The Prevalence and Social Determinants of Exclusive Breastfeeding and Implications for
Infant Growth in Rural Haiti: A Mixed-Methods Study

by

Lauren C. Zalla

Duke Global Health Institute
Duke University

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Kathryn Whetten, Supervisor

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David Walmer

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Dennis Clements

Thesis submitted in partial fulfillment of
the requirements for the degree of
Master of Science in the Duke Global Health Institute
in the Graduate School of Duke University

2015
ABSTRACT

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Abstract

Background: While exclusive breastfeeding is known to protect against infant morbidity and mortality, its effects on growth are not well understood. This study aimed to identify individual and household characteristics associated with exclusive breastfeeding in a rural population in Haiti, and to test the association between duration of exclusive breastfeeding and infant height-for-age (HAZ), weight-for-height (WHZ) and weight-for-age (WAZ). In addition, qualitative methods were employed to identify community perceptions of exclusive breastfeeding and barriers to its adoption. Methods: A household survey was conducted to assess breastfeeding practices and maternal and infant nutritional status in rural Léogâne Commune (N=119), and linear regression was used to estimate the associations between duration of exclusive breastfeeding and infant HAZ, WHZ and WAZ. In addition, 32 community health workers completed a written survey and participated in focus group discussions of the benefits of exclusive breastfeeding and barriers to its adoption in their communities. Results: Survey variables associated with shorter duration of exclusive breastfeeding (α=0.10) included preterm birth, late initiation of breastfeeding, maternal employment and the practice of giving infants tea. Community health workers identified several additional socio-cultural and institutional barriers to exclusive breastfeeding in their communities, including the advice of community elders, poverty and food insecurity. Duration of
exclusive breastfeeding was positively associated with both HAZ and WAZ ($\alpha=0.05$), but not significantly associated with WHZ. **Conclusions:** This study provides evidence that duration of exclusive breastfeeding is positively associated with infant height-for-age and weight-for-age in a rural, resource-limited setting, suggesting that promotion of exclusive breastfeeding may be an effective means to prevent underweight and stunting among infants at risk of malnutrition. In addition, qualitative findings suggest that efforts to promote exclusive breastfeeding should pay attention to underlying issues of poverty and food security, and the effects of the physical and social environment on the choices women make regarding infant feeding in Haiti.
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Part I: The Prevalence and Determinants of Exclusive Breastfeeding and its Association with Infant Anthropometry in Rural Léogâne Commune, Haiti
1. Introduction

The World Health Organization (WHO) recommends that infants be exclusively breastfed until the age of 6 months, followed by continued breastfeeding paired with appropriate complementary feeding until age 2 (World Health Organization, 2003). In 2004 alone, 1.06 million deaths and 37.0 million disability-adjusted life-years (DALYs) were attributed to non-exclusive breastfeeding in the first 6 months of life (Black et al., 2008). A recent meta-analysis estimates that during months 0-5, the relative risk of all-cause mortality is 2.85 (95% CI 1.59-5.10) times greater among partially breastfed infants and 14.40 (95% CI 6.09-34.05) times greater among non-breastfed infants compared to exclusively breastfed infants (Black et al., 2008). Partial breastfeeding is associated with significantly higher risks of diarrhea (RR 3.04; 95% CI 1.32–7.00) and pneumonia (RR 2.48; 95% CI 0.23–27.15 compared to exclusive breastfeeding (Black et al., 2008). Partial breastfeeding is also associated with a three to four-fold increased risk of HIV transmission; a recent randomized controlled trial suggests that partial breastfeeding may cause gut inflammation, leading to increased intestinal permeability and thus greater susceptibility to HIV (Kourtis et al., 2013; World Health Organization, 2008).

The risks of partial breastfeeding are particularly salient in low-income countries. The use of powdered milk or formula can spread waterborne pathogens in communities without access to safe water, and impoverished mothers may dilute formula to stretch supplies, resulting in malnutrition (Andresen, Rollins, Sturm, Conana, & Greiner, 2007;
While exclusive breastfeeding is known to protect against infant morbidity and mortality, its effects on infant growth are not well understood. The most commonly used child growth indicators are height-for-age z-scores (HAZ), weight-for-height z-scores (WHZ), and weight-for-age z-scores (WAZ). These z-scores are calculated based on an international reference population of healthy children enrolled in the WHO Multicentre Growth Reference Study. Stunting, or low HAZ, is a manifestation of chronic undernutrition; wasting, or low WHZ, is a manifestation of acute undernutrition. Children who are underweight, or have low WAZ, may be stunted, wasted, or both.

A recent review article found that the WHO exclusive breastfeeding indicator was negatively associated with HAZ among infants under 6 months in datasets from 7 countries; however, this association was only significant in Kenya and Ethiopia (Jones et al., 2014). Exclusive breastfeeding was positively associated with WHZ among infants under 6 months in 8 countries, although this association was only significant in Bangladesh and Zambia (Jones et al., 2014). Given the dearth of persuasive evidence, further research is needed to better understand the relationship between exclusive breastfeeding and infant growth. In particular, research conducted in a geographically concentrated and relatively homogenous population could help to control for community-level variations that confound the association between exclusive breastfeeding and infant growth. This study begins to fill that gap by testing the
association between exclusive breastfeeding and infant HAZ, WHZ and WAZ in rural Léogâne Commune, Haiti.

In rural Haiti, a recent Demographic and Health Survey found that 97.6% of infants were breastfed and the median duration of breastfeeding was 17.6 months (Cayemittes et al., 2013). However, “mixed feeding from infancy is the norm” in Haiti (Dornemann & Kelly, 2012). The median duration of exclusive breastfeeding is estimated at only 1.8 months, with 20% of infants receiving foods or liquids other than breast milk within three days postpartum (Cayemittes et al., 2013). Within a few days to a few months postpartum, most infants start receiving labouyi or porridge made from plantain, corn or arrowroot that is dried and ground into a powder, and then prepared with boiled water and sometimes milk and sugar (Alvarez & Murray, 1981). Previous studies have elucidated various cultural factors that impact the decision to introduce supplemental foods in lieu of exclusive breastfeeding in rural Haiti (Alvarez & Murray, 1981; Wiese, 1976). However, the individual-level characteristics that may influence this decision are not as well understood. To the best of our knowledge, no published study has attempted to identify the individual-level demographic or socio-economic variables associated with exclusive breastfeeding in rural Haiti. Knowledge of the variables associated with exclusive breastfeeding could help organizations working to improve maternal-child health to better target interventions to promote breastfeeding in rural Haiti.
The aims of this study were threefold: (1) to describe the prevalence and duration of exclusive breastfeeding in rural Léogâne Commune, (2) to identify individual-level demographic and socio-economic variables associated with exclusive breastfeeding in this population, and (3) to test the association between duration of exclusive breastfeeding and infant growth, measured as HAZ, WHZ and WAZ. It was hypothesized that duration of exclusive breastfeeding would be positively associated with HAZ, WHZ and WAZ.
2. Methods

2.1 Setting

Léogâne Commune is one of the 140 communes of Haiti, located less than 20 miles from Port-au-Prince in the Ouest Department (Figure 1). The commune consists of three lowland urban sections, located on the coast, and ten mountainous rural sections, spread out over 25,000 acres stretching south toward Jacmel.

