Formula use in a breastfeeding culture: changing perceptions and patterns of young infant feeding in Vietnam

by
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ABSTRACT

Background: Child malnutrition, including both undernutrition and overweight, is a global issue with consequences for survival, incidence of acute and chronic diseases, healthy development, and the economic productivity of individuals and societies. Exclusive breastfeeding in the first six months along with continued breastfeeding has been identified as the single most effective preventive intervention for improving the survival and health of children. Exclusive breastfeeding is associated with decreased mortality and morbidity, and is the globally endorsed optimal feeding method for infants in the first six months of life. Despite high rates of any breastfeeding, formula use is known to be one of the main contributors to low exclusive breastfeeding rates in Vietnam. The overall objective of this thesis was to explore perceptions and practices related to formula use among rural Vietnamese households, to understand options and support for infant feeding for women who work outside the home, and to evaluate the association between breastfeeding problems and other risk factors at three months postpartum and subsequent use of formula.

Methods: In-depth interviews were conducted as part of the “Alive and Thrive” (A&T) initiative, which enrolled 120 mothers, fathers, and grandparents of infants between May and June 2012 in Thanh Hóa and Vĩnh Long provinces as part of a process evaluation conducted by the Institute of Social and Medical Studies (ISMS) under the supervision of The International Food Policy Research Institute (IFPRI), an independent organization contracted to perform a rigorous evaluation of the A&T initiative in
Vietnam. A maximum variation sampling approach was used to efficiently capture three dimensions defined *a priori* as: location, exposure to the intervention, and age of infant. Households within communes were purposively selected to fill these dimensions. Interview guides were designed to focus on facilitators and barriers to project implementation and impact, and asked for respondents’ recollections of prenatal care and birth experiences, as well as plans for infant feeding, care, and work and household responsibilities in the first year of the infant’s life. All interviews were conducted in Vietnamese and recorded with digital recording devices in respondents’ homes by ISMS field staff. A complete transcript was made in Vietnamese from the recorded interview, which was translated into English by ISMS staff based in Hanoi, Vietnam. A subset of 24 households, each comprising a mother, father, and cohabitating grandparent, were analyzed to understand perceptions, decision-making and behaviors related to formula use for infants in rural Vietnam using a case study approach. Feeding formula when mothers returned to work emerged as a theme from this analysis, and the full set of 120 transcripts were subsequently coded to explore maternal work in-depth in relation to this practice. Pumping breastmilk was also coded as a potential solution to this constraint.

Data previously collected from the A&T 2010 baseline study were also analyzed. The baseline study was conducted as part of a clustered randomized controlled trial in four rural Vietnamese provinces to measure the impact of the A&T initiative on breastfeeding and stunting rates in Vietnam. Descriptive analysis explored types of breastfeeding difficulties and support-seeking behaviors in the full sample. A subset of
604 women who were breastfeeding infants between 3-6 months of age were used to investigate the association between experiencing breastfeeding difficulties at three months postpartum and formula feeding between three and six months of age. Logistic regression, was used to determine the magnitude and significance of the association of breastfeeding difficulties and subsequent formula use after adjusting for potential confounding factors.

**Results:** Families valued and practiced breastfeeding, but relied on formula in the absence of other support. At birth, infant crying was perceived as a sign that colostrum or breastmilk was insufficient to satisfy infant hunger, mothers reported a lack of hands-on support for breastfeeding difficulties, and some fathers perceived formula feeding as a way to support the mother while she rested and recovered after birth. In the first few months of an infant’s life after birth, formula was often used when mothers perceived insufficient milk. Complementary foods were introduced around four months, and families reported formula was often introduced at the same time as other complementary foods and a means to enhance child development. Intelligence and height were two of the most desirable qualities formula was thought to provide, information respondents identified from television and other media advertisements.

The message to exclusively breastfeed was widely known, but was not thought to be achievable for working mothers in particular. Formula was perceived as the only solution for feeding when mothers and infants were physically separated for long hours. Acceptability toward the idea of pumping breastmilk was low, due to a lack of
awareness about the practice, concerns about safe storage, and that the same term (vắt sữa) was used for both the traditional practice of expressing unsuitable milk to discard and pumping milk to feed a child.

The baseline survey showed that 12.7% of women experienced breastfeeding difficulties. The most common breastfeeding difficulties at 3 months postpartum were perception of insufficient milk (38.2%), breast pain (15.5%), and poor latch (15.5%). Only half of mothers sought help for insufficient milk, and seeking help for breast pain or latch was more common (75.9% and 67.1%, respectively). Mothers most often sought support from their mother/mother-in-law (52.7%), another family member (32.2%), or a doctor (31.3%), and each source of support recommended formula use more than any other solution.

Experiencing breastfeeding difficulties at 3 months postpartum was found to be associated with higher odds of subsequent formula feeding in infants 3 to 6 months of age (OR=2.32; 95% CI: 1.38, 3.91), as was maternal work outside the home (OR=2.03; 95% CI: 1.30, 3.18), formula feeding at birth (OR=1.86; 95% CI: 1.27, 2.73), and child age (mo) (OR=1.34; 95% CI: 1.06, 1.68) whereas higher birth weight (kg) was associated with lower odds of formula use (OR=0.60; 95% CI: 0.40, 0.91) in a multivariable logistic regression analysis. No association was found between formula use and maternal age, education, social and wealth conditions, having previously heard about EBF, household food security, maternal body mass index, breastfeeding difficulties at birth, or recent child illness.
Conclusions: Breastfeeding is culturally normative in Vietnam, but our study suggests that formula feeding is a leading factor undermining exclusive breastfeeding. Using a mixed methods approach, reasons for formula use were elicited in a rural Vietnamese context where mothers were employed and faced the challenge of continued breastfeeding when returning to work. In this context, formula feeding was often perceived as a solution for mothers returning to work, whereas breastfeeding difficulties (both at birth and within the first six months), also led to formula use. Formula feeding was also perceived by family members as a way to provide rest to the mother after birth, and advertised properties of formula appealed to caregivers as a way to enhance child development.

It is essential to incorporate the perspective of Vietnamese families, who receive messages regarding infant feeding, particularly regarding formula, interpret them, and ultimately make the decisions that impact child feeding, growth, and survival within their culturally and politically determined world. This research contributes new information about reasons for formula use in a rapidly industrializing setting, and suggests future areas of research and policy change so that exclusive breastfeeding messages are reinforced with breastfeeding support at the workplace, health facilities, and within households.
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This is my grandchild, so I will do what’s best to take care of him. No one loves him more than us.

We all are all connected by the universal wish for a better life for our children, and in partnership—with the experiences of rural Vietnamese families as a foundation and the support of so many along the way—we are creating a healthier future through this work.
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# Glossary of Terms

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<th>Abbreviation</th>
<th>Full Form</th>
<th>Description</th>
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<tr>
<td>A&amp;T</td>
<td>Alive &amp; Thrive</td>
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<tr>
<td>DHS</td>
<td>Demographic and Health Survey</td>
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<tr>
<td>IFPRI</td>
<td>International Food Policy Research Institute</td>
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<tr>
<td>ISMS</td>
<td>Institute of Social and Medical Studies</td>
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<tr>
<td>IYCF</td>
<td>Infant and Young Child</td>
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<tr>
<td>EBF</td>
<td>Exclusive Breastfeeding</td>
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<tr>
<td>UN</td>
<td>United Nations</td>
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<tr>
<td>UNICEF</td>
<td>The United Nations Children’s Fund</td>
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<td>WHO</td>
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1 Introduction and Research Objectives

Child malnutrition, including both undernutrition and overweight, is a global issue with consequences for survival, incidence of acute and chronic diseases, healthy development, and the economic productivity of individuals and societies\(^1\). Child undernutrition includes stunting, wasting, and deficiencies of essential vitamins and minerals. In 2011, 165 million children younger than 5 years of age were stunted (height-for-age Z score, HAZ<−2) based on the WHO Child Growth Standards\(^1\); in low-income and middle-income countries (LMIC) the prevalence was 28.0% (95% CI: 25.6, 30.4)\(^1\).

Overweight and obesity can exist in the same setting, representing what has been called the “double burden” of malnutrition. The global prevalence of overweight, defined as a weight-for-height Z score (WHZ) of +2 or higher, was 7% for children younger than 5 years in 2011\(^1\). The most overweight children younger than 5 years (32 million in 2011) live in LMICs; over half of these children (17 million) live in Asia\(^1\).

There are many determinants of child stunting and overweight that originate in the period of infancy and young childhood. Globally, 70% of deficits in height are due to faltering in the first “1000 days” of life\(^2\). Several infectious diseases in early childhood have been associated with long-term effects on linear growth, the most important determinant being diarrhea\(^1\). Overweight also has many contributing factors, but it is known that rapid weight gains in the first 1000 days are strongly associated with body composition in adulthood\(^1\).
Optimal nutrition in the period of infancy and young childhood is defined by The World Health Organization (WHO) and The United Nations Children's Fund (UNICEF) as:

1) Early initiation of breastfeeding within the first hour after the birth
2) Exclusive breastfeeding for the first six months of life (EBF)
3) Continued breastfeeding for two years or more, together with safe, nutritionally adequate, age appropriate, responsive complementary feeding starting in the sixth month

There is evidence from observational studies to suggest an association between exclusive breastfeeding and prevention of stunting, and strong evidence exists for the association between breastfeeding and protection against infectious morbidity, particularly for diarrhea. Breast milk also contains non-nutrient factors that promote intestinal adaptation and maturation and protect against infection and inflammatory disorders, which may be one pathway through which breastfeeding protects infants from infection and allows energy to be directed toward growth and development.

Breastfed infants self-regulate energy intake at a lower level and exhibit slower weight gain compared to formula-fed infants, which may contribute to the association observed between breastfeeding and reduced risk of later obesity.

Exclusive breastfeeding in the first six months along with continued breastfeeding has been identified as the single most effective preventive intervention for improving the survival and health of children globally. Counseling and education have been identified as two methods that significantly increase exclusive breastfeeding rates in various settings, but the limited scope of past studies and the complete absence of trials to support breastfeeding in the workplace have led to calls for an increase in evidence-based promotion of breastfeeding.
“Alive & Thrive” (A&T) is a six year (2009-2014) Bill & Melinda Gates Foundation-supported initiative to improve infant and young child feeding (IYCF) behaviors in three countries (Bangladesh, Ethiopia, and Vietnam) and to generate lessons on how to achieve impact at scale. In 1986, these three countries were the poorest in the world\textsuperscript{20}. Bangladesh and Ethiopia are still classified by the World Bank as low-income countries, but Vietnam has transformed into a lower-middle-income country over the past 25 years\textsuperscript{21}. In 1989, shortly after initiation of the 1986 \textit{chính sách Đổi Mới} (political and economic reforms), GNI per capita (annual gross national income, divided by midyear population) in Vietnam was $220. By 2013, per capita income was $1,740\textsuperscript{22}. The ratio of population in poverty also fell from 58% in 1993 to 14.5% in 2008\textsuperscript{21}. A World Bank report stated, “Vietnam’s economic and social achievements in the 1990s are nothing short of amazing, arguably placing it among the top two or three performers among all developing countries”\textsuperscript{20}. In the past two decades, this rapid economic growth and rising household incomes have been largely responsible for early progress toward reducing national rates of stunting and child mortality\textsuperscript{20}.

Even while prosperity has increased and many national health indicators have improved, indicators for the poorest households remained virtually unchanged in Vietnam, demonstrating that economic growth does not “guarantee improvements in every dimension of a nation’s standard of living”\textsuperscript{20}. In addition, the pace of improvement for indicators such as stunting has slowed, while overweight has emerged as an important issue. According to a 2011 report from Vietnam’s National Institute of Nutrition, the national prevalence of stunting in Vietnam was 29.3% (2.1 million
stunted). In 10 of 63 provinces, rates of stunting were between 35.0 and 41.6%. The prevalence of overweight (WHZ ≥2SD) among children under 5 years of age was 4.8%; a rate six times higher than in 2000.

Focused attention on programs and policies that will improve breastfeeding rates in particular is now a priority for the Vietnamese government. Breastfeeding in Vietnam is culturally normative. 97.9% of children are ever breastfed, with a median duration of 18 months. However, practices do not conform to the WHO/UNICEF recommendations. While 61.7% of women initiate breastfeeding within the first hour, 30.1% discard colostrum before the first breastfeed. Exclusive breastfeeding (EBF) is not common and appears to be declining. The median duration of EBF is 0.5 months, and the proportion of infants under 4 months that is exclusively breastfed has declined from 27% to 20% from 1997-2002, according to the most recent Demographic Health Survey. A 2011 report from the National Institute of Nutrition states that just 20% of infants under 6 months were exclusively breastfed in 2010, and in-depth interviews from smaller samples in a variety of Vietnamese settings report that EBF is not actually practiced for a full six months.

One of the main factors undermining exclusive breastfeeding in Vietnam is formula use. In an urban sample, 98% of mothers had been exposed to formula advertisements in 2005. The rate of formula use has increased from 12% in 2002 to 39% in 2011. A survey of 11 provinces across Vietnam found that 54% of infants were

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1. The most recently available national surveillance data from the Vietnam DHS was published in 2003. The reporting of the EBF indicator reflects that at that time, the WHO recommendation (and associated promotional efforts) was to EBF through 4 months; in 2008 the recommendation was changed to 6 months.
fed formula in first three days of birth\textsuperscript{31}. One reason for formula use as reported by mothers includes poor nutrition leading to insufficient breastmilk; in a sample of 463 mothers, 97\% said formula is necessary if a mother experiences insufficient milk\textsuperscript{32}. Formula is perceived as providing extra nutrition for infants\textsuperscript{32} for added growth and strength\textsuperscript{28}. Breastfed infants were also given formula when there was no apparent problem feeding if parents could afford it\textsuperscript{32}. Formula is costly for families; one study found that one container of formula cost the equivalent of 10\% of a rural family’s monthly income\textsuperscript{29}.

One of the main reasons for formula use in Vietnam is because a mother returned to work\textsuperscript{32}. In Vietnam, the majority of women (68\%) participate in the labor force, comprising 40\% of non-agricultural paid labor and 50\% of the professional and technical workforce\textsuperscript{33}. Although it is discussed less in the literature, difficulties related to breastfeeding while employed are experienced by rural, often informally employed, working mothers. In one study including 1118 women (88\% farmers) in Vietnam, 25\% of the women who stopped breastfeeding before one year identified working conditions as the cause\textsuperscript{34}. In another survey of rural households in northern Vietnam, women who had returned to work were 14.0 times (95\% CI: 3.8, 51.7) more likely to fail to exclusively breastfeed compared to mothers who had not yet returned to work\textsuperscript{27}. Employed mothers and their families perceive formula as the best infant feeding option while physically separated from their children\textsuperscript{27}.

The A&T initiative in Vietnam presented a unique opportunity to continue to explore these issues in depth. A&T was launched in 2009 with following aims: 1)
increase rates of EBF by 62% (from 17% to 27.5%), 2) improve complementary foods and practices, and 3) reduce stunting by 2% each year in Vietnam. A&T worked with the Ministry of Health, the National Institute of Nutrition and the Women’s Union and provincial authorities to three main components of the initiative in Vietnam: 1) policy advocacy (a national mass media campaign, advocacy efforts to extend maternity leave legislation, strengthening the marketing code for breastmilk substitutes\textsuperscript{35}), 2) community intervention (introduction of a social franchise model for IYCF\textsuperscript{36} and IYCF support group for harder-to-reach areas), and 3) private sector partnerships (workplace interventions and micronutrient products).

The A&T initiative was implemented intensively in 15 provinces: 11 non-evaluation and four evaluation\textsuperscript{37}. The International Food Policy Research Institute (IFPRI) is an independent organization contracted to design and conduct the A&T evaluation, which included a baseline survey and rigorous process evaluations. Through this process, the A&T initiative was better able to understand successes and failures, make changes to improve outcomes, and to make recommendations for future interventions. A large baseline survey in 2010, part of the impact evaluation, and a focused household qualitative research study with mothers and other caregivers in 2012, part of the process evaluation, were both analyzed for this study.

The overall goal of this project was to understand more about formula use, the main barrier to exclusive breastfeeding in Vietnam.
The specific research questions explored through secondary data analysis of the baseline interviews for the A&T initiative as well as data analysis of household qualitative interviews with mothers and other caregivers in Vietnam are as follows:

• **Research Objective 1:** To understand perceptions and describe practices related to offering formula to infants before one year in rural Vietnam.
  o **Research Question 1a:** What are the perceptions at a household level (mothers, fathers, and grandmothers) related to timing and reasons for offering formula?
    ▪ What is the basis for decision-making regarding the acceptable types and appropriate time to offer formula (i.e., infant’s age, achievement of milestones, a desire to fulfill infant’s potential development, community tradition, advertisement, advice from others, family circumstances)?
    ▪ Are perceptions consistent among family members?
  o **Research Question 2a:** Is there a pattern to formula use between households related to timing and reasons for offering formula?

• **Research Objective 2:** To understand what women perceive as options and support for breastfeeding and infant feeding when they return to employment outside the home post-delivery.
  o **Research Question 2a:** How do traditional and current patterns of extended and nuclear family living and workload expectations for mothers impact breastfeeding support?
  o **Research Question 2b:** What is the awareness, attitude, and feasibility regarding pumping and storing breastmilk for mothers returning to employment? How are the varied perceptions of family members (grandmothers, fathers, and mothers) incorporated into the ultimate decisions and practices regarding infant feeding?
  o **Research Question 2c:** What is the role of formula or other non-breastmilk liquids and solids in replacing breastmilk for mothers returning to work?
    ▪ How are traditional perceptions of healthy infants and methods of infant feeding compatible, or actually promote, formula feeding? What aspects might be useful in preventing the use of formula?

• **Research Objective 3:** To understand the association between breastfeeding difficulties at 3 months postpartum and formula feeding between 3 and 6 months of age.
o **Research Question 3a:** What are the types and prevalence of breastfeeding difficulties mothers report at 3 months, and in what ways is this similar or distinct from difficulties reported at initiation?

o **Research Question 3b:** Are women seeking support for later breastfeeding difficulties? From whom is it sought, and what is the type of support and advice they are offered?
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2 Literature Review

2.1 The Global Burden and Causes of Child Malnutrition

Child malnutrition, including both undernutrition and overweight, is a global issue with consequences for survival, incidence of acute and chronic diseases, healthy development, and the economic productivity of individuals and societies\(^1\). Child undernutrition includes stunting, wasting, and deficiencies of essential vitamins and minerals. In 2011, 165 million (25.7\%) children younger than 5 years of age had a height-for-age Z score (HAZ) of \(-2\) or lower (stunted) based on the WHO Child Growth Standards\(^1\). In high income countries (HIC), the prevalence was 7.2\% (95\% CI: 4.1, 12.6) while in low-income and middle-income countries (LMIC) the prevalence was 28.0\% (95\% CI: 25.6, 30.4)\(^1\).

Overweight and obesity can exist in the same setting, representing what has been called the “double burden” of malnutrition. The global prevalence of overweight, defined as a weight-for-height Z score (WHZ) of +2 or higher based on the WHO Child Growth Standards\(^2\), was 7\% for children younger than 5 years in 2011, and is projected to increase in most world regions\(^1\). Although prevalence is higher in HIC, the most overweight children younger than 5 years (32 million in 2011) live in LMICs; over half of these children (17 million) live in Asia\(^1\).

According to the 2009-10 report from the Vietnam’s National Institute of Nutrition and UNICEF, the national prevalence of stunting in Vietnam (a lower-middle-income country) was 29.3\%\(^3\), but in 10 of 63 provinces was found to be between 35.0 and 41.6\%\(^4\). The rate of overweight and obesity (WHZ $\geq 2$SD) among children under 5
years of age is 4.8%. This rate from 2009 is six times higher than in 2000, and the prevalence of obesity has found to be as high as 19.6% in urban adolescents.5

There are many determinants of child stunting and overweight, and many originate in the period of infancy and young childhood. Optimal nutrition in the period of infancy and young childhood includes exclusive breastfeeding (EBF), breastmilk without additional food or drink for the first six months of life, introduction of complementary foods at six months, and continued breastfeeding for at least two years.6

Globally, 70% of deficits in height are due to faltering in the first “1000 days” after conception.7,8 The association between breastfeeding and long-term effects on linear growth is not well-established,9 but infectious disease in early childhood has been associated with long-term effects on linear growth,1,9 with diarrhea representing the most important determinant. Strong evidence exists for the link between breastfeeding and protection against infectious morbidity,10-12 particularly for diarrhea.13,14

In one meta-analysis, the risk of diarrhea incidence was higher for partial (RR=3.04; 95% CI=1.32, 7.00) and non-breastfed infants (RR=3.65; 95% CI=1.69, 7.88) compared to exclusively breastfed infants.13 Breast milk contains non-nutrient factors that promote intestinal adaptation and maturation and protect against infection and inflammatory disorders,15-17, which may be one pathway through which breastfeeding protects infants from infection and allows energy to be directed toward growth and development.
Risk of overweight also has many potential determinants, including breastfeeding patterns. One recent meta-analysis showed a pooled adjusted odds ratio (AOR) of 0.78 (95% CI: 0.74, 0.81)\textsuperscript{18} while another demonstrated a 12% reduction in the risk of overweight or obesity\textsuperscript{1} associated with breastfeeding.

Exclusive breastfeeding in the first six months along with continued breastfeeding has been identified as the single most effective preventive intervention for improving the survival and health of children\textsuperscript{19}. Two systematic literature reviews of breastfeeding promotion interventions identified counseling and education as two methods to significantly increase exclusive breastfeeding rates in various HIC and LMIC settings\textsuperscript{20,21}, but potential for scaling up was unclear. In addition, no trials were found in either of the breastfeeding promotion reviews nor in a Cochrane review of interventions in the workplace to support breastfeeding\textsuperscript{22} that addressed the issues of barriers around work environments or maternity leave provisions.

Although breastmilk is well known to be economically and physiologically crucial to child survival\textsuperscript{13}, breastfeeding promotion also faces a competition from a “voracious global marketing by the formula-milk industry”\textsuperscript{23} as a strategy for infant feeding. In Vietnam, 98% of mothers in an urban sample had been exposed to formula advertisements in 2005\textsuperscript{24}. The rate of formula use has increased from 12% in 2002\textsuperscript{25} to 39% in 2011\textsuperscript{26}, and is the main factor undermining exclusive breastfeeding. A survey of 11 provinces across Vietnam found that 54% of infants were fed formula in first three days of birth\textsuperscript{27}. Formula use in Vietnam has been reported if a mother experiences
insufficient milk\textsuperscript{28}, for extra nutrition for infants\textsuperscript{28,29}, or because a mother returned to work\textsuperscript{28}.

In this literature review, optimal breastfeeding guidelines will be introduced, followed by the biological and epidemiological foundation for such recommendations. Risks of formula feeding will also be discussed. Global trends and interventions in breastfeeding and formula use will be reviewed, including infant feeding and maternal employment. Finally, trends, interventions, and breastfeeding knowledge, attitudes, and behaviors specific to Vietnam will be discussed.

2.2 Optimal Breastfeeding Guidelines

2.2.1 Optimal Breastfeeding Guidelines

Optimal breastfeeding guidelines and common classifications for breastfeeding patterns are introduced here, followed by their biological and epidemiological rationale. The WHO infant feeding guidelines\textsuperscript{6} recommend that:

- Breastfeeding should be initiated within the first hour of birth, without prelacteals, bottles, or pacifiers.

- Infants should continue to exclusively breastfeed on demand for the first six months of life without additional food or drink (not even water) to achieve optimal growth, development and health.

- Thereafter, to meet their evolving nutritional requirements, infants should receive nutritionally adequate and safe complementary foods while breastfeeding continues for up to 2 years of age or beyond.

It is necessary to have a common language when classifying women and infants by breastfeeding practice across epidemiological studies; the most widely used are the WHO definitions below\textsuperscript{6}:
• **Exclusive breastfeeding**: Receives only breast milk from mother or wet nurse, or expressed breast milk and no other solids or liquids except drops or syrups containing vitamins and minerals, or medicines

• **Predominant breastfeeding**: Predominant source of nourishment is breast milk, but may have received water or water-based drinks (sweetened or flavored water, teas); fruit juice; oral rehydration solution; vitamin and mineral syrups/drops; medicines; folk fluids (tea, herbal preparations, gripe water, oil)

• **Partial breastfeeding**: Giving some breastfeeds and some artificial feeds (milk, cereal, or other food)

• **Replacement feeding**: The process of feeding a child who is not receiving any breast milk with a diet that provides all the nutrients the child needs. (Before 6 months, infant formulas etc. After 6 months, formula plus suitable complementary food)

These are presented with the recognition that standard definitions for breastfeeding trajectories often do not capture the complexity of actual practices\(^{30}\).

### 2.2.2 Lactation Physiology Supporting Guidelines

The WHO guidelines are supported by an understanding of lactation physiology as well as epidemiological evidence; the former will be described here.

There are five main pathways by which newborn health may be enhanced with early onset of lactation: 1) early initiation stimulates prolactin receptors that facilitate later adequate milk production, 2) frequent and early suckling releases oxytocin which stimulates pair-bonding and lowers maternal stress, 3) close contact with mother and lipids in breastmilk aid in infant thermoregulation, 4) nursing assists in expelling meconium and 5) colostrum is provided in early life when it is critical for immune protection.
Prolactin is the principal hormone that maintains milk biosynthesis. Frequent feeding early in lactation may stimulate the development of prolactin receptors in the mammary gland. Studies have found that the number of receptors per cell increases in early lactation and remains constant thereafter in other species. In addition, prolactin levels are lower but milk volume is significantly higher in the first 4 days postpartum in multiparous mothers compared to primiparous mothers. It may be that the number of receptors established in early lactation is the controlling factor in milk output rather than the amount of prolactin, and more receptors may result in adequate milk production even with lower prolactin levels.

Oxytocin is another major hormone required for the milk ejection reflex (or “letdown” effect) that allows infants to extract milk from the gland. During suckling or breast stimulation, oxytocin is released in discrete pulses and carried through the bloodstream to the breast where it interacts with receptors on the myoepithelial cells surrounding the alveoli to cause contractions that force milk into the ducts. Animal knockout models that do not produce oxytocin and are incapable of milk ejection.

Oxytocin released by suckling not only causes physiological changes such as contracting the mother’s uterus, but facilitates behavioral and psychological changes in mothers as well. Oxytocin has been implicated not only in parturition and lactation, but also maternal behavior and pair bond formation and reduced maternal stress.
Close maternal contact during breastfeeding can reduce ambient heat loss and subsequent hypothermia\textsuperscript{42,43}. A recent study in mice also demonstrated that breastmilk itself may prevent hypothermia\textsuperscript{44}. Suckling immediately after birth prompted the free fatty acids from lipid-rich milk to activate genes related to thermogenic activation and glucose utilization in brown adipose tissue, which is abundant in the newborn as an alternative means of heat regulation (newborns do not shiver, have a lack of thermal insulation, and an immature nervous system).

Nursing assists in expelling meconium (which has built up during the time in utero and includes intestinal epithelial cells, lanugo, mucus, amniotic fluid, bile, and water), which promotes fecal bilirubin clearance and reduces the likelihood of neonatal jaundice\textsuperscript{36}.

Finally, and perhaps most importantly, colostrum is secreted by the mother in the first few days of the infant’s life and contains higher levels of vitamin A, vitamin B12, and protein compared to mature milk. Vitamin A is required for vision and maintenance of epithelial structures, while B12 is important for early development of the infant’s central nervous system\textsuperscript{36}. Human milk contains casein and whey protein. Casein is low in early lactation then increases whereas whey is high and decreases; the ratio of casein to whey is 10:90 in early lactation, 60:40 in mature milk, and 50:50 in late lactation\textsuperscript{45}. Whey proteins are acidified in the stomach and quickly digest to supply a continuous flow of nutrients to the infant. Caseins form tough, less digestible curd that requires higher energy expenditure. Whey is composed of α-lactalbumin, serum albumin, lactoferrin, immunoglobulins,
and lysosome. The latter three play important roles in immunological defense. In addition, a large number of other proteins (enzymes, growth modulators, and hormones) are also present in low concentrations. The immunological properties of lactoferrin, SIgA, enzymes, maternal antibodies, living cells (leukocytes, neutrophils and macrophages), oligosaccharides, and non-pathogenic bacteria in colostrum are “are resistant to digestive enzymes, confer protection without triggering inflammatory reactions, compensate for the infant’s inability to process antimicrobial agents, kill certain bacterial pathogens synergistically, and are common to mucosal sites”. Withholding and discarding of colostrum deprives the infant of this rich source of immunoprotection.

Infant and young child health is further enhanced by exclusive breastfeeding. Breastmilk provides appropriate amounts of key nutrients through six months. Even after complementary foods are introduced, breastmilk provides substantial nutrition especially for protein, fat, and most vitamins. Maternal undernutrition has little effect on the volume or composition of breast milk unless malnutrition is severe. A meta-analysis of the milk volume secreted by exclusively breastfeeding women showed that milk volume at 6 months postpartum is remarkably constant, approximately 800mL/d in populations worldwide. In women with very little body fat who secrete milk with a lower lipid content, milk volume is increased 5% to 15%, resulting in a decrease in caloric density of as much as 15%. Milk volume secretion in lactating women is regulated by infant demand, and when infants are supplemented with non-breastmilk liquids
and solids, milk secretion is proportionately reduced. Studies in Peru and the
Gambia showed that maternal milk production was 600mL/d due to
supplementation with small amounts of food at mealtimes\textsuperscript{34}.

Continued breastfeeding provides continued immunoprotective factors,
although not in the high levels seen in colostrum\textsuperscript{15}. In some settings, higher
morbidity and mortality with less exposure to breastmilk may also be due to
displacement of immunoprotective and nutritionally appropriate breastmilk with
contaminated or physiologically inappropriate non-breastmilk liquids or solids\textsuperscript{49}.

2.2.3 Epidemiological Studies Supporting Guidelines
2.2.3.1 Early Initiation

Three studies in Ghana\textsuperscript{50,51}, Nepal\textsuperscript{52}, and India\textsuperscript{53} have shown an association
between early initiation of breastfeeding and reduced risk of mortality during the
neonatal period, suggesting a promising window of opportunity to reduce child
deaths if women can be supported in breastfeeding during the critical first hours
after birth.

In Nepal, Mullany et al. observed that partially breastfed infants were at a
greater mortality risk (RR=1.77; 95% CI=1.32-2.39) than those that were exclusively
breastfed\textsuperscript{52}. They also observed a trend (p=0.03) toward higher mortality with
increasing delay in breast-feeding initiation. Mortality was greater among those who
began breastfeeding more than 24 hours after birth compared to those who began
within 24 hours (RR=1.41; 95% CI=1.08-1.86). This study is supported by results from
Edmond et al. in Ghana, where they observed that initiation of breastfeeding after
day one compared with earlier was also associated with a three-fold increase in neonatal mortality risk (OR=3.23; 95% CI=1.07, 9.82).

Using estimates from an adjusted model of mortality risk varying by breastfeeding initiation time, it was concluded that approximately 7.7% of all neonatal deaths in rural southern Nepal could be avoided with universal initiation of breastfeeding within the first 24 hours of life, and 19.1% of deaths could be prevented with initiation within the first hour of life\textsuperscript{52}.

All of the studies examining breast-feeding patterns and time to initiation were observational. Few breastfeeding studies are randomized control trials, as it is “unfeasible and probably unethical to randomise newborn human infants to breast-feeding vs formula-feeding, or even to more vs less exclusive, or to longer vs shorter durations of breast-feeding”\textsuperscript{54} based on the difficulty of establishing a placebo and the known benefits of breastmilk. Consequently, these observational studies did not assign participants to commence breastfeeding at specified times; factors that determine these choices are outside the control of the investigator and may have been the same factors associated with the outcome. Although many of these confounding factors were considered in the analysis, other unmeasured confounders could exist.

The authors of each study examined the potential for reverse causation bias (that caretakers delayed breastfeeding because of preexisting morbid conditions) by restricting analyses to infants surviving to 2 days, and reported that no direct evidence for residual reverse causation bias was found.
2.2.3.2 Exclusive Breastfeeding through Six Months

**Mortality**

Breastmilk has a significant positive impact on child survival, morbidity, and
growth and development. Just as early initiation is associated with decreased
neonatal mortality, exclusive breastfeeding for the first six months of life is
associated with decreased mortality for children under 5 years of age\(^\text{13}\). The Lancet
series on Maternal and Child Undernutrition performed random effects meta-
analysis of seven studies from developing countries to examine morbidity and
mortality in relation to four distinct patterns of breastfeeding in infants under 6
months of age: EBF (breastmilk only), predominant (only water or teas in addition to
breastmilk), partial (other liquids or solids in addition to breastmilk), and not
breastfeeding. Not breastfeeding had a relative risk of 14.40 (95% CI=6.09-34.05)
compared to EBF\(^\text{13}\). There also appeared to be a dose effect where the less exposure
to breastmilk an infant received, the greater the risk of death. Partially breastfed
infants had a relative risk of 2.85 (95% CI=1.59, 5.10), and even predominant
breastfeeding carried a slightly higher and statistically significant relative risk of 1.48
compared to EBF (95% CI=1.13, 1.92).

**Morbidity**

Breastfeeding has a particularly well-established association with reductions
in morbidity from infectious diseases in low/middle income countries\(^\text{55-57}\), as well as
high income countries\(^\text{11}\). Given that diarrheal disease is the second leading cause of
death for children under 5 (accounting for approximately 1.34 million deaths)\(^\text{13}\), and
is the most important infectious disease determinant of stunting\(^1\), it is important to quantify the preventive effect of breastfeeding practices on diarrhea-specific morbidity and mortality specifically.

Black et al.\(^1^3\) found that while there was no additional risk for diarrhea incidence for predominant breastfeeding, the risk rose for partial (RR=3.04; 95\% CI=1.32, 7.00) and non-breastfed infants (RR=3.65; 95\% CI=1.69, 7.88). Similarly, risk of diarrhea mortality rose for partial (RR=4.62; 95\% CI=1.81, 11.77) and non-breastfed infants (RR=10.53; 95\% CI=2.80, 39.64).

A more recent systematic review of 18 studies in developing countries by Lamberti et al.\(^1^4\) assessed levels of suboptimal breastfeeding as a risk factor for diarrhea morbidity and mortality, and similar patterns were found. The risk of diarrhea incidence was higher for partial (RR=1.68; 95\% CI=1.03, 2.76) and non-breastfed (RR=2.65 95\% CI=1.72, 4.07) infants compared to exclusively breastfed infants. Diarrhea mortality was higher for partial (RR=4.62; 95\% CI=1.81, 11.76) and non-breastfed infants (RR=10.52; 95\% CI=2.79, 39.6) compared to exclusively breastfed infants as well.

A recent review by Fewtrell\(^1^0\) examined the conclusions of four recent meta-analyses on breastfeeding practices and a broad range of health outcomes, with careful consideration of the limitations of public health recommendations in a field where the scientific evidence is based on studies other than randomized controlled trials. Fewtrell reports that the strongest scientific data on the health effects of breastfeeding for infants is protection against infectious morbidity, which is
proportional to the length of breastfeeding, even in a developed setting. For example, population-based data from the United Kingdom Millennium Cohort Study included data on 15,890 healthy, singleton, term infants and suggested that 53% of hospital admissions for gastroenteritis and 27% of admissions for lower respiratory tract infections could be prevented each month by EBF; 31% and 25% of respective admissions could be prevented with partial breastfeeding in Great Britain\textsuperscript{11}.

A retrospective population level study in Scotland linked birth, death, maternity, infant health, child health surveillance, and admission records for children born between 1997 and 2009 (n=502,948) and found within the first 6 months of life, there was a greater hazard ratio of hospitalization for common childhood illnesses among formula-fed infants (HR=1.40; 95% CI: 1.35, 1.45) and mixed-fed infants (HR=1.18; 95% CI: 1.11, 1.25) compared with infants exclusively breastfed after adjustment for parental, maternal, and infant health characteristics. Within the first year of life and beyond, a greater relative risk of hospitalization was observed among formula-fed infants for a range of individual illnesses including gastrointestinal, respiratory, ear, and urinary tract infections; fever, asthma, diabetes, and dental caries\textsuperscript{12}.

\textit{Growth}

Although the relationship between breastfeeding and reduced mortality, protection from infection, and promotion of brain development has been well-established, the relationship between breastfeeding and linear growth is weak\textsuperscript{9}. It is known that the pattern of growth in infants who are formula fed differs from infants
who receive breastmilk alone for the first six months of life$^{58}$, and WHO standards have been recently updated to “explicitly identify breastfeeding as the biological norm and establish the breastfed child as the normative model for growth and development”$^{72}$. However, significant differences in growth have not been found when evaluating the effect of breastfeeding promotion initiatives. This may be due in part to a lack of rigor in study design$^{9,59}$. Very few randomized controlled trials of breastfeeding promotion have examined growth as an outcome, but among those no effect has been found$^{60-62}$.

Brennan et al. examined data from the 1998–1999 National Family Health Survey (NFHS) in India and found that adherence to recommended feeding practices (as defined by not discarding colostrum, avoiding bottle feeding, and exclusive breastfeeding followed by complementary feeding beginning at about 7 months in their study) collectively reduced the prevalence of severe stunting (HAZ < -3) by up to 30%$^{63}$. However, in another secondary data analysis of the 2005-6 NFHS, stunting prevalence was 21% at 6 months even among those classified as practicing EBF (based only on a 24-hour recall period)$^{64}$.

In Vietnam, a report prepared for A&T found that early (p=0.02) and exclusive (p=0.01) breastfeeding was significantly associated with decreased mean HAZ score after controlling for maternal education and ethnicity$^{65}$. A 2007 study in Nghe An province (on the north central coast of Vietnam directly south of Thanh Hoá) found that duration of exclusive breastfeeding under six months (82.9% of the sample of 607 mother-infant pairs) was associated with higher odds of underweight
(OR=5.98; 95% CI: 2.57, 13.91), stunting (OR=3.74; 95% CI: 2.09, 06.69), and wasting (OR=3.92; 95% CI: 1.08, 14.24) compared to exclusive breastfeeding for the last six months (17.1%) after adjusting for infant characteristics (gender, age, birth weight, recent illness), SES and region of residence, maternal characteristics (age, BMI, parity, education), and breastfeeding initiation.66

A 2013 systematic review conducted by Horta and Victor for the WHO found that breastfeeding was associated with a significant 12% reduction in overweight and/or obesity in childhood.67 This pooled analysis was restricted to 16 high-quality studies with larger sample sizes that controlled for confounding by socioeconomic, birthweight and gestational age, and parental anthropometry. The authors found similar odds ratios when comparing results from 48 high income (OR=0.76; 95% CI: 0.71, 0.81) and 20 low/middle income (OR=0.75; 95% CI: 0.64, 0.89) settings, although residual confounding is possible among this expanded set of studies.

Another recent meta-analysis showed the breastfeeding was associated with a significantly reduced risk of obesity in children (OR=0.78; 95% CI: 0.74, 0.81) across 25 studies in 12 countries.18 Categorical analysis of 17 studies revealed a dose-response effect between breastfeeding duration and risk of childhood obesity. Specifically, breastfeeding for under 3 months provided a minor protective effect for childhood obesity (OR=0.90; 95% CI: 0.84, 0.95), while breastfeeding for 7 or more months showed a significantly higher protection (OR=0.79; 95% CI: 0.70, 0.88).
**Formula Feeding**

Few studies have been conducted that include exclusive formula feeding in countries in economic transition, possibly because mixed feeding is the norm and exclusive formula feeding is not common\(^6^8\). One case-control study in the Philippines found that exclusively formula-fed infants were more likely to be hospitalized for any infection (OR=3.7; 95% CI: 1.8, 7.5), pneumonia (OR=3.0; 95% CI: 1.2, 7.4), and diarrhea (OR=10.5; 95% CI: 2.5, 41.9) compared to exclusively breastfed infants after adjusting for age, education, and place of delivery\(^6^9\).

There are biological mechanisms proposed for the increased risk seen in formula use on infectious disease, allergy, and obesity aside from the immunological contributions conferred in human milk. In other words, it is not just the absence of specialized breastmilk components, but qualities of formula itself that alter biological pathways.

The “early protein hypothesis” has been suggested as biological mechanism that links formula use to later development allergy and obesity. Kinase mTORC1 is the master regulator of cell growth, and it is predominantly activated by amino acids. Excess protein in formula (as compared to breastmilk) upregulates mTORC1, possibly over-activating the infant’s mTORC1 signaling pathways, enhancing adipocyte differentiation while negatively regulating the type of T-cells found to be deficient in individuals with allergies. The absence of bioactive microRNAs and bifidobacteria in formula also play a role in the maturation of these T-cells\(^7^0\).
Differences in dietary iron intakes between breastfed and formula fed infants may also contribute to the increased morbidity of formula-fed infants. Human milk is low in iron (0.2–0.5 mg/L). The majority of infant iron stores are accumulated during gestation and depleted over the first few months of life in breastfeeding infants. Formula in the United States is typically fortified with 10–12 mg/L of iron, (although the more widely adopted global standard is 4–8 mg/L). Many pathogens involved in illness require iron for growth and replication. In breastfed infants, free iron concentrations in the gut are likely very low, and cannot support large colonies of iron-requiring pathogenic bacteria. Commercial infant formula fortification practices may result in an excess of dietary iron, increasing its availability to these pathogens and increasing frequency and severity of infection.

Several requirements, including a safe water supply, correct dosage, ability to purchase sufficient and continued formula, and a clean environments are necessary for safe formula use. Adverse health outcomes (including death) also occurred in China after exposure to fake or contaminated formula, which may be of great concern in neighboring Vietnam. According to a report from the WHO, the Chinese Ministry of Health confirmed that 294,000 infants were affected by melamine-contaminated infant formula by the end of November 2008, including over 50,000 hospitalized infants and six deaths.

2.3 Breastfeeding Worldwide: Trends and Interventions

The most recent data from UNICEF show a modest increase from 34% in 1990 to 41% in 2004 for the percentage of children under 6 months of age in the
developing world who are exclusively breastfed. UNICEF data also report 39% of newborns in the developing world are put to the breast within one hour of birth. In South Asia, children born in the richest households are more likely to be breastfed within one hour of birth than those in the poorest, while the opposite is true in the Middle East/North Africa and East Asia/Pacific regions.

A 2014 Cochrane Review analyzed 52 randomized or quasi-randomized controlled trials comparing extra support for healthy breastfeeding mothers of healthy term babies. The authors reflected that "a striking aspect of this updated review is the heterogeneity of the support interventions, and the diversity of setting and of standard care." Support was categorized as proactive vs. indirect, one-to-one vs. group, professional vs. lay, no vs. additional training, face-to-face vs. telephone, and antenatal vs. postnatal timing. In addition, intensity, duration, and control group care of each study were examined.

The review, which comprised 56,451 mother-infant pairs across 21 countries, showed that all forms of extra support increased the duration of breastfeeding (partial and exclusive), with a RR for stopping any breastfeeding before six months=0.91 (95% CI: 0.88, 0.96). All forms of extra support together also had a positive effect on duration of EBF, with a RR at six months=0.86 (95% CI: 0.82, 0.91); RR at 4-6 weeks=0.74 (95% CI: 0.61, 0.89). Extra support by both lay and professionals had a positive impact on breastfeeding outcomes.

Importantly, the most successful trials occurred in communities with high (over 80%) levels of breastfeeding initiation, suggesting that breastfeeding
promotion at a population level should continue for maximum return on any targeted intervention aiming to increase breastfeeding duration and exclusivity\textsuperscript{75}.

Another review systematic review in 2010 identified all studies that evaluated the impact of breastfeeding promotional strategies on EBF rates at 4-6 weeks and at 6 months\textsuperscript{20}. Thirty-two randomized and quasi-randomized controlled trials (10 from developing countries) provided the outcome of EBF at 4-6 weeks postpartum. There was a statistically significant 43\% increase in the EBF rate (RR = 1.43; 95\% CI: 1.28, 1.60) associated with breastfeeding interventions, with prenatal counseling showing the highest impact. Fifteen studies (6 from developing countries) reported EBF rates at 6 months where a 137\% increase was seen with interventions vs. controls, with prenatal and postnatal counseling combined showing the highest impact. Education alone had no significant impact.

With the exception of Haider et al.\textsuperscript{76}, however, no intervention group was able to achieve high rates of EBF. The authors of the review assert that, “This supports the observation that EBF is difficult and implies that it requires substantially more than education and support targeted solely at the mother to improve EBF rates in developing and developed countries”\textsuperscript{20}.

The authors also speculated that pre-intervention breastfeeding knowledge is higher in HIC, and when combined with factors such as early employment and availability of formula, the effectiveness of interventions is decreased\textsuperscript{20}.

A meta-analysis by Bhutta et al. found that either individual (9 studies) (OR=1.93; 95\% CI: 1.18, 3.15, p<0.0001) or group (five studies; OR=5.19; 95\% CI:
1.90, 14.15, p<0.0001) counseling (vs. routine care) in the prenatal and postnatal period increased the odds of EBF at 6 months of age\textsuperscript{59}.

Jolly et al. performed a systematic review of peer support-based randomized controlled trials for continuation of breastfeeding, and found peer counseling improved EBF. Similar to previous findings in breastfeeding promotion, peer support appeared less effective in high-income countries; the risk of non-exclusive breastfeeding was reduced 37\% (RR 0.63; 95\% CI: 0.52, 0.78) in low and middle-income countries, but just 10\% (RR 0.90; 95\% 0.85, 0.97) in high income countries\textsuperscript{77}.

### 2.3.1 Promotion and Interventions Targeted Against Formula Use

Global protection and promotion of breastfeeding began in 1990 when WHO and UNICEF produced the \textit{Innocenti Declaration on the Protection, Promotion and Support of Breastfeeding}\textsuperscript{78}. The Innocenti Declaration proposed four ambitious targets: 1) establishment of national breastfeeding committees, 2) implementation of the \textit{Ten Steps to Successful Breastfeeding} in maternity services, 3) national legislation to protect the breastfeeding rights of working women, and 4) action to give effect to the International Code of Marketing of Breastmilk Substitutes. The following year, WHO and UNICEF launched the Baby-friendly Hospital Initiative (BFHI), using compliance with the Ten Steps to Successful Breastfeeding as the basis by which hospitals could be designated “Baby-Friendly”. In 2003, WHO and UNICEF published the \textit{Global Strategy for Infant and Young Child Feeding}\textsuperscript{6}, reaffirming the four targets of the 1990 \textit{Innocenti Declaration} while adding a complementary feeding target, guidance for feeding in exceptionally difficult circumstances, and
expanding the call to action beyond the original national and facility-level stakeholders to communities and households\textsuperscript{79}.

International Code of Marketing of Breastmilk Substitutes (the WHO Code), which also arose from the Innocenti Declaration, calls for the “prohibition of all forms of direct-to-consumer promotion of breast milk substitutes and related feeding accessories by manufacturers and distributors, and it specifies appropriate practices in relation to public education about infant feeding”\textsuperscript{80}. The Code is not designed to ban the sale of breast milk substitutes, but rather to “regulate certain marketing activities which may be harmful to or discourage breastfeeding”\textsuperscript{81}.

Within three years of adoption of the WHO Code by the World Health Assembly in 1981 (with only one negative vote from the United States), 130 countries had passed legislation or formulated policies to restrict formula advertising\textsuperscript{82}. The WHO Code is legislated and enforced by individual governments (no portion of the WHO Code has been legislated in the United States)\textsuperscript{83}, but the WHO report to the 63rd World Health Assembly in 2010 indicates that monitoring infrastructure is inadequate in a majority of countries\textsuperscript{81}. A 2013 WHO report shows that of 199 countries, only 37 (22%) have adapted in full various recommendations of the Code\textsuperscript{84}.

The International Code is supported by evidence that infant formula promotion is negatively associated with successful breastfeeding\textsuperscript{80}. Prenatal infant feeding materials distributed by formula manufacturers (compared to independently prepared educational materials), commercial hospital discharge bags, and general
exposure to infant formula advertisements have all been shown to have a negative impact on breastfeeding indicators.

Howard et al. randomized 547 women to receive either formula company or specially designed educational packs about infant feeding at their first prenatal visit in the United States. Although breastfeeding initiation and long-term duration were not affected, those given formula company packs were more likely to quit breastfeeding before hospital discharge RR 5.80 (95% CI: 1.25, 54.01) and before two weeks, adjusted OR=1.91 (95% CI: 1.02, 3.55). Women with uncertain or modest breastfeeding goals were most vulnerable. In subgroup analyses, women with uncertain goals or breast-feeding goals of 12 weeks or less experienced shortened exclusive, full (including infrequent water, juice, or ritualistic feeds), and overall breastfeeding duration when exposed to the commercial intervention (HR 1.53 (95% CI: 1.06, 2.21), 1.70 (95% CI: 1.18, 2.48), and 1.75 (95% CI: 1.16, 2.64), respectively)\textsuperscript{85}.

Another study in the United States examined a population-based sample of women who initiated breastfeeding before hospital discharge and found 66.8% received commercial hospital discharge packs from formula companies. These women were more likely to exclusively breastfeed for fewer than 10 weeks compared to women who had not received the packs (OR=1.39; 95% CI: 1.05, 1.84 (adjusted for maternal age, race/ethnicity, education, and family income)\textsuperscript{86}.

A study conducted in the Philippines in 2006 examined the association between mothers’ exposure to advertising and other information sources and
formula-feeding decisions in 345 households across 16 randomly selected communities in 3 purposively selected disadvantaged municipalities. The study found that infants were more likely to be given formula if the mother recalled advertising messages, or a doctor, mother, or relative recommended use of formula. Mothers who began breastfeeding but started using formula were 6.4 (95% CI: 1.8, 23.1) times more likely to stop breastfeeding before 12 months. In follow-up focus groups with 38 mothers, they explained that formula promotion occurred through “‘television’, ‘there are doctors who advise us’ and ‘there are others who gave out some books and bottles.’”

Coutsoudis et al, writing in the Lancet, states “human error and greed pose some of the greatest threats to the full development of children” and leadership is needed to prevent “the actions of large corporations, who promote breastmilk substitutes and slow progress towards achievement of the Millennium Development Goals”. The authors recommend action on three fronts: 1) policies and legislation for working mothers, 2) “properly funded, focused, innovative mass-media marketing of breastfeeding science and practice,” and 3) government commitment “to reviewing legislation that drives implementation of the International Code of Marketing of Breast Milk Substitutes, insists on rigorous scrutiny of the manufacturing and marketing practices of artificial-milk producers, and imposes severe penalties for infringement of the Code.”
2.3.1.1 Promotion and Interventions Targeting Maternal Employment

Another challenge in increasing global breastfeeding rates is addressing the needs of mothers who return to work while breastfeeding. Planning to, preparing for, and returning to work is associated with a shorter duration of breastfeeding among mothers in countries at all economic levels. Among women who initiate breastfeeding in the United States and return to work at 6 months, dramatic declines in breastfeeding are observed at 3-5 months, perhaps because as women prepare to return to work they make infant feeding decisions based on the conclusion that they will not be able to manage both breastfeeding and employment.

Although maternity leave policies should be “explicitly based on a calculus of the time required for lactation to be successful,” a recent review of maternity legislation shows great variability in duration of leave available to women worldwide. In an analysis of 193 United Nations member states, 83 countries provided less than 14 weeks maternity leave, and 145 provided less than 26 weeks (approximately six months, the duration of exclusive breastfeeding recommended by the WHO). The fraction of women covered by leave policies also varied; the majority countries did not provide any social insurance for women working in the informal economy.

Even for women covered by the law, maternal leave by itself does not provide mothers sufficient opportunity to combine breastfeeding and work. After women return to work, breaks at the workplace are necessary to breastfeed directly or pump, but break policies vary globally as well. In a separate analysis of United Nations member states in 2014, 51 countries (26.7%) did not guarantee breastfeeding breaks in any form,
and four provided had only unpaid breaks. The East Asia and Pacific and the Americas regions had a slightly higher share of countries that did not guarantee any form of breastfeeding breaks103.

The ability to bring children in the workplace and breastfeed during the day has been associated with the longest duration of breastfeeding in the United States91. Several recent studies outside HIC describe similar successful breastfeeding strategies among working women, including in Ghana104, Indonesia105, and Nepal106. However, the ability for mothers and infants to have physical contact during the day is not universal. In addition, many mothers in these studies still used non-breastmilk substances, primarily formula, in addition to breastfeeding.

Studies in the United States have shown that expressing breastmilk is associated with the longest duration of breastfeeding91,92 among employed mothers who are physically separated from their infants during work hours. Breastmilk expression includes extracting breastmilk either by hand expression or breast pumping with electrical or hand pumps107.

Little is known about breastmilk expression as a solution for working women globally. In 1996, Hight-Laukaran et al argued the perception that formula is necessary for employed women disproportionately harmed families in LMIC countries due to a heightened risk for “infant mortality, morbidity, hastened resumption of fertility, and loss of money for other necessities” and concluded that milk expression and storage were essential strategies to ensure infants continue to receive breastmilk108.
Despite this early call, few studies describe the use of breastmilk expression in LMIC. In Nairobi, less than 3% of a sample of 444 mothers working a mean 46.2 hours per week identified expressed breastmilk as an infant’s main food while the mother was at work, compared to 32% who received mainly cow’s milk\textsuperscript{109}. In Malaysia, a qualitative exploration of breastmilk expression among formally employed women revealed that nine of 20 women were able to exclusively breastfeed through the use of expressed milk. All women, however, voiced concerns regarding the familiarity, feasibility, and safety of pumping. Even with access to a refrigerator in the workplace, women were concerned about lack of freshness once stored, contamination of breastmilk among other foods, drinks, and medicines in the shared space, and vulnerability if the fridge was frequently opened. It was common in this sample to use formula as well\textsuperscript{110}.

2.4 Breastfeeding in Vietnam

2.4.1 Trends

Mean duration of any breastfeeding is 18.0 months\textsuperscript{ii} in Vietnam, and the proportion of children breastfed at any period in infancy is high\textsuperscript{25}. However, early initiation and exclusive breastfeeding rates are low. According to a 2009 national survey conducted by IFPRI, 55% of mothers initiated breastfeeding within the first hour, but 55% of infants were given non-breastmilk liquids during first 3 days of birth. Twenty-seven percent of mothers expressed some colostrum before they breastfed their children\textsuperscript{65}.

\textsuperscript{ii} SDs are not reported in the 2002 DHS.
A recent comparison across nine East and Southeast Asian countries found that EBF rates for Vietnam were also very low (15%; CI: 10.4, 22.5); only Myanmar had lower rates\(^{111}\). Even when predominant breastfeeding was included (breastmilk and non-milk liquids), Vietnam was among the countries with the lowest percentage of infants not receiving solids. This is confirmed in the IFPRI nationwide survey, where only 10% of children between 0 and 6 months of age were exclusively breastfed\(^{65}\). The Demographic and Health Survey (DHS) Vietnam 2002 also reported that mean duration of exclusive breastfeeding is 0.5 months and mean duration of “full” breastfeeding (allowing for water as well as breastmilk) is 2.2 months\(^{25}\).

### 2.4.2 Breastfeeding Knowledge, Attitudes, and Behaviors

In addition to the prevalence of breastfeeding indicators, it is important to examine the culture of breastfeeding in Vietnam. In Vietnam, sữa mẹ means mother’s milk, while formula is referred to as sữa bột (literally powdered milk) and sữa ngoài (outside milk). The following discussion will begin with a focus on the mother, and will include an overview of Vietnamese medicine followed by practices during childbirth related to breastfeeding. Infant feeding practices in Vietnam are then described, followed by attitudes toward breastfeeding.

#### 2.4.2.1 Vietnamese Ethnomedicine

Traditional Vietnamese medicine constitutes a mix of traditional Chinese medicine (in Vietnamese thuốc Bắc, or northern medicine) and indigenous Vietnamese folk medicine (thuốc Nam, or southern medicine)\(^{112}\). According to the latter, the human body, like the entire universe, is controlled by ‘vital energy’ (chi’i).
This energy is crucial for health and is obtained by breathing and eating. Two opposite forces âm and durong are the Vietnamese equivalents of the Chinese yin and yang. Âm symbolizes the male, the heat and the blood, whereas durong represents the female, the cold and the breath. Health requires balance between these forces, and illness is a sign of imbalance. Medicine and therapies aim at restoring the balance through heating or cooling. Traditionally, pregnancy is considered to be a ‘hot state’, âm. Through the loss of blood during childbirth, however, the woman loses heat and goes into a ‘cold state’, durong, in which she is vulnerable\textsuperscript{112,113}. Efforts to warm the mother up include the traditional practice of placing a warming device such as charcoal fire in a clay stove under the new mother’s bed\textsuperscript{113}.

Qualitative studies mention a traditional period of rest for the new mother of one to three months, where women are not allowed to participate in their traditional duties, which are instead performed by mothers, mothers-in-law, and other family members\textsuperscript{112,113}. The restrictions and liberties afforded women during this time vary. One study reported that women described staying in their houses and avoided travel after birth in order to be protected from illness caused by wind. Some women also mentioned that they should not read, watch television, or sit in front of a computer as it might permanently damage their eyesight after birth. The majority of women reported avoiding heavy physical activities because they needed rest, did not want to come in contact with water and wind, and wanted to avoid uterine prolapse\textsuperscript{112}.  

40
In addition, the majority of the women believed certain foods should be eaten to rebuild strength, promote recovery, and improve breastfeeding during the postpartum period\textsuperscript{112}. All women put restrictions on what type of food they would eat: ‘hot’ or ‘warm’ food was consumed while ‘cold’ food was avoided for a month after birth to restore balance. New mothers’ diets were often set up by their mothers or mothers-in-law and included meat and eggs (hot), which were thought to enrich the blood, help recovery, encourage expulsion of the lochia and stimulate lactation. Some women mentioned that food could be made warmer by adding ginger and wine. Fresh vegetables and fruits were considered cold, but some boiled vegetables were consumed. The most common food eaten during the postpartum period was pig’s feet with papaya or red bean and potato, eaten with rice. This particular dish was described in a number of Vietnamese studies to stimulate lactation\textsuperscript{29,113-115}. One new mother’s feeling about the food was captured by Lundberg and Trieu:

\textit{My mother cooks a soup with pig’s trotter and papaya or red bean for me to eat every day. I don’t like it but I have to eat it because my mother told me that it will help me have more breast milk.}

In another study in Vietnam by the same research team, 23 women visiting a well-baby clinic in Ho Chi Minh City were interviewed\textsuperscript{29}. Many mothers indicated that the nutritional value of breastmilk was dependent upon the health of the lactating mother and the availability of her traditional postnatal diet. If a mother was weak, suffering from any illness or taking medications, or if she had had operations, her milk was believed to be inferior. The lactating mothers were similarly urged to
eat large quantities of food and drink much warm water. Some mothers also drank large quantities of milk that they believed would help them produce more breast milk.

Qualitative studies have investigated the attitudes of women and their families toward breastfeeding. Almroth et al. found that women universally believed that breast milk was best for babies, and that it provided enough nutrition for up to four months, promoted immunity, was convenient, and made the uterus smaller. Women reported techniques thought to make breastmilk warmer (compress for breasts, showers) so the infant would not feel stomach pain. Breastfeeding is a cultural norm and breastmilk is viewed positively in Vietnam, but discarding colostrum at birth and prelacteal feeding are common, and exclusive breastfeeding is rare.

The practice of discarding colostrum can delay the start of breastfeeding. Water has been reported as being offered in its place in Vietnam and among Vietnamese-born women living in other countries. The principle reason for offering water according to mothers, grandmothers, and health workers in one study was to clean the baby’s mouth in order to avoid “tongue disease,” and in another mothers or relatives feared that colostrum could make infants sick or bring bad luck, or that it held no nutritional value.

In a more recent study, more than three-quarters of mothers knew to feed colostrum, but added prelacteals while initiating breastfeeding. Only 7.9% knew newborns only needed 5-7ml of breastmilk on the first day of life, and about half of
mothers lacked confidence in their ability to produce enough breastmilk to exclusively breastfeed for the first 24 hours.

The most common prelacteal was infant formula, given to 53.5% of infants, followed by plain water, given to 44.1%. In multivariate regression, mothers reporting the highest levels of confidence in behavioral control had the lowest odds of feeding any prelacteals, including water or infant formula specifically, the OR (95% CI) were 0.12 (0.07, 0.19), 0.55 (0.42, 0.73), and 0.12 (0.09, 0.17) respectively.27

In Vietnam, the prevalence of EBF (using 24-hour recall) ranges from 12% to 20% in national surveys from 2000 to 2011. This indicator is known to overestimate EBF and in-depth interviews from smaller samples in a variety of Vietnamese settings report that EBF is not practiced for a full six months.24,29,125

In a qualitative study conducted in one rural and one urban site each in the North and South Vietnam, none of the 28 mothers interviewed practiced exclusive breastfeeding. Although small and qualitative this study showed that the most common fluid was plain or sugared water introduced in an infant’s diet at birth or soon after. Water is thought to be necessary for infants’ thirst in various studies in Vietnam, especially in the summer. Formula or powdered milk was the second most common non-breastmilk feed in the first six months, generally introduced at a later age than water. Liquid, packaged milk was less common and fresh animal milk was rare. Sweetened condensed milk, the only type of milk available for earlier generations, was understood to be harmful for children and was said not to be offered at all. The authors suggest exclusive breastfeeding was rare because it was
poorly understood and little appreciated, by health professionals as well as lay persons, as the best way to feed an infant during the first 6 months<sup>28</sup>. Another more recent study conducted for A&T found that 85% of 10,834 mothers across 11 provinces were aware of the benefits of EBF, but only 20% practiced it (P < 0.05 for the comparison between awareness and practice). It should be noted that among those with infants 4-5 months of age, prevalence of EBF is about 10%. The EBF gap between awareness and practice was smaller among those who perceived EBF as the social norm (OR=0.20; 95% CI: 0.15, 0.27) and were supported by health workers at birth (OR=0.82; 95% CI: 0.70, 0.95), but was larger if the mother had the intention of feeding infant formula at birth (OR=1.28; 95% CI: 1.08, 1.51) or experienced breastfeeding difficulty (OR=1.29; 95% CI: 1.06, 1.57)<sup>119</sup>. Nguyen et al. found that complementary foods were introduced very early in a review of the Demographic and Health Survey (DHS), National Nutritional Surveillance Surveys and Multiple Indicator Country Surveys (MICS)<sup>116</sup>. They cited a lack of studies on the quality of such foods, but found low energy density as well as low protein and micronutrient content of complementary foods in the studies available. Rice flour was the most common food first offered to children, followed by formula and rice porridge<sup>116</sup>. A traditional progression of infant feeding of solids includes thin gruels (bột) that are gradually introduced into the infant's diet, followed by thicker porridges (cháo) or rice (cơm) made from or served with “neutral” foods (neither "hot" nor "cold"). Beginning at about 12-18 months, the child may eat more freely<sup>126</sup>.
Almroth et al. found that after four to five months, formula or solid food was given due to return to work, perception of insufficient breastmilk, or for extra nutrition. The principle reason for offering formula (espoused by half of the mothers, larger proportions of grandmothers and fathers and nearly all health workers) was due to poor nutrition of the mother leading to insufficient breastmilk. This insufficiency was generally perceived as relating to quality rather than quantity.28

If parents could afford it, breastfed babies were given other milk even if there was no apparent problem in feeding. The combination of breastmilk and formula was thought to help children become stronger and grow better compared to exclusive breastfeeding. No one interviewed reported formula was better than breastmilk, but the combination was thought to be superior.116 Aside from health risks, there are economic consequences to this type of formula use; Duong et al. reported in 2005 that one package of formula is 10% of a rural family’s monthly income.24

In a study of three groups of women in Australia117, women born in Vietnam breastfed less (75%) than women born in Australia (84%) or Turkey (98%). The Vietnamese-born women perceived their partners as having a negative attitude toward breastfeeding and not appreciating the health benefits of colostrum. Mothers’ educational level and comfort with breastfeeding in public places, the father’s occupation and feeding preference, and the availability of sufficient food for
the family significantly also influence the practice of exclusive breastfeeding\textsuperscript{25,28,116,117}.

\subsection*{2.4.3 Interventions}

\subsubsection*{2.4.3.1 Promotion and Interventions Targeting Formula Use in Vietnam}

Exposure to formula advertising is high; 98\% of 463 rural Vietnamese women had seen infant formula ads in 2004, where marketing included an “urban wealthy couple with a healthy, clever baby” advertising that formula could provide “super nutrients” that mothers found very influential\textsuperscript{24}. In a 2011 Alive & Thrive survey across 11 provinces, 79.8\% of respondents had seen formula advertisements on TV in the past 30 days, and half of all respondents said they saw ads daily\textsuperscript{119}. Qualitative studies have described the influence exposure to formula advertisements has on mothers’ infant feeding decisions\textsuperscript{29}.

The Baby Friendly Hospital Initiative (BFHI) has been supported by the government of Vietnam since 1992. A 2010 review found that only 59 general or maternity/infant specialized hospitals at the central and provincial levels were BFHI-certified (representing less than 1\% of Vietnam’s 12,146 hospitals). Inadequate support and funding in recent years for BFHI facilities and staff, along with lack of incentives for participation, may have contributed to a decline in commitment to the initiative\textsuperscript{127}.

Infant formula marketing is aggressive in Vietnam, and although laws exist governing the marketing of breastmilk substitutes, enforcement is weak\textsuperscript{116}. An industry report estimates global formula sales at $11.5 billion for 2011, due in large
part to Asia, which claims the largest and fastest-growing market. Southeast Asia alone accounts for a disproportionately large fraction (25%) of global market, relative to its population\textsuperscript{128}.

The WHO Code was implemented in Vietnam in 2006 as “Decree 21,” but it did not include the full provisions intended to be the minimum set of standards for monitoring and enforcement\textsuperscript{129}. Decree 21 does explicitly prohibit advertising for products intended for children under 6 months of age, however. It also requires that advertisements for products for children over 6 months of age include the statement “breast is best”\textsuperscript{28}. One study found that while advertisers do include “breast is best”, they also name and suggest that certain nutrients in the formula are responsible for effects such as improved growth and brain development. Almroth et al. found that mothers, grandmothers, fathers and health workers recalled from infant food advertising that “formula and milk powder had ‘more vitamin and minerals’ and ‘many nutrients’, which led to ‘better growth and development’, especially ‘more brain development’, and this helped the baby ‘become more intelligent’ and ‘more smart’”. While respondents recalled the “breast is best” message, they also recalled from the advertisements that many kinds of milk have the quality of breast milk.

It is important to note that exclusive formula feeding is very rarely reported in Vietnam. This is similar to patterns shown in a study of infant feeding practices across Thailand, Colombia, Kenya and Indonesia where mothers reported formula use “for a variety of reasons but not usually as an attempt to wean”\textsuperscript{68}. 
2.4.3.2 Promotion and Interventions Targeting Maternal Employment in Vietnam

The majority of women (68%) participate in the labor force in Vietnam, comprising 40% of non-agricultural paid labor and 50% of the professional and technical workforce\textsuperscript{26,130}. Maternity leave legislation was enacted in May 2013 specifically designed to protect EBF. Article 157 of the amended Labor Code extended paid maternity leave to 6 months while maintaining 60 minutes of daily paid time for female workers to breastfeed children under 12 months. According to a 2014 review of global maternity protection by the United Nation’s International Labour Organization (ILO), Vietnam has among the longest maternity leave policies in the world, and the longest in Asia\textsuperscript{131}.

While this new law is a “bold departure from other maternity leave policies”\textsuperscript{132}, without support in place to prepare mothers to return to work and utilize the time guaranteed to them, 6 months of fully paid maternity leave is unlikely to raise EBF rates as intended\textsuperscript{133}. Additionally, the ILO estimates that maternity leave provisions only cover 30% of the workforce in Vietnam, given the predominance of the informal sector, notably agriculture\textsuperscript{133}.

In one study including 1118 women (88% farmers) in Vietnam, 25% of the women who stopped breastfeeding before 1 year identified working conditions as the cause\textsuperscript{134}. In another survey of rural households in northern Vietnam in 1999, women who had returned to work were 14.0 times (95% CI: 3.8, 51.7) more likely to fail to exclusively breastfeed compared to mothers who had not yet returned to work. Families in follow-up focus groups were presented with EBF scenarios for
employed women, including returning from work to breastfeed, taking the infant to work, expressing milk, and wet nursing. None of these options were acceptable to the majority of Vietnamese families mostly due to time constraints, appropriate conduct while working, and concerns regarding the health of the child. However, the study authors did highlight “positive deviants,” the few mothers that, despite cultural norms, returned home during the day or expressed breastmilk.\textsuperscript{125}

The difficulty employed breastfeeding mothers experience in Vietnam has been discussed in many studies\textsuperscript{24,29,112,118,125} and among the issues mothers raise are: difficulty maintaining breastmilk supply, exhaustion after nighttime feedings, and the need to introduce formula and complementary foods so the infant can be cared for by others. Despite the extensive mention of this issue central to breastfeeding in Vietnam, a search of the literature did not find any work-related interventions nor any studies based in work settings for employed breastfeeding mothers in Vietnam.

2.5 Summary

Exclusive breastfeeding (EBF) in the first 6 months of life is associated decreased mortality in low and middle-income countries (LMIC)\textsuperscript{51-53}, and decreased morbidity\textsuperscript{10,13,55,135-137}, particularly diarrhea and respiratory illness\textsuperscript{11,56,57,69,138,139}, across countries at all economic levels. It is a central component of a globally recommended set of core interventions aimed at improving infant and young child health\textsuperscript{13,59}.

Vietnam is a rapidly developing country where 91\% of women are literate\textsuperscript{140}, 68\% participate in the workforce (comprising half of professional and technical workforce)\textsuperscript{130}, and 85\% are knowledgeable about the benefits of exclusive
Breastfeeding in Vietnam is culturally normative. 97.9% of children are ever breastfed, with a median duration of 18 months\textsuperscript{25}. However, EBF is rarely\textsuperscript{3,111,119}, if ever\textsuperscript{24,29,125}, practiced. Formula use has been described in urban\textsuperscript{29}, rural\textsuperscript{118}, and national settings\textsuperscript{119,141} in Vietnam, and has been identified as the second most common supplement given in the first six months of life, following water\textsuperscript{28}.

Although mothers’ reasons for formula use have been explored, we aim to expand this understanding of perceptions and practices to include other household members. Exploring these viewpoints, as well as the family dynamic of decision-making for infant feeding, is essential to providing an intervention that includes fathers and grandparents who influence and support the mother in her choices, as well as have the potential to independently purchase and feed formula.

Understanding the challenges of employed mothers, especially in LMIC, has been identified as a global priority in breastfeeding promotion. Pumping breastmilk is particularly relevant in a rapidly industrializing country such as Vietnam with high rates of employed women, but has only briefly been discussed in the literature. We explore infant feeding choices and the concept of pumping breastmilk among rural Vietnamese families where many mothers return to work while breastfeeding.

Breastfeeding difficulties and formula use at birth have been explored in the literature, but the association between breastfeeding difficulties reported after breastfeeding has been established and association with subsequent formula use is an area that requires further exploration. We explore types and consequences of breastfeeding difficulties women experience at three months postpartum, support and
advice provided to these mothers, and examining the association between later breastfeeding difficulties and formula feeding.
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3 Study Design and Methods

The overarching goal of this study was to understand the patterns and reasons for formula feeding in rural Vietnam. Each research question was addressed by a method appropriate to the inquiry, resulting in a mixed methods (qualitative and quantitative) approach (Table 3.1). Qualitative research methods were used to understand how participants perceived events, and how this perception influenced behavior, while quantitative methods were used to assess prevalence and risk factors for formula feeding behavior.

For the first research objective, understanding perceptions and describing patterns related to offering formula before one year in rural Vietnam, qualitative data was collected in Thanh Hóa and Vĩnh Long provinces as part of the 2012 process evaluation of the “Alive & Thrive” (A&T) initiative (Appendix Figure A1). One hundred twenty respondents in 48 households participated in in-depth interviews, discussing prenatal care and birth experiences; plans for infant feeding, care, and work; and household responsibilities in the first year of the infant’s life. A sub-sample of 24 households, those in which the mother, father, and grandparent were all interviewed, were analyzed following an instrumental case study as proposed by Stake (2000).

For the second research objective, understanding what women perceived as options and support for infant feeding when they left the home for employment outside the home, all 120 interviews from the A&T 2012 process evaluation were analyzed through focused line-by-line coding.
For the third research objective, the association between later breastfeeding difficulties (at 3 months) and formula feeding between 3 and 6 months was investigated. This was achieved by conducting a secondary analysis of the 2010 A&T Evaluation Baseline Survey conducted from June to August 2010.

Table 3.1. Research objectives and associated methods

<table>
<thead>
<tr>
<th>Research Objective</th>
<th>Method &amp; Sample Size</th>
<th>Data Source</th>
<th>Data Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Research Objective 1</strong>: To understand perceptions and describe practices related to offering formula to infants before one year in rural Vietnam.</td>
<td>72 in-depth interviews with 24 families • 24 mothers • 24 fathers • 24 grandparents</td>
<td>A&amp;T Process Evaluation, May-June 2012</td>
<td>Case study analysis</td>
</tr>
<tr>
<td><strong>Research Objective 2</strong>: To understand what women perceive as options and support for infant feeding when they leave the home for employment outside the home.</td>
<td>120 in-depth interviews with 48 families • 47 mothers • 40 fathers • 33 grandmothers</td>
<td></td>
<td>Focused line-by-line coding</td>
</tr>
<tr>
<td><strong>Research Objective 3</strong>: To understand the association between later breastfeeding difficulties (at 3 months) and formula feeding between 3 and 6 months of age.</td>
<td>604 mother-infant dyads surveyed</td>
<td>A&amp;T Impact Evaluation Baseline Survey, June-August 2010</td>
<td>Multiple logistic regression</td>
</tr>
</tbody>
</table>

Study design, methodology, and analytic approach to address each research question will be described in detail in following sections of this chapter.

3.1 Alive & Thrive

The “Alive and Thrive” initiative (A&T, aliveandthrive.org) is a six year (2009-2014) Bill & Melinda Gates Foundation-supported effort aimed at reducing
undernutrition and death caused by suboptimal infant and young child feeding (IYCF) practices in Vietnam, Bangladesh, and Ethiopia\textsuperscript{3,4}. In Vietnam, working with the Ministry of Health, the National Institute of Nutrition, the Women’s Union and provincial authorities, A&T’s aim is to double the rate of exclusive breastfeeding, improve complementary feeding, and reduce stunting by two percent each year.

The specific strategies to promote EBF in Vietnam included three main components: 1) policy advocacy (a national mass media campaign, advocacy efforts to extend maternity leave legislation, strengthening the marketing code for breastmilk substitutes\textsuperscript{4}), 2) community intervention (introduction of a social franchise model for IYCF\textsuperscript{5} and IYCF support group for harder-to-reach areas), and 3) private sector partnerships (workplace interventions and micronutrient products). The franchise model, a core community intervention, aimed to deliver high-quality IYCF counseling services in existing and well-utilized community health center facilities. Vietnam’s National Institute of Nutrition assumed responsibility for accreditation of each Mật Trời Bé Thơ franchise (MTBT) (“The Little Sun” in English), enabling existing community health centers to offer a uniform package of branded services by trained health staff in an upgraded IYCF counseling room\textsuperscript{4,5} (Appendix Figure A2). As of 2013, 782 franchises were functioning intensively in 15 of Vietnam’s 63 provinces\textsuperscript{5}. Four out of 15 provinces were selected for evaluation using a rigorous study design of clustered randomized controlled trial. Within these provinces, forty communes were randomly assigned to either 1) A&T-intensive areas (A&T-I) (standard government health services, mass media, and IYCF counseling), or 2) A&T-NI areas (A&T-NI) (standard government health
services and mass media only). The International Food Policy Research Institute (IFPRI) 
is an independent organization contracted to design and conduct the A&T evaluation.

Figure 3.1 shows the overall evaluation design, including the data source for 
each research objective. Repeated cross-sectional surveys were used to measure 
impact; the baseline measure in 2010 served as the data source for research objective 3.
In 2012, a process evaluation was conducted that included in-depth interviews at the 
household level. This evaluation took place one year after franchises were launched, 
and served to document the extent to which the program was being implemented as 
planned and explain how the intervention was (or was not) leading to impact. The 
household interviews from these interviews were analyzed for research objectives 1 & 2. Both the 2010 baseline survey and 2012 process evaluation household interviews will 
be described in-depth in the following sections.
Figure 3.1. Overall evaluation design for A&T Vietnam and data sources for research objectives

3.1.1 Ethical approval

The baseline survey and process evaluation were approved by IFPRI’s Institutional Review Board (IRB), and the Ethical Review Board of the Center for Creative Initiatives in Health and Population (belonging to the Vietnam Union of Science and Technology Association) in Vietnam. This author was included as a student investigator in the IRB protocol. Written informed consent was obtained from all participants.
3.2 A&T 2010 Baseline Survey

Data collection and methods have been described in detail in the Alive & Thrive Baseline Survey Report\(^7\) and are summarized below. The 2010 baseline survey captured the main impact indicators for A&T (child anthropometry and WHO-recommended IYCF indicators), as well as challenges in IYCF practices, caregiver resources (education, childcare knowledge and experience, and mental and physical health), and household resources (household composition, socioeconomic status, and food insecurity).

The survey was executed in three stages. The first stage involved mapping, listing of households, sample design, and implementation of sampling procedures. The second stage encompassed interviewing and data collection. The fieldwork started on June 14, 2010, and finished on August 31, 2010. The third stage involved data entry and management, which was completed on September 30, 2010\(^7\).

3.2.1 Study population and setting

Four provinces were selected for the A&T impact evaluation using the following criteria: 1) High level of stunting and stagnant pattern of stunting over time; 2) provinces without major economic barriers to adopting IYCF recommendations; 3) geographically representative of the 15 provinces in which A&T had been fully implemented. The selected provinces of Thanh Hóa, Thái Nguyên, Vĩnh Long, and Quảng Ngãi spanned the northern, central, and southern regions of Vietnam.

3.2.2 Sample size calculation

Sample size for the 2010 baseline survey was estimated based on rates of
stunting, EBF, and appropriate child feeding, as well as the expected change in rates after A&T initiative was complete and power to detect differences between A&T-I and A&T-NI areas, and level of significance\(^7\).

The most current stunting rate in rural areas at the time of the baseline survey had been reported as 44 percent\(^8\). A standard deviation in the population of 1.0 was assumed for a calculated mean height-for-age-Z-score (HAZ) of -1.85. Using a one tailed test and a significance level of \(\alpha = 0.05\), a minimum sample of 1,000 children per group (2,000 total) was necessary to detect a minimum increase in HAZ of 0.2 among children 24-59.9 months with 90 percent power\(^7\).

The EBF rate for rural areas had been reported at 19.5 percent, while the appropriate complementary feeding rate was 42 percent\(^8\). Using a similar method, a minimum sample of 500 children 0-5.9 months per group and 500 children 6-23.9 months per group was necessary to detect an increase in EBF and complementary feeding of 10 percentage points with 90 percent power\(^7\).

Based on these sample size calculations, a sample of mothers with children 0-5.9 months old was necessary for assessing EBF (500 in intervention and 500 in control groups), mothers with children 6-23.9 months for assessing complementary feeding (500 in intervention and 500 in control groups), and children 24-59.9 months for assessing stunting (1,000 in intervention and 1,000 in control groups), resulting in a total sample size of 4,000 children between 0-59.9 months\(^7\).
3.2.3 Sampling methodology

A total of 40 community health centers were randomly selected from the four evaluation provinces using a two-stage cluster sampling methodology. The first-stage sampling unit was 40 clusters, representing 40 communes. Each commune consisted of one community health center. In Vietnam, a community health center is typically staffed by a doctor and four to six other healthcare providers, and is mandated to be the first point of contact for curative and preventative healthcare for a community of 5,000 to 7,000 people\(^7\). Pairs of clusters were selected so the location, geographic, ecologic conditions and access to a healthcare center were comparable between the group of communities within each cluster and those in the other cluster to show program impact in the end line survey.

The second-stage sampling unit for the survey was households with eligible children under 5 years of age. After selecting communes, lists of children under five and their mothers were collected with support from local health authorities. The list included names of children, date of birth, names of the mother, and address. The list was further divided into children under 6 months, between 6-23.9 months, and between 24-59.9 months. The number of households with children of each age group were estimated using the population proportionate to size method, and were selected by systematic random sampling as follows\(^6,7\): the sampling interval \(k\) was obtained by dividing the total households (with name of mother) in the sampling frame by the desired sample size. A random number \(x\) between one and the sampling interval \(k\) was chosen as the starting point using random number tables, and the sampling interval was
added cumulatively. The households to be surveyed were those with the 

\((x + k)\)

household, the \((x + 2k)\)th household, \((x + 3k)\)th household, etc. until sufficient numbers of households met each age-specific sample size requirement.

In total, 4,029 mothers of children under 5 years old were included in the cross-sectional baseline survey, 35.0% from Thanh Hóa (n=1,408), 19.8% from Thái Nguyên (n=798), 20.4% from Vĩnh Long (n=821), and 24.9% Quảng Ngãi (n=1,002).³

3.2.4 Data collection

Data collection tools and questionnaires were developed following the UNICEF conceptual framework for child growth and development⁹ and previous nutrition evaluation questionnaires used by IFPRI, which were grounded in the questionnaire model used for Demographic and Health Surveys⁷. These models were substantially adapted for evaluation purposes, and further altered after formative research, input following the training of interviewers, and two rounds of rigorous pre-testing. The survey was conducted by an independent research firm, the Institute of Social and Medical Studies (ISMS; Hà Nội, Vietnam).

3.2.4.1 Selection, training, and supervision of fieldworkers

A team of data collectors was recruited and trained in Hà Nội, Vietnam. Interviewer selection criteria included 1) education and training background as well as experience in health-related fields, 2) ability to observe and take notes during communication, and 3) time commitment. A total of 26 potential fieldworkers were trained for eight days in early June 2010 and of these, 22 were selected for inclusion in
the final survey team after a short field-based evaluation in which each interviewer pretested the questionnaire in two households. Each held a bachelor’s degree in public health, medicine, or sociology and approximately two-thirds were women.

Training classes were organized ISMS with support from the A&T staff. Training included understanding the A&T project, training on the survey questionnaire, and practical experience in using the questionnaire through mock interviews and practice in the field. Standardized procedures for data collection, supervision, and coordination were also introduced and used consistently during data collection.

Eight fieldworkers were selected to receive specialized training to use equipment and record anthropometric data. Two days of in-class lectures, demonstrations, and practice was followed by a day during the pretest phase measuring the height and weight of infants and children in a commune. Height measurements were verified to ensure standardization. Weight was measured using an electronic scale. As part of the standardization exercise, the height and weight of children under 60 months of age was measured twice by all fieldworkers and the supervisors. The measurements of each fieldworker were compared to those of the supervisor. Based on the findings, six of eight fieldworkers were selected to conduct the anthropometric measurements for the survey.

The data collectors were organized into four teams. Each team consisted of one person in charge of anthropometric measurement and hygiene spot observations, and five to six interviewers. Each team was headed by a supervisor who reported to the study field director at ISMS, who in turn reported directly to the coordinator at IFPRI.
(see Figure 3.2). During fieldwork, the data collection teams were combined or reformulated as necessary. However, the entire team of data collectors traveled to all four provinces to reduce the variability that could be introduced by using several regional teams.

Figure 3.2. Organizational structure for field operations


3.2.4.2 Administration of the Survey

The survey was administered to the mother of the index child chosen for the survey. Data were collected in participants’ households in three parts: 1) a face-to-face interview based on the structured questionnaire, 2) a hygiene spot observation, and 3) anthropometric measurement. Weight and height of mothers and children were
measured twice using standardized weighing scales (Seca scale) and length boards (UNICEF designed), with increments of 50 grams and 0.1 centimeter respectively. For height, recumbent length was measured for children from 0-23.9 months and standing height was measured for children between 24 months and five years old.

3.2.5 Data Quality Control

Fieldworkers reviewed each questionnaire before leaving the household where it was administered. At the end of each day of fieldwork, ISMS field supervisors reviewed each questionnaire for accuracy, logical consistency, and legible writing. Questionnaires missing over five percent of the responses were not accepted. In this case, the fieldworker returned to survey household or discarded the questionnaire. The supervisor also conducted spot checks by randomly visiting sampled households and re-interviewing a number of respondents. The original and new responses were compared, and any differences were discussed. If an interviewer submitted more than two questionnaires in one day with five percent or more missing answers, field supervisors reported to the team leader. The interviewer was replaced if his or her skill could not be improved.

If a respondent mother was absent from her home, the survey team made an appointment for a day when the mother was likely to be home. If a mother worked too far away to come back or the respondent refused to be interviewed, the household was replaced with one of the 10 replacement households previously selected from the pool of eligible households.
3.2.6 Data management

Fieldwork and data processing activities occurred concurrently. The questionnaires for each commune were sent to the ISMS central office in Hà Nội where a senior researcher was in charge of data processing and management. After double entry, a report comparing the two datasets was produced and data entry was considered acceptable if the difference was less than five percent. Data were fully labeled in English and then transferred into a Stata software, version 11 (Stata Corp, College Station, TX) data file for cleaning and analysis.

3.3 2012 Process Evaluation Household Interviews

3.3.1 Study population and setting

Two of the four evaluation provinces were selected to be part of the 2012 process evaluation. Thanh Hóa represented the north part of the country, while Vĩnh Long represented the south. Within the two provinces, four out of 20 impact evaluation communes were selected for in-depth interviews at the household level. Consequently, one commune in each province included a community health center that had been converted into the A&T “Little Sun” franchise and the other had not. Exposure to the counseling services through the franchises was found to be low at this early stage of the initiative, and for the current study analysis was conducted without regard to franchise attendance.

3.3.2 Sampling methodology

Local health authorities within each commune provided A&T staff with a list of women who had given birth within the last year. A maximum variation sampling
approach was used to efficiently capture the dimensions of variation most relevant to the larger study. These dimensions were defined a priori as 1) location (north vs. south), 2) exposure to “The Little Sun” franchise (franchise users vs. nonusers), and 3) age of infant (under six months vs. six to twelve months). Households within communes were purposively selected to fill these dimensions.

Although there may be less data about any particular kind of case, setting, or individual than there would be with a more homogeneous sample, it was still possible to reach saturation on many topics with the number of interviews performed. Saturation is when the collection of new data does not reveal new information regarding the issue under investigation. Previous research has estimated that about 12 interviews are necessary to reach saturation in qualitative work, with more interviews required if subjects are relatively heterogeneous within a strata or data quality is poor.

3.3.3 Data collection

Each set of household interviews included the mother of the infant as well as the father and/or live-in grandparent. In total, 120 interviews were completed as part of the 2012 process evaluation (1 mother’s transcript was lost), including 47 mothers, 40 fathers, and 33 grandparents.

A semi-structured interview guide was created in advance of the fieldwork by A&T investigators and collaborators ISMS (Appendix Table A1). The interview guides were focused on understanding respondents’ perspectives and behaviors related to facilitators and barriers to project implementation and impact. Respondents were asked about their recollections of prenatal care and birth experiences, as well as
plans for infant feeding, care, and work and household responsibilities in the first year of the infant’s life. That is, each participant was asked a similar set of questions based on a pre-established list of questions and topics. The interviewer used probes such as “tell me more about that” and decided when conversation on a topic had satisfied research objectives. In-depth interviews are designed to be flexible, allowing the interviewer to modify order and details of how topics are covered to provide a wealth of information on the “flow of everyday life”; the data can then be analyzed to understand participants’ experiences13.

Interviews were conducted in respondents’ homes to lessen the burden on families and increase comfort and rapport between interviewers and respondents. Respondents were offered the equivalent of 2 USD for their time.

All interviews were conducted in Vietnamese and recorded with digital recording devices, and field notes were kept as well. A complete transcript was made in Vietnamese from the recorded interview, which was translated into English by an agency based in Hà Nội that was sub-contracted by ISMS.

3.3.4 Selection, training, and supervision of fieldworkers

One team from ISMS, familiar with A&T through previous work on the initiative, handled the logistics and completed all household interviews. The field team was composed of 6 data collectors (typically with a bachelor’s degree in public health, medicine, or sociology; two-thirds were women). A senior ISMS staff member (with a PhD) and IFPRI research associate (a medical doctor with a PhD based in Vietnam) were also present during fieldwork. This first author was also present for the first set of
interviews in Thanh Hóa, participating at daily team meetings to discuss findings and strategies for probing emerging issues in subsequent interviews. In addition, observations and interactions with households members, mothers visiting the community health centers, and local markets selling formula were made with the assistance of a translator.

Training classes were organized by ISMS with support from the A&T staff, which provided learning about interview skills, understanding of the A&T project, training on the survey questionnaire, and practical experience in using the questionnaire (mock interview and practice in the field). After the fieldwork was completed, five of the six data collectors were trained by the author and IFPRI research associate (based in Washington, DC) to use Nvivo 10 (QSR International Pty. Ltd., Melbourne, Victoria, Australia) to code the transcripts. Based on comfort with the software and English proficiency, three continued to work with the author to create and refine a codebook as well as code all transcripts as a team.

3.3.5 Data Quality Control

Daily team meetings prior to fieldwork allowed the interviewers to discuss any issues or findings, ensure all equipment was charged and working properly, and make any changes to the interview guides if necessary.

For issues of time and cost, a senior researcher at ISMS reviewed the transcripts and removed lengthy sections that did not directly pertain to the research prior to translation into English by ISMS staff. English transcripts were evaluated by three native English speakers serving as interns at ISMS, and portions that needed clarification were
identified. A subset of transcripts were reviewed by native-Vietnamese speaking ISMS researchers fluent in English to ensure completeness and accuracy.

### 3.3.6 Data Management

Fieldwork and data processing activities occurred concurrently. The interviews for each commune were sent to the ISMS central office in Hà Nội, where the transcription and translation efforts were started immediately. Transcribed, translated English transcripts were transferred into NVivo 10 (QSR International Pty. Ltd., Melbourne, Victoria, Australia) for analysis.

### 3.4 Research Objectives 1 & 2

- **Research Objective 1**: To understand perceptions and describe practices related to offering formula to infants before one year in rural Vietnam.

- **Research Objective 2**: To understand what women perceive as options and support for breastfeeding and infant feeding when they return to employment outside the home post-delivery.

#### 3.4.1 Analysis

Analysis for research objectives 1 & 2 both began with coding of all 120 transcripts by a team standardized coders using an *a priori* codebook. Research objective 1 then used a case study approach to focus on household decision-making related to formula use for the subset 24 households where mothers, fathers, and a grandparent were all interviewed. Research objective 2 utilized the entire set of transcripts, but went beyond codes established in the initial codebook to explore perceptions specific to pumping breastmilk.
3.4.1.1 Coding

Coding of transcripts was facilitated by Nvivo 10 (QSR International Pty. Ltd., Melbourne, Victoria, Australia) by a team of four standardized coders over four months, including this author. Coders used a detailed *a priori* thematic code list, but frequent meetings early in the coding process allowed for emergent codes. The final codebook included 187 unique codes and definitions, including “formula before 6mo,” “formula after 6mo,” “heard/not heard about pumping milk,” “response to pumping milk,” and “personal experience pumping milk,” that could be used alone or in combination with other codes such as “delivery experience,” “initiation of breastfeeding sufficiency, personal” “breastfeeding experience,” “mother’s workload”. Text associated with relevant codes was exported as a matrix and further analyzed using Excel for Mac 2011 (Microsoft Corporation, Redmond, WA).

For research objective 2, initial coding revealed that extracting breastmilk took place outside the context of pumping to feed an infant, so transcripts were reviewed and re-coded with an expanded selection of codes specific to the act and perceptions related to extracting breastmilk for any purpose. Different types of maternal employment and impact on breastfeeding also emerged as an important theme, and this was further explored with additional coding and analysis beyond the initial group coding effort.

The goal of coding is to “fracture” the data and rearrange them into categories that facilitate comparison and aid in theory development\(^1\). The coded units were sorted and each set of related quote segments were compared and
categorized. When a concept could not be described within the existing definitions, either the definition was expanded or a new code was created with its own definition until no new concepts or themes emerged. Line-by-line coding was performed as recommended by Charmaz (2001) to remain close to the data and to make decisions about what to explore next \(^{14}\).

Memo-writing was used throughout the coding process to record ideas about codes and their possible relationships \(^{11}\). Memos were treated as preliminary, partial, and correctable. Raw data (such as quotes from participants) were incorporated into the memos to preserve vivid examples of emerging ideas from the beginning of analysis so that they were accessible at later stages of analysis \(^{11}\).

3.4.1.2 Case study analysis

Case study, which “provides tools for researchers to study complex phenomena within their contexts” \(^{15}\), includes two key methodologies proposed by Robert Stake \(^{16}\) and Robert Yin \(^{17}\). Analysis for the first research objective utilized an instrumental case study as proposed by Stake (2000) \(^{2}\), which is the exploration of a particular case with a view to understanding or gaining insights about a phenomenon of interest. Like all case studies, an instrumental case study focuses on a real-life process bounded by time and place \(^{16,18}\), but its unique feature is that the approach accesses the phenomena of interest via cases, rather than concentrating on the cases themselves.

Case study is distinct from ethnography or grounded theory in that research questions and/or theoretical perspectives guide data analysis from the beginning rather than emerge from the data \(^{19}\). Use of theories, models, concepts or specific knowledge
of institutional conditions and social patterns can result in focused analysis that goes beyond gathering basic information, but the researcher must be careful not to be limited by previous knowledge\textsuperscript{19}. Here, the research objectives guided a data analysis focused on formula use from the beginning of the analysis.

There is no agreed upon set of methods for case studies; rather, methods are chosen based on their capacity to address the research aims, nature of the case, and ontological and epistemological choices of the researcher\textsuperscript{2,16}. In the present study, taking advantage of the sampling used for the household interviews for the process evaluation, the case was defined \textit{a priori}\textsuperscript{20} as a household (n=24). Three transcripts within every case were coded using the research objectives as a guide, narratives were created for each case, and patterns related to the phenomena of interest (formula use) were compared among all the cases.

Throughout this process, a researcher’s narrative was kept in MS Word to note emerging themes, similarities, and differences in the cross-case comparisons\textsuperscript{21}.

3.4.2 Rigor

Qualitative research relies on a variety of techniques to increase trustworthiness (the level of trust that the researcher did everything possible to ensure that data was appropriately and ethically collected, analyzed, and reported, also called authenticity, goodness, plausibility, or credibility)\textsuperscript{22}. Procedures to increase trustworthiness in qualitative research include audit trails, reflexivity, thick and rich description, triangulation, and member checking\textsuperscript{22}. 

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An audit trail, or keeping careful documentation through observation notes, interview notes, journals, records, were be maintained throughout the study.

Reflexivity is critical reflection on how a researcher influences the research. All researchers have personal biases that can influence their interpretation of data, but in qualitative data collection these can have a significant influence on the development of the research since the researcher often creates the instruments of data collection. This requires that the investigator reflexivity, carefully reflect on, deal with, and report potential sources of bias and error\textsuperscript{10}. Peer debriefing is a process of talking to a disinterested peer to help uncover biases, perspectives and assumptions on the researcher's part that might otherwise remain implicit within the researcher’s mind. Peer debriefing took place throughout analysis to defend emergent hypotheses and assess whether they appear reasonable and plausible to a researcher outside the project.

Thick and rich description of settings, participants, data collection, and analysis procedures can both provide an understanding of relevance to other settings\textsuperscript{22}, increase coherence, and evoke a sense of connection between the reader and participants in the study\textsuperscript{18}. These descriptions were included in the reporting of results where possible.

Triangulation is the use of multiple data collection techniques to study the same setting, issue, or program\textsuperscript{23}. Areas of convergence can increase confidence in the findings. However, Patton cautions that areas of divergence should not invalidate the data but rather “open windows to better understanding the multifaceted, complex nature of a phenomenon”\textsuperscript{23}. Triangulation is not as much a means of confirming existing
data as it is an enlargement of the landscape of inquiry, offering a deeper and more comprehensive picture\textsuperscript{24}. This mixed-methods study used qualitative and quantitative techniques to study the same issues in a similar setting, with many areas of convergence, increasing confidence in the overall findings.

“Member checking” allows for an opportunity for participants to check (and often approve) aspects of the interpretation of the data they provided to the researcher. Often transcripts will be provided for the participants to read over and verify for accuracy. This appropriateness of this procedure has been questioned due to the philosophical stance that no one reality exists, but is instead created by the researcher and participant through the research process\textsuperscript{24}. In addition, there are practical difficulties in returning to the research site in this study, and danger that reading one’s own words in an unfamiliar format such as a transcript can lead to a embarrassment, breakdown of rapport, and even the participant’s withdrawal of data\textsuperscript{22}. As an alternative, rapport was sustained and meanings negotiated during the interviews to the fullest extent possible.

By adhering to the principles of trustworthiness that logically apply to this study, rigor will be documented and maintained. Patton states that “systematic data collection procedures, triangulation, external reviews...are aimed at producing high-quality qualitative data that are credible, trustworthy, authentic, balanced about the phenomenon under study, and fair to the people studied”\textsuperscript{23}. 

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3.5 Research Objective 3

- **Research Objective 3**: To understand the association between breastfeeding difficulties at 3 months postpartum and formula feeding between 3 and 6 months of age.

3.5.1 Measures

The main dependent variable was formula use between 3-6 months of age as assessed by 24-hour recall. Mothers were asked if they had given their child infant formula during the previous day or the night, and a yes or no response was recorded. The exposure variable of interest was breastfeeding difficulty reported by mothers at three to four months postpartum. Mothers were asked, “Did you face any problems with breastfeeding later on, when the child was 3-4 months old?”

Twenty-six additional independent variables were examined for potential association with formula feeding in each of the following domains: maternal and infant biological characteristics; social and wealth conditions; birth setting, practices, and knowledge; and post-birth infant feeding practices.

Maternal and infant biological characteristics included maternal age, child age, maternal body mass index (BMI, weight/height\(^2\)) as assessed at the time of the interview, and maternal recall of birthweight (kg), all analyzed as continuous variables. Child gender and mother’s report of child illness in the past two weeks (including fever, cough or cold, shortness of breath, or diarrhea) were also included. A maternal stress score was created using the World Health Organization 20-item Self-Reporting Questionnaire (SRQ-20), designed to measure symptoms of common mental disorders across different cultures in low-income settings\(^25\).

Social and wealth conditions included marital status, highest grade the mother
had completed in school, maternal occupation, frequency of work outside the home, and paternal occupation. Measures of wealth included possessing land, a house, small animals, or a motorbike. Food security was assessed using the Household Food Insecurity Access Scale (HFIAS) for Measurement of Food Access developed by the U.S. Food and Nutritional Technical Assistance Project (FANTA).

The domain of birth setting, practices, and knowledge included whether the mother had received any counseling regarding breastfeeding while pregnant, if the mother had a cesarean section at birth, time to breastfeeding initiation (dichotomized into three categories: within the first hour, after the first hour but before 24 hours, and after 24 hours), if the mother received help breastfeeding at birth, experienced difficulty at birth, and the type of attendant present at birth. Use of formula at birth was also dichotomized by no formula use, use at initiation but stopped afterward, or use at initiation and continued afterward.

Two post-birth infant feeding practices were included: if the child had been introduced to bột (thin rice gruel, a traditional first food) or semi-solid foods (cháo thicker rice porridge, soft rice, mashed potato, ripe banana, other mashed family foods).

3.5.2 Statistical analysis

The association between breastfeeding difficulties reported around three months postpartum and formula feeding during three to six months of age was investigated. The time frame of 3-6 months of age for formula use was chosen to follow the exposure and precede the end of the recommended period of exclusive
breastfeeding at six months. For this analysis, we combined data from the control and intervention areas because there was no intervention at the time of this baseline survey.

The original sample included n=4,029 mother-infant dyads. Regression analyses were restricted to mothers with infants between three and six months old at the time of the interview (n= 616 out of 4029). Additionally, inclusion criteria included mothers who were still breastfeeding at three months of age (n= 609) to be eligible to experience breastfeeding difficulties, and mothers with no missing data regarding breastfeeding difficulties (n=604). Out of the total sample of n=4,029 mother-infant dyads, 604 met all inclusion criteria and were included in the analysis (Figure 3.3).
Frequency distributions were tabulated, and chi-squared tests (for categorical variables), as well as t-tests (for continuous variables) were performed to assess differences between the formula fed and non-formula fed infant categories. Variables associated with the outcome at a significance level of $p<0.05$ were selected for the base model using multivariate logistic regression, along with variables previously shown to be associated with formula feeding such as mother’s education$^{27,28}$, and social and wealth conditions$^{28}$.

Multivariable logistic regression was used to obtain odds ratios (OR) and 95% confidence intervals (CI) to estimate the relationships of independent variables with
formula or non-formula fed infants. The cluster command was used to compute robust standard errors and estimate 95% CI to account for cluster-sampling by commune. All data analysis was performed in Stata software, version 13 (Stata Corp, College Station, TX). The base model was compared to more parsimonious models for final model selection.

Further descriptive analysis using the full n=4,029 sample explored types of breastfeeding difficulties that mothers reported, sources of support when difficulties arose, and advice offered.
References


27. Li L, Thi Phuong Lan D, Hoa N-T, Ushijima H. Prevalence of breast-feeding

4 A case study approach to elucidate patterns and household decision-making regarding formula use in rural Vietnam (Paper 1)

Abstract

Background: Awareness and use of formula is widespread in Vietnam and undermines exclusive breastfeeding. Although mothers’ reasons for formula in Vietnam use have been explored, understanding perceptions and practices of other household members is essential to providing an intervention that includes fathers and grandparents who influence and support the mother in her choices, as well as have direct responsibility for infant feeding.

Objectives: The objectives of this study were 1) to elucidate the use of infant formula in this rural Vietnamese sample and its pattern and timing in the first six months of age of the infant, and 2) to evaluate family members’ decision-making regarding breastfeeding attitudes and the types and time to offer formula.

Methods: Data for this study were collected as part of a process evaluation for Alive and Thrive, a six-year initiative aimed at improving infant and young child nutrition by increasing rates of EBF and improving complementary feeding practices in Ethiopia, Bangladesh, and Vietnam. An instrumental case study approach, as proposed by Stake (2000), was used to access a phenomena of interest (formula use under twelve months in rural Vietnam) via a series of cases (interviews with 24 households including a mother, father, and cohabitating grandparent). After cases were defined, transcripts
within each case were coded using the research objectives as a guide, a narrative was created for each case, different patterns related to the phenomena of interest (formula use) were compared among all the cases.

**Results:** In this rural Vietnamese sample, 75% of families used formula before six months. Families valued and practiced breastfeeding, but relied on formula in the absence of other support. Unique problems were reported at distinct periods under six months: at birth, breastfeeding difficulty and perception of insufficient colostrum or breastmilk to satisfy infant hunger; at 1-3 months, perception of insufficient milk to satisfy infant hunger or infant development; at 4-6 months, return to work and early complementary feeding.

**Conclusion:** Interventions must address formula as a perceived solution for many families experiencing infant feeding problems. By identifying reasons for formula use at distinct stages, targeted interventions can begin immediately to assist mothers in maintaining breastfeeding as the solution instead. In addition to targeted support for specific problems leading to formula use, policies to prevent the influence of formula advertising are necessary to maintain breastfeeding and improve exclusive breastfeeding in rural Vietnam.
Introduction

Exclusive breastfeeding (EBF), defined by nothing but breastmilk for the first six months of life, is recommended by the World Health Organization (WHO) for the health of both mothers and infants\(^1\). The rate of exclusive breastfeeding in Vietnam has remained stagnant at 19.6%\(^2\), despite efforts to improve breastfeeding practices\(^3\).

Awareness and use of formula is widespread in Vietnam and undermines EBF. In an urban sample, 98% of mothers had been exposed to formula advertisements in 2005\(^4\). The rate of formula use has increased from 12% in 2002\(^5\) to 39% in 2011\(^6\). A survey of 11 provinces across Vietnam found that 54% of infants were fed formula in first three days of birth\(^7\). One reason for formula use as reported by mothers includes poor nutrition leading to insufficient breastmilk; in a sample of 463 mothers, 97% said formula is necessary if a mother experiences insufficient milk\(^8\). Other reasons to use formula previously reported in Vietnam include returning to work\(^8\), and providing extra nutrition for infants\(^8\) for added growth and strength\(^9\). Breastfed infants were also given formula when there was no apparent problem feeding if parents could afford it\(^8\).

Despite the high rates of use and awareness of formula among urban mothers, Duong et al. found a pattern of stopping and starting formula before six months concurrent with breastfeeding, and less than 2% of the sample exclusively bottle fed\(^4,10,11\).

Although mothers’ reasons for formula use have been explored, understanding perceptions and practices of other household members is essential to providing an intervention that includes fathers and grandparents who influence and support the mother in her choices, as well as have the potential to independently purchase and feed
formula. In addition, placing the reasons for formula use in the context of a timeline may help identify patterns before six months where breastfeeding is difficult or conflicts with other demands, and families see formula as the best solution.

The objectives of this study were 1) to elucidate the use of infant formula in this rural Vietnamese sample and its pattern and timing in the first six months of age of the infant, and 2) to evaluate family members’ decision-making regarding breastfeeding attitudes and the types and time to offer formula. Recommendations and strategies for action can be based on patterns of formula use, utilizing the perspective of all infant caregivers.

Methods
Study population and context
Data for this study were collected as part of a process evaluation for Alive and Thrive (A&T, aliveandthrive.org), a six-year initiative aimed at improving infant and young child nutrition by increasing rates of EBF and improving complementary feeding practices in Ethiopia, Bangladesh, and Vietnam.

The specific strategies to promote EBF in Vietnam included a national mass media campaign, advocacy efforts to extend maternity leave legislation, strengthening the marketing code for breastmilk substitutes, and the introduction of a social franchise model for the existing and well-utilized community health centers (CHC). Vietnam’s National Institute of Nutrition assumed responsibility for accreditation of each Mắt Trời Bé Thơ (MTBT) “The Little Sun” franchise, enabling existing CHCs to offer a uniform package of branded services by trained health staff in an upgraded infant and
young child feeding counseling room\textsuperscript{12,13}. As of 2013, 782 franchises were functioning in 15 of Vietnam’s 63 provinces. A process evaluation including qualitative data collection was conducted in 2012, one year after franchises were launched, and served to document the extent to which the program was being implemented as planned and explain how the intervention was (or was not) leading to impact\textsuperscript{14}.

\textit{Sampling and household selection for household in-depth interviews}

As part of the process evaluation, two of the four evaluation provinces were selected for in-depth interviews at the household level. Thanh Hóa on the central coast (population 3.4 million, 88% rural) represented the north part of the country, while Vĩnh Long (1.0 million, 84% rural) represented the south. Four communes were drawn from the 20 impact evaluation communes in the two provinces. Each commune provided A&T with a list of women who had given birth within the last year. Maximum variation sampling was used to efficiently capture the dimensions of variation most relevant to the larger study\textsuperscript{15}. Each set of household interviews included the mother of the infant as well as the father and/or live-in grandparent. In total, 121 interviews were completed from 48 households, but loss of one transcript resulted in 120 interviews for analysis.

\textit{Participants and data collection}

A semi-structured interview guide was created in advance of the fieldwork by A&T and the Institute of Social and Medical Studies (ISMS), an NGO based in Hanoi, Vietnam that handled the logistics and research team to conduct the interviews. The interview guides were focused on understanding respondents’ perspectives and
behaviors and exposing facilitators and barriers to project implementation and impact. Respondents were asked about their recollections of prenatal care and birth experiences, as well as plans for infant feeding, care, and work and household responsibilities in the first year of the infant’s life. Two questions related directly to formula use, “Immediately after birth, was the baby fed or given any liquids (formula, cow’s or other animal’s milk, sugar water, honey, or anything else) in his/her mouth? If yes, who fed and why?” and “Do you feed your child foods other than breastmilk? Probe for formula, rice-water, porridge-water.”.

Data collection was performed by one team composed of 6 data collectors (typically with a bachelor’s degree in public health, medicine, or sociology; two-thirds were women), ISMS staff as field supervisors (2 people), a field coordinator (1 person), and a team leader (senior person, a medical doctor with a PhD or master’s degree). Training classes were organized by the same staff from ISMS with support from the A&T staff, which provided learning about interview skills, understanding of the A&T project, training on the survey questionnaire, and practical experience in using the questionnaire (mock interview and practice in the field).

The first author did not interview respondents but was present for the first set of interviews in Thanh Hóa, and was present at daily team meetings to discuss findings and strategies for probing emerging issues in subsequent interviews. In addition, observations and interactions with households members, mothers visiting the CHC, and local markets selling formula were made with the assistance of a translator and used for this analysis. Direct observation served to illuminate discrepancies between what
people said in the interviews and what was said in more casual conversations, as well as what they actually did\textsuperscript{16}.

Interviews were conducted in Vietnamese and recorded with digital recording devices, and field notes were kept as well. A complete transcript was made in Vietnamese from the recorded interview. For issues of time and cost, senior researchers reviewed the transcripts and removed lengthy sections that did not directly pertain to the research prior to translation into English.

**Initial Data Analysis**

Coding of transcripts was facilitated by Nvivo 10 (QSR International Pty. Ltd., Melbourne, Victoria, Australia) by a team of six standardized coders over four months, including the first author. Coders used a detailed \textit{a priori} thematic code list, but frequent meetings early in the coding process allowed for emergent codes. The final codebook included 187 unique codes and definitions, including “formula before 6mo” and “formula after 6mo” that could be used alone or in combination with other codes such as “delivery experience,” “initiation of breastfeeding sufficiency, personal” “breastfeeding experience,” “mother’s workload”. Text associated with relevant codes was exported as a matrix and further analyzed using Excel for Mac 2011 (Microsoft Corporation, Redmond, WA).

**Case Study Analysis**

Instrumental case study as proposed by Stake (2000)\textsuperscript{17} is the exploration of a particular case with a view to understanding or gaining insights about a phenomenon of
interest. Like all case studies, an instrumental case study focuses on a real-life process bounded by time and place\textsuperscript{18,19}, but its unique feature is that the approach accesses the phenomena of interest via cases, rather than concentrating on the cases themselves.

There is no agreed upon set of methods for case studies; rather, methods are chosen based on their capacity to address the research aims, nature of the case, and ontological and epistemological choices of the researcher\textsuperscript{17,18}. In the present study, methods will be described below but included defining cases, coding three transcripts within each case using the research objectives as a guide, creating narratives for each case, and evaluating the different patterns related to the phenomena of interest (formula use) among all the cases.

First, a case is defined \textit{a priori}, as it serves as the unit of analysis\textsuperscript{20}. Based on the research objective of understanding the family members’ perspectives on use formula and the dynamic of household decision-making on infant feeding, each case was defined as one family unit. Boundaries placed on each case (as recommended by Yin\textsuperscript{21} and Stake\textsuperscript{18} to remain within the scope of the study objectives\textsuperscript{22}) included households in which interviews took place for the mother, father, and live-in grandparent. Households that did not use formula were included as avoidance of formula is a valuable perspective pertaining to the research objectives. 24 cases were used for the case study, representing a subset of 72 interviews (24 mothers, 24 grandmothers, and 24 fathers) from the full 120 interviews completed as part of the process evaluation.

Second, each transcript was read by the first author and re-coded using both relevant codes from the original codebook (related to concepts such as breastfeeding
support at birth, birth experience, breastfeeding difficulties, and employment) as well as new codes more specific to the newly developed research questions (such as first use of formula (when and why), planned use of formula, actual use of formula, reasons to use/not use formula, exposure to formula advertising, and description of choosing/preparing formula). The original transcripts were referenced when the language in the translation made it unclear if breastmilk, formula, or milk-flavored rice powder was being used.

Third, each transcript in a case was read a final time by the first author, and one case narrative was created. Using this method, attention was paid to variations within each case (between family members) before considering the similarities and differences in cross-case comparisons (between families). Throughout this process, a researcher’s narrative was kept in MS Word to note emerging themes, similarities, and differences in the cross-case comparisons.

Finally, patterns of formula use were compared visually by recording any planned or actual formula use across a timeline representing the first twelve months post-partum. This was done for all mothers, then all fathers, and finally for all grandparents.

Because the perspective of many family members is used in this analysis, respondents will be identified by their relationship to the infant for consistency and clarity (mother, father, paternal grandmother, etc.)
Results
Study Sample

Transcripts from the families of 24 families of infants ages one to 11 months were used (Table 4.1). The mean age for mothers, fathers, and grandparents was 28, 31, and 64 years respectively. The majority of parents lived with the paternal grandmother (71%). Mothers had slightly more years of schooling than fathers; 63% of mothers and 75% of fathers had a middle school education or less. The majority of mothers described themselves as farmers (46%), while the majority of fathers described themselves as self-employed traders, shop-keepers, and drivers (42%). The average household income was $212/month. The majority of households had one child (63%), a minority had two children (38%). Due to the study design, half of the infants were under 6 months of age and half were between 6 and 12 months of age. All mothers in the sample were breastfeeding at the time of the interview. One infant had been exclusively breastfed for six months.

Food insecurity and the expense of formula

Food insecurity was referenced frequently, especially by fathers who discussed borrowing money from relatives and neighbors or buying on credit (mua chiu) and paying the seller later for food, a lack of money to afford meeting infant feeding recommendations, buying less for adults to maintain children’s diets, or not being able to go to the market if money had “run out”.

Sometimes, we run out of money to buy food. If we cannot afford food for our child, we have to borrow money from other people.
I try to afford these foods no matter how hard it is. In fact, we often spend 50,000 VND (2.34 USD) on a meal for the whole family. If necessary, I’ll spare that money to buy food for our child.

Father, Family 16

Although fathers were specific about the way their economic situation had an impact on diets for the mother during pregnancy and breastfeeding (buying nutritious foods when they could) and complementary feeding (limiting dietary diversity), relatively little was said regarding the expense of formula. One respondent mentioned spending 190,000 VND ($8.91) for formula that lasted 12 days. A few mothers said family members or doctors told them to breastfeed because they were too poor to afford formula, and others talked about receiving money from relatives or working extra specifically to buy formula.

My husband told me that our baby should be breastfed because we are poor and that if I do not breastfeed, we would not be able to afford formula for him.

Mother, Family 3

I thought that our baby was underweight, so I tried to save money to buy the advertised milk for our baby.

Father, Family 14

Reporting of formula use

Using only responses from mothers, 67% (n=16) of families had used formula before the infant turned one; 38% (n=9) before the infant was six months of age. When case narratives were used and any formula use reported by the mother, father, or grandparent was counted, 92% of families (n=22) had or planned to use formula before the infant turned one, 75% (n=18) before the infant was six months of age (Figure 4.1).
Fewer mothers reported formula use at birth or continued use after birth. 21% of mothers (n=5) said their infant was given formula at birth, but that formula was discontinued within days or weeks. When case narratives were used, 46% of families (n=11) reported giving formula at birth, and about half of these families (n=5) described continued use beyond initiation.

Mothers reported waiting until six months to introduce non-breastmilk liquids and solids, while other family members reported earlier use. In five cases where formula was introduced with complementary foods or due to a return to work, mothers reported introducing formula at 6 months postpartum, while the father or grandmother reported 4 months postpartum.

Patterns related to timing of introduction of formula under six months of age

Distinct time periods emerged for when and why formula was offered: at birth, between 1-4 months, and 4-6 months (Table 4.2).

Birth

At birth, many mothers and their families perceived infant crying as a sign of hunger and worried that the mother’s milk had not come in, or that colostrum was insufficient. A specific kind of formula called “colostrum formula” (called sữa non, the same term for human colostrum) was usually purchased. Some mothers also described breastfeeding difficulties, particularly positioning the infant and proper latch. Both mothers who had Cesarean sections formula fed.
In general, parents reported that healthcare workers gave the message to initiate breastfeeding soon after birth, feed colostrum, breastfeed for six months, and in a few cases, not to feed water or formula. However, details on how to accomplish these goals and hands-on support were rarely reported. In addition, when difficulties at birth were faced, parents said doctors or midwives told parents to buy formula. A few families brought formula to the hospital just in case it was needed, but most families reported little difficulty buying it from shops near the health facility if they felt it was needed. One family bought formula in the hospital canteen.

Mothers said they stopped using formula when breastmilk “came in” or was sufficient, although three reported ongoing breastfeeding difficulties, including what they after using bottles, that made returning to breastfeeding challenging.

Case study: A family perspective on introducing formula at birth

Family 45 was a household comprised of a mother, father, and paternal grandmother of a 1.5 month old infant. Although initial responses regarding formula use differed, as each interview progressed the events began to correspond while the perspectives remained distinct (Table 4.3).

The mother initiated breastfeeding within an hour after birth but said she did not have breastmilk after delivery. The infant was small (about six pounds) and she could not hold him properly to breastfeed. She then experienced what she identified as a painful clogged milk duct. Although the mother said both the maternal and paternal grandmothers of the infant (present at birth), instructed her on technique, provided home remedies, massaged the her breasts and used a breast pump, formula and
“colostrum formula” had to be fed with a bottle until her milk “came in” days later. By then the infant experienced nipple confusion. Over time the mother said she was still able to transition to breastfeeding without formula with the help of her sister. The mother said she was a picky eater after birth, which she thought could have contributed to her low milk supply, and after eating more and healthier foods her milk supply increased. She also said she did not follow all the strict rules about what to eat, as there are “always different opinions”.

The father was more informed and involved in infant feeding than most other fathers. He said all parents-to-be know breastfeeding is the best, should start immediately after birth, and should continue for the first six months. Consequently, he said he tried his best to help his wife breastfeed. However, his view was that milk sufficiency at birth depends on the individual mother, and that some mothers have milk right after birth while others have to wait. The father bought pre-packaged colostrum formula from a store after his infant’s birth. At the same time, he knew what specific foods elders recommended for increasing milk supply and said he also tried his best to find them for his wife’s diet. He described acquiring formula for the infant (if necessary) and food for his wife (specifically for breastmilk production) as his role as a father, which was a viewpoint expressed by many other fathers.

The paternal grandmother first maintained that nothing aside form breastmilk had been given at birth, per her direction. Later, she discussed her confusion and frustration at her daughter-in-law’s low ability to produce milk. Although the grandmother said her daughter-in-law wanted to use formula, she was able to persuade
her to try massaging and stimulating milk glands and using a breast pump, which the grandmother acknowledged made the mother scream with pain. The midwives at the health center told the family to buy colostrum milk powder. The grandmother explained that when formula was introduced, the baby “fed better and more powerfully,” and when he became full and fell asleep, "everybody felt such relief". Afterward, the grandmother controlled what the mother ate so that her breastmilk supply could be improved through diet, but said the mother did not follow her instructions well enough at first. She told the mother, “Everyone took care of you, but your milk was not sufficient for the baby...only you can take good care of the baby, other people can only do so much”. After that, the grandmother said she didn’t know whether her daughter-in-law respected or feared her, but she ate more and through an improved diet, was finally able to breastfeed again.

1-3 Months

Insufficient milk supply was discussed by all families, and was the primary reason given for formula use between one and three months. Families described mothers’ actual as well as potential to experience insufficient milk and consensus was that a mother’s diet determined milk supply. A proper diet was necessary for sufficient milk supply, and specific foods such as pig trotters and papaya were eaten if milk supply did become low. As with birth, crying was perceived as a sign of hunger, which was due to low milk supply. Introducing formula was usually described by the mother as temporary
remedy while the mother improved her diet with the help of grandmothers (who dictated what to eat) and fathers (who purchased the foods).

[At 3 months] my baby was big and his demand increased, but I did not produce enough... The hot weather in May or June significantly affected my appetite and my supply. He cried very loud when he got hungry so I thought I had to give a bottle to fill him up... we had to find out what to do to stop his crying. Then we bought formula and introduced bottle to him.

Mother, Family 31

A common viewpoint was that breastfeeding messages had been heard and accepted, but formula had to be used in the case of insufficient milk.

I have heard about it on TV, saying that breastmilk is the best for children. I also read some online articles saying that breastmilk has something that can help prevent certain diseases for children. Breastfeeding helps a child grow up comprehensively. Therefore, a mother should breastfeed her child as much as possible. When she cannot produce enough breast milk for her child, she can give him formula.

Father, Family 43

4-6 months

Mothers and grandmothers listed similar reasons for introduction of formula in this period, but grandmothers placed use around four months while mothers placed it around six or seven months. One-quarter of mothers used formula at this time because they returned to work (n=6). Grandmothers said formula was introduced before the mother returned to familiarize the infant with both the new taste, method of feeding, and new caregiver. Three families introduced complementary foods at this time in order so the person feeding the infant had more flexibility while the mother was away. There was wide agreement that if a mother had to return to work, formula feeding was the only option.
It was because my wife needed to go out for work in the fields. It was harvest time. My child was taken care of by my parents and we had no choice except feeding him/her formula milk.

Father, Family 34

Over one-third of mothers (n=9) said the formula was introduced around six months when it was time to introduce complementary foods. In this case, mothers did not characterize formula use as the result of any constraint such as breastfeeding difficulty or employment. Most gave no explanation other than it was time for complementary foods, while a minority cited specific qualities in formula that were beneficial.

*I bought a formula milk can named [specific brand] for my baby when he/she was over 6 months old. I thought that milk has DHA, vitamins and minerals which are good for child’s brain and digestive system.*

Mother, Family 22

Grandmothers also described introducing formula with complementary foods, but again placed it earlier, around four months. Most grandmothers were aware that exclusive breastfeeding was recommended for a full six months, and acknowledged that they engaged in early complementary feeding. Early complementary feeding was connected to the theme of insufficient milk, but there appeared to be a subtle distinction around the fourth and fifth months that it was not an individual mother’s breastmilk (which could be addressed by diet) but rather that breastmilk alone was insufficient to sustain growth for a full six months. Grandmothers and fathers in particular expressed concern over the infant’s growing hunger and insufficient milk to meet the demand.

*F: For the last several months, as the baby has grown bigger, [my wife] no longer has enough supply. We gave formula to the baby as well.*
I: How do you know that your wife does not have enough milk?
F: My wife said that she did not have enough milk to make the baby full. However, my wife also stated that it was normal.

Father, Family 28

At the moment, I have enough breast milk for my son, but I don’t know if I will still have enough breast milk when he is 4 or 5 months old. If I have enough, I will keep breastfeeding him. If not, I may have to give him some formula.

Mother, Family 43

Grandmothers also observed that formula is often used if the mother does not have sufficient milk, but its use is ubiquitous regardless of milk supply.

In my opinion, exclusive breastfeeding in the first six month is good. However, it depends on the mother’s body and if the mother can produce sufficient milk for the baby. Otherwise, the baby will be fed with formula milk. Our ancestors said that if the mother cannot produce milk, we could use traditional medicine to boost milk production...Now most of the women who do not have enough milk will feed their baby with formula.

Grandmother, Family 39

Exclusive breastfeeding is good. But if the mother does not have enough milk, we have to feed the baby with formula milk. However, nowadays, even if the mother has enough milk, or not enough milk, they still feed the baby with formula milk. Everybody does that; everyone does that as a movement.

Grandmother, Family 31

Cool (good) and hot (bad) breastmilk was discussed by respondents, but in only a minority of grandmothers and fathers perceived this as an immutable quality of breastmilk. Because breastmilk could not be improved, however, use of breastmilk alternatives were deemed absolutely necessary for these mothers.

Her milk is hot that may make the baby get gum infections rashes. My wife’s breast milk is tasteless. Other nursing mothers' breast milk has very good smell but my wife’s does not.
A baby whose mother has cool breast milk will put on weight and look fat. On the other hand, if the mother has hot milk, the more the baby breastfeeds, the thinner he becomes. When the other people come across the woman she smells nasty, so the mother who has hot milk should wean earlier.

Family members’ decision-making regarding breastfeeding attitudes and the types and time to offer formula

Grandparents accept formula as a modern way to feed infants

The primary source childcare support from a cohabitating family member was the infant’s grandmother, usually the father’s mother. Grandmothers in particular had a great deal of influence—often the final word—regarding the care and feeding of their grandchildren, and they discussed many traditional practices to achieve good health, particularly height and intelligence. Breastfeeding was expected of daughters and daughters-in-law, considered superior to any other form of infant feeding, and grandparents were committed to supporting the mother in breastfeeding (although exclusive breastfeeding was undermined by strong beliefs about the necessity of water and early complementary feeding).

One mother and one father from different families reported pressure from parents to feed formula, but in general the attitude from grandparents was one of reluctant acceptance of ubiquitous and modern infant feeding methods. Grandparents professed a willingness to relinquish control over infant feeding decisions due to their lack of understanding of what was best or belief that new information was better than what they had in the past.
At my age, we did not have much access to science and knowledge...
[Advice now] is not from the experience or lessons of the ancestors. It is from the television.

Grandmother, Family 39

Breastfeeding is the right thing...[but regarding formula] every family does that now; seeing a family buy formula milk, the other families also buy it.

Grandmother, Family 31

**Fathers perceive formula feeding as a way to support the mother**

Most mothers did not expect fathers to be involved with decisions regarding infant feeding. Accordingly, most fathers said they were busy with work, or men in general are not involved in infant feeding, but that it was the role of the father’s female relatives to support the mother and infant.

*I talked to my husband. He says he defers it to me and my mother-in-law because he works outside all day long, he will not be able to help out much. He won’t help much with feeding the baby.*

Mother, Family 43

*To be honest, I didn’t know how other guys deal with it, but I am not good at those things. Not at all. I did not know what to do but asked for [my female relatives’] help to take good care of my wife.*

Father, Family 48

*It depends on the way my wife raises the baby. I am a man and I am not good at those things...she was a woman and a housewife, she should know...I just buy whatever my wife asks me to. Then, my wife prepares the food for the baby. I don’t even know how the baby eats.*

Among those that professed ignorance about infant feeding and those who were more involved, fathers had the most to say regarding formula, and usually promoted use. First, a common theme was that one way to be involved and support the mother was the act of purchasing formula (and less commonly, preparing and feeding it). This
act was often at the request of the mother, but in three cases at birth it was not clear if the mother knew that the father fed formula while the mother recovered after birth.

Because my wife was too weak, she needed to rest. What I could do for her was feed our baby with formula.

Father, Family 21

In another two cases, formula was purchased by the father expressly against the mother’s wishes. Although the mothers denied use, the father described formula feeding at that point.

My husband asked me if he had to buy formula milk advertised on TV that could make babies taller and grow faster, but I explained to him that nothing could be better than breast milk. At first my husband did not listen...he insisted on buying it, but I did not feed it to my baby and returned the milk to the shop. I told him that I had enough breast milk and he didn’t need to buy formula. Seeing me return the milk to the shop, he stopped buying it.

Mother, Family 25

I bought formula because sometimes people said that it would be good for the baby if he/she was fed formula. When we came to see the doctor, doctor said that we did not need to buy formula milk because my wife had enough breast milk.

Father, Family 14

Fathers discussed the influence of formula advertisements at more length than other family members.

I: Which TV ads do you like to watch?
F: Formula ads; I want to know what is the best so that I can choose for my baby.

I: Why did you decide to purchase that product?
F: I think only good products can appear on TV. I see this [specific brand of formula] ad almost every day...I thought it must be good.

Father, Family 5
My boss also has kids; their children also drank [a specific brand of formula] when they were babies. Moreover, they advertised that kind of milk on the television.

Father, Family 31

One father discussed being approached directly by a formula company representative, and although he expressed cynicism about the process, he used that brand of formula.

Someone from a formula company came to our house to introduce their products...their job is selling something to you, not solving your problems.

Father, Family 12

Specific qualities of formula such as conferring "better height and intelligence" (Father, Family 3), and aiding to “grow up well, both mentally and physically” (Father, Family 43) were the qualities that fathers desired for their children.

Discussion

In this rural Vietnamese sample, 75% of families used formula before six months. Families valued and practiced breastfeeding, but relied on formula in the absence of other support. Unique problems were reported at distinct periods under six months: at birth, breastfeeding difficulty and perception of insufficient at birth; at 1-3 months, perception of insufficient milk; at 4-6 months, return to maternal employment and early complementary feeding.

A case study approach allowed for an in-depth exploration of patterns of formula use and family decision-making. Fewer mothers reported formula use at birth and continued use after birth compared to fathers and grandparents. Mothers also reported
waiting until six months to introduce non-breastmilk liquids and solids, while other family members reported introducing formula with early complementary feeding. Grandparents were largely accepting of formula use, while fathers often promoted it.

A recent study in Vietnam found a discrepancy between awareness and practice of optimal breastfeeding practices, and this study explores some of the reasons a gap may exist. Having heard the message to exclusively breastfeed was inadequate to prevent formula use because formula provided solutions for infant feeding problems and added perceived benefits to infant development. Throughout the first six months, respondents reported formula use due to perception of insufficient milk, which has been reported previously as the main reason to use formula in Vietnam. In this study, we found this term was perceived in three distinct ways: 1) at birth when milk had not “come in”, 2) in the first months after bottle feeding caused nipple confusion or maternal diet was too poor to support adequate milk supply, and 3) between 4-6 months when breastmilk alone was not sufficient to sustain infant growth.

Insufficient milk supply is a biological factor with strong psychological component. At birth, only 7.9% of a nationally representative survey of mothers knew newborns only need 5-7 ml of breastmilk per feed on the first day of life, although increasing the number of mothers who possess this knowledge is unlikely to provide parents solutions to overcome the anguish expressed at hearing infants “cry with hunger”. At birth and in the first months, having a poor milk supply can result from infrequent feeding, poor breastfeeding techniques, or mixed feeding that results in less infant suckling and stimulation of breastmilk production, but lack of confidence and self-
efficacy in breastfeeding and understanding the normal physiology of lactation can lead to a perception of insufficient milk when in fact there is enough to nurture the infant\textsuperscript{26,27}.

As has been reported previously, formula was a widely accepted solution for a return to maternal employment\textsuperscript{8}; in this study respondents further expressed frustration at “no other choice” but to feed formula when women were separated from their infants.

Formula companies (through advertising, messages on cans, and websites) were also a widely viewed and trusted source of infant feeding advice, and some respondents perceived an added benefits to child development by adding formula, as has been noted previously in Vietnam\textsuperscript{8,9}. Similar to Duong et al.\textsuperscript{4}, formula use did not preclude breastfeeding, and no respondent was exclusively formula fed, but use interfered with breastfeeding under six months.

The WHO Code was implemented in Vietnam in 2006 as “Decree 21,” and revised in 2012 to expand a ban on advertising of breast milk substitutes for children up to 24 months\textsuperscript{28}, but it did not include the full provisions intended to be the minimum set of standards for monitoring and enforcement\textsuperscript{29}. The expanded law was enacted after this study took place, so the effects are unclear. However, marketing through healthcare workers\textsuperscript{30}, and price caps on formula\textsuperscript{31} set by the government as a response to rising prices\textsuperscript{32} have both been reported in Vietnamese media following implementation of the law and are likely to increase formula use.
Strengths of this study include a case-study approach that allowed deeper understanding of the family and social context influencing decisions about infant feeding. Evaluation of 24 cases through qualitative methods through coding and creation of narratives created insights about formula feeding in this population. Triangulation among family members was not meant to be a representation of an “objective truth,” but rather a tool to compare and understand how different family dynamics and pressures may shape perception and reporting, as was shown through an in-depth look at one case at birth.

The sample size allowed for saturation on number of topics and for distinct patterns to emerge between cases, lending confidence that the results reflect the perception of the respondents. In-home interviews allowed for observation of practices such as response to infant cues and formula preparation, as well as less formally structured conversations for greater context.

There were limitations to this study. Every respondent interviewed once, preventing further exploration of any one topic in depth. Infants of varied ages resulted in a mix of actual and planned behavior. The period of birth reflects actual behavior, but the 1-3 and 4-6 month periods may have under-reported formula use. Many families who did not expect to use formula may have encountered difficulties later and used it. Response bias was likely, but can be assessed by the incorporation of multiple perspectives from additional caregivers. Response bias appeared highest among mothers, who have primary responsibility for infant feeding in this context. Exposure to the A&T franchises was low at this point because implementation of the initiative had
occurred one year prior and few mothers reported counseling through franchises. However, the media campaign (in the form of television advertisements) had been viewed by many respondents, and it is possible that respondents knew the A&T objectives to promote breastfeeding. In general mothers were highly aware of the recommendation to exclusively breastfeed, and any of these may have prompted mothers to view or report their actions more favorably\textsuperscript{33} or obscure reasons for formula feeding\textsuperscript{34} as has been observed in previous studies among mothers who recognize exclusive breastfeeding as the ideal infant feeding method. This has implications for assessing formula use in future research, as sensitive questionnaire development and/or incorporating multiple perspectives may provide greater accuracy in reporting of use.

Areas of future research include a focused look on formula use in food insecure households. Based on limited information provided on the cost and amount of formula used by respondents, observations of markets selling formula at the field sites, and list prices of popular brands mentioned by respondents\textsuperscript{iii}, the least expensive formula would cost about 10\% of a family’s monthly income, the same percentage reported by Duong et al. in a rural Vietnamese setting\textsuperscript{4}. Poverty was discussed as a barrier to formula use by those not using formula, but the expense of formula was rarely discussed by those who did use it. How families afford this expensive commodity in the context of insufficient food for the family is important to understand, especially as all families were (and could be closer to exclusively) breastfeeding. Although the pattern of

\textsuperscript{iii}Specific brands mentioned by respondents cost between $9.37 (a domestic brand) to $20.11 (for a US import) for a 900g can\textsuperscript{35} (lasting between 8-11 days, according the majority of families that described details of making formula).
formula use was clear, frequency of use, dilution, safety, and other practices need to be
further elucidated.

In addition, fathers in particular felt that one way they could support the mother
during times that she needed rest or experienced breastfeeding difficulties was to feed
formula. Further research is needed regarding the best way to incorporate the support
of other family members in ways that do not undermine breastfeeding.

Increasing hands-on support for the mother at various stages and decreasing the
effect of formula advertising through policy will likely be effective for many of the
difficulties and influences discussed by respondents. For women returning to work,
especially for farmers that represented the majority of this sample, no ready solutions
currently exist. Families said that when mothers returned to work, they were left with
“no choice” but to formula feed. Facilitating continued breastfeeding among informally
employed women must be addressed to have an impact on exclusive breastfeeding
rates in rural Vietnam.

Formula use was the major barrier to exclusive breastfeeding in this rural
Vietnamese sample. Patterns of use, desire for use, and resistance to use must be
understood apart from other factors undermining breastfeeding because it is a
marketed commodity often endorsed by trusted sources such as healthcare workers and
family members. In this sample, formula was costly to the family and posed unnecessary
health risks to the infant and mother by diminishing the amount of breastmilk the infant
received under six months. However, formula was perceived by families to solve infant
feeding problems under six months such as infants crying from hunger at birth,
insufficient milk due to breastfeeding problems, poor maternal diet, infant nutritional demands that could not be met with breastmilk alone, and return to maternal work.

Interventions must compete with formula as the solution for infant feeding problems. By identifying reasons for formula use at distinct stages, targeted interventions can assist mothers in maintaining breastfeeding as the solution instead. In addition, policies to prevent influence of formula advertising are necessary to increase rates of exclusive breastfeeding in rural Vietnam.
Tables
Table 4.1. Demographic information for mothers, fathers, grandparents

<table>
<thead>
<tr>
<th>Respondents</th>
<th>Mother, n=24</th>
<th>Father, n=24</th>
<th>Grandparent, n=24</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age of respondent, mean (range) (yrs)</td>
<td>28 (20-38)</td>
<td>31 (21-41)</td>
<td>64 (47-85)</td>
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<tr>
<td>Education level</td>
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<td>7 (29%)</td>
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<tr>
<td>Completed elementary school</td>
<td>7 (29%)</td>
<td>5 (21%)</td>
<td>8 (33%)</td>
</tr>
<tr>
<td>Completed middle school</td>
<td>8 (33%)</td>
<td>11 (46%)</td>
<td>2 (8%)</td>
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<td>Completed high school</td>
<td>5 (21%)</td>
<td>5 (21%)</td>
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<td>Above high school</td>
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<tr>
<td>Farmer</td>
<td>11 (46%)</td>
<td>8 (33%)</td>
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<td>Self-Employed</td>
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<td>Monthly household income, mean (range) (USD)</td>
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<td>Cohabitating grandparent</td>
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<td>Paternal grandmother</td>
<td>17 (71%)</td>
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<tr>
<td>Paternal grandfather</td>
<td>1 (4%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maternal grandfather</td>
<td>1 (4%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total number of children</td>
<td>15 (63%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>15 (63%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>9 (38%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age of youngest child</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Under 6 months</td>
<td>12 (50%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 months and over</td>
<td>12 (50%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time Period</td>
<td>Birth</td>
<td>1-3</td>
<td>4-6</td>
</tr>
<tr>
<td>-------------</td>
<td>-------------------------------------------</td>
<td>------------------------------------------</td>
<td>------------------------------------------</td>
</tr>
<tr>
<td>Respondents’ reasons for formula use</td>
<td>Infant crying seen as sign that infant is hungry; colostrum/breastmilk perceived as insufficient</td>
<td>Perception of Insufficient milk/nipple confusion after formula use at birth</td>
<td>Perception of Insufficient milk</td>
</tr>
<tr>
<td></td>
<td>Breastfeeding after C-section difficult</td>
<td>“Hot” (harmful) breastmilk</td>
<td>Preparation for/return to work</td>
</tr>
<tr>
<td></td>
<td>Poor infant latch</td>
<td>Formula bought just in case</td>
<td>With introduction of complementary foods/improve development (intelligence, height)</td>
</tr>
<tr>
<td></td>
<td>Mother needs to rest/recover, Father perceives formula as one way to support mother</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Formula brought to hospital just in case</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 4.3. Case study for formula use at birth for Family 45

<table>
<thead>
<tr>
<th>Expectations regarding breastfeeding initiation</th>
<th>Mother</th>
<th>Father</th>
<th>Father’s Mother</th>
</tr>
</thead>
<tbody>
<tr>
<td>In the beginning I was very nervous; being a first-time mom gave me anxiety…I was not confident and that even made my mother and mother-in-law feel anxious… We all know breast milk is really good for the baby and worried about feeding him formula.</td>
<td>At first, I did not do much research as I thought breastfeeding was easy. Only when my wife started breastfeeding, did problems arise.</td>
<td>I don’t understand why she could make no milk. Really, I don’t know why it happened. Usually, a postpartum mother can easily have milk, but it was not easy with my daughter-in-law.</td>
<td></td>
</tr>
</tbody>
</table>

| Formula use at birth | I did not have enough milk so I had to feed him infant formula (sữa ngoài) and buy colostrum formula for the baby to drink (mua cái sữa non y cho bé uống) for 3 to 4 days until my milk supply returned (sữa về)...but I know breast milk is the best (sữa mẹ thì nó là tốt nhất). | Up until now, my baby has been fed with 100% breast milk. In the first 3 to 4 days when my wife had little breast milk, I fed my baby with artificial milk, but as soon as my wife could, we only fed with breast milk. I also bought pre-packaged colostrum to feed my baby. | Sometimes when she breastfed her baby, her nipples hurt. She had no milk. She frowned. She wanted to give her child non-breast milk, but I asked her to follow my advice…I didn’t allow giving my grandson anything else…I had him breastfed within the first hour but not given anything else, nothing else to eat, nothing else to drink, nothing at all. |

| Continued Use | In the beginning I had hard time not having enough milk and gave him bottle for formula feeding. He got used to it and had nipple confusion, then ignored his mother’s breasts. I then had to switch...it took quite time for him to learn...My older sister [helped me]...now he is completely breastfed. | Sometimes, when breast milk is not enough, I feed my baby with artificial milk, but not much. I find it necessary to first, provide my wife with a nutritious diet to ensure the breastfeeding for my baby and second, to directly provide my baby supplements. | The mother was provided with lactogenic foods...we gave her good care with great effort, and she was able to breastfeeding her baby. |
Figures

Figure 4.1. Report of formula use in the first year of life for all households (n=24)
References


mothers in infant and young child feeding at scale. *Food Nutr Bull.* 2013;34(Supplement 2):156S–168S.


26. US Department of Health and Human Services OOTSG. The Surgeon General's Call


5 Type of employment and acceptability of pumping breastmilk among mothers in Vietnam, a rapidly industrializing country (Paper 2)

Abstract

Background: Breastfeeding is globally endorsed as the optimal strategy for feeding newborns and young infants. Although breastfeeding is prevalent in Vietnam, exclusive breastfeeding (EBF) for the first 6 months of life as recommended by the World Health Organization (WHO) is rarely practiced. Previous research has identified returning to work as a major barrier to EBF in Vietnam. Pumping breastmilk is a potential solution to this constraint.

Objectives: To understand the nature of employment for rural Vietnamese women and infant feeding choices families make when women return to work after the birth of an infant. To assess perceptions and acceptability of pumping breastmilk among rural Vietnamese families.

Methods: 120 respondents within 48 households participated in in-depth interviews from May through June 2012 as part of a process evaluation for the “Alive & Thrive” initiative.

Results: Among mothers (n=47), 6 women were formally employed as factory or office workers and teachers, and 29 were informally self-employed as shop-keepers, traders, or farmers. The nature of employment had an impact on infant feeding decisions and has important implications for a pumping initiative through identified injunctive (what should be practiced) and descriptive (what is practiced) norms. An injunctive norm was that mothers should delay returning to work to breastfeed to facilitate breastfeeding
“directly from the breast”. Formally employed women were less able to follow this norm, and returned to work within four months to a year after birth. Informally employed women reported more flexibility about when they returned to work and planned to stay home longer, due in part to the ability of a family member to work in the mother’s place. However, they also reported a variety of circumstances that would require a sudden return to work.

A descriptive norm was that women fed formula after returning to work, which was true for both types of employed women but with different consequences for breastfeeding. Formally employed women generally breastfed before and after work and at night, and left formula with a caretaker during work hours. Informally employed women, especially farmers, reported that working conditions such as long hours away from their infants, lack of breaks, and hard physical labor made continued breastfeeding difficult. Respondents representing both types of employment expressed frustration with the lack of solutions that reconciled continued breastfeeding and employment.

Awareness of the practice of pumping milk was low among all respondents, but acceptability of the idea was higher among those who had previously heard of it. Only one employed woman had practiced pumping, others had no experience pumping for work. Many families associated the concept of pumping milk with the practice of expressing for the purpose of discarding breastmilk, likely due to the fact that the same Vietnamese word vắt sữa (squeeze/express/extract milk) was used for both actions. Most respondents had concerns about the difficulty of safe breastmilk storage.
Conclusion: Formally employed women were separated from their infants earlier, but were able to combine infant feeding strategies and continue some breastfeeding after returning to work. Informally employed women were generally able to stay at home with their infants and breastfeed longer, but once they returned to work they reported difficulty continuing to breastfeed at all.

Increasing awareness and differentiating types of breastmilk expression are essential strategies in increasing acceptability of pumping, a novel and foreign idea in this population. However, type of maternal employment has important implications for implementation of a successful pumping initiative due to differing expectations regarding when mothers would return to work and their subsequent work-related demands.

A conceptual framework is presented to organize the findings from this study within existing contextual, psychosocial, and technological factors relating to increasing awareness, acceptability, and practice of pumping breastmilk among employed mothers in rural Vietnam. This framework is intended to inform intervention development as well as structure scholarly discussion on behavior change in a non-pumping society where the practice is not currently accepted, yet may be an essential tool to increase low rates of EBF among all types of employed mothers.
Introduction

The risks associated with not breastfeeding include increased mortality in low and middle-income countries (LMIC)\textsuperscript{1-3}, and increased morbidity\textsuperscript{4-9}, particularly diarrhea and respiratory illness\textsuperscript{10-15}, across countries at all economic levels. Based on this and other wide-ranging health consequences for mothers and children, the World Health Organization (WHO) recommends exclusive breastfeeding (EBF), defined by an infant receiving only breastmilk without any additional food or drink through six months, followed by continued breastfeeding through two years\textsuperscript{16}.

One challenge in increasing global breastfeeding rates is addressing the needs of mothers who return to work while breastfeeding. Planning to, preparing for, and returning to work is associated with a shorter duration of breastfeeding among mothers in countries at all economic levels\textsuperscript{17-26}. Studies in the United States have shown that expressing breastmilk is associated with the longest duration of breastfeeding\textsuperscript{20,21} among employed mothers who are physically separated from their infants during work hours. Breastmilk expression includes extracting breastmilk either by hand expression or breast pumping with electrical or hand pumps\textsuperscript{27}.

Little is known about breastmilk expression as a solution for working women globally. Hight-Laukaran et al (1996) argue that the perception that formula is necessary for employed women disproportionately harmed families in LMIC countries due to a heightened risk for “infant mortality, morbidity, hastened resumption of fertility, and loss of money for other necessities” and concluded that milk expression and storage were essential strategies to ensure infants continue to receive breastmilk\textsuperscript{28}.
Despite this early call, few studies describe the use of breastmilk expression in LMIC. In Nairobi, less than 3% of a sample of 444 mothers working a mean 46.2 hours per week identified expressed breastmilk as an infant’s main food while the mother was at work, compared to 32% who received mainly cow’s milk\textsuperscript{29}. In Malaysia, a qualitative exploration of breastmilk expression among formally employed women revealed that nine of 20 women were able to exclusively breastfeed through the use of expressed milk. All women, however, voiced concerns regarding the lack of familiarity, feasibility, and safety of pumping\textsuperscript{30}.

Vietnam is a rapidly industrializing country where the majority of women (68%) participate in the labor force, comprising 40% of non-agricultural paid labor and 50% of the professional and technical workforce\textsuperscript{31}. The 2011 Multiple Indicator Cluster Survey (MICS) showed that 98% of children are ever breastfed\textsuperscript{32}, but prevalence of EBF at 1 month is only 27.2% and declines to 3.7% by 4-5 months of age\textsuperscript{32,33}. A 2013 study across 11 provinces found 53.5% of infants were introduced to formula within the first few days after birth\textsuperscript{34}, and the 2011 MICS reported that 39% of infants under six months were breastfed with the addition of formula\textsuperscript{32}.

According to a 2014 review of global maternity protection by the United Nation’s International Labour Organization (ILO), Vietnam has among the longest maternity leave policies in the world, including in Asia\textsuperscript{35}. In May 2013, article 157 of the amended Labor Code of Vietnam was enacted to extend paid maternity leave to six months. The law also preserved 60 minutes of daily paid time for female workers to provide breastmilk for infants 0-12 months of age. Despite this protection, the ILO cites many challenges in
enforcement of parental leave laws both globally\textsuperscript{35} and in Vietnam\textsuperscript{36}. Additionally, the ILO estimates that maternity leave provisions only cover 30\% of the workforce in Vietnam, given the predominance of the informal sector, notably agriculture\textsuperscript{36}.

Workers in the informal sector cannot be disregarded when devising solutions to facilitate continued breastfeeding among employed women. In one study including 1118 women (88\% farmers) in Vietnam, 25\% of the women who stopped breastfeeding before 1 year identified working conditions as the cause\textsuperscript{37}. In another survey of rural households in northern Vietnam, women who had returned to work were 14.0 times (95\% CI: 3.8, 51.7) more likely to fail to exclusively breastfeed compared to mothers who had not yet returned to work\textsuperscript{38}. Families in follow-up focus groups were presented with EBF scenarios for employed women, including returning from work to breastfeed, taking the infant to work, expressing milk, and wet nursing. None of these options were acceptable to the majority of Vietnamese families mostly due to time constraints, appropriate conduct while working, and concerns regarding the health of the child. However, the study authors did highlight “positive deviants,” the few mothers that, despite cultural norms, returned home during the day or expressed breastmilk\textsuperscript{38}.

Pumping breastmilk is particularly relevant in a rapidly industrializing country such as Vietnam, where many women are separated from their infants while they work, breastfeeding is prevalent, but formula is readily available and widely accepted. The objective of this qualitative study analyses was to examine and better understanding and practices of breastfeeding and use of breastmilk substitutes for women returning to work in a rural Vietnamese context, differences by type of employment (formal vs.
informal) in breastfeeding patterns, and to explore factors related to a possible initiative to increase the acceptability and practice of pumping breastmilk through the creation of a conceptual framework that contextualizes study findings.

**Methods**

**Study population and context**

Data for this study were collected as part of a process evaluation for “Alive and Thrive” (A&T, aliveandthrive.org), a six-year initiative aimed at improving infant and young child nutrition by increasing rates of EBF and improving complementary feeding practices in Ethiopia, Bangladesh, and Vietnam.

The specific strategies to promote EBF in Vietnam included a national mass media campaign, advocacy efforts to extend maternity leave legislation, strengthening the marketing code for breastmilk substitutes\(^{33}\), and the introduction of a social franchise model for the existing and well-utilized community health centers (CHC)\(^{39}\). Vietnam’s National Institute of Nutrition assumed responsibility for accreditation of each Mắt Trời Bé Thơ (MTBT) “The Little Sun” franchise, enabling existing CHCs to offer a uniform package of branded services by trained health staff in an upgraded infant and young child feeding counseling room\(^{33,39}\). As of 2013, 782 franchises were functioning in 15 of Vietnam’s 63 provinces. A process evaluation involving qualitative data collection was conducted in 2012, one year after franchises were launched, and served to document the extent to which the program was being implemented as planned and explain how the intervention was (or was not) leading to impact\(^{40}\).
Sampling and household selection for qualitative study

Two of the four evaluation provinces were selected to be part of the 2012 process evaluation. Thanh Hôa on the central coast (population 3.4 million, 88% rural) represented the north part of the country, while Vĩnh Long (1.0 million, 84% rural) represented the south. Within the two provinces, four out of 20 impact evaluation communes were selected for in-depth interviews at the household level. Local health authorities within each commune provided A&T staff with a list of women who had given birth within the last year. A maximum variation sampling approach was used to efficiently capture the dimensions of variation most relevant to the larger study\textsuperscript{41}. These dimensions were defined \textit{a priori} as 1) location (north vs. south), 2) exposure to “The Little Sun” franchise (franchise users vs. nonusers), and 3) age of infant (under six months vs. six to twelve months). Households within communes were purposively selected fill these dimensions. Exposure to the franchise information was limited at this point in the initiative, and because pumping was not yet a component of the standardized franchise materials, transcripts were evaluated without regard to users of “The Little Sun” franchises for purposes of this analysis.

Participants and data collection

Each set of household interviews included the mother of the infant as well as the father and/or live-in grandparent. In total, 121 interviews were completed between May and June 2012 (1 mother’s transcript was lost). The entire set of 120 interviews
were analyzed for this study, including those from 47 mothers, 40 fathers, and 33
grandparents.

A semi-structured interview guide was created in advance of the fieldwork by
A&T investigators and collaborators at the Institute of Social and Medical Studies (ISMS),
an NGO based in Hanoi, Vietnam that handled the logistics and research team to
conduct the interviews. The interview guides were focused on understanding
respondents’ perspectives and behaviors related to facilitators and barriers to project
implementation and impact (Appendix Table A1). Respondents were asked about their
recollections of prenatal care and birth experiences, as well as plans for infant feeding,
care, and work and household responsibilities in the first year of the infant’s life. A brief
exploration of pumping breastmilk (vắt sữa) was included in the interview guide’s
structured questions (Figure 5.1). Emerging themes from early interviews prompted
changes to the field guides to better capture respondents’ perspectives.

All interviews were conducted in Vietnamese and recorded with digital
recording devices, and field notes were kept as well. A complete transcript was made in
Vietnamese from the recorded interview. For issues of time and cost, senior researchers
reviewed the transcripts and removed lengthy sections that did not directly pertain to
the research prior to translation into English.

**Data Analysis**

Coding of transcripts was facilitated by Nvivo 10 (QSR International Pty. Ltd.,
Melbourne, Victoria, Australia) by a team of six standardized coders over four months.
Coders used a detailed *a priori* thematic code list, but frequent meetings early in the coding process allowed for emergent codes. The final codebook included 187 unique codes and definitions, among them four codes pertaining directly to pumping breastmilk (Appendix Table A2). Text associated with relevant codes was exported as a matrix and further analyzed using Excel for Mac 2011 (Microsoft Corporation, Redmond, WA).

A review of the original transcripts in Vietnamese revealed that “vặt” and “vặt sữa” were the original Vietnamese words spoken by the respondent almost every time any of the terms pump, extract, express, squeeze, milk, or press were used in the English translation. The English term the Vietnamese translators selected when they translated “vặt sữa” has been retained in this transcript, but may reflect the translator’s assessment of the respondents’ sentiments as only one the term vặt sữa was used in Vietnamese. Translators chose the word “extract” half of the time, as often as “pump” or “express” combined.

Descriptive norms (an individual’s perception of what is practiced) and injunctive norms (an individual’s perception of what others believe should be practiced and is appropriate conduct) were used to evaluate simultaneously held yet apparently conflicting beliefs regarding breastfeeding and formula feeding while employed. Descriptive and injunctive norms are related, but are conceptually and motivationally separate; injunctive norms mobilize individuals into action via social evaluation, while descriptive norms move them to act via social information about what is likely to be adaptive and effective conduct in a particular setting (i.e. if a lot of people are doing this, it is probably a wise thing to do”.)

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Results

Study Sample

Transcripts from the families of 47 mothers of infants ages one to 11 months were used (Table 5.1). Mothers’ mean age was 28 and just over 50% had only one child. About 66% had a middle school education or less. The average household income was $192/month. Twelve women (26%) identified as housewives; none reported specific future plans to work outside the home. The other 36 women (74%) described themselves farmers (40% of the sample), self-employed traders or shop-keepers (21%), and teachers or factory workers (13%). All mothers in the sample were breastfeeding at the time of the interview. One woman had exclusively breastfed to six months. Only one woman, a teacher, was pumping breastmilk (by hand expression) while working full time outside the house.

Types of Maternal Employment and Infant Feeding Decisions

For women employed outside the home, the nature of employment had an impact on infant feeding decisions (Table 5.2). Formally employed women included factory workers (n=4), an office worker (n=1), and a teacher (n=1). Among these six women, five (83%) planned to return to work within a year of birth. Informally employed women included farmers (n=19) or were self-employed shopkeepers or traders (n=10). Among these 29 women, five farmers and two self-employed women (24%) had or planned to return to work within one year.
Formula was an infant feeding solution for both types of employed women, but the relationship to breastfeeding was different. Formally employed women generally breastfed before and after work and at night, and left formula with a caretaker during work hours. One factory worker returned to work after six months and is representative of what most formally employed women planned to do. She combined infant feeding strategies: establishing breastfeeding during maternity leave, introducing non-breastmilk liquids and solids (formula and rice gruel) at three months to prepare the infant to be cared for by family members during the day, and breastfeeding before and after work and at night. She said that although her workplace was less than one mile away and she would like to come home to breastfeed, she was not allowed to go home during lunch.

Informally employed women, especially farmers, reported working conditions made any breastfeeding difficult. Unlike formally employed mothers, five informally employed mothers said returning to work would force them to quit breastfeeding before they wished IV:

*We are farmers and we have too much work to do. Sometimes a mother has to work far away from home for the whole day, or work extra hours. I think I will have to stop breastfeeding my child when he is around [12 months].*

*Mother, Family 1*

Farmers also discussed the effect of physical labor and breastfeeding:

*Once getting back to the farm work, I think my body won’t produce enough milk to breastfeed. It will be very tiring...the farm work will take*

---

IV 62% of mothers expressed a desire to continue breastfeeding for at least 24 months.
all my time. I wouldn’t have time to eat. In order to produce good milk, the mother should have a well-balanced diet, not miss any meal...I may start to wean my baby at this point.

*Mother, Family 23*

Respondents expressed frustration at knowing breastfeeding would be best while lacking the practical solutions to achieve these goals while working:

*Exclusive breastfeeding for the first six months is not always possible for working mothers...The mother can’t do it because she has to go to work...It’s very difficult if there’s no solution...Therefore, we have to find other solutions. We may have to supplement breastfeeding with other nutritional sources.*

*Grandmother, Family 44*

*To be honest, everyone wants the best thing for his or her own baby. It is not a so-called “folk” (dân gian) thing. It depends on our economic condition. The economic condition decides that, and everything...We are not professionals, we have no qualifications. We just work simple jobs...If we were rich, we would stay at home to take care of the baby for a longer time but if we are not, we leave the child at home to go to work.*

*Father, Family 47*

**Norms and the Impact of Maternal Employment on Infant Feeding Decisions**

The injunctive norm (what should be practiced, or an individual’s perception of how one should behave in a group) regarding maternal return to employment and breastfeeding was that a mother should delay returning to work in order to breastfeed. Family support to keep the mother-infant dyad together was very specific to the idea of breastfeeding, and mothers and grandmothers particularly emphasized the importance of breastmilk “directly from the breast”.

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Formally employed women were not able to do this, and returned to work within four months to a year after birth. Informally employed women reported more flexibility about when they returned to work and planned to stay home longer. One way women negotiated a delay in returning to work was that a relative (usually an aunt or live-in grandmother of the infant) could temporarily work in the mother’s place, giving the mother more flexibility during a traditional period of recovery and breastfeeding after birth. During their interviews, grandmothers often expressed a willingness to work in place of the daughters or daughters-in-law after birth, although it should be noted that one mother expressed reluctance to place herself in obligation to her mother-in-law by entering into such an arrangement.

*When the baby is still small, I would not let [the infant’s] mother go out for work. I can do everything for her like fieldwork or household work, cooking; that is no problem at all.*

*Grandmother, Family 19*

The descriptive norm (what is practiced as adaptive and effective conduct) was when mothers did return to work, they introduced formula. Formula was considered to be inferior to breastfeeding by all respondents, and concerns were raised regarding expense and safety. No infant was exclusively formula fed. However, 11 mothers, ten grandmothers and seven fathers in twenty unique families volunteered that formula was used if the mother had to return to work:

*Relying on manufactured milk is unavoidable since the mother has to go to work.*

*Grandmother, Family 36*
It is said that as breastmilk is very precious, and exclusive breastfeeding is the best. Only when mothers have to go to work should babies be fed with artificial milk.

Grandmother, Family 42

Awareness about Pumping Milk

Mothers were more aware of pumping milk than other family members: 43% of mothers, 30% of grandmothers, and 24% of fathers had heard about expressing breastmilk to feed a baby when the mother returned to work. Everyone who had previously heard of pumping (n=39) volunteered an opinion about whether they would consider pumping breastmilk. 62% said they were or might consider pumping (although strong concerns were often raised), while the other 38% said they would never consider pumping.

Nine respondents (from seven families) mentioned hearing about pumping from community health centers and four heard about it from co-workers (not through any formal programs or support provided by the workplace). One mother attributed her awareness of pumping to an encounter with a healthcare worker during a social encounter:

[The health worker and I] usually see each other at the market when we are shopping for groceries. We talk to each other when we meet. She told me that I could extract breast milk and save it for my child if I had to go out for long hours.

Mother, Family 47
Among those who had never heard of pumping (n=77), two-thirds volunteered an opinion about whether they would pump or not. Only 8% said they might consider it while 92% said they would not (Figure 5.2).

**Attitudes toward Pumping Milk**

There were two main reasons for the negative attitude toward pumping milk. Many families associated the concept of pumping with the practice of expressing for the purpose of discarding breastmilk. Most respondents had concerns about hygiene, especially the difficulty of safe breastmilk storage.

Sixteen families described the process of restoring the mother’s hot/cold balance after she had been in contact with the outside environment, usually by warming her body by a fire or cooling it near a fan.

*When I get home, I have to get warm first to make my breast milk "done" before nursing him/her. I used the burning coal to warm my breasts, like this. I think that if I do not do that, my breast milk would not be "done" and it would not be good for the baby, not good for his digestion.*

*Mother, Family 3*

Breastmilk would then be expressed and discarded before breastfeeding could commence. Respondents used the same word, văt sữa for expressing (for the purpose of discarding) as interviewers and pumping mothers used for pumping (for the purpose of feeding).
R: I always [express milk] when I go out for long hours, either in the morning or in the evening. I take a bath and press (vắt sữa) my breastmilk and leave it at home.
I: And you give the milk to your child?
R: Oh no! I press (vắt) into a bath towel. My baby is not given that breastmilk.

Mother, Family 35

Among families that expressed milk to discard, the suggestion to feed it to infants instead was not well accepted:

Extracted milk will be poured down to the roof for the dogs. (Vắt sữa để đổ lên mái nhà, cho chó ăn y.)

Grandmother, Family 27

We should discard the extracted milk (vắt sữa). My grandson threw up several times when his mother did not squeeze (vắt) the hot and cold milk away before nursing him. So I assume if he took in the extracted milk it would be very likely that he would have tummy ache.

Grandmother, Family 37

Although it was not asked explicitly, just over half of all respondents (n=62) volunteered their concerns regarding pumped milk once the concept was introduced. Reactions were classified into two categories: 37 respondents perceived that as soon as milk left the mother’s body the quality of the milk decreased, unless it was immediately and directly consumed by the infant while 31 respondents voiced concern that improper storage would negatively affect quality and safety.

Within the group of respondents citing improper storage as a concern, there was a subtle but important distinction. A minority said that breastmilk was so vulnerable
that once it left the mother’s body, it became immediately unhygienic and no safe storage of breastmilk was possible. Nutritious substances (hoi tốt) would disappear and breastmilk would be poisoned (ngô) or completely decomposed (hoại) after the contact with the outside environment required by pumping milk. Others identified a 2-3 hour window in which breastmilk could be safely left out at room temperature, but identified a lack of proper storage facilities (such as a refrigerator in the household) for any longer storage. The perception was that safe storage of breastmilk was possible in this case, but not available.

When respondents rejected the idea of pumping many did so by reinforcing breastfeeding directly as the injunctive norm and formula feeding as the descriptive norm.

*Breastfeeding directly is always better than extracting breast milk. If the expressed milk goes bad, it will cause harm to the baby’s digestive system. I would resort to formula if I had to work far from home.*

*Mother, Family 28*

*I’m not sure how a mother can extract breast milk, so I just chose the bottle-feeding option. It’s more popular.*

*Grandmother, Family 1*

*In the first 6 months, if the mother is busy at work, she needs to give her child formula...I think formula, if mixed and used instantly, is better than expressed breastmilk, which can easily get infected and cause diarrhea.*

*Mother, Family 35*

A minority of respondents mentioned expressing milk as a necessary practice of the past, obviated by the current availability of formula:
[Regarding pumping] No way, never do that. We have formulas now; there is no need to do such a thing.

*Grandmother, Family 19*

**Practice of Pumping Milk**

The practice of expressing milk to feed to infants was described by nine families in four distinct contexts: four women described using mechanical pumps at birth while in the hospital, three hand-expressed to go out briefly for non-work related purposes, one father described mixing hand-expressed milk with medicine to give to his infant, and one mother pumped for work. Seven of the mothers from the nine families who described some experience with pumping still had unfavorable attitudes toward pumping for work, usually identifying breastmilk storage as the concern:

> No, I have not heard about pumping and I think working moms have to give formula to the baby when they are at work...I don't think we can keep pumped milk for long hours. If you kept it long then it would not be good for the baby.

*Mother, Family 44*

*Extracted breast milk likely gets fishy and cold (nó tanh rỏi với nó lạnh) very fast, so that milk is not good for the baby to be fed with.*

*Mother, Family 10*

One teacher was the only mother who pumped for work. She returned to work at four months and described her maternity leave as a period when “I just needed to focus my time on nursing the baby”. After returning to work, she became aware and received ongoing support from her co-workers who had also pumped milk:
I learned from my co-workers’ experience. They advised me that when I have to be away from the baby for long hours, I should extract my breast milk and leave it at home for feeding the baby.

Mother, Family 22

She utilized two strategies to continue breastfeeding, 1) returning home during the day to breastfeed when possible, and 2) pumping before work and leaving the milk when returning home was not possible:

If I have two classes and then a break before another class starts, I go home to nurse my baby and come back. If I have more than two classes at a row, I extract my milk and leave it at home and have my family members feed him/her with the extracted milk.

Mother, Family 22

She expressed milk by hand and a family member used a spoon to feed the baby because they did not consider plastic bottles safe. The household did not have a refrigerator, so the mother left the milk “in a clean place” and the milk heated to be “as warm as the baby’s temperature—about 37 °C [98.6°F]” and fed within a few hours of being expressed.

Discussion

In this rural Vietnamese sample breastmilk was considered the optimal way to nourish infants, and importance was placed on breastfeeding “directly at the breast”. Formally employed women returned to work earlier that informally employed women,
but were able to combine infant feeding strategies and continue some breastfeeding while working. Informally employed women were generally able to breastfeed “directly at the breast” for a longer period than formally employed women, but once they returned to work they reported difficulty continuing to breastfeed at all. Families expressed frustration with the lack of solutions that reconciled breastfeeding and employment, yet pumping breastmilk was not widely accepted or practiced. Expressing breastmilk to discard it and the safety of breastmilk storage were strong concerns.

Previous literature has shown that rural working women (like their urban counterparts) are separated from their infants shortly after birth and use breastmilk substitutes in Vietnam\textsuperscript{37,38,43,44}. In one study, 95% of 463 rural Vietnamese women (63% of whom identified as farmers) had returned to their usual work by 16 weeks. This is higher than what was found in the present study but the consequences were similar: 27.6% gave formula and only two women (0.4%) practiced EBF by 24 weeks\textsuperscript{44}. Almroth et al. described that the ability to return home during the workday was rare and bringing children to work was impossible in rural Vietnam\textsuperscript{45}, and Lunderg et al. reported that infant formula was perceived by mothers as the most acceptable option when mothers were separated from infants due to work\textsuperscript{46}, both of which concur with our findings.

Although Vietnam has progressive maternal leave laws, it is known that meeting EBF goals requires more than just legislation\textsuperscript{47,48}. In Ho Chi Minh City, Vietnam, 31% of 192 urban mothers cited the “impossibility of breast-feeding at scheduled times because of work” as the reason they introduced breastmilk substitutes by 3 months\textsuperscript{49}.
even though protected time during the workday may have been available to mothers employed full-time under the law. Similarly, our work suggests formally employed women were not aware legislation regarding maternal employment, and increasing awareness of employees’ rights should be a priority.

Pumping as a strategy among employed Vietnamese women has not been explored extensively in the literature, although awareness was previously found to be low in a 2002 study. Only one mother pumped for work in this sample, and she reported becoming aware and receiving support from co-workers. A study in the United States suggested a positive association between breastfeeding duration and breast pump education from friends or relatives (OR=1.70; 95% CI: 1.13, 2.55) that was not found from contact with healthcare workers, but more research is needed on pumping education in general in LMIC settings in particular.

Another important factor for pumping in Vietnam was the almost universal practice of expressing milk unsuitable for an infant and discarding it before commencing breastfeeding, which has been described previously in Vietnam and among Vietnamese immigrants in Australia. The term vắt sữa was used for both the traditional practice of expressing unsuitable milk to discard and pumping milk to feed a child, and may have contributed to a lack of acceptance.

Interviews with mothers and other family members allowed for greater understanding of family dynamics supporting employment and infant feeding at the household level. The large number of families interviewed allowed for saturation on a number of topics and greater confidence that results reflected the perception of
respondents in the sample. The in-depth nature of the interview and building of rapport between interviewer and respondent allowed for initial responses (often closely aligned with an ideal infant feeding practice) to develop into richer, more complex accounts regarding difficult infant feeding choices for employed mothers and their families.

This study does not attempt to claim generalizability. Although interviews were conducted in both the north and south of Vietnam, both were rural areas populated by Vietnam’s ethnic majority. For ethnic minorities and urban settings, differences in types of occupations, awareness and support for pumping, income level and access to formula, and availability of family and childcare support would be among many factors shaping the experience of returning to work and infant feeding. The range of infants’ ages under one year resulted in a greater understanding of challenges for different families at different times. However, the study results combine actual respondents’ experiences from events that passed as well as other respondents’ plans (or ignorance) of what was yet to happen in the future.

Formula was used for many reasons (and at many times) outside the context of maternal work, and while a successful pumping initiative may increase the amount of breastmilk infants receive, it may not have a large impact on formula use overall on its own. Injunctive norms may be driving formula use in additional contexts, even while respondents express the belief that breastfeeding is the best infant feeding choice for infants.

Our study aimed to describe the perceptions and practice of pumping breastmilk in rural Vietnam from the perspective of mothers and other infant caregivers. We offer
a conceptual diagram (Figure 5.3) that places our findings at the individual and household level within the context of the relevant workplace, health facility, and public policy factors in which they operate\textsuperscript{52}. In addition, we aim to provide a preliminary model that can be explored and refined through further investigations and utilized for interventions.

One main area for further study was suggested by respondents themselves. Families in this sample voiced clear concerns about the gap between breastfeeding recommendations and the infant feeding solutions available to them, and this was especially true for informally employed mothers. Lack of protection under existing laws and the long, physically challenging days that farmers reported are a challenge for any employed person, let alone a breastfeeding mother. An approach such as community-based participatory research (CBPR) where community members explore, contribute expertise, and share decision-making and ownership in the research process may be the best way to shape a future intervention that may include pumping (as well as other strategies) to provide the best nutrition to infants of informally employed mothers.

A first step to raise awareness of pumping at a community level may be to identify a term unique to pumping to feed breastmilk to infants that has a positive connotation, differentiate it from expressing to discard breastmilk, and thereby increase its social acceptability. Finally, any initiative would have to educate and demonstrate the practice of pumping, and the appropriate strategy (including the use of hand expression versus manual pumps versus machines) must be thoughtfully considered with regard to limited resources and unnecessary waste. Concerns regarding breastmilk storage for
long lengths of time in a hot, humid climate such as Vietnam often experiences are valid and may require innovation for communities that lack refrigeration capabilities. The ability of our framework to highlight the challenges of a specific technology is useful in beginning to address the factors related use of pumps specifically.

This study adds to a small but important body of literature regarding employed women in LMIC, and while it outlines circumstances unique to the study setting, it also demonstrates that the need for breastfeeding solutions among employed mothers is universal. Increasing awareness and acceptability of pumping breastmilk is timely in a society with a high rate of working mothers who are increasingly turning toward formula as an infant feeding solution. Promotion of pumping that takes cultural perspectives and resource constraints into account is likely to successfully increase rates of EBF in Vietnam.
Tables

Table 5.1. Demographic information for mothers and households

<table>
<thead>
<tr>
<th>Education level</th>
<th>n (%):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completed elementary school</td>
<td>15 (32%)</td>
</tr>
<tr>
<td>Completed middle school</td>
<td>17 (36%)</td>
</tr>
<tr>
<td>Completed high school</td>
<td>8 (17%)</td>
</tr>
<tr>
<td>Above high school</td>
<td>7 (15%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Employment</th>
<th>n (%):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housewife</td>
<td>12 (26%)</td>
</tr>
<tr>
<td>Farmer</td>
<td>19 (40%)</td>
</tr>
<tr>
<td>Employed Outside Home (Office, Factory)</td>
<td>6 (13%)</td>
</tr>
<tr>
<td>Self-Employed (Trader/Freelance Worker)</td>
<td>10 (21%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Household, n=48</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Monthly household income, mean (range) (USD)</td>
<td>$192 ($96, $384)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total number of children</th>
<th>n (%):</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>28 (58%)</td>
</tr>
<tr>
<td>2</td>
<td>16 (35%)</td>
</tr>
<tr>
<td>3</td>
<td>3 (6%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Age of youngest child</th>
<th>n (%):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 6 months</td>
<td>24 (50%)</td>
</tr>
<tr>
<td>6 months and over</td>
<td>24 (50%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Infant feeding &lt;6mo</th>
<th>n (%):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breastfeeding (any)</td>
<td>48 (100%)</td>
</tr>
<tr>
<td>Breastfeeding (exclusive)</td>
<td>1 (2%)</td>
</tr>
<tr>
<td>Formula feeding</td>
<td>32 (67%)</td>
</tr>
</tbody>
</table>

Table 5.2. Experience pumping and impact of work on infant feeding

If/when you return to work, how will you feed your infant? (21 unique respondents)

<table>
<thead>
<tr>
<th>Type of Paid Employment</th>
<th># Mothers</th>
<th>Feed formula</th>
<th>Stop BF</th>
<th>May pump</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>12</td>
<td>5 (42%)</td>
<td>1 (8%)</td>
<td>0</td>
</tr>
<tr>
<td>Informal: Farmer</td>
<td>19</td>
<td>3 (16%)</td>
<td>4 (21%)</td>
<td>2* (11%)</td>
</tr>
<tr>
<td>Informal: Self-Employed</td>
<td>10</td>
<td>2 (20%)</td>
<td>1 (10%)</td>
<td>0</td>
</tr>
<tr>
<td>Formal</td>
<td>6</td>
<td>1 (17%)</td>
<td>2 (33%)</td>
<td>3** (50%)</td>
</tr>
<tr>
<td>Total</td>
<td>47</td>
<td>11 (23%)</td>
<td>8 (17%)</td>
<td>5 (11%)</td>
</tr>
</tbody>
</table>

*Both said they would pump only “if they had no other choice”
**Includes mother currently pumping
Figures

Figure 5.1. Semi-structured interview guide excerpt regarding pumping breastmilk

<table>
<thead>
<tr>
<th>Vietnamese</th>
<th>English</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chỉ đã từng nghe về việc vắt sữa mẹ để ở nhà cho trẻ khi mẹ đi làm chưa?</td>
<td>Have you heard about extracting breastmilk to feed baby when his/her mother goes out for work?</td>
</tr>
<tr>
<td>• [nếu có] chỉ nghe từ đâu, từ ai?</td>
<td>• (If yes) where/from whom did you receive the information?</td>
</tr>
<tr>
<td>• Chỉ nghe được những điều gì?</td>
<td>• What is it about?</td>
</tr>
<tr>
<td>• Cách bảo quản sữa mẹ vắt ra thế nào?</td>
<td>• How does one keep extracted breast milk in a good condition?</td>
</tr>
<tr>
<td>• Cách cho trẻ ăn sữa mẹ vắt ra thế nào?</td>
<td>• How does one feed the baby with that milk?</td>
</tr>
</tbody>
</table>

Figure 5.2. Spontaneous reactions to pumping breastmilk among all respondents
Figure 5.3. Conceptual diagram for pumping breastmilk in rural Vietnam
References


25. Haider R, Kabir I, Hamadani JD, Habte D. Reasons for failure of breast-feeding


6 Breastfeeding Difficulties are Associated with Formula Use between 3-6mo in Vietnam (Paper 3)

Abstract

Background: Insufficient milk is the most commonly identified problem among women reporting breastfeeding difficulties at birth in Vietnam, and is associated with subsequent formula use. Breastfeeding difficulties have also been reported in the months after lactation is established in Vietnam, but the types and consequences are not as well understood, and lack of skilled support may lead to infant feeding practices that undermine a woman’s ability to achieve the WHO recommendation to exclusively breastfeed (EBF) for six months.

Objectives: To assess the association between breastfeeding difficulties experienced at three months postpartum and use of formula among infants in Vietnam.

Methods: Data for this analysis were derived from a 2010 cross-sectional baseline impact evaluation survey for a large infant and young child feeding initiative called Alive and Thrive, conducted among 4,029 mother-infant pairs in Vietnam. Descriptive analysis explored types of breastfeeding difficulties and support-seeking behaviors in this sample. A subset of n=604 women who were breastfeeding infants between 3-6 months of age were used to investigate the association between experiencing breastfeeding difficulties at three months postpartum and formula feeding between three and six months of age. Multivariable logistic regression was used to determine the magnitude and significance
of the association of breastfeeding difficulties and subsequent formula use after adjusting for confounders in four domains: maternal and infant biological characteristics; social and wealth conditions; birth setting, practices, and knowledge; and post-birth infant feeding practices.

Results: 12.7% of all 4,029 mothers reported breastfeeding difficulties. Among mothers reporting difficulties, the most common were perception of insufficient milk (PIM, 38.2%), breast pain (15.5%), and poor latch (15.5%). Only half of mothers (49.7%) sought support for PIM compared to two-thirds for pain or latch (75.9% and 67.1%, respectively). For breastfeeding difficulties at three months postpartum, 52.7% of mothers reported seeking breastfeeding support from their mother/mother-in-law, 32.2% from another family member, and 31.3% from a doctor. Each source of support recommended formula use more than any other solution for breastfeeding difficulties.

Prevalence of formula feeding was 30.1% between 3 to 6 months of age. In multivariable analysis, experiencing breastfeeding difficulties at 3 months postpartum was associated with higher odds of subsequent formula feeding (OR=2.32; 95% CI: 1.38, 3.91), after adjusting for maternal work outside the home (OR=2.03; 95% CI: 1.30, 3.18), formula feeding at birth (OR=1.86; 95% CI: 1.27, 2.73), child age (mo) (OR=1.34; 95% CI: 1.06, 1.68), and birth weight (kg) (OR=0.60; 95% CI: 0.40, 0.91). Maternal age, education, social and wealth conditions, having previously heard about EBF, household food security, maternal body mass index, breastfeeding difficulties at birth, or recent child illness were not associated with formula use between 3 to 6 months of age.
Conclusion: In Vietnam, the experience of breastfeeding difficulties is associated with formula use. Reduced formula use at birth and support for working mothers are also necessary to decrease formula use between three to six months of age.
Introduction

Exclusive breastfeeding (EBF) in the first 6 months of life is associated with lower mortality and morbidity\(^1\),\(^2\), and improving EBF rates is a central component of a globally recommended set of core interventions aimed at improving infant and young child health\(^3\). In Vietnam, breastfeeding is culturally normative: 97.9% of children are ever breastfed, with a median duration of 18 months\(^4\). Adherence to the recommended WHO guidelines of EBF for six months\(^5\), however, is among the lowest in Asia\(^6\). EBF rates (determined using 24-hour recall) range from 12% to 20% in national surveys from 2000 to 2011\(^6\)-\(^8\). This prevalence indicator is known to overestimate EBF\(^9\)-\(^13\) and in-depth interviews from smaller samples in a variety of Vietnamese settings report that EBF is not actually practiced for a full six months\(^14\)-\(^16\).

A number of non-breastmilk liquids or solids are introduced in the first six months, including infant formula. The influence and practice of formula use has been described in urban\(^15\), rural\(^17\), and national settings\(^7\),\(^18\) in Vietnam, and has been identified as the second most common supplement given in the first six months of life, following water\(^19\). In a study of 260 mothers recruited from three child health centers in Ho Chi Minh City in 2000, 42.6% used formula at birth; by three months of age 35.4% were both breastfeeding and formula feeding, and 11.5% were exclusively formula feeding\(^20\).

An association between breastfeeding difficulties and formula use at birth has been established previously in Vietnam. Formula was the most common prelacteal given at birth in a 2011 cross-sectional survey across 11 Vietnamese provinces; 53.5% of 6,068
infants were fed formula at birth\textsuperscript{21}. After adjustment for relevant factors, infants were found to be 1.48 times (95% CI: 1.21, 1.82) more likely to be fed formula as a prelacteal if the mother experienced breastfeeding problems at birth\textsuperscript{21}. Of the 260 mothers in the study in Ho Chi Minh City, 52.2% of mothers who used formula cited insufficient milk supply at birth as the reason\textsuperscript{20}.

Vietnamese mothers report breastfeeding difficulties after the well-documented period of breastfeeding initiation at birth\textsuperscript{15,20}, but an association with formula use has not yet been established for this later breastfeeding period. Insufficient breastmilk (experienced in later months, after breastfeeding had been established) was reported by 61.8% of the mothers in Ho Chi Minh City and was identified as the main factor for formula feeding, however statistical associations were not investigated\textsuperscript{20}.

The present study was conducted to examine the association between breastfeeding difficulties reported around three months postpartum and formula feeding from three to six months of age rural Vietnam. The purpose of this study was to characterize patterns of formula use during the first six months of life and explore types and consequences of the breastfeeding difficulties women experienced, and support provided to mothers in addition to examining the association between later breastfeeding difficulties and formula feeding. We hypothesized that breastfeeding difficulties at three months postpartum increase formula use between three and six months of age.
Participants and Methods

Participants

Data for this secondary analysis were derived from a baseline household survey conducted from June through August 2010 under the “Alive & Thrive (A&T)” initiative, which aimed to reduce undernutrition and death caused by suboptimal infant and young child feeding practices in Vietnam, Bangladesh, and Ethiopia\(^{22,23}\). In Vietnam, A&T was implemented intensively in 15 provinces with a franchise model to deliver high-quality infant and young child feeding counseling services in health facilities.

An impact evaluation was conducted in four provinces selected using the following criteria: 1) High level of stunting and stagnant pattern of stunting over time; 2) provinces without major economic barriers to adopting IYCF recommendations; 3) geographically representative of the 15 provinces in which A&T operates. The selected provinces of Thanh Hóa, Thái Nguyên, Vĩnh Long, and Quảng Ngãi spanned the northern, central, and southern regions of Vietnam.

Households with children between 0 and 59.9 mo of age were selected by using a multistage cluster sampling method. A total of 40 CHCs were randomly selected from the above four provinces using the population proportionate to size method. Three sampling frames were constructed from the household listing: 0–5.9 mo, 6–23.9 mo, and 24–59.9 mo. Children in each age category were randomly selected to reach the required number of children for that age. Households selected for one category of age were not included in the other categories, even if they had children of other age categories. In Vietnam, the survey was conducted between April and June, a period
after harvest and not the peak season for food insecurity. Detailed descriptions of sampling are available elsewhere\textsuperscript{24,25}.

In total, 4,029 mothers of children <5 years old were included in the cross-sectional baseline survey, 35.0% from Thanh Hóa (n=1,408), 19.8% from Thái Nguyên (n=798), 20.4% from Vĩnh Long (n=821), and 24.9% Quảng Ngãi (n=1,002).

Data collection

The survey was conducted by an independent research firm, the Institute of Social and Medical Studies (ISMS; Hanoi, Vietnam). Data were collected via face-to-face interviews administered to mothers through the use of a structured questionnaire following the UNICEF conceptual framework of causes of child undernutrition\textsuperscript{26}. The questionnaire included modules on immediate determinants of child undernutrition, such as infant and young child feeding practices and childhood illnesses. It also contained several maternal and household questionnaire modules on underlying determinants of child undernutrition at maternal and household levels. The interviewers who collected data underwent rigorous classroom and field-based training on questionnaire administration. An experienced team of interviewers underwent a full training and standardization process for anthropometric measurements to ensure the precision and reliability of anthropometric measurements.

This study received ethical approval from institutional review boards in Vietnam and the institutional review board at the International Food Policy Research Institute.

Measures

The main dependent variable was formula use between 3-6 months of age as
assessed by 24-hour recall. Mothers were asked if they had given infant formula during the previous day or the night, and a yes or no response was recorded.

The exposure variable of interest was self-reported breastfeeding difficulty at three to four months postpartum. Mothers were asked, “Did you face any problems with breastfeeding later on, when the child was 3-4 months old?” An affirmative response prompted a series of follow-up questions. Twenty-six additional independent variables were examined for potential association with formula feeding in each of the following domains: maternal and infant biological characteristics; social and wealth conditions; birth setting, practices, and knowledge; and post-birth infant feeding practices.

Maternal and infant biological characteristics included maternal age, child age, BMI as assessed at the time of the interview, and maternal recall of birthweight (kg), all analyzed as continuous variables. Child gender and mother’s report of any child illnesses in the past two weeks (including fever, cough or cold, shortness of breath, or diarrhea) were also included. A maternal stress score was created using the World Health Organization 20-item Self-Reporting Questionnaire (SRQ-20), designed to measure symptoms of common mental disorders across different cultures in low-income settings²⁷.

Social and wealth conditions included data on whether the mother was married, the highest grade she had completed in school, her occupation, and if she worked outside the home. The father’s occupation was included as well. Measures of wealth included possessing land, a house, small animals, or a motorbike. Finally, food security
was assessed using the Household Food Insecurity Access Scale (HFIAS) for Measurement of Food Access developed by the U.S. Food and Nutritional Technical Assistance Project (FANTA)\textsuperscript{28}.

The domain of birth setting, practices, and knowledge included whether the mother had received any counseling regarding breastfeeding while pregnant, if the mother had a cesarean section at birth, time to breastfeeding initiation (dichotomized into three categories: within the first hour, after the first hour but before 24 hours, and after 24 hours), if the mother received help breastfeeding at birth, experienced difficulty at birth, and the type of attendant present at birth.

About one-third of mothers reported use of formula at birth (35.9%). Among these mothers using formula at birth, 17.5% used formula at initiation but stopped immediately afterward, while 82.5% used formula at initiation and continued for at least three days afterward. These behaviors were dichotomized for the “formula use at birth” variable as: no formula, formula feeding only at initiation (then stopped), and formula feeding at initiation (then continued). Although the percentages are about the same, the approximately one-third of mothers reporting formula use at birth and one-third reporting formula use between 3 to 6 months were distinct. For example, 36.4% of mothers who reported any formula use at birth reported formula use between 3 to 6 months, but 26.8% of mothers who reported no formula at birth also reported formula use between 3 to 6 months, showing the dynamic use of formula under six months of age in this sample.

Two post-birth infant feeding practices were included: if the child had been
introduced to bột (thin rice gruel, a traditional first food) or semi-solid foods (cháo thicker rice porridge, soft rice, mashed potato, ripe banana, other mashed family foods).

**Statistical analysis**

Descriptive, bivariable, and multivariable analyses were performed with Stata software, version 13 (Stata Corp, College Station, TX). The full sample was used for descriptive analysis, including types of breastfeeding difficulties and help-seeking behaviors reported by mothers. We then investigated the association between breastfeeding difficulties reported around three months postpartum and formula feeding during three to six months of age, a topic that emerged during in-depth household interviews with mothers in a 2012 A&T process evaluation (in preparation).

The time frame of 3-6 months of age for formula use was chosen to follow the exposure defined as experiencing breastfeeding problems, which was reported by mothers at three months postpartum, and because it ended at the recommended period of exclusive breastfeeding at six months (Figure 6.1). For this analysis, we combined data from the control and intervention areas because there was no intervention at the time of this baseline survey.

The original sample included 4,029 mother-infant dyads. Because this paper focuses on the predictors of formula use between three and six months, regression analyses were restricted to mothers with infants between three and six months old at the time of the interview (n= 616 out of 4029). Additionally, inclusion criteria included mothers who were still breastfeeding at three months of age (n= 609) to be eligible to experience breastfeeding difficulties, and mothers with no missing data regarding
breastfeeding difficulties (n=604). Out of the total sample of n=4,029 mother-infant dyads, 604 met all inclusion criteria and were included in the analysis.

To explore the data, we tabulated frequency distributions and used Chi-squared tests for categorical variables, as well as t-tests for continuous variables, to assess differences between the formula fed and non-formula fed infant categories. Variables associated with the outcome at a significance level of p<0.05 were selected for the base model using multivariable logistic regression, along with variables previously identified as potential confounders in the Vietnamese context such as maternal age\textsuperscript{14,29}, maternal education\textsuperscript{14,20,21,29}, and social and wealth conditions\textsuperscript{21,29}.

Multivariable logistic regression was used to obtain odds ratios (OR) and 95% confidence intervals (CI) to estimate the relationships of independent variables with formula or non-formula fed infants. In the regression model, the cluster function in Stata was used to derive robust standard errors to account for clustering at the commune level. Three models were created; the first and second included combinations of maternal age, maternal education and indicators of wealth. Maternal age and wealth were not significant in bivariable or multivariable analysis, but were retained to control for possible confounding effects based on previous literature. Eliminating all three factors created a more parsimonious model with improved Akaike Information Criteria values (AIC), and as the remaining estimates were not significantly changed, these potential confounders were eliminated from the final model. Model fit was assessed by comparing the log likelihoods of the fitted model to the intercept-only model.
Results

Characteristics of participants

In this sample (n=604), the mean (SD) age of mothers was 27.3 years (5.2) and that of their infant was 4.4 months (0.8) (Table 6.1). 51.2% identified as farmers, and 61.5% had completed middle school or above. Breastfeeding problems at 3-4 months were experienced by 13.6% (n=82) of the mothers, and prevalence of formula feeding was 30.1% (n=182) between 3 to 6 months of age.

Types and consequences of breastfeeding difficulties and support at 3-4 months

Using the full sample of 4,029 mother-infant dyads, 511 women reported experiencing breastfeeding difficulties at three months postpartum (12.7%). Perception of insufficient milk (PIM) was the most common difficulty, reported by 38.2% of women who reported problems. However, only 49.7% of women experiencing PIM sought help. Conversely, among women reporting the least common problem, cracked nipples (3.9%), 80.0% reported seeking help (Figure 6.2).

Over half of all women (52.7%) who sought support for breastfeeding problems at three months postpartum reported seeking help from their mother or mother-in-law. About one-third sought help from other family members (32.3%) and another third sought help from a doctor (31.3%). Out of all breastfeeding solutions offered to mothers, offering formula to the infant was the most common. When mothers sought support for breastfeeding difficulties\(^\dagger\), 13.9% of mothers/mothers-in-law, 25.7% of other family members, 16.0% of doctors, 15.4% of nurses, and 18.2% of neighbor/friends

\(^\dagger\) Advice was not reported by type of support sought. Analysis is restricted to n=198 mothers who reported just one source of support (62% of those seeking support for breastfeeding difficulties) to isolate type of advice given by the type of support sought.
recommended mothers offer infants formula. Formula use was the most common advice given by any type of support sought.

**Association between later breastfeeding difficulties and formula feeding**

Among the 604 mother-infant dyads, formula was used by 182 mothers between three and six months (30.1%). In addition to self-reported breastfeeding difficulties at three months postpartum, twenty-six additional variables were examined for potential association with formula feeding in each of the following domains: maternal and infant biological characteristics; social and wealth conditions; birth setting, practices, and knowledge; and post-birth infant feeding practices. Six variables reached statistical significance using Chi-squared and t-tests (p<0.05) (Table 6.2). Further analysis showed higher odds of formula use with breastfeeding difficulties at three months postpartum, child age, maternal education, working outside home at least one day per week, and the pattern of formula at birth, and lower odds of formula use with higher birthweight before adjustment for possible confounding factors (Table 6.3). Variables examined but not significantly associated with formula feeding included maternal age and BMI, child gender and recent illness, measures of social and wealth conditions, and household food security, prenatal counseling and factors related to birth setting, and early introduction to complementary foods.

In a multivariable analysis (Table 6.3), factors associated with formula in the final model included breastfeeding difficulties at three months postpartum (adjusted OR=2.32; 95% CI: 1.38, 3.91), child age (mo) (adjusted OR=1.34; 95% CI: 1.06, 1.68), birthweight (kg) (adjusted OR=0.60; 95% CI: 0.40, 0.91), mother’s work outside the
home at least one day per week (adjusted OR=2.03; 95% CI: 1.30, 3.18). Formula use at birth was associated with formula feeding between 3 to 6 months only if the mother continued to feed formula after birth (adjusted OR=1.86; 95% CI=1.27, 2.73) and not if she stopped after initiation.

**Discussion**

Women experiencing breastfeeding difficulties at three months postpartum were more than twice as likely to use formula between three and six months than women who did not experience breastfeeding difficulties. Among the 12.7% of all mothers reported breastfeeding difficulties, the most common was perception of insufficient milk, followed by breast pain and poor latch. Only half of mothers sought support for PIM compared to three-quarters for pain and two-thirds for latch. Regardless of type of difficulty, formula was the most common recommendation to mothers when they sought help from mothers/mothers-in-law, other family members, or healthcare workers.

Multiple studies across countries, socioeconomic levels, and generations indicate that a primary reason for supplementing breastfeeding with formula or discontinuing breastfeeding is self-reported insufficient milk supply\textsuperscript{30-36}. Our study also found that PIM was reported at twice the rate of any other breastfeeding difficulty. We also found that mothers were less likely to seek help for PIM compared to other breastfeeding problems.
Maternal work outside the home was also associated with higher odds of formula feeding, and has been identified as a barrier to exclusive breastfeeding in a Vietnamese context\textsuperscript{14,16,19}. Previous studies have discussed the importance of focusing on the aspects of maternal work that may affect breastfeeding (flexibility during the work day, time away, full-time or part-time status, etc.) and not just the existence of work itself, to obtain meaningful results\textsuperscript{37}. Our analysis is consistent with this interpretation, as maternal occupations was not significant, while time spent working away from home was significantly associated with formula feeding.

The pattern of formula feeding at initiation may be important for later formula use. If mothers gave formula at birth and then stopped, there was no association with later formula feeding. If mothers fed formula at birth and continued for at least three days, however, the odds of formula feeding later were significantly higher. There is support in the literature for limited use of formula at birth and successful breastfeeding later\textsuperscript{38}, although this needs further investigation.

Higher birthweight was associated with lower odds of formula use. Higher birthweight has been positively associated with breastfeeding initiation\textsuperscript{39}, being exclusively or predominantly breast-fed at three months of age\textsuperscript{40}, and the introduction of non-breastmilk foods\textsuperscript{41}. It may be that smaller infants are more likely to be supplemented or weaned because mothers perceive their breast milk as inadequate\textsuperscript{42}.

There was a lack of association between any indicator of social and wealth status and formula use. In the Vietnamese context, one study among rural families reported that one package of formula was 10% of a rural family’s monthly income, and cost was
perceived as a barrier to use among respondents\textsuperscript{16}. However, while a family’s economic condition impacts formula use, it may not prevent it. Another study in Vietnam reported that women purchase formula and mix it with breastmilk to prolong use\textsuperscript{15} while results from our recent qualitative study in rural Vietnam indicate that families are willing to pool resources or work extra hours in order to purchase formula (publication in progress). It is possible that social and wealth conditions are associated with exclusive formula feeding use or with the amount of formula a family can purchase, but not with \textit{any} formula use as investigated in this study.

A lack of association with breastfeeding knowledge is not unexpected. Although some misconceptions are common, breastfeeding knowledge in Vietnam has been reported to be high\textsuperscript{7,21} and breastfeeding awareness was not translated exclusive breastfeeding practice\textsuperscript{7}.

Intrapartum experiences (aside from formula use) did not appear to be associated with later formula use. A negative association between cesarean delivery and breastfeeding initiation has been found\textsuperscript{43} in previous work, but our results add to a recent review that found most studies find that once breastfeeding is established, type of birth does not have a lasting effect on breastfeeding duration\textsuperscript{43-46}.

Our study examined the association between breastfeeding problems and later formula use using a representative sample from four Vietnamese provinces. The cross-sectional design cannot be used to conclude causal relations, but plausibility of causality was increased by selecting age ranges for which breastfeeding difficulties and covariate variables occurred before or at about the same time as the later formula feeding.
Mothers were asked to retrospectively report feeding practices in the first three days following delivery, and recall bias may be a factor. However, there is little reason to believe that mothers would recall such information differentially based on exposure and outcome status, reducing the likelihood that recall bias significantly impacted our results. Furthermore, no mother was more than six months past the birth of her infant, minimizing the period of recall. In this sample, mothers were asked about breastfeeding difficulties at three months within three months of experiencing them. Formula use was not the focus of this study, and determination of use after birth was based solely on a 24-hour recall. Like EBF, this indicator likely underestimates formula use, and some mothers who said they had not used formula in the past 24 hours may have been misclassified if they had used it on another day (or started to use it at some point after the interview but before six months). Based on qualitative data and the sharp increase in formula use seen at six months, this may be related to the use of formula alongside the introduction of complementary foods, an association that should be further investigated.

Mothers and their families could be better prepared for issues regarding insufficient milk, especially as it relates to their cycle of early formula use, lack of suckling at the breast, and decreased breastmilk production. Insufficient milk supply is a biological factor with strong psychological component\(^{44}\). Having a poor milk supply can result from infrequent feeding or poor breastfeeding techniques, but lack of confidence in breastfeeding and understanding the normal physiology of lactation can lead to a perception of insufficient milk when in fact there is enough to nurture the infant\(^{47}\). Low
maternal breastfeeding self-efficacy has been previously associated with maternal perceptions of insufficient milk supply\textsuperscript{45}, and may be a factor here.

It has also been suggested that self-reported PIM could be used to obscure real reasons for giving formula among mothers who recognize EBF as the ideal infant feeding method or perceive social pressure from peers or relatives who expect the mother to be breastfeeding\textsuperscript{48}. More should be known about modifiable risk factors that might lead to PIM in a Vietnamese context such as reduced suckling caused by the introduction of non-breastmilk foods, breastfeeding techniques, self-efficacy, and perception of sufficient maternal diet, as well as the complex relationship between social pressure, PIM, and infant feeding behavior.

Mothers cannot be expected to know how to treat every breastfeeding difficulty that may arise, especially those requiring hands-on evaluation and support such as breast pain or poor latch\textsuperscript{47}. These are clinical difficulties that require specialized care. Mothers should know how to find timely, qualified, and knowledgeable support from a healthcare worker in a comfortable setting. More needs to be known about healthcare worker training to provide optimal hands-on support for later breastfeeding difficulties, to allow time to focus on the mother-infant dyad and follow-up care, and be free of pressure and ties to infant formula companies that influence the advice and support given.

In Vietnam, later breastfeeding difficulties are associated with formula use. Targeted support for PIM, breast pain, and latch is necessary if EBF goals are to be
achieved. Reduced formula use at birth and support for working mothers are also necessary to decrease formula use between three and six months.
Table 6.1. Background characteristics of the study population

<table>
<thead>
<tr>
<th>Post-birth infant feeding practices</th>
<th>Total n</th>
<th>Percent or Mean, (SD)</th>
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<tr>
<td>Formula use</td>
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<tr>
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<table>
<thead>
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<tr>
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**Birth setting, practices, and knowledge**

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### Table 6.2. Risk factors associated with formula use in Vietnam

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<tr>
<td>FF only at initiation, stopped</td>
<td>601</td>
<td>7.6</td>
<td>3.3</td>
<td>0.000</td>
</tr>
<tr>
<td>FF at initiation, continued</td>
<td>601</td>
<td>25.3</td>
<td>40.1</td>
<td>0.000</td>
</tr>
</tbody>
</table>

* T-tests were performed for continuous variables (maternal age, BMI, child age, child birthweight); chi-squared tests were performed for all other dichotomous variables
Table 6.3. Univariable and multivariable models for risk factors associated with formula use

<table>
<thead>
<tr>
<th>Factors</th>
<th>Formula given to infant between 3-6 months of age</th>
<th>Model 1 (n=577)</th>
<th>Model 2 (n=577)</th>
<th>Model 3 (n=579)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unadj OR (95% CI)</td>
<td>Adj OR(^a) (95% CI)</td>
<td>Adj OR(^a) (95% CI)</td>
<td>Adj OR(^a) (95% CI)</td>
</tr>
<tr>
<td>Breastfeeding problems at 3-4 mo</td>
<td>2.27 (1.46,3.51)</td>
<td>2.23 (1.49,3.35)</td>
<td>2.22 (1.48,3.30)</td>
<td>2.32 (1.38,3.91)</td>
</tr>
<tr>
<td>Maternal age, yrs</td>
<td>1.00 (0.96,1.03)</td>
<td>0.99 (0.95,1.04)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child age at time of interview, mo</td>
<td>1.28 (1.03,1.59)</td>
<td>1.32 (1.05,1.67)</td>
<td>1.32 (1.04,1.66)</td>
<td>1.34 (1.06,1.68)</td>
</tr>
<tr>
<td>Birthweight, kg</td>
<td>0.65 (0.42,1.00)</td>
<td>0.61 (0.39,0.95)</td>
<td>0.61 (0.39,0.95)</td>
<td>0.60 (0.40,0.91)</td>
</tr>
<tr>
<td>Mother’s highest grade completed</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None/Less than elementary</td>
<td>0.54 (0.32,0.91)</td>
<td>0.68 (0.37,1.25)</td>
<td>0.66 (0.36,1.21)</td>
<td></td>
</tr>
<tr>
<td>Elementary</td>
<td>0.82 (0.45,1.47)</td>
<td>1.02 (0.50,2.07)</td>
<td>0.98 (0.50,1.93)</td>
<td></td>
</tr>
<tr>
<td>Middle school</td>
<td>0.68 (0.31,1.46)</td>
<td>0.88 (0.38,2.03)</td>
<td>0.87 (0.38,1.98)</td>
<td></td>
</tr>
<tr>
<td>High school</td>
<td>1.42 (0.75,2.67)</td>
<td>1.54 (0.71,3.32)</td>
<td>1.47 (0.70,3.06)</td>
<td></td>
</tr>
<tr>
<td>Beyond high school</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Possess land</td>
<td>1.12 (0.77,1.64)</td>
<td>0.98 (0.52,1.81)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Possess house</td>
<td>1.20 (0.81,1.79)</td>
<td>1.40 (0.75,2.61)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Possess small animals</td>
<td>0.89 (0.60,1.31)</td>
<td>0.89 (0.56,1.40)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Possess motorbike</td>
<td>1.09 (0.79,1.50)</td>
<td>0.96 (0.65,1.43)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother works outside home at least 1 day/week</td>
<td>1.90 (1.30,2.78)</td>
<td>1.78 (1.13,2.78)</td>
<td>1.74 (1.11,2.73)</td>
<td>2.03 (1.30,3.18)</td>
</tr>
<tr>
<td>Formula pattern at birth</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No formula</td>
<td>0.51 (0.18,1.47)</td>
<td>0.56 (0.19,1.65)</td>
<td>0.56 (0.20,1.55)</td>
<td>0.58 (0.21,1.60)</td>
</tr>
<tr>
<td>FF initiation, stop</td>
<td>1.88 (1.23,2.86)</td>
<td>1.79 (1.23,2.61)</td>
<td>1.81 (1.23,2.67)</td>
<td>1.86 (1.27,2.73)</td>
</tr>
</tbody>
</table>

OR, odds ratio; CI, confidence intervals; \(^a\) OR and 95% CI calculated using multivariable logistic regression analysis using robust standard error estimates to account for clustering at the commune level
Figures

Figure 6.1. Reported formula use in the previous day in a cross-sectional sample of rural Vietnamese infants 0-12 months of age (n=1476)

Figure 6.2. Types breastfeeding problems and support-seeking among all women
References


7 Conclusion

7.1 Introduction

Exclusive breastfeeding (EBF) in the first 6 months of life is associated with reduced mortality in low and middle-income countries (LMIC)\(^1\)\(^-\)\(^3\), and decreased morbidity\(^4\)\(^-\)\(^9\), particularly diarrhea and respiratory illness\(^10\)\(^-\)\(^15\), across countries at all economic levels. It is a central component of a globally recommended set of core interventions aimed at improving infant and young child health\(^4\),\(^16\).

Vietnam is a rapidly developing country, transitioning from a low-income to lower-middle-income country\(^17\) in just two decades. Previous work has shown 85% of mothers are knowledgeable about the benefits of EBF, yet a gap exists between this knowledge and the practice of feeding infants breastmilk alone for the first six months of life\(^18\). Formula use is increasing in Vietnam\(^19\)\(^-\)\(^21\), and has been previously identified as one of the main factors undermining EBF\(^18\),\(^22\)\(^-\)\(^24\), but understanding use from families’ perspectives has not yet been explored.

The overall goal of this study was to understand perceptions and describe practices related to offering formula to infants under one year of age in Vietnam in order to elucidate the constraints families face regarding optimal infant feeding, and to explore potential solutions at the household level that support breastfeeding.

In the first paper (Chapter 4), an instrumental case study\(^25\) approach was used to access a “phenomena of interest” i.e. formula use under twelve months in rural Vietnam, via a series of “cases” derived from interviews with mothers, fathers, and cohabitating grandparents living in the same household. In this rural Vietnamese
sample, 75% of the 24 households reported using formula before six months. Families valued and practiced breastfeeding, but relied on formula in the absence of other support.

Formula was usually offered by caregivers in response to infant feeding problems at distinct time periods. At birth, many family members perceived infant crying as a sign that colostrum or breastmilk was insufficient to satisfy infant hunger, mothers reported a lack of hands-on support for breastfeeding difficulties, and some fathers perceived formula feeding as a way to support the mother while she recovered after birth. Most fathers denied involvement in infant feeding decisions, declaring mothers and other female family members held that responsibility. However, fathers were the most vocal about the benefits of formula based on advertisements they had seen, and their ability to purchase formula appeared to be one way they felt they were supporting their families.

In the first few months of an infant’s life after birth, formula feeding was widely perceived as appropriate if the traditional remedy of improving a mother’s diet was unable to address the problem of insufficient milk. Later, from the period of four to six months, perception of insufficient milk remained a reason for which families provided formula, but often the perception was that mothers could not make enough breastmilk at this point to meet an infant’s needs. Formula was often introduced along with early complementary foods to enhance child development, especially intelligence and height.

One main issue for mothers was how to feed infants after they had to return to work;
formula feeding was perceived as the only solution while mothers and infants were physically separated for long hours.

In the second paper (Chapter 5), we sought to gain a better understanding of the infant feeding practices of women returning to work, as this circumstance was common and one of the main reasons families reported using formula in the case study analysis. We also explored pumping breastmilk as a possible solution to this constraint. An expanded dataset of all 120 interviews were used to code for themes related the nature of employment, infant feeding practices for families with working mothers, and pumping breastmilk.

Injunctive (an individual’s perception of what others believe should be practiced and is appropriate conduct) and descriptive (an individual’s perception of what is practiced) norms\textsuperscript{26} were useful in understanding simultaneously held yet apparently conflicting beliefs regarding breastfeeding and formula feeding while employed.

The injunctive norm was that a mother should delay returning to work in order to breastfeed, while the descriptive norm was that when mothers did return to work, they introduced formula. For working mothers to maintain exclusive breastfeeding was “very difficult if there’s no solution,” and relying on formula was seen as “unavoidable”. Acceptability toward the idea of pumping breastmilk to feed to an infant was low, and practiced by only one working mother. The main factors contributing to lack of acceptance were low awareness of the practice and that the term vât sữa was used for both the traditional practice of expressing unsuitable milk to discard and pumping milk to feed a child. Additionally, over half of the respondents voiced concerns about the
safety of pumped milk; primarily that once milk left the mother’s body the quality of the milk decreased or that improper storage would negatively affect quality and safety.

In the third paper (Chapter 6), we assessed the association between breastfeeding difficulties at three months postpartum experienced by 12.7% of mothers and formula feeding among infants in a subsample of the “Alive & Thrive” initiative 2010 baseline household survey in Vietnam. Among mothers reporting difficulties, the most common were perception of insufficient milk (PIM, 38.2%), breast pain (15.5%), and poor latch (15.5%). Only half of mothers (49.7%) sought support for PIM compared to two-thirds for pain or latch (75.9% and 67.1%, respectively). For breastfeeding difficulties at three months postpartum, 52.7% of mothers reported seeking breastfeeding support from their mother/mother-in-law, 32.2% from another family member, and 31.3% from a doctor. Each source of support recommended formula use more than any other solution for breastfeeding difficulties.

Prevalence of formula feeding was 30.1% between 3 to 6 months of age. In multivariate analysis, experiencing breastfeeding difficulties at 3 months postpartum was associated with higher odds of subsequent formula feeding (OR=2.32; 95% CI: 1.38, 3.91), as was maternal work outside the home (OR=2.03; 95% CI: 1.30, 3.18), formula feeding at birth (OR=1.86; 95% CI: 1.27, 2.73), and child age (mo) (OR=1.34; 95% CI: 1.06, 1.68). Higher birth weight (kg) was associated with lower odds of formula use (OR=0.60; 95% CI: 0.40, 0.91) after adjusting for maternal age, education, and social and wealth conditions. Having previously heard about EBF, household food security, maternal body mass index, breastfeeding difficulties at birth, or recent child illness were not associated
with formula use between 3 to 6 months of age.

7.2 Limitations and Strengths

The greatest strength of this mixed-methods research was that it combined analytic approaches to both understand perspectives and practices through qualitative methods and explore associations through quantitative methods to understand contemporary breastfeeding in the Vietnamese context. The greatest limitation was that in undertaking secondary data analysis, the information available on emerging themes was limited and overlap in concepts between the qualitative interviews and quantitative survey were restricted to a design that had already been established and data that had already been collected.

A related limitation of the qualitative research was exploring acceptability of pumping within a culture where familiarity with the concept was extremely limited. Findings from the study cannot be used immediately for program implementation in this setting; rather it suggests that further research and exploration in partnership with working women in rural Vietnam is needed before breastfeeding solutions can be offered in this context.

Future work could enhance the strengths of mixed-methods work during the initial design of the study; increased probing during interviews could enhance understanding of the discrepancy that was found between mothers and grandmothers regarding the timing of introduction of formula, iterative interviews could be performed with women who do pump after returning to work to understand if a positive deviance
approach would be a possible intervention model, or focus groups with fathers could be incorporated to gain greater insight into the effect of advertising and the extent of fathers’ formula-related infant feeding advice within the family. A follow-up quantitative survey could take the concepts from the associated qualitative work to design variables meaningful in this population.

7.3 Implications

Despite successful efforts to educate mothers about the benefits of exclusive breastfeeding for the first 6 months of the infant’s life, the practice of exclusive breastfeeding remains rare in Vietnam. Our findings suggest that although women value and practice breastfeeding, formula is the most widely used breastmilk substitute under six months of age in rural Vietnam because it provides solutions to infant feeding difficulties that EBF messages do not address.

The most effective way to promote exclusive breastfeeding is to facilitate breastfeeding as the solution to the infant feeding problems reported in our study. Our finding that formula is used at distinct times for distinct reasons suggests an intervention strategy tailored to infant feeding needs at various stages. At prenatal visits, increasing awareness of the appropriate amount of colostrum produced, as well as when to expect milk to come in, may better prepare mothers who perceive insufficient milk at birth. At birth, healthcare workers trained to deliver hands-on lactation support may provide an alternative to families who reported feeding formula
after experiencing problems after a cesarean, or with pain or latch. Skilled support
cannot be limited to birth; an additional finding is that later breastfeeding difficulties
were associated with increased odds of formula feeding as well. Mothers rarely sought
help, and when they did, the most common advice (including from doctors) was to feed
infants formula. Healthcare providers should be better trained to offer breastfeeding
solutions for breastfeeding problems, rather than endorse formula feeding solutions for
breastfeeding problems.

Similarly, family members should be targeted for exclusive breastfeeding
messaging, but also educated in ways to support mothers that facilitate rather than
undermine successful breastfeeding. Unlike breastfeeding, formula is a commodity that
can be purchased and fed by anyone. Limiting the influence of formula advertising and
providing family members (particularly fathers) with meaningful ways to support
breastfeeding mothers should be incorporated into interventions in this context.

For formally employed women returning to work, pumping breastmilk may
provide the type of solution that respondents desired: a way for caregivers to
conveniently continue to provide optimal nutrition to infants. Increasing acceptability
could be achieved through differentiating pumping breastmilk for work from the
practice of expressing to discard breastmilk, and by addressing concerns about safe
storage. However, further work is required on how to provide solutions for continued
breastfeeding for the many informally employed women who are not covered by the
current laws regarding parental leave and breaks during the day to breastfeed. Most of
these women worked long hours away from their infants at physically demanding jobs,
and more research about how to provide breastfeeding solutions for these mothers is needed.

This research reveals that it is essential to incorporate the perspective of Vietnamese families in efforts to increase rates of exclusive breastfeeding. Mothers, fathers, and grandparents receive messages regarding infant feeding, interpret them, and ultimately make decisions within their culturally and politically determined world. This research contributes new information about patterns of formula use in a breastfeeding culture, specifically that breastfeeding is valued and practiced, but that formula helps solve infant feeding difficulties including those encountered by women returning back to work. With better support from households, healthcare facilities, workplaces, and policies, breastfeeding could become the solution in many of these cases, increasing exclusive breastfeeding rates and improving child health and growth in this rapidly industrializing setting.
References


11. Mihrshahi S, Oddy WH, Peat JK, Kabir I. Association between infant feeding patterns and diarrhoeal and respiratory illness: A cohort study in Chittagong,


Appendix

Table A 1. Household In-Depth Interview Guide

<table>
<thead>
<tr>
<th>Questions</th>
<th>Notes/Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EXPERIENCE DURING PREGNANCY</strong></td>
<td></td>
</tr>
<tr>
<td>A1. Which prenatal care did you receive (if any) during the pregnancy of your youngest child?</td>
<td></td>
</tr>
<tr>
<td>• [If yes] At which month of pregnancy did you start receiving care?</td>
<td></td>
</tr>
<tr>
<td>Where did you go?</td>
<td></td>
</tr>
<tr>
<td>How many times did you go for prenatal care?</td>
<td></td>
</tr>
<tr>
<td>A2. What information or advice about breastfeeding (BF) did you receive during your checkups?</td>
<td></td>
</tr>
<tr>
<td>• [If yes] Who did you receive this from?</td>
<td></td>
</tr>
<tr>
<td>What information/messages did you receive?</td>
<td></td>
</tr>
<tr>
<td>What do you think about the usefulness of the information/message you received?</td>
<td></td>
</tr>
<tr>
<td>Why useful or why not useful?</td>
<td></td>
</tr>
<tr>
<td><strong>EXPERIENCE OF BIRTH</strong></td>
<td></td>
</tr>
<tr>
<td>A3. Where did you deliver your child? (at CHC, obstetric clinic, or a hospital..?)</td>
<td></td>
</tr>
<tr>
<td>A4. How was the baby’s health when he/she was born?</td>
<td></td>
</tr>
<tr>
<td>• Did you have any difficulties during labor and delivery? What were they? [e.g. forceps, episiotomy, C-section]</td>
<td></td>
</tr>
<tr>
<td>Did this affect your desire or ability to breastfeed your baby?</td>
<td></td>
</tr>
<tr>
<td>A5. Who helped you at your baby’s birth? (Besides doctors and medical staffs who did accompany and support you when you delivered your child?)</td>
<td></td>
</tr>
<tr>
<td>A6. Did you receive any advice about breastfeeding or shown how to breastfeed after child birth?</td>
<td></td>
</tr>
<tr>
<td>• [If yes] Who did you receive this from?</td>
<td></td>
</tr>
<tr>
<td>What information/support did you receive?</td>
<td></td>
</tr>
<tr>
<td>Was this information/support useful/helpful or not to you?</td>
<td></td>
</tr>
<tr>
<td>Why and why not?</td>
<td></td>
</tr>
<tr>
<td><strong>RECOMMENDED BF PRACTICE 1: “DO NOT FEED WITH PRE-LACTEALS”</strong></td>
<td></td>
</tr>
<tr>
<td>A7. Immediately after birth, was the baby fed or given any liquids (water, formula, cow’s or other animal’s milk, sugar water, honey, or anything else) into her/his mouth?</td>
<td></td>
</tr>
<tr>
<td>• [If yes] What liquids did you feed?</td>
<td></td>
</tr>
<tr>
<td>Who put these liquids into the baby’s mouth?</td>
<td></td>
</tr>
<tr>
<td>Why did you feed these liquids?</td>
<td></td>
</tr>
</tbody>
</table>

INSTRUCTIONS:
- Introduce yourself and the purpose of this interview.
- Inform the respondent that this interview should take 1.5-2 hours.
- NOTE: Text in *italics* and brackets OR shaded boxes are instructions only for the interviewer.

Interviewer uses demographic form to collect information of the participant. After that turn on the recorder and start the interview.
A8. Have you ever heard about not putting any other liquids, other than breast milk, into the baby’s mouth from birth to his/her first few days?
   • [If yes] Where/from whom did you hear about this?
   What is your opinion about this?

RECOMMENDED BF PRACTICE 2: “INITIATE BF WITHIN 1 HOUR OF BIRTH”

A9. When should a mother start breastfeeding?
   • Have you ever heard about when a child should start being breastfed?
   [If yes] Where/from whom did you hear about this?

A10. How long after child birth did you start breastfeeding your child? (how many hours/days after birth?)

A11. How was your experience in breastfeeding your child for the first time?
   • [If difficult] What made it difficult? Why?
   How did you handle/manage it?
   • Did you receive any support or advice during that time?
   [If yes] Where/from whom did you receive this support/advice?
   What kind of support or advice did you receive?
   • What did your family members think about giving breast milk to the child right after birth? And, what made he/she think that way?

A12. [If mother did not breastfeed her child within an hour of child’s birth] Why did you not breastfeed your child within the first hour after his/her birth?
   [Explore in detail.]

A13. According to you, why is it important to give only breast milk after birth? Please explain it in detail.

A14. Have you ever heard about colostrums?
   • [If yes] what do you know about colostrums?
   • What is the benefit of colostrums? Why should the baby be fed with colostrums?

RECOMMENDED BF PRACTICE 3: “EXCLUSIVE BF UP TO 6 MONTHS”

A15. Do you still breast-feed your child?
   [If yes] Tell me more about your breastfeeding experience so far.
   [If not] when did you stop breastfeeding your child? Why?

A16. Did you or anyone else give anything else to your child other than breast milk from his/her birth to 6 months?
   • [If yes] What was given to your baby?
   When/at what age did your baby start to receive this?
   Why? (e.g. cultural practice, beliefs about child growth, insufficient breast milk, etc.)
   Who instructed/advised you to do that?
   [If another family member] How did you react to that? Why did you react in that way?

A17. Do you think breast milk alone is enough/sufficient to feed the baby up to six months? Why?
   Do you have enough breast milk to do exclusive breastfeeding to your child
up to six months of age?

• [If mother has felt breast milk was insufficient at times] Could you tell me more about that [not having enough breast milk]? What made you feel that your milk was insufficient? How did you sense that you did not have enough breast milk for your child? [e.g. child stomach is not filled]? What did you think about that?
  • [if someone else] Whose idea was this? Where did this idea come from?
  • What did he/she tell you about this?
  • Did you discuss about this with anyone? Did you seek advice from anyone?
    • [If yes] From whom?
    • What kind of advice did you receive?
    • What did you do after hearing this advice?

A18. Have you ever heard that only breast milk and not even a drop of water should be given to a child until completion of six months of age?

• [If yes] Where/from whom did you hear about this?
  • What did you hear about this?
  • What is your opinion about this advice?
  • What do the other members in your household say about this?
  • Should a child be given some water to wash his/her mouth after breastfeeding? Why and why not? In reality, have you ever given your child water after you breast-feed him/her?
  • Should a child under 6 months of age be given water during hot days? Why and why not?

A19. How many times per day/night should a baby under 6 months of age be fed? When should he/she be fed? [At a certain time of the day, when he/she’s crying, or whenever he/she is hungry…]

A20. Have you heard about extracting breast-milk to feed baby when his/her mother goes out for work?

• (If yes) where/from whom did you receive the information?
• What is it about?
• How to keep extracted breast milk in a good condition?
• How to feed the baby with that milk?

A21. According to you, up to which month/age should baby be breastfed?

• Why baby should be breastfed until that month/age?
• Where did you hear it?
  • [If mother is still breastfeeding]: When will you stop breastfeeding your baby? Why?
  • [If mother already stopped breastfeeding]: When did you stop breastfeeding your baby? Why?

### A22. [In relation to mother’s time, work and child feeding] Does anyone help you to do household work?
- Are you able to manage your housework and breastfeed your child properly?
- Who takes care of your child when you do household work?
- Who feeds your child when you do household work?
- [If mother is involved in any work outside the house] Who takes care of your child when you go outside for work (job)?
- What do you feed your child after coming back from work (job)?

### PART B: PROGRAM-RECOMMENDED COMPLEMENTARY FEEDING PRACTICES [40 minutes]

<table>
<thead>
<tr>
<th>Questions</th>
<th>Notes/Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RECOMMENDED CF PRACTICE 1: “TIMELY AND ADEQUATE QUANTITY OF COMPLEMENTARY FOODS”</strong></td>
<td></td>
</tr>
<tr>
<td>B1. Do you feed your child foods other than breast milk? (It's necessary to ask the mother in detail about if she feeds her child formula milk, rice-water, porridge-water “nuoc chao”, “nuoc cam”...or not.)</td>
<td></td>
</tr>
<tr>
<td><strong>If NO, move to B8</strong></td>
<td><strong>If YES (currently complementary feeding):</strong></td>
</tr>
<tr>
<td>B2. At what age did you start feeding foods (other than breast milk) to your child?</td>
<td></td>
</tr>
<tr>
<td>B3. How many times per day do you feed your child?</td>
<td></td>
</tr>
<tr>
<td>B4. How much (amount) food do you usually feed your child during a feeding episode? Throughout an entire day?</td>
<td></td>
</tr>
<tr>
<td>- When your child first started receiving foods?</td>
<td></td>
</tr>
<tr>
<td>- At 6-8 months? (no need to ask if the baby less than 6 months)</td>
<td></td>
</tr>
<tr>
<td>- At 9-12 months? (no need to ask if the baby less than 9 months)</td>
<td></td>
</tr>
<tr>
<td>B5. Tell me about your experience when you first started feeding foods to your child?</td>
<td></td>
</tr>
<tr>
<td>- How did your child react to the foods?</td>
<td></td>
</tr>
<tr>
<td>- [If difficult experience] What made it difficult? How did you handle/manage it?</td>
<td></td>
</tr>
<tr>
<td>- Did you receive any advice during that time?</td>
<td></td>
</tr>
<tr>
<td>- [If yes] Where/from whom did you receive advice?</td>
<td></td>
</tr>
<tr>
<td>- What kind of advice did you receive?</td>
<td></td>
</tr>
<tr>
<td>- What did you do after that?</td>
<td></td>
</tr>
<tr>
<td>B6. Tell me about your experience in feeding your child now?</td>
<td></td>
</tr>
<tr>
<td>- How does your child react to the foods?</td>
<td></td>
</tr>
<tr>
<td>- [If difficult experience] What makes it difficult? How do you handle/manage it?</td>
<td></td>
</tr>
<tr>
<td>- Did you receive any advice during that time?</td>
<td></td>
</tr>
<tr>
<td>- [If yes] Where/from whom do you receive advice?</td>
<td></td>
</tr>
</tbody>
</table>

### What kind of advice do you receive?

B7. How do you manage to find time to feed your child?
   - Does anyone help you?
     - Who helps you?

B8. Have you heard that you should start feeding foods to your child at six months and to give more amounts of food with age (at different ages)?
   - [If yes] Where/from whom did you hear about this?
     - What is your opinion about this?
     - What did you do after hearing this advice?
     - What do the other members of your household say about this?

#### If NO (not complementary feeding):

B9. When will you feed foods (other than breast milk) to your child?
   - How often (frequency) will you feed your child per day?
     - At 6-8 months? At 9-11 months? At 12-23 months?
   - How much (amount) food will you feed your child?
     - At 6-8 months? At 9-11 months? At 12-23 months?
     - Why do you plan to do so? Who gave you information/instructions?
     - Which sources of information did you get?

B10. Have you ever heard about when to start feeding foods to a child and how much to feed at different ages?
   - [If yes] Where/from whom did you hear about this?
     - What did you hear?
     - What is your opinion about this?
     - What did you do after hearing this advice?
   - Have you discussed with family members about when and how much to feed foods to your child?
     - [If yes] What are their opinions?
     - What do you think about these ideas?

### RECOMMENDED CF PRACTICE 2: "FEED BABIES AND YOUNG CHILDREN ANIMAL SOURCE FOODS LIKE MEAT, FISH, EGG, AND CHICKEN LIVER"

B11. [for the mother who’s already fed her baby complementary foods] Did you or anyone else in your family ever try giving animal source foods (fish/meat/chicken/liver/eggs) to your child?
   - (If the answer is No, need to be carefully verified again)

#### If Yes, move to B16
#### If NEVER tried feeding meat, fish, eggs, etc.:

B12. Have you ever heard of giving animal foods (fish/meat/chicken/liver/eggs) to your child?
   - [If yes] Where/from whom did you hear this? [Probe for health worker, TV, radio, etc.]
     - What did you hear?
     - How many times should animal source foods be given to the child?
<table>
<thead>
<tr>
<th>B13. What do you think about giving children six months and older animal source foods like fish, eggs, liver, etc.?</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Do you think this is something you could do?</td>
</tr>
<tr>
<td>• At what age do you think children can start eating these foods?</td>
</tr>
<tr>
<td>B14. What do other family members think about feeding animal source foods to your child?</td>
</tr>
<tr>
<td>• What does your husband think? (if live with grandparents, ask about their opinions)</td>
</tr>
<tr>
<td>• To what extent do you and your husband talk about what should be brought home when he stops for food?</td>
</tr>
<tr>
<td>B15. How often (frequency) do you cook these foods (fish, eggs, meat, chicken) for the whole family?</td>
</tr>
<tr>
<td>• [If not every day] What are some reasons why you are not able to cook these every day? [Probe for issues related to lack of money, frequency of market days/shopping, food preferences.]</td>
</tr>
</tbody>
</table>

**If YES [for those who tried feeding animal source foods]:**

<table>
<thead>
<tr>
<th>B16. What types of animal source foods did you try feeding your child?</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Why did you try these?</td>
</tr>
<tr>
<td>• Which types did you decide not to try feeding?</td>
</tr>
<tr>
<td>• Why did you decide not to try these?</td>
</tr>
<tr>
<td>B17. How many times did you try feeding meat, fish, eggs, liver, etc. to your child?</td>
</tr>
<tr>
<td>• How did your child react when you tried feeding these foods?</td>
</tr>
<tr>
<td>• What happened then?</td>
</tr>
<tr>
<td>• Were there any issues of your child refusing these food or not being interested them? [Probe for comparison with other types of foods the mother tried feeding him/her.]</td>
</tr>
<tr>
<td>• What did you do when that happened?</td>
</tr>
<tr>
<td>• How much time did it take to feed the fish/meat/eggs, compared to other foods you were feeding your child at that time?</td>
</tr>
<tr>
<td>B18. Do you feel any difficulties or barriers to feed these types of food? What are they?</td>
</tr>
<tr>
<td>• Are there any problems related to buying or getting these foods?</td>
</tr>
<tr>
<td>B19. Are you able to feed animal source foods to your child every day? Why and why not?</td>
</tr>
<tr>
<td>• How do you manage to find the time to do this?</td>
</tr>
<tr>
<td>B20. How often (frequency) do you cook these foods (fish, eggs, meat, chicken) for the whole family?</td>
</tr>
<tr>
<td>• [If not every day] What are some reasons why you are not able to cook these every day? [Probe for issues related to lack of money, frequency of market days/shopping, food preferences, time, workload,</td>
</tr>
</tbody>
</table>
ease of food preparation.]

B21. What do other family members think about feeding animal source foods to your child every day?
- What does your husband think? How about other family members?
- To what extent do you and your husband talk about what should be brought home when he stops for food?

**RECOMMENDED CF PRACTICE 3: “USE DIVERSE FOODS (WITH FOUR FOOD GROUPS OR MORE) AND ADD OILS”**

B22. Have you heard about dietary diversity (or feeding a variety of foods) in feeding your child?
- [If yes] Where/from whom did you hear this? [Probe for health worker, TV, radio, etc.]
  - What did you hear?
  - What do you think about this?
  - Is this something that you could do for your child?
  - Why/why not?

B23. How many food groups do you know (tell the name)?

B24. How many types of food groups do you currently feed your baby? [If not giving her complementary foods yet then ask her intentions]
- How many types of food groups do you typically feed your baby in a single day?
- How do you decide what types of food group to give to your child?

B25. Do you feel any difficulties or barriers to feed your child a variety of foods every day?
- [Probe for issues related to lack of money, frequency of market days/shopping, food preferences, time, workload, ease of food preparation.]

B26. What do other family members think about feeding a variety of food to your child every day?
- What does your husband (parents-if live together) think?
- What would you do if family members have different perspectives on that?

B27. Did you ever hear about adding extra oil to your child’s food?
- [If yes] Where/from whom did you hear about this?
  - What do you think about this?
  - Is this something that you could do for your child?
  - Why/why not?
  - In reality, do you add oil to your child’s food? How/how often? If not, why?

B28. Do you feel any difficulties or barriers to add oil to your child’s food?
Please tell me detail about that.
- Was there ever a problem with not having oil at home to add to food?
- Did anyone in your family say anything about adding oil to your child’s food?
-
B29. What can you do to make sure oil is always added to your child’s food daily?
•  (if yes) what can you actually do?
•  (if not) why?

RECOMMENDED CF PRACTICE 4: “FEEDING CHILDREN WITH IRON-RICH FOODS AND VITAMIN A”

B30. Have you heard anything about feeding children with iron-rich foods and vitamin A? Which foods are they?
[if yes] Where/from whom did you hear this?  [Probe for health workers, TV, family members, other people in the community.]
What did you hear?
What do you think about this?

RECOMMENDED CF PRACTICE 5: “FEEDING SICK CHILDREN: ENCOURAGE CHILDREN TO EAT AND SUPPLEMENT FOODS AFTER THEY GOT SICK”

B31. Have you heard anything about how to feed children when they are sick?
[If yes] Where/from whom did you hear this?  [Probe for health workers, TV, family members, other people in the community.]
What did you hear?
•  What do you think about this?

B32. How to feed a child when he/she is sick?
•  More meals or fewer meals? Why?
•  How much food per meal?
•  What kinds of foods? Which foods should not be fed? Why?

B33. How to feed a child when he/she is recovering after being sick?
•  More meals or fewer meals? Why?
•  How much food per meal?
•  What kinds of foods? Which foods should not be fed? Why?

RECOMMENDED CF PRACTICE 6: “FOOD SAFETY AND HYGIENE FOR CHILDREN”

B34. What do you do to keep food safe and hygiene for your child?  [Probe: cleaning hands, clean cooking utensils, clean foods, storage....]  
Any difficulty to do it?

EXPERIENCE WITH A&T COUNSELING UNIT (MAT TROI BE THO)

Now I want to discuss more with you about your experience when you and your wife use “MAT TROI BE THO” service

Have you ever attended counseling at MTBT room?
[If not]: Have you ever heard the name of MTBT counseling room? If yes,
where/from whom did you hear it? Why not use this counseling?

[If yes]: How many times have you got there? When did you go? (Probe: when you were pregnant? At which month of pregnancy? After delivery? At which month of age of the child?) Why did you go there (who introduced or from any source)?

What do you think about the service you received at MTBT counseling room?
How were counselors? How was the service? Do you want to go back there? Why or why not?
Do you think you would recommend this service to others? If so why? If not why?

PART C: MEDIA SPOT-RELATED MODULES [40 minutes]

<table>
<thead>
<tr>
<th>Questions</th>
<th>Notes/Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TV VIEWING HABITS</strong></td>
<td></td>
</tr>
<tr>
<td>C1. Do you watch TV?</td>
<td></td>
</tr>
<tr>
<td>• Where do you watch?</td>
<td></td>
</tr>
<tr>
<td>• Do you have a TV at home?</td>
<td></td>
</tr>
<tr>
<td>[If mother does not have TV or does not have access to TV, then skip to</td>
<td></td>
</tr>
<tr>
<td>questions 5 and 6 below.]</td>
<td></td>
</tr>
<tr>
<td>C2. How many days are you able to watch TV in a week?</td>
<td></td>
</tr>
<tr>
<td>• How much time do you spend each day to watch TV?</td>
<td></td>
</tr>
<tr>
<td>• When can you manage time to watch TV? [e.g. between work gap]</td>
<td></td>
</tr>
<tr>
<td>• What are some reasons that you are not able to watch TV more</td>
<td></td>
</tr>
<tr>
<td>often? [Probe for access to TV, cable and electricity, radio.]</td>
<td></td>
</tr>
<tr>
<td>C3. Many women told us that they often do not have time to watch TV</td>
<td></td>
</tr>
<tr>
<td>because they have too much work to do. Do you find yourself in the</td>
<td></td>
</tr>
<tr>
<td>same situation? To what extent does that sound like your situation?</td>
<td></td>
</tr>
<tr>
<td>C4. Who decides which TV channel will be watched?</td>
<td></td>
</tr>
<tr>
<td>• How is the channel to watch decided?</td>
<td></td>
</tr>
<tr>
<td>• Do you have any favorite programs or programs that you watch</td>
<td></td>
</tr>
<tr>
<td>regularly? [If yes] What program is it?</td>
<td></td>
</tr>
<tr>
<td>When and how many times in a week is this program broadcasted?</td>
<td></td>
</tr>
<tr>
<td>C5. When you are watching TV and an advertisement break happens, what do</td>
<td></td>
</tr>
<tr>
<td>you usually do?</td>
<td></td>
</tr>
<tr>
<td>[Probe: Watch the ad? Get up and do work? Get something to eat/drink?</td>
<td></td>
</tr>
<tr>
<td>Change channels?]</td>
<td></td>
</tr>
<tr>
<td>C6. Do people in this area/region talk to each other about the types of</td>
<td></td>
</tr>
<tr>
<td>things seen on TV?</td>
<td></td>
</tr>
</tbody>
</table>

**A&T VIETNAM PROCESS EVALUATION**

**INTERVIEW GUIDE: MOTHERS – ver. 27 March 2012**

| Form No.: 004 | District:  
| Commune:  
| Hamlet/Village: |

**INTERNET USE**

C7. Do you use the internet (search the web)?
   - [If yes] Where do you access the internet?
   - Do you have a computer at home?
   - Do you have internet access at home?

   [[If mother does not use the internet, skip the following questions, and move on to showing the TV spots.]]

C8. Have you ever searched for child nutrition/feeding information on the internet?
   - [If yes] What did you find?
   - What is your opinion about this information?

C9. Have you seen the "mat troi be tho" on the web?
   - [If yes] What do you think about it?

- After asking the questions above, tell the mother that you would like to show her short video spots on your computer, and then ask some questions about them.
- Open the computer (which will need to be fully charged and running on battery), and show the appropriate spot before proceeding to the associated questions.

**TV SPOT 1: EXCLUSIVE BREASTFEEDING, NO WATER**

[Key messages: Only breast milk for the first 6 months; no water, no formula. Breast milk has enough water and nutrition to be healthy and smart.]

C10. Have you seen this spot before?
   - [If yes] Where have you seen this?
     - When did you see this?
     - How many times have you seen this?

   [[If haven’t, keep asking]]

[Targets and main messages]

C10a. What do you remember the most from this spot?
   - What do you understand about this spot?
   - Was there anything you didn’t understand?
   - What do you think this TV spot is asking you to do?

[Synergy/reinforcing CHC/VCHW messages]

C10b. Were you aware of this information before watching this spot?
   - [If yes] Where/from whom have you heard this?

[Believability and feasibility of putting into action]

C11. When the baby says “breast milk has enough water and all the nutrition you need” to the other baby, do you think the baby is right or wrong?
   - Why do you think so?

C12. When the baby says “feed me only breast milk in the first 6 months. Breast milk has enough water and nutrition to be healthy and smart” to the mother, do you think the baby is right or wrong?
<table>
<thead>
<tr>
<th>QUESTION</th>
<th>RESPONSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>C13. Do you think mothers should follow this</td>
<td></td>
</tr>
<tr>
<td>recommendation?</td>
<td></td>
</tr>
<tr>
<td>Why/why not?</td>
<td></td>
</tr>
<tr>
<td>C14. Did anyone share the information in this</td>
<td></td>
</tr>
<tr>
<td>spot (exclusive breastfeeding, no water)</td>
<td></td>
</tr>
<tr>
<td>with you before?</td>
<td></td>
</tr>
<tr>
<td>[If yes] Who was this person(s)?</td>
<td></td>
</tr>
<tr>
<td>What did they share?</td>
<td></td>
</tr>
<tr>
<td>Have you shared what you saw in this spot</td>
<td></td>
</tr>
<tr>
<td>with anyone else?</td>
<td></td>
</tr>
<tr>
<td>With whom did you share?</td>
<td></td>
</tr>
<tr>
<td>What did you share?</td>
<td></td>
</tr>
<tr>
<td>C15. Does seeing this spot remind you of</td>
<td></td>
</tr>
<tr>
<td>anything else?</td>
<td></td>
</tr>
<tr>
<td>What do you think of?</td>
<td></td>
</tr>
<tr>
<td>C16. Have you seen this spot before?</td>
<td></td>
</tr>
<tr>
<td>[If yes] Where have you seen this?</td>
<td></td>
</tr>
<tr>
<td>When did you see this?</td>
<td></td>
</tr>
<tr>
<td>How many times have you seen this?</td>
<td></td>
</tr>
<tr>
<td>C17. What do you remember the most from this</td>
<td></td>
</tr>
<tr>
<td>spot?</td>
<td></td>
</tr>
<tr>
<td>What do you understand about this spot?</td>
<td></td>
</tr>
<tr>
<td>Was there anything you didn’t understand?</td>
<td></td>
</tr>
<tr>
<td>What do you think this TV spot is asking you</td>
<td></td>
</tr>
<tr>
<td>to do?</td>
<td></td>
</tr>
<tr>
<td>C18. Were you aware of this information</td>
<td></td>
</tr>
<tr>
<td>before watching this spot?</td>
<td></td>
</tr>
<tr>
<td>[If yes] Where/from whom have you heard this?</td>
<td></td>
</tr>
<tr>
<td>C19. When the baby says “the more you</td>
<td></td>
</tr>
<tr>
<td>suckle, the more milk will be produced” to</td>
<td></td>
</tr>
<tr>
<td>the other baby, do you think the baby is</td>
<td></td>
</tr>
<tr>
<td>right or wrong?</td>
<td></td>
</tr>
<tr>
<td>Why do you think so?</td>
<td></td>
</tr>
<tr>
<td>C20. When the baby says “don’t worry about</td>
<td></td>
</tr>
<tr>
<td>not having enough breast milk, exclusive</td>
<td></td>
</tr>
<tr>
<td>breastfeeding during the first 6 months”</td>
<td></td>
</tr>
<tr>
<td>do you think the baby is right or wrong?</td>
<td></td>
</tr>
<tr>
<td>Why do you think so?</td>
<td></td>
</tr>
<tr>
<td>C21. Do you think mothers should follow this</td>
<td></td>
</tr>
<tr>
<td>recommendation?</td>
<td></td>
</tr>
<tr>
<td>Why/why not?</td>
<td></td>
</tr>
<tr>
<td>C22. Did anyone share the information in this</td>
<td></td>
</tr>
<tr>
<td>spot (exclusive breastfeeding, no water)</td>
<td></td>
</tr>
<tr>
<td>with you before?</td>
<td></td>
</tr>
<tr>
<td>[If yes] Who was this person(s)?</td>
<td></td>
</tr>
<tr>
<td>What did they share?</td>
<td></td>
</tr>
</tbody>
</table>

Form No.: 004

District: Commune: Hamlet/Village:

DATE: ____ / ____ / 2012
START TIME: ____ : ____
END TIME: ____ : ____
• Have you shared what you saw in this spot with anyone else?
  With whom did you share?
  What did you share?

[Competition with other spots]
C23. Does seeing this spot remind you of anything else?
• What do you think of?

Thank you for your time and participation.
Table A 2 Codebook excerpt (codes pertaining to pumping breastmilk)

<table>
<thead>
<tr>
<th>Code</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump milk heard</td>
<td>SPECIFIC MESSAGE: Have you heard about pumping breastmilk to feed baby when his/her mother goes out for work?</td>
</tr>
<tr>
<td></td>
<td>• If informant has heard specific message (or elements of specific message), and the source</td>
</tr>
<tr>
<td></td>
<td>• What the informant has heard about it</td>
</tr>
<tr>
<td></td>
<td>o How to store pumped breastmilk</td>
</tr>
<tr>
<td></td>
<td>o How to keep pumped breastmilk in good condition</td>
</tr>
<tr>
<td></td>
<td>o How to feed pumped breastmilk to an infant</td>
</tr>
<tr>
<td></td>
<td>• Interpretation (not opinion) of message</td>
</tr>
<tr>
<td>Pump milk response</td>
<td>• Informant’s response (thoughts or actions) regarding specific message (or elements of specific message)</td>
</tr>
<tr>
<td></td>
<td>• Opinions of others (not the informant) regarding specific message (or elements of specific message)</td>
</tr>
<tr>
<td></td>
<td>• Any discussion of specific message (or elements of specific message) with family</td>
</tr>
<tr>
<td></td>
<td>Note: If informant says that “I have not heard the pump milk message,” but goes on to respond to the message during the interview, use this code to capture their opinion of the pump milk message</td>
</tr>
<tr>
<td>Pump milk never heard</td>
<td>• If informant states that he or she has not heard specific message (or elements of specific message), and why</td>
</tr>
<tr>
<td>Pump milk personal</td>
<td>• Mother in household is currently or has ever pumped her own milk</td>
</tr>
<tr>
<td></td>
<td>• Mother’s personal experience (or father/grandparent’s description of mother’s experience) pumping her own milk</td>
</tr>
<tr>
<td></td>
<td>Note: Include pumped or expressed milk that was not given to the infant</td>
</tr>
</tbody>
</table>
Figure A 1. Map of Vietnam (Thanh Hóa and Vĩnh Long Provinces Highlighted)
Figure A 2 A&T Website for MTBT “Little Sun” Franchises, Vietnamese and English

Curriculum Vitae

MEGAN E. HENRY

9 S Regester St
Baltimore MD 21231
408-799-6045
mhenry16@jhu.edu

EDUCATION

2009-2015  PhD
Program in Human Nutrition
Department of International Health
The Johns Hopkins University Bloomberg School of Public Health,
Baltimore MD
Thesis: Formula use in a breastfeeding culture: changing perceptions and patterns of young infant feeding in Vietnam

2006  MS Community Nutrition with minor in Epidemiology
Cornell University, Ithaca NY
Thesis: Understanding the Importance of Meal Delivery for the Well-being of Frail Elders in New York City.

2000  AB *cum laude* Biological Anthropology
Harvard University, Cambridge MA

PROFESSIONAL EXPERIENCE

2011-2012  Teaching Assistant, *Nutrition and Life Stages*
Dr. Parul Christian
Program in Human Nutrition
Johns Hopkins Bloomberg School of Public Health, Baltimore MD
Assisted in discussion sections, supported and graded students for final projects, managed course website and administrative details, delivered *Nutrition for Infants and Young Children* lecture.

2011  Project Coordinator, mINAMO: mHealth for Improved Neonatal and Maternal Outcomes
Dr. Alain Labrique
Department of Global Disease Epidemiology and Control
Johns Hopkins Bloomberg School of Public Health, Baltimore MD
Co-created a protocol for large-scale mHealth intervention to prevent neonatal and child mortality in Bangladesh and Uganda, coordinated meetings and contributions within an international team, assisted in presenting work to NGO that commissioned protocol.

2010 Research Assistant, MAL-ED: A Global Network for the Study of Malnutrition and Enteric Diseases
Dr. Laura Caulfield
Program in Human Nutrition
Johns Hopkins Bloomberg School of Public Health, Baltimore MD
Compiled comprehensive infant and young child feeding reports for study field sites.

2007-2008 Breastfeeding Coordinator, Site Supervisor and High-Risk Nutritional Counselor
Nutrition Program for Women Infants and Children (WIC)
Clinica Sierra Vista, Bakersfield CA
Coordinated efforts to support breastfeeding and implement WIC policies and designed customized nutrition classes in low-income communities through a grant provided by the Central Valley Health Network.

2004 Teaching Assistant, Nutrition Communications and Counseling
Dr. Susan Travis
Division of Nutritional Sciences Cornell University, Ithaca NY
Led small-group discussions, graded assignments, created original course materials and managed administrative details.

2004 Teaching Assistant, The Biology of Normal and Abnormal Behavior
Dr. Barbara J. Strupp
Division of Nutritional Sciences Cornell University, Ithaca NY
Graded assignments and managed administrative details.

2003 Teaching Assistant, Nutrition Health and Society
Dr. David Levitsky
Division of Nutritional Sciences Cornell University, Ithaca NY
Led small-group discussions and graded assignments.

2002-2003 Research Assistant, Center for Complementary and Integrative Medicine
Dr. Mary E. Charlson
Weill Cornell Medical College, New York NY
Recruited patients in long-term studies and utilized Motivational Interviewing techniques to encourage patients to adopt healthy behaviors.

2000-2002  
**Technical Writer and Testing Specialist**  
Dr. Benjamin B. Brodey  
TeleSage Inc., Seattle, WA  
Collaborated on National Institutes of Health Innovative Technology Grant to create and test user interface and features and of medical software. Created 100-page manual and additional specialized documentation as requested by clients. Provided technical support.

2000-2001  
**Research Assistant, Department of Esophageal & Gastric Surgery**  
Dr. Brant Oelschlager  
University of Washington Medical Center, Seattle, WA  
Recruited and interviewed participants by mail and phone for several concurrent studies. Maintained database of patients’ pre- and post-operative test results. Organized and prepared data for presentations.

1998-2001  
**Head Teaching Fellow, *Introduction to Personal Computers and the Internet***  
Dr. David J. Malan  
Harvard University Extension School, Cambridge, MA  
Taught weekly class, in person and streamed over course website. Managed team of teaching assistants, all sections and workshops, created original material, and managed administrative details.
CERTIFICATIONS

2007    Certified Lactation Educator (CLE)

LANGUAGES

Vietnamese    College-level coursework
Spanish      College-level coursework

HONORS AND AWARDS

2012    The Harry D. Kruse Fellowship in Nutrition
        Johns Hopkins University Bloomberg School of Public Health

2009    Adele Diaz Scholarship Fund Award
        Johns Hopkins University Bloomberg School of Public Health

2004    Outstanding Teaching Assistant in Agriculture and Life Sciences
        Cornell University

2000    Outstanding Contribution to House Life Award
        Harvard University

PUBLICATIONS


REPORTS


PRESENTATIONS


April 2005 Oral Presentation Experimental Biology Conference San Diego CA

INVITED LECTURES

Jan 2015       Guest Lecturer, Introduction to Nutrition
May 2014       Tulane University School of Public Health and Tropical Medicine
               *Breastfeeding in Public Health: from Science to Action*
May 2014       Guest Lecturer, Formative Research for Behavioral and Community Interventions
May 2013       Johns Hopkins School of Public Health
               *Program Evaluation as Formative Research* lecture

ACADEMIC SERVICE

2004-2005       Co-President Nutrition Graduate Students Organization Cornell University.

PERSONAL STATEMENT OF RESEARCH

My research interests are in the area of global breastfeeding and complementary feeding utilizing qualitative and quantitative research methods.

Specific interests include:

1. Optimizing early initiation of breastfeeding practices to reduce mortality and morbidity;
2. Strategies to increase exclusive breastfeeding rates;
3. Understanding use of non-breastmilk liquids and solids in context;
4. Consequences for infants on early introduction of complementary foods;
5. Supporting evidence-based policy decisions

KEYWORDS

Nutrition
Breastfeeding
Early initiation of breastfeeding
Exclusive breastfeeding
Non-breastmilk liquids and solids
Complementary feeding