initiation of breastfeeding (after 1 hour of birth) on neonatal mortality is particularly relevant now as countries aim to more effectively reduce neonatal mortality (and consequently under-5 mortality). The third Sustainable Development Goal (SDG) identifies the need to end preventable deaths among newborns and children under 5 years of age, with the target of all countries reducing their neonatal mortality to at least as low as 12 per 1,000 live births by 2030. As of 2015, the global neonatal mortality rate was 19 deaths per 1,000 live births (UNICEF 2018a). However, neonatal mortality is significantly higher in most lower and middle-income countries, with neonatal mortality rates in 2016 of 28 deaths per 1,000 live births in sub-Saharan Africa and Southern Asia as compared to 14 deaths per 1,000 live births in South East Asia (UNICEF 2017a).

To achieve the SDG 3 targets, more effective means of addressing neonatal mortality are required. The first step is to improve access to quality maternal and child health services, particularly access to skilled birth attendants and facilities capable of addressing the main causes of newborn mortality (UNICEF 2018a). This means that facilities need clean water, sanitation facilities, electricity, well-trained health-care workers, and necessary life-saving drugs and

#### Sustainable Development Goal 3:

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 1,000 live births and under-5 mortality to at least as low as 25 per 1,000 live births.

equipment (e.g., antibiotics, blankets, phototherapy machines, etc.). Women and girls also need the self-efficacy and support to make an informed decision regarding their and their babies' care during pregnancy, labor, and the post-partum period (UNICEF 2017a). Supporting early initiation of breastfeeding is one of the key ways in which health workers can save the lives of newborns and help empower women during this critical time period. Although most women are capable of breastfeeding, they need support, encouragement, and guidance immediately after birth on how to initiate and maintain breastfeeding from both health workers and family members. Initiating breastfeeding can be extremely difficult for some mothers, and without proper support, they may fail to continue the practice. However, despite the important role health care providers play in supporting optimal breastfeeding practices, data indicate that health care providers are often unable to provide the necessary support to mothers, either due to lack of time, knowledge, or skills, or practices/policies that separate newborns from mothers immediately after birth (e.g., assessment or washing) (UNICEF 2017a). It is also important to note that a significant proportion of births are to adolescent mothers, who face additional challenges with early initiation of breastfeeding because of their young maternal age and life-stage. Adolescent mothers in many developing countries may also be more isolated and often less able to access facilities to deliver their newborns, adding to the challenge of early initiation of breastfeeding by this group.

Global evidence establishes that to effectively improve breastfeeding practices, mothers need sustained support at multiple levels (family, community, and societal) and over time during pregnancy and beyond. This requires improving both facility- and community-based strategies to support early and exclusive breastfeeding and an enabling policy environment that promotes the implementation of the Baby-Friendly Hospital Initiative, adheres to the International Code of Marketing Breast-milk Substitutes, and supports continued breastfeeding in the workplace through paid maternity leave and workplace amenities (e.g., lactation rooms) (Rollins et al. 2016). Investing in approaches that provide mothers with effective, intensive, targeted support to be able to immediately initiate breastfeeding after birth, exclusively breastfeed their children during the first 6 months of life, and continue breastfeeding until 2 years and beyond, is critical to reducing neonatal and under-5 mortality, and therefore key to reaching the SDG 3 targets.

Even some high-income countries, where neonatal mortality rates are often lowest, have high neonatal mortality rates, indicating that not all high-income countries have a health system that is strong enough to tackle this issue. Countries need strong political will and commitment to save newborn lives. Intensive efforts are required across multiple levels and by various stakeholders to support not only national-level policy changes, but also community-level implementation of interventions and services that effectively improve neonatal survival, including the promotion of optimal breastfeeding practices. This requires advocacy to create an enabling environment for political commitment, support multisectoral collaboration, and ensure the implementation of effective interventions at both the health system and community levels. Country-level advocacy is critical to garnering the political will at multiple levels to support efforts to mitigate the consequences of suboptimal breastfeeding and to fulfill national commitments to the SDG 3 targets. Both the new PROFILES model that estimates neonatal mortality risk related to late initiation of breastfeeding and the original PROFILES model that estimates the impact of suboptimal breastfeeding on child mortality are useful tools to support country-level advocacy efforts to reducing neonatal and under-five mortality.

### How Does the Model Work?

The basic approach in PROFILES is to provide two scenarios: a status quo scenario and an improved scenario. The status quo scenario calculates estimates based on the assumption that the current situation will not change throughout a chosen time period (e.g., 10 years), aside from projected changes in population size and structure, and that the prevalence of early initiation of breastfeeding will remain the same from year to year. In contrast, the improved scenario calculates estimates for the same time period, assuming that the prevalence of early initiation of breastfeeding is improved. For the improved scenario, it is necessary to set targets for the increase in the prevalence of early initiation of breastfeeding; these targets are discussed and agreed upon by participants during PROFILES workshops, taking into account various national priorities and development objectives. The improved scenario assumes a linear change in early initiation, with a gradual improvement from the first year (when prevalence equals that in the status quo scenario) to the last year (when the target prevalence is reached).

## Information Needed to Generate PROFILES Estimates

Every model in PROFILES utilizes the following information to generate estimates:

- A **time period** to determine the number of years for which the estimates should be calculated (e.g., 10 years).
- **Prevalence information** provides the magnitude of the nutrition problem (for example, percent of newborns put to the breast within 1 hour of birth). Current prevalence information is needed to serve as a baseline for the equations in the model.<sup>a</sup> Information on the early initiation of breastfeeding is often included in nationally representative household surveys, such as the Demographic and Health Survey and the Multiple Indicator Cluster Surveys.
- **Targets** are set to determine what the goal should be with regard to prevalence of the nutrition problem at the end of the given time period (e.g., improve early initiation of breastfeeding from 40 percent to 65 percent). The targets reflect the proportion by which the nutrition problem will be reduced (or in this case improved) over the chosen time period and therefore influence the outcome of interest.<sup>b</sup>
- **Demographic information** serves as the basis for the population projections by providing population size and structure.
- **Mortality, economic, employment, or education-related information** provides details to estimate the outcome of interest. This information is needed to compute the consequence of the nutrition problem on the outcome of interest.

a. PROFILES uses the best available, recent information on point prevalence, which is the prevalence at a point in time, often referred to as a snapshot of a population.

b. It is important to note that specific nutrition interventions are not entered into the model to develop the PROFILES estimates. Rather, the improvement in the nutrition situation is based on the expectation that if nutrition interventions known to be effective are implemented at scale they will succeed in reaching the stated targets. However, PROFILES estimates can be used to advocate for nutrition interventions to improve nutrition.

Models in the PROFILES spreadsheet workbook rely on coefficients based on the scientific literature to show the association between a nutrition problem and an outcome of interest. To create the late initiation of breastfeeding and neonatal mortality model, FANTA reviewed peer-reviewed literature that quantified the association between late breastfeeding initiation (after the first hour of life) practices and neonatal mortality risk. The Neovita Study Group analyzed data from three large neonatal vitamin A trials in Ghana, India, and Tanzania to examine the association between the timing of breastfeeding initiation and neonatal mortality (Neovita Study Group 2016). The analysis found that compared to infants for whom breastfeeding was initiated early (in the first hour of life), infants for whom breastfeeding was initiated late—after the first hour and through the remainder of the first day of life—had a 41 percent higher risk of mortality (a relative risk [RR] of 1.41) (Neovita Study Group 2016).<sup>1</sup> A systematic review and meta-analysis was conducted to review the evidence on the effect of initiation of breastfeeding early after birth and of exclusive breastfeeding during the first month in reducing neonatal mortality and morbidity (Khan et al. 2015). This analysis found that initiating breastfeeding after the first hour of life doubled the risk of neonatal mortality (Khan et al. 2015). These two publications served as the starting point for the development of the PROFILES model. PROFILES uses an RR of neonatal death on day 2 through the end of the neonatal period of 1.53, derived by pooling the analyses of Khan et al. (2015) and Neovita (2016). This RR reflects the increased risk for infants with late initiation of breastfeeding compared to infants whose breastfeeding is initiated in the first hour of life. The population attributable fraction (PAF), calculated from the prevalence of late initiation and the RR, is used to calculate the number of neonatal deaths attributable to late initiation. These are in addition to any neonatal deaths that occur in the first 2 days of life (about half); such deaths are not included in the model.

The model is intended for use in developing countries where the percentage of infants who are ever breastfed is very high, but where there is a substantial problem with timing of initiation. In such settings, never breast-fed infants are more likely to be sick

<sup>1</sup> In 2017, Smith et al. (on behalf of the Neovita Study Group) reviewed the evidence to date on the association between early initiation of breastfeeding and neonatal mortality risk, including an analysis of the three neonatal vitamin A trials. The findings of the 2017 meta-analysis are similar in order of magnitude to the 2016 publication.

and to have experienced a complicated or preterm delivery and hence be more likely to die in the first 2 days of life. In the model, the relative risk of neonatal death for never breastfed infants is considered to be the same as for ever breastfed infants who initiate breastfeeding late. The never breastfed infants represent a very small percentage of all infants who survive past the first 2 days, hence they are grouped with those for whom breastfeeding was initiated late. Note that the research on the link between the initiation of breastfeeding and neonatal mortality can be difficult to interpret because newborns at highest risk of death may not be able to breastfeed in the first hour because of their small size, illness, or treatment—a classic example of reverse causality. Generally, research on the link between late initiation of breastfeeding and neonatal mortality therefore excludes deaths in the first 2 days after birth. A systematic review of timing of neonatal deaths in developing countries found that 54.5 percent of neonatal deaths occur during the first and second days of life (Sankar 2016). Based on this, 54.5 percent of neonatal deaths are excluded from consideration in the PROFILES model.

In addition to this coefficient, the model also uses country-specific information on the percentage of infants who started breastfeeding within 1 hour of birth, information on whether children were ever breastfed, and information on the neonatal mortality rate; this breastfeeding information is for all infants born during a specific time period (for example, the past 2, 3, or 5 years before a survey). Representative population-based surveys, such as Demographic and Health Surveys (DHS), are a common source of information for many models in the PROFILES spreadsheet workbook. After excluding neonatal deaths occurring in the first 48 hours, PROFILES multiplies the PAF<sup>2</sup> (calculated from the RR and the prevalence of late initiation) by the number of remaining neonatal deaths to estimate neonatal deaths related to the late initiation of breastfeeding. The estimates calculated by this model refer to the likelihood of infants dying on the third day of life through the end of the neonatal period related to the late initiation of breastfeeding and the reduced likelihood if the prevalence of early initiation of breastfeeding were improved. In the status quo

scenario the results would be presented as “[number] lives of newborns lost related to late initiation of breastfeeding,” whereas for the improved scenario the results would be presented as “[number] lives of newborns saved related to improved early initiation of breastfeeding (within an hour of birth).”

Using the method described, the PROFILES late initiation of breastfeeding model calculates country-specific estimates of the total number of neonatal deaths related to late initiation of breastfeeding over the course of the time period for the status quo scenario, and the total number of neonatal deaths that will be averted by reducing late initiation of breastfeeding over the same time period for the improved scenario.

### How Can this Model Be Used to Support Country-Level Advocacy?

The promotion of early initiation of breastfeeding is not only critical to reducing global undernutrition but also is a critical intervention to help reduce neonatal mortality, which today constitutes the most significant proportion of under-5 child deaths. Given the importance of optimal breastfeeding practices on both reducing mortality and improving the health and lives of children and their mothers, the new PROFILES model (in concert with the original breastfeeding models<sup>3</sup>) can be used to engage country governments and donors to improve early and exclusive breastfeeding practices as part of the broader nutrition advocacy process. With the support of PROFILES estimates, nutrition advocacy can emphasize how addressing suboptimal breastfeeding practices is not only critical to reducing childhood malnutrition but is also a key intervention to reducing neonatal mortality. Given the slow reduction in neonatal mortality, additional attention needs to be focused on saving newborn lives. The promotion of the early initiation of breastfeeding is one intervention that can help achieve that goal and help countries and the world reach the SDG 3 targets.

For more information from FANTA on using PROFILES for country-level nutrition advocacy, visit [www.fantaproject.org/tools/profiles](http://www.fantaproject.org/tools/profiles).

2 The population attributable fraction is the proportion (or fraction) of the condition (neonatal mortality) that is attributable to the risk factor (not being breastfed within an hour of birth).

3 PROFILES contains two other breastfeeding related models. One that estimates the impact of suboptimal breastfeeding practices on child mortality and the other that estimates preschool overweight/obesity related to suboptimal breastfeeding practices (not exclusively breastfeeding for six months). See Oot et al. 2015 and Oot et al. 2016 for more information.

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