![Map of Léogâne Commune, Haiti](image.png)

**Figure 1.** Map of Léogâne Commune, Haiti
This study was conducted in the ten rural sections of Léogâne Commune, with an estimated total population of 97,000 (Institut Haïtien de Statistique et D’Informatique, 2009). These rural sections are primarily agricultural, however, most households do not produce enough to satisfy their food needs. The World Food Programme reported in 2008 that 68% of food consumed by households in rural Haiti is bought on the market, with food expenditure representing 59% of total household spending (Desamours et al., 2008). Households that depend entirely on small-scale farming, with no secondary income stream such as animal husbandry, non-agricultural wage labor or remittances, are more likely to purchase food on credit and more likely to be food insecure (Desamours et al., 2008).

The proportion of food insecure households in rural Haiti is estimated at 34.1% among households engaged in small-scale farming and 22.9% among households engaged in the sale of agricultural products (Desamours et al., 2008). Food insecurity is among the factors contributing to elevated rates of childhood malnutrition in rural Haiti. Among children under 5, the prevalence of chronic malnutrition is estimated at 24.7% and the prevalence of acute malnutrition is estimated at 5.3%, compared to 15.8% and 4.7% in urban Haiti (Cayemittes et al., 2013).

2.2 Participants

Eligible participants included all women ages 18 and older with infants born between November 1, 2013 and April 1, 2014, who were currently residing in the
following six rural sections of Léogâne: Citronniers, Cormiers, Fond de Boudin, Fonds d’Oie, Gros Morne, and Oranger. The study area was limited to six of the ten rural sections of Léogâne in order to limit the sample size, due to time and resource constraints. A sample size of 96 was deemed necessary to detect a difference of 20 percentile points or approximately 0.6 standard deviations in HAZ, WHZ or WAZ with 80% power at the 5% significance level.

The sampling frame used to identify eligible participants was a database of children under 5 in rural Léogâne Commune that is maintained by the Children’s Nutrition Program of Haiti, known locally as Kore Timoun. The 36 community health workers, called monitrices, who are employed by Kore Timoun keep a record of births and home visits for all children under 5 in their catchment areas, and those records are input into a central database monthly. In addition to using this database to identify eligible participants, the monitrices were asked to identify any recent births that were not recorded in the database due to delays in data entry.

Once eligible participants were identified, home visits were conducted by the data collector (LZ) and the monitrice responsible for each catchment area. If the mother was present, the full survey was administered and physiological measurements were collected for both the mother and infant. If the mother was not present, another caretaker such as the father or grandmother of the infant was asked to respond to a
subset of questions, and only the infant was weighed and measured. Informed consent was obtained from all mothers and caretakers participating in the study.

2.3 Procedures

A survey was administered to all mothers participating in the study, including questions about demographic characteristics and breastfeeding beliefs and practices. Following the survey, weight, height and mid-upper arm circumference measurements were taken for both mothers and infants. Mothers were also tested for iron deficiency.

All study procedures were approved by the ethical review boards at Duke University in the U.S. and Family Health Ministries in Haiti. In the event that a study participant met the criteria for moderate acute malnutrition or severe acute malnutrition without medical complications, he or she was immediately referred to the nearest outpatient nutrition clinic staffed by Kore Timoun. Kore Timoun operates 13 mobile nutrition clinics in rural Léogâne and one fixed nutrition clinic in urban Léogâne. Participants who met the criteria for severe acute malnutrition with medical complications were immediately transported to an inpatient treatment center in Petit-Goâve. If mothers were identified as moderately or severely anemic, they were given a card with their test results and a 90-day supply of 200mg ferrous sulphate supplements.

2.4 Measures

The full survey instrument is included in Appendix A. Household food insecurity was assessed using the Household Hunger Scale, developed and cross-culturally
validated by the Food and Nutrition Technical Assistance Project (FANTA) of USAID (Ballard, Coates, Swindale, & Deitchler, 2011). Indicators of socio-economic status were adapted from the Haitian Demographic and Health Survey Household Questionnaire (ICF International, 2011).

Infant weight and recumbent height were measured by the monitrices, who are trained in national measurement protocols (Ministère de la Santé Publique et de la Population, 2010). Weight was measured to the nearest 0.1 kilogram using hanging scales manufactured by Salter. Recumbent height was measured to the nearest centimeter using length mats issued by the Ministère de la Santé Publique et de la Population (MSPP). Vitamin A supplementation status was measured using health records kept by the monitrices. Maternal weight and height were measured by the data collector (LZ), to the nearest 0.1 kilogram using a portable standing scale and to the nearest 0.5 centimeter using a portable stadiometer manufactured by Charder. A test for maternal iron deficiency was performed by the data collector using a HemoCue Hb 201+. The mid-upper arm circumference (MUAC) of mothers and infants ages 6 months and older were measured by the monitrices using armbands issued by MSPP. Infant height and weight measurements were transformed to HAZ, WHZ, and WAZ based on the WHO Child Growth Standards using the *igrowup* macro for Stata SE 13.1.

GPS coordinates were obtained for each household in the sample from the central database maintained by Kore Timoun. The coordinates were collected by Kore
Timoun from 2011-2012 in a census of rural Léogâne Commune, using handheld eTrex GPS units manufactured by Garmin. Coordinates were used to create maps of survey data in ArcGIS 10.2.

2.5 Analysis

Data were entered into an Excel database at the end of each day, and entries were double-checked for inaccuracies. Missing data were flagged and attempts were made to fill in missing data when possible by going back to re-interview the participant. Statistical analyses were performed in Stata SE 13.1. The primary exposure variable of interest was the duration of exclusive breastfeeding. This variable was operationalized as the age at which infants started receiving any foods other than breast milk, reported in weeks or months as remembered by the mothers. The outcome variables of interest were z-scores of infant height-for-age (HAZ), weight-for-height (WHZ) and weight-for-age (WAZ). These z-scores were not empirical, but rather assigned based on height, weight, gender and age using the WHO Child Growth Standards, which were developed using data collected in the WHO Multicentre Growth Reference Study.

As appropriate, statistical tests were performed to test the bivariable associations between the exposure variable, outcome variables, and all other survey variables.¹

¹ If the continuous outcome variable was normally distributed, t-tests were used to assess differences in means by levels of binary exposure variables. Analysis of variance (ANOVA) was conducted if the exposure variable was categorical with three or more levels, and linear regression was used if the exposure variable was continuous. If the continuous outcome variable was not normally distributed, t-tests were conducted to compare means by levels of binary exposure variables unless the number of respondents in either category was small, in which case a non-parametric test was used (Wilcoxon Rank-Sum). Kruskal
Significance was determined using an alpha level of 0.1. All variables significantly associated with the exposure were included in linear regression models of the effect of the exposure on HAZ, WHZ and WAZ. Variables associated with both the exposure and outcome variables were evaluated as potential confounders or effect modifiers. Potential confounders were included in the models, and nested models were compared using the likelihood ratio (LR) test.

Wallis tests were conducted for categorical and continuous exposure variables when the continuous outcome variable was not normally distributed.
3. Results

Initially, 127 mother-infant pairs were identified as eligible to participate in the study. While care was taken to avoid surveying in communities on designated market days when many women were away from home, 12 mothers were away at the time of the home visit. In 6 cases, the grandmother or father of the infant was surveyed instead, but in another 6 cases a caretaker could not be found. Two mothers declined to participate. In total, 119 infants and their mothers or caretakers participated in the study.

3.1 Characteristics of the Study Sample

Descriptive statistics of the infants, mothers and households in the study sample are displayed in Table 1. The average age of infants in the sample was 5.1 months (SD=1.4). Figure 2 shows a map of mother-infant pairs surveyed, displayed by place of delivery. Because more than 70% of deliveries took place at home, data on birth weight and gestational age were not available. Preterm birth was assessed by asking mothers whether they delivered before 9 months; using this method, the estimated proportion of preterm births was 6%. Morbidity, measured as any diarrhea in the previous week, was relatively high at 29%. Breastfeeding initiation was nearly universal at 98%, and 69% of infants were breastfed within one hour of birth. About half of mothers reported giving their infants tea, a traditional remedy for a broad range of problems including diarrhea and insomnia, and over 70% of mothers reported giving their infants some type of milk supplement. Powdered milk and powdered formula were equally popular, with only
one mother reporting that she gave her infant cow’s milk.

Mothers who were not practicing exclusive breastfeeding were asked to list the types of foods they regularly fed their infants. The most commonly reported food was *labouyi* or porridge, made with boiling water and one of a variety of locally prepared flours, including manioc, plantain, arrowroot, rice, corn, potato, and wheat flours. After about four months, many infants were given small portions of the same foods that older
family members would eat, such as rice, mashed plantains, cornmeal, bean sauce and stewed vegetables.

Only 3.4% of infants in the sample were wasted based on their WHZ. No infants were severely wasted based on their mid-upper arm circumference, which is a common diagnostic criterion for identifying severe acute malnutrition in Haiti. However, 9.2% of infants were underweight and 17.8% were stunted based on their WAZ and HAZ. Among mothers, 15% were underweight, 20% were overweight and 5% were obese based on their body mass index (BMI). 26% of mothers reported that their nutritional status was insufficient to properly nourish their children through breastfeeding. However, only 31% of mothers reported that they ate more food while breastfeeding than they were accustomed to eating before they became pregnant. This statistic suggests that maternal food intake may be limited, which is corroborated by the results of the Household Hunger Scale. More than half of participants experienced moderate household hunger, and 10% experienced severe household hunger. The geographical distribution of household hunger in the study population is shown in Figure 3. Many households were impoverished, as indicated by the proportion of households with a dirt floor (57%) and the proportion of households that obtained their drinking water from a river or stream (47%). Although remittances constitute a significant portion of GDP in Haiti, only 8% of households in the sample reported receiving remittances from family members overseas, pointing to the relative isolation and poverty of rural Léogâne.
Figure 3. Geographical distribution of household hunger in the study sample based on the Household Hunger Scale, N=117.
Table 1. Characteristics of mothers, infants and households in a cross-sectional survey of infants born between Nov. 1, 2013 and Apr. 1, 2014 in rural Léogâne Commune, Haiti.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean (SD) or %</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Infant Characteristics</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age in Months</td>
<td>5.1 (1.4)</td>
<td>119</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>56.3%</td>
<td>67</td>
</tr>
<tr>
<td>Male</td>
<td>43.7%</td>
<td>52</td>
</tr>
<tr>
<td>Place of Delivery</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Home</td>
<td>72.3%</td>
<td>86</td>
</tr>
<tr>
<td>Clinic or Hospital</td>
<td>27.7%</td>
<td>33</td>
</tr>
<tr>
<td>Preterm Birth</td>
<td>5.9%</td>
<td>7</td>
</tr>
<tr>
<td>Any Diarrhea in Past Week</td>
<td>28.6%</td>
<td>34</td>
</tr>
<tr>
<td>Ever Breastfed</td>
<td>98.32%</td>
<td>117</td>
</tr>
<tr>
<td>Breastfed within 1 Hour of Birth</td>
<td>68.9%</td>
<td>82</td>
</tr>
<tr>
<td>Given Tea</td>
<td>53.4%</td>
<td>63</td>
</tr>
<tr>
<td>Type of Milk Supplement</td>
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<tr>
<td>None</td>
<td>28.9%</td>
<td>33</td>
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<tr>
<td>Cow’s Milk</td>
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</tr>
<tr>
<td>Powdered Milk</td>
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</tr>
<tr>
<td>Powdered Formula</td>
<td>35.1%</td>
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</tr>
<tr>
<td>Wasting (WHZ &lt; -2)</td>
<td>3.4%</td>
<td>4</td>
</tr>
<tr>
<td>Severe Wasting (MUAC &lt; 115mm)</td>
<td>0%</td>
<td>0</td>
</tr>
<tr>
<td>Stunting (HAZ &lt; -2)</td>
<td>17.8%</td>
<td>21</td>
</tr>
<tr>
<td>Underweight (WAZ &lt; -2)</td>
<td>9.2%</td>
<td>11</td>
</tr>
<tr>
<td><strong>Maternal Characteristics</strong></td>
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<td></td>
</tr>
<tr>
<td>Age in Years</td>
<td>26.8 (5.8)</td>
<td>115</td>
</tr>
<tr>
<td>Highest Level of Education Completed</td>
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<td></td>
</tr>
<tr>
<td>None</td>
<td>7.7%</td>
<td>9</td>
</tr>
<tr>
<td>Some Elementary School</td>
<td>30.1%</td>
<td>34</td>
</tr>
<tr>
<td>Some Middle School</td>
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<tr>
<td>Some High School</td>
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<td>Finished High School</td>
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<tr>
<td>Employment Status</td>
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<tr>
<td>Employed</td>
<td>46.2%</td>
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<tr>
<td>Unemployed</td>
<td>50.4%</td>
<td>60</td>
</tr>
<tr>
<td>Type of Work</td>
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<td></td>
</tr>
<tr>
<td>Seller</td>
<td>22.7%</td>
<td>27</td>
</tr>
<tr>
<td>Farmer</td>
<td>22.7%</td>
<td>27</td>
</tr>
<tr>
<td>Artisan</td>
<td>0.9%</td>
<td>1</td>
</tr>
<tr>
<td>Variable</td>
<td>Mean (SD) or %</td>
<td>N</td>
</tr>
<tr>
<td>-----------------------------------------</td>
<td>--------------------</td>
<td>-------</td>
</tr>
<tr>
<td>Number of Children</td>
<td>2.9 (1.9)</td>
<td>117</td>
</tr>
<tr>
<td>BMI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underweight (&lt;18.5)</td>
<td>15.2%</td>
<td>17</td>
</tr>
<tr>
<td>Overweight (≥25)</td>
<td>19.6%</td>
<td>22</td>
</tr>
<tr>
<td>Obese (≥30)</td>
<td>5.4%</td>
<td>6</td>
</tr>
<tr>
<td>Perceived Nutritional Status</td>
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<td></td>
</tr>
<tr>
<td>Sufficient</td>
<td>74.1%</td>
<td>86</td>
</tr>
<tr>
<td>Insufficient</td>
<td>25.9%</td>
<td>30</td>
</tr>
<tr>
<td>Any Prenatal Vitamins</td>
<td>60.5%</td>
<td>69</td>
</tr>
<tr>
<td>Food Intake During Lactation</td>
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<td></td>
</tr>
<tr>
<td>More than Before Pregnancy</td>
<td>30.7%</td>
<td>35</td>
</tr>
<tr>
<td>Less than Before Pregnancy</td>
<td>16.7%</td>
<td>19</td>
</tr>
<tr>
<td>Same as Before Pregnancy</td>
<td>52.6%</td>
<td>60</td>
</tr>
<tr>
<td>Anemia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mild</td>
<td>30.3%</td>
<td>33</td>
</tr>
<tr>
<td>Moderate</td>
<td>29.4%</td>
<td>32</td>
</tr>
<tr>
<td>Severe</td>
<td>0.9%</td>
<td>1</td>
</tr>
<tr>
<td>Household Characteristics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Occupants</td>
<td>6.8 (2.8)</td>
<td>117</td>
</tr>
<tr>
<td>Improved Floor (Concrete or Wood)</td>
<td>42.9%</td>
<td>51</td>
</tr>
<tr>
<td>Latrine</td>
<td>69.8%</td>
<td>83</td>
</tr>
<tr>
<td>Source of Drinking Water</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Purchased</td>
<td>2.5%</td>
<td>3</td>
</tr>
<tr>
<td>Pump</td>
<td>42%</td>
<td>50</td>
</tr>
<tr>
<td>Cistern</td>
<td>8.4%</td>
<td>10</td>
</tr>
<tr>
<td>River or Stream</td>
<td>47.1%</td>
<td>56</td>
</tr>
<tr>
<td>Receive Remittances</td>
<td>7.8%</td>
<td>9</td>
</tr>
<tr>
<td>Household Hunger Scale</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Little to No Household Hunger</td>
<td>35.9%</td>
<td>42</td>
</tr>
<tr>
<td>Moderate Household Hunger</td>
<td>53.9%</td>
<td>63</td>
</tr>
<tr>
<td>Severe Household Hunger</td>
<td>10.3%</td>
<td>12</td>
</tr>
</tbody>
</table>

* Only measured for infants 6 months of age or older (N= 46)
3.2 Prevalence and Duration of Exclusive Breastfeeding

Figure 4 shows a histogram of the duration of exclusive breastfeeding in the study sample. The median duration of exclusive breastfeeding was 2.0 months (mean 2.2; sd 1.8). Nearly 25% of infants began receiving foods other than breast milk before one month of age. After one month, the proportion of exclusively breastfed infants gradually declines, with slightly elevated proportions of exclusively breastfed infants at 3 months (18.9%) and 6 months (11.2%).

Figure 5 shows the cumulative distribution of exclusively breastfeed infants by age, with slight inflection points at months 3 and 6.
Figure 5. Cumulative distribution of the proportion of exclusively breastfed infants by age among infants born between November 1, 2013 and April 1, 2014 in rural Léogâne Commune, Haiti, N=107.

Twelve infants younger than 6 months of age were exclusively breastfed at the time of the survey. The ages at which these infants would eventually stop exclusively breastfeeding could not be determined; that is, the variable for duration of exclusive breastfeeding was prospective for these infants and censored at the date of the survey. Consequently, these observations were not included in summary statistics of the duration of exclusive breastfeeding. The median age of these 12 infants was 4.4 months, 2.4 months beyond the median duration of exclusive breastfeeding. Thus, they are likely to have had longer-than-average durations of exclusive breastfeeding, so excluding
them may have produced a slight bias toward the null in the sample mean and median
duration of exclusive breastfeeding. However, it is still possible to calculate a
conservative upper bound on the proportion of infants exclusively breastfed until 6
months in the study sample. If all 12 of these infants continued to breastfeed exclusively
until the age of 6 months, the sample proportion of infants exclusively breastfed for 6
months would be 20%.

These infants were, however, included in analyses of the association between
exclusive breastfeeding and infant growth. For that purpose, their current age was
reported as the duration of exclusive breastfeeding.

The geographical distribution of all infants in the study sample by exclusive
breastfeeding status is shown in Figure 6.
Figure 6. Geographical distribution of infants in the study sample by exclusive breastfeeding status.

### 3.3 Distributions of Infant Growth Indicators

Figure 7 presents histograms of the three main outcome variables: infant HAZ, WAZ and WHZ. The distribution of HAZ was bimodal, with peaks at about -0.5 and -
1.5. The distributions of WAZ and WHZ were approximately normal. Figure 8 shows side-by-side boxplots of HAZ, WAZ and WHZ.

![Boxplots of HAZ, WAZ, and WHZ](Image)

**Figure 7.** Histograms of infant HAZ, WHZ and WAZ from a cross-sectional survey of infants ages 0-9 months in rural Léogâne Commune, Haiti, 2014.

---

2 Skewness-kurtosis tests were performed to test the normality of all three distributions. The distribution of HAZ produced a χ² test statistic of 4.99 (p = 0.083). The distribution of WHZ produced a χ² test statistic of 0.28 (p=0.869), and the distribution of WAZ produced a χ² test statistic of 1.14 (p = 0.564).
Figure 8. Boxplots of HAZ, WAZ and WHZ from a cross-sectional survey of infants ages 0-9 months in rural Léogâne Commune, Haiti, 2014.

Table 2 presents summary statistics for all three distributions, as well as results of t-tests comparing the means of the distributions to 0. The means of both HAZ and WAZ are significantly lower than 0 (p <0.001), meaning that average HAZ and WAZ in the study sample were significantly lower than in the reference population used to generate the WHO Child Growth Standards. Average mid-upper arm circumference (MUAC) was also significantly lower in the study population (p = 0.020), but average WHZ was not significantly different from 0 (p = 0.340).
Moderate stunting or underweight are defined as HAZ or WAZ of <2; severe stunting or underweight are defined as a HAZ or WAZ of <3. Figure 9 shows the geographic distributions of stunting and underweight among infants in the study sample.

**Table 2.** Summary statistics of infant growth indicators and results of one-sample t-tests of the null hypothesis that the mean of the distribution is less than 0.

<table>
<thead>
<tr>
<th>Infant Growth Indicator</th>
<th>N</th>
<th>Mean (SD)</th>
<th>Median</th>
<th>Test Statistic (p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height-for-Age (HAZ)</td>
<td>118</td>
<td>-0.88 (1.33)</td>
<td>-1.01</td>
<td>-7.202 (&lt;0.001)</td>
</tr>
<tr>
<td>Weight-for-Age (WAZ)</td>
<td>119</td>
<td>-0.59 (1.18)</td>
<td>-0.63</td>
<td>-5.369 (&lt;0.001)</td>
</tr>
<tr>
<td>Weight-for-Height (WHZ)</td>
<td>118</td>
<td>0.10 (1.18)</td>
<td>0.10</td>
<td>0.958 (0.340)*</td>
</tr>
<tr>
<td>MUAC-for-Age</td>
<td>46</td>
<td>-0.32 (0.89)</td>
<td>-0.26</td>
<td>-2.422 (0.010)</td>
</tr>
</tbody>
</table>

* The p-value for WHZ is for a two-sided hypothesis test that the sample mean ≠ 0.
Figure 9. Geographic distributions of stunting and underweight among infants in the study sample.
3.4 Individual-Level Variables Associated with Exclusive Breastfeeding and Infant Growth Indicators

The associations between duration of exclusive breastfeeding and each of the infant growth indicators were tested using simple linear regression. Duration of exclusive breastfeeding was significantly associated with both HAZ and WAZ at an alpha level of 0.002. However, duration of exclusive breastfeeding was not significantly associated with either WHZ (p = 0.341) or MUAC (p = 0.391).

In order to construct multiple regression models of the effect of duration of exclusive breastfeeding on HAZ and WAZ, it was necessary to first identify potential confounders. To that end, all survey variables were tested for their association with duration of exclusive breastfeeding as well as with HAZ and WAZ. Significant associations are reported in Table 3. Characteristics that were associated with longer duration of exclusive breastfeeding included early initiation of breastfeeding and maternal unemployment. Neither of these variables was significantly associated with HAZ or WAZ. Characteristics associated with shorter duration of exclusive breastfeeding included preterm birth and the practice of giving the infant tea. Both of these variables were significantly associated with lower HAZ and WAZ. Maternal height and highest level of education completed were positively associated with infant HAZ, and being employed as a market seller was negatively associated with infant HAZ.

Other variables tested for their association with duration of exclusive
breastfeeding and infant growth are included in Table 1. No significant associations were found for any of these variables, which include household-level socio-economic characteristics, household food security, infant sex, maternal age, maternal iron-deficiency and BMI.

To help assess whether preterm birth could be an effect modifier of the association between exclusive breastfeeding and infant growth, HAZ and WAZ were plotted against duration of exclusive breastfeeding by term status. These scatter plots are shown in Figure 10. There appears to be a downward trend in growth as duration of exclusive breastfeeding increases among preterm infants, but an upward trend in growth as duration of exclusive breastfeeding increases among term infants. This indicates that the association between duration of exclusive breastfeeding and infant growth may be modified by term status. However, this assessment may be subject to selection bias because of the very small number of preterm infants in the sample (N=7). Because the number of preterm infants was too small to assess potential effect measure modification, preterm infants were excluded from models of the effect of duration of exclusive breastfeeding on HAZ and WAZ.
Figure 10. Scatter plots of HAZ and WAZ on duration of exclusive breastfeeding by term status among infants ages 0-9 months in rural Léogâne Commune, Haiti, 2014.
Table 3. Bivariate associations between infant and maternal characteristics and duration of exclusive breastfeeding, infant HAZ and infant WAZ among 119 mother-infant pairs in rural Léogâne Commune, Haiti in 2014.

<table>
<thead>
<tr>
<th>Infant Chars.</th>
<th>Exposure</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Duration of Exclusive BF (Months)</td>
<td>Height-for-Age Z-Score (HAZ)</td>
</tr>
<tr>
<td></td>
<td>N  Mean (SD)  Test Statistic</td>
<td>N  Mean (SD)  Test Statistic</td>
</tr>
<tr>
<td><strong>Term Status</strong></td>
<td>Preterm 7 1.26 (1.49) 1.79* 0.074</td>
<td>7 -2.23 (0.84) 2.85* 0.005</td>
</tr>
<tr>
<td></td>
<td>Term 112 2.51 (1.87)</td>
<td>111 -0.80 (1.31)</td>
</tr>
<tr>
<td><strong>Breastfeeding Initiation</strong></td>
<td>≤1 Hour After Birth 82 2.73 (1.80) -2.29* 0.024</td>
<td>62 -1.13 (1.28) -2.18* 0.031</td>
</tr>
<tr>
<td></td>
<td>&gt;1 Hour After Birth 35 1.89 (1.90)</td>
<td>34 -0.73 (1.36)</td>
</tr>
<tr>
<td><strong>Given Tea</strong></td>
<td>Yes 63 2.02 (1.81) 2.77* 0.007</td>
<td>30 -0.78 (1.12) 2.19* 0.093</td>
</tr>
<tr>
<td></td>
<td>No 55 2.95 (1.84)</td>
<td>19 -0.67 (1.75)</td>
</tr>
<tr>
<td><strong>Maternal Chars.</strong></td>
<td>Level of Education</td>
<td></td>
</tr>
<tr>
<td></td>
<td>None 9 1.91 (1.15)</td>
<td>9 -1.91 (1.15)</td>
</tr>
<tr>
<td></td>
<td>Some Elementary School 33 0.73 (1.36)</td>
<td>34 -0.73 (1.36)</td>
</tr>
<tr>
<td></td>
<td>Some Middle School 51 0.78 (1.12)</td>
<td>51 -0.78 (1.12)</td>
</tr>
<tr>
<td></td>
<td>Some High School 19 0.67 (1.75)</td>
<td>19 -0.67 (1.75)</td>
</tr>
<tr>
<td></td>
<td>Height (cm) 111 0.05 (0.02)* 2.82* 0.006</td>
<td>55 0.05 (0.02)*</td>
</tr>
<tr>
<td><strong>Employment Status</strong></td>
<td>Employed 55 2.12 (1.94) -2.01* 0.047</td>
<td>27 -1.45 (1.26) -2.43* 0.018</td>
</tr>
<tr>
<td></td>
<td>Unemployed 60 2.82 (1.76)</td>
<td>51 -0.78 (1.12)</td>
</tr>
<tr>
<td><strong>Type of Employment</strong></td>
<td>Market Seller 27 -1.45 (1.26) -2.43* 0.018</td>
<td>27 -0.60 (1.26)</td>
</tr>
<tr>
<td></td>
<td>Farmer 27 -1.45 (1.26)</td>
<td>51 -0.78 (1.12)</td>
</tr>
</tbody>
</table>

*A Wilcoxon Rank-Sum Test; *T-Test; cANOVA; * Linear Regression Coefficient (SE)
3.5 Effect of Exclusive Breastfeeding on Infant Growth

Results of linear regression models estimating the effect of duration of exclusive breastfeeding on HAZ and WAZ are reported in Table 4. Infants who received tea were identified as having significantly shorter durations of exclusive breastfeeding and lower HAZ and WAZ than infants who did not receive tea. Therefore, this variable was included in both models as a potential confounder. Likelihood ratio tests were performed on nested models and test results are reported in Table 4. Adjusting for whether infants received tea decreased the estimate of the effect of duration of exclusive breastfeeding on height-for-age by 12.6%, and decreased the estimate of the effect of duration of exclusive breastfeeding on weight-for-age by 19.1%.

There was a significant positive association between duration of exclusive breastfeeding and HAZ and WAZ in the study sample, even after controlling for potential confounders. Each additional month of exclusive breastfeeding was associated with an increase of 0.206 HAZ (95% CI 0.08, 0.33) and an increase of 0.131 WAZ (95% CI 0.02, 0.25). According to these models, the average cumulative effect of exclusive breastfeeding over six months would be an increase of 1.236 HAZ and 0.786 WAZ. These values are equivalent to standard deviations in the international reference distributions of height-for-age and weight-for-age, adjusted for gender. To give a more interpretable example, a six-month-old girl who measures 58.8 cm would be classified as severely stunted, and a six-month-old girl who measures 61.1 cm would be classified as
moderately stunted. The difference between their heights, in HAZ, is 1.0.

Figure 11 presents histograms of the residuals of the final models, which are approximately normally distributed.

* Model adjusted for whether infants received tea.

**Figure 11.** Residuals of final models of the effect of duration of exclusive breastfeeding on HAZ and WAZ, overlaid with normal curves.

Figures 12 and 13 show observed and predicted HAZ and WAZ for term infants based on the final models. Excluding preterm infants slightly attenuated the association between duration of exclusive breastfeeding on infant growth. When preterm infants were excluded, the coefficient in the height-for-age model decreased by 4.4% and the coefficient in the weight-for-age model decreased by 13.9%.

Because of the nature of this cross-sectional survey, infant height and weight were not measured after a consistent length of time had passed since infants stopped exclusively breastfeeding. If infants are more likely to have limited nutrient intake and be exposed to pathogens once they stop exclusively breastfeeding, this length of time
could have an effect on infant growth independent of the effect of the duration of exclusive breastfeeding. Because these variables are collinear, they cannot both be included in the same model. However, in an effort to assess the effect of the length of time between halting exclusive breastfeeding and measuring infant height and weight, a variable was constructed to measure the length of time since infants were exclusively breastfed. This variable was substituted for duration of exclusive breastfeeding in models of the effect of exclusive breastfeeding on infant growth. Doing so resulted in very similar estimates of the effect of exclusive breastfeeding on infant growth. The regression coefficients are reported in Table 5. Notably, the regression coefficients are negative because time since infants stopped exclusively breastfeeding is negatively associated with HAZ and WAZ. $R^2$ values, which indicate that time since exclusive breastfeeding is a fairly strong independent predictor of infant growth outcomes, are also given in Table 5. After controlling for potential confounders, time since exclusive breastfeeding explained 14.0% of the variation in HAZ and 12.4% of the variation in WAZ. Figures 14 and 15 show observed and predicted HAZ and WAZ for term infants, using time since exclusive breastfeeding as the explanatory variable.
**Table 4.** Linear regression models of the effect of duration of exclusive breastfeeding on HAZ and WAZ among term infants ages 0-9 months in Léogâne Commune, Haiti, 2014

<table>
<thead>
<tr>
<th></th>
<th>Height-for-Age Z-Score (HAZ)</th>
<th></th>
<th>Weight-for-Age Z-Score (WAZ)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Coeff.</td>
<td>95% CI</td>
<td>Likelihood Ratio Test</td>
</tr>
<tr>
<td>Adjusted Model*</td>
<td>110</td>
<td>0.180</td>
<td>0.008</td>
<td>(0.05, 0.31)</td>
</tr>
<tr>
<td>Unadjusted Model</td>
<td>110</td>
<td>0.206</td>
<td>0.002</td>
<td>(0.08, 0.33)</td>
</tr>
</tbody>
</table>

* Models adjusted for whether infants received tea.

**Table 5.** Linear regression models of the effect of time since infants were exclusively breastfed on HAZ and WAZ among term infants ages 0-9 months in Léogâne Commune, Haiti, 2014

<table>
<thead>
<tr>
<th></th>
<th>Height-for-Age Z-Score (HAZ)</th>
<th>Weight-for-Age Z-Score (WAZ)*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Coeff.</td>
</tr>
<tr>
<td></td>
<td>111</td>
<td>-0.240</td>
</tr>
</tbody>
</table>

* Model adjusted for whether infants received tea.
Figure 12. Observed height-for-age z-scores (HAZ) and scores predicted by linear regression model of the effect of duration of exclusive breastfeeding on HAZ among term infants in rural Léogâne Commune, Haiti, 2014, N=111.

Figure 13. Observed weight-for-age z-scores (WAZ) and scores predicted by linear regression model of the effect of duration of exclusive breastfeeding on WAZ among term infants in rural Léogâne Commune, Haiti, 2014, N=111.*

* Model adjusted for whether infants received tea.
**Figure 14.** Observed height-for-age z-scores (HAZ) and scores predicted by linear regression model of the effect of time since exclusive breastfeeding on HAZ among term infants in rural Léogâne Commune, Haiti, 2014, N=111.

* Model adjusted for whether infants received tea.

**Figure 15.** Observed weight-for-age z-scores (WAZ) and scores predicted by linear regression model of the effect of time since exclusive breastfeeding on WAZ among term infants in rural Léogâne Commune, Haiti, 2014, N=111.*
4. Discussion

This study suggests that, in a population at risk of chronic undernutrition, exclusive breastfeeding may help to encourage growth and protect infants against underweight and stunting. Infants born between November 1, 2013 and April 1, 2014 in rural Léogâne Commune, Haiti were shorter and weighed less on average than the reference population of healthy infants used to generate the WHO Child Growth Standards. However, the longer infants were exclusively breastfed, the closer they came to the reference population in mean HAZ and WAZ. Over six months, exclusive breastfeeding was associated with an average cumulative increase of 1.24 HAZ and 0.79 WAZ. HAZ and WAZ correspond to standard deviations in the distributions of height and weight, adjusted for age and gender, in the reference population used to generate the WHO Child Growth Standards. This finding supports the hypothesis of a positive association between duration of exclusive breastfeeding and infant growth. However, there was no association between duration of exclusive breastfeeding and WHZ. This may be due to the low prevalence of wasting in the study sample; only 3.4% of infants had WHZ < -2. A possible explanation for this low prevalence of wasting is that all study participants were being monitored by monitrices employed by Kore Timoun, who are trained to identify and treat acute malnutrition.

In the study sample, breastfeeding initiation was nearly universal, but early supplementation was common. The median duration of exclusive breastfeeding was
only two months, with nearly 25% of infants receiving supplemental foods within the first month. Common supplements included powdered milk or formula, tea, and porridges made predominantly from locally dried and ground plantains, corn, and root vegetables. The prevalence of exclusive breastfeeding to six months in the study sample was between 11.2 – 20.0%.

After controlling for potential confounders, duration of exclusive breastfeeding was positively associated with both HAZ and WAZ. Most previous studies have found a negative, but not statistically significant, effect of exclusive breastfeeding on HAZ and a positive, but not statistically significant, effect of exclusive breastfeeding on WAZ (Jones et al., 2014). However, this study is among the first to measure duration of exclusive breastfeeding as a continuous variable, rather than current exclusive breastfeeding as a binary variable. Most previous studies have analyzed data from the Demographic and Health Surveys, which use a 24-hour dietary recall method to classify infants as exclusively breastfed or not exclusively breastfed. This method is known to lack specificity; it is prone to misclassify infants who are not exclusively breastfed but received nothing but break milk in the previous 24 hours, and therefore it tends to overestimate the proportion of infants who are exclusively breastfed (Jones et al., 2014). This misclassification could lead to a false negative association between exclusive breastfeeding and HAZ (Jones et al., 2014). By measuring duration of exclusive breastfeeding rather than current exclusive breastfeeding, this study is less prone to
misclassification bias and thus able to more accurately characterize the associations between exclusive breastfeeding and infant growth.

While breastfeeding practices may be measured retrospectively in cross-sectional studies, infant anthropometry is typically assessed at a single time point in the present. The span of time between the adoption or cessation of certain breastfeeding practices and the measurement of infant anthropometry may confound estimates of the effect of those breastfeeding practices on infant growth. For example, if exclusive breastfeeding protects against stunting, then we would expect a three-month-old infant who stopped exclusively breastfeeding two days ago to be slightly taller than a three-month-old infant who stopped exclusively breastfeeding two months ago. The operationalization of the exclusive breastfeeding variable in this study makes it possible to estimate the effect of time since infants ceased exclusively breastfeeding on current HAZ and WAZ. In the study sample, the length of time since infants ceased exclusively breastfeeding was significantly negatively associated with both HAZ (p<0.001) and WAZ (p=0.005). Specifically, each passing month since infants were last exclusively breastfed was associated with an average decrease of -0.24 HAZ (95% CI -0.35, -0.13) and -0.15 WAZ (95% CI -0.26, -0.05). This finding demonstrates further support for the hypothesis that exclusive breastfeeding protects against stunting and underweight.

Whether infants were given tea confounded the relationship between duration of exclusive breastfeeding and infant growth. Compared to infants who were not given tea,
infants who were given tea had significantly shorter durations of exclusive breastfeeding and lower HAZ and WAZ. This practice has not been measured in previous studies of breastfeeding practices in Haiti. It may be associated with both breastfeeding practices and infant growth through a set of values, beliefs and practices related to reliance on systems of traditional medicine, or through environmental factors such as geographic isolation resulting in less exposure to health education and less access to biomedical healthcare. Alternatively, it is possible that drinking tea mediates the relationship between duration of exclusive breastfeeding and infant growth if infants who cease exclusive breastfeeding earlier are more likely to get sick, and thus more likely to be given tea, and if drinking tea is somehow causally related to poor growth outcomes by increasing the risk of malnutrition or infection. In linear regression models of the effect of duration of exclusive breastfeeding on infant growth, controlling for tea resulted in only minor attenuation of the effect of duration of exclusive breastfeeding.

4.1 Implications for Policy and Practice

This study indicates that infants born in rural Léogâne Commune are at risk of retarded growth, as evidenced by significantly lower average HAZ and WAZ in the study sample than in the reference population used to generate the WHO Child Growth Standards. Furthermore, this study provides evidence of a positive association between duration of exclusive breastfeeding and HAZ and WAZ. This finding could be very useful to practitioners and policymakers seeking to prevent malnutrition in rural Haiti.
Given that the prevalence of exclusive breastfeeding to six months is currently very low at <20%, increasing the population prevalence of exclusive breastfeeding may be an effective means of reducing the risk of underweight and stunting among infants in rural Haiti.

4.2 Implications for Further Research

There have been few studies of the effect of exclusive breastfeeding on infant growth, and given the mixed evidence on this subject further research is urgently needed. A prospective birth cohort study could help to establish directionality of the relationship between exclusive breastfeeding and infant growth, and help to identify patterns in this relationship over the age of the infant. Future research should also consider whether this relationship differs for term and preterm infants.

4.3 Study Strengths and Limitations

While hunger was prevalent in the study population, household hunger was not significantly associated with duration of exclusive breastfeeding or with infant growth. Other household-level proxies for socio-economic status, as well as individual-level variables such as maternal age, education and nutritional status, were likewise not associated with exclusive breastfeeding or infant growth. This may be due to the low variance in some of these variables, given the relatively homogeneous study population. In fact, one of the advantages of collecting data in a homogenous population is that confounding variance is limited; this study sample was essentially restricted to rural
households of a certain socio-economic status, with similar levels of education, access to healthcare, and other variables that could potentially confound the relationship between duration of exclusive breastfeeding and infant growth. However, it is also possible that the measures used to assess these household-level and individual-level variables had low sensitivity or construct validity. For example, measures of body mass and iron deficiency may not accurately represent the nutritional status of women who have recently gained weight and lost blood during pregnancy and delivery.

In fact, recent qualitative evidence such as that reviewed in Part II suggests that maternal nutritional status, age, and socio-economic status are all associated with the practice of exclusive breastfeeding. In light of this qualitative evidence, concerted efforts should be made to accurately measure these variables and to tease out their effects on breastfeeding practices and potentially on infant growth.

This study improves on the design of previous cross-sectional studies seeking to assess the effect of exclusive breastfeeding on child growth. By measuring duration of exclusive breastfeeding as a continuous variable, misclassification bias in the measurement of exclusive breastfeeding is greatly reduced. However, it is not possible to establish causality when employing a cross-sectional design. Some authors have hypothesized that continued breastfeeding beyond six months is negatively associated with infant growth because smaller children are weaned later, an example of reverse causality (Jones et al., 2014). In Haiti, supplements are often seen as superior to breast
milk when the diet of the mother is poor (Dornemann & Kelly, 2012). If malnourished infants are more likely to receive supplements because their mothers are malnourished, then the observed association between duration of exclusive breastfeeding and infant growth may also be an example of reverse causality. It is also possible that duration of exclusive breastfeeding is associated with other, unmeasured variables that are themselves responsible for improved growth.

Furthermore, measuring duration of exclusive breastfeeding as a continuous variable introduces the possibility of recall bias. As opposed to the 24-hour dietary recall, this method asks mothers to recall when they first started giving their infants anything other than breast milk. While this method relies on longer-term recall and thus may be more prone to recall bias, some evidence suggests that mothers can accurately remember when they started introducing supplemental foods (Launer et al., 1992).

Finally, the sampling strategy was to survey all infants born between November 1, 2013 and April 1, 2014 in rural Léogâne Commune. This sampling strategy was more practical than taking a random sample of all infants under eight months, because the study took place over a period of three months and a population defined by age is a moving target, with infants being born into and aging out of the population each day. However, it is important to note that the sampling frame used to identify potential participants was a database maintained by Kore Timoun. This limits the external validity of the study findings, as all infants in the study were being monitored by
monitrices trained to identify and treat acute malnutrition. Certain characteristics of the study sample, especially the prevalence of acute malnutrition, cannot be generalized to other populations in rural Haiti. In fact, the low prevalence of acute malnutrition in the study sample may have prevented the detection of any differences that may exist in infant weight-for-height by duration of exclusive breastfeeding. In addition, while Kore Timoun strives to monitor all children under five in rural Léogâne Commune, some communities are very isolated and it is possible that some births were not identified for inclusion in the sample. In light of this, and because no information could be collected from non-responders (N=8), selection bias cannot be ruled out.
5. Conclusion

This study provides evidence that duration of exclusive breastfeeding is positively associated with infant height-for-age and weight-for-age in a rural, resource-limited setting. This finding suggests that increasing the population prevalence of exclusive breastfeeding may be an effective means of reducing the risk of underweight and stunting among infants at risk of malnutrition in rural Haiti. Further research is needed to determine whether the association between exclusive breastfeeding and infant growth is causal, and to identify patterns in this association over the age of the infant.
Part II: “The Day a Leaf Falls in the Water is Not the Day it Sinks”: Community Perspectives on the Benefits of Exclusive Breastfeeding and the Barriers to its Adoption in Rural Léogâne Commune, Haiti
1. Introduction

The World Health Organization (WHO) recommends that infants be exclusively breastfed until the age of 6 months, followed by continued breastfeeding paired with appropriate complementary feeding until age 2 (World Health Organization, 2003). In 2004 alone, 1.06 million deaths and 37.0 million disability-adjusted life-years (DALYs) were attributed to non-exclusive breastfeeding in the first 6 months of life (Black et al., 2008). A recent meta-analysis estimates that during months 0-5, the relative risk of all-cause mortality is 2.85 (95% CI 1.59-5.10) times greater among partially breastfed infants and 14.40 (95% CI 6.09-34.05) times greater among non-breastfed infants compared to exclusively breastfed infants (Black et al., 2008). Partial breastfeeding is associated with significantly higher risks of diarrhea (RR 3.04; 95% CI 1.32-7.00) and pneumonia (RR 2.48; 95% CI 0.23-27.15) compared to exclusive breastfeeding (Black et al., 2008). Partial breastfeeding is also associated with a three to four-fold increased risk of HIV transmission; a recent randomized controlled trial suggests that partial breastfeeding may cause gut inflammation, leading to increased intestinal permeability and thus greater susceptibility to HIV (Kourtis et al., 2013; World Health Organization, 2008).

The risks of partial breastfeeding are particularly salient in low-income countries. The use of powdered milk or formula can spread waterborne pathogens in communities without access to safe water, and impoverished mothers may dilute formula to stretch supplies, resulting in malnutrition (Andresen et al., 2007; Surjono et al., 1980).
In rural Haiti, a recent Demographic and Health Survey found that 97.6% of infants were breastfed and the median duration of breastfeeding was 17.6 months (Cayemittes et al., 2013). However, “mixed feeding from infancy is the norm” in Haiti (Dornemann & Kelly, 2012). The median duration of exclusive breastfeeding is estimated at only 1.8 months, with 20% of infants receiving foods or liquids other than breast milk within three days postpartum (Cayemittes et al., 2013). Within a few days to a few months postpartum, most infants start receiving *labouyi* or porridge made from plantain, corn or arrowroot that is dried and ground into a powder, and then prepared with boiled water and sometimes milk and sugar (Alvarez & Murray, 1981).

Previous qualitative research has found that Haitian mothers consider breast milk to be the best food for an infant (Dempsey & Gesse, 1983; Dornemann & Kelly, 2012; Roman, 2007; Thomas & DeSantis, 1995). A Haitian proverb states “lèt tete pi bon pase tout lòt lèt,” or “milk from the breast is better than any other milk” (Freeman, 2007). Breastfeeding is seen as part of being a good mother, and necessary to achieve developmental milestones such as walking (Alvarez & Murray, 1981; Dornemann & Kelly, 2012). However, the practice of exclusive breastfeeding to six months is a relatively recent phenomenon that most mothers associate with Western biomedicine. In a series of focus groups and interviews conducted in 2011, Dornemann and Kelly (2012) found that all mothers who were practicing exclusive breastfeeding “had intense contact
with the biomedical care system” and “related their behaviour to the advice they had received.”

Recent studies have identified some external factors that may motivate mothers to introduce formula or other foods; for example, maternal diet is believed to have a strong impact on the quality of breast milk, so mothers who lack the resources to purchase ‘good food’ often doubt the quality of their breast milk and decide to “back up their milk with powdered milk” (Dornemann & Kelly, 2012; Laterra, Ayoya, Beaulière, Bienfait, & Pachón, 2014; Roman, 2007). Yet with few exceptions (Alvarez & Murray, 1981; Wiese, 1976), most qualitative research on the breastfeeding practices of Haitian mothers has been conducted in urban Haiti or in immigrant populations outside of Haiti. Further study is needed to understand the unique determinants of breastfeeding practices in rural Haiti, particularly as quantitative research has identified “striking urban-rural differences” in infant feeding practices in Haiti (Graitcer, Allman, Amédée-Gedeon, & Gentry, 1984).

In addition, most of the literature on breastfeeding practices in Haiti focuses on cultural barriers to breastfeeding, including illnesses such as lèt gate (“spoiled milk”), food taboos and other beliefs related to humoral medicine or vodou (Dempsey & Gesse, 1983; Farmer, 1988; Harris, 1987; Wiese, 1976). Institutional barriers to breastfeeding such as poverty, family pressures and work responsibilities have not yet been adequately explored. Furthermore, to the best of our knowledge, no published studies
have attempted to define the specific benefits of exclusive breastfeeding as perceived by women in Haiti.

Breastfeeding has been hailed as “the great equalizer” because of its ability to give infants from all socioeconomic backgrounds a fair start at life (United Nations Standing Committee on Nutrition, 2004). However, promoting exclusive breastfeeding as a pathway to health equity requires a clear understanding of its perceived benefits as well as the barriers to its practice. Though focus group and surveys of community health workers who are directly engaged in promoting exclusive breastfeeding, this study starts to fill that gap by taking into account the lived realities of women in rural Haiti.
2. Methods

2.1 Setting

Léogâne Commune is located in the Ouest Department, less than 20 miles from Port-au-Prince. The commune consists of three lowland urban sections, located on the coast, and ten mountainous rural sections, spread out over 25,000 acres stretching south toward Jacmel (Figure 1). This study was conducted with community health workers who work in the ten rural sections, where the primary economic activity is agriculture. The population of the ten rural sections is estimated at 97,000 (Institut Haïtien de Statistique et D’Informatique, 2009).

2.2 Participants

The Children’s Nutrition Program of Haiti, known locally as Kore Timoun, employs 36 community health workers, or monitrices, in the ten rural sections of Léogâne. The monitrices are women ranging in age from 19-49 who live in the communities where they work and must be able to read and write. They undergo extensive training on the identification and treatment of acute malnutrition according to the National Protocol for the Management of Global Acute Malnutrition in Haiti (Ministère de la Santé Publique et de la Population, 2010). They monitor the growth of all children under five in their catchment areas by conducting home visits where they track child weight, height, and mid-upper arm circumference against a national standard growth chart. The monitrices also deliver health education on topics such as
nutrition, sanitation, safe water and family planning, and provide deworming medication and vitamin A. Children who meet the criteria for moderate acute malnutrition or severe acute malnutrition without medical complications are referred to the nearest outpatient nutrition clinic staffed by Kore Timoun. Kore Timoun operates 13 mobile nutrition clinics in rural Léogâne and one fixed nutrition clinic in urban Léogâne. Children who meet the criteria for severe acute malnutrition with medical complications are transported to an inpatient treatment center in Petit-Goâve.

2.3 Procedures

A written survey consisting of both closed and open-ended questions was administered to 32 monitrices to elicit their opinions about the barriers to exclusive breastfeeding in their communities. The monitrices completed the survey in Haitian Creole. In addition, 4 focus group discussions (FGD) with 6-8 monitrices each were conducted on days when the monitrices were gathered together for training. Groups were selected purposively by the Kore Timoun Community Coordinator to include monitrices with varying years of experience and from more and less rural communities. The FGD lasted between 30-60 minutes, and were conducted in Haitian Creole by LZ.

This study was guided by the Code of Ethics of the American Anthropological Association. It was conducted as part of a mixed-methods study of breastfeeding practices in Léogâne that was approved by the Duke University IRB in the United States and the Family Health Ministries IRB in Haiti.
2.4 Analysis

The FGD were recorded and transcribed verbatim. Survey responses and FGD transcripts were coded in the original Haitian Creole using themes emerging from the data, and manually analyzed for the frequency of each theme. Representative quotes were then chosen and translated into English.
3. Results

The themes that emerged from the focus group discussions can be organized into three broad categories. First, the monitrices identified what they and other women in their communities consider to be the most significant benefits of exclusive breastfeeding. Second, they identified various barriers to exclusive breastfeeding, based on their encounters with women in their communities. Third, they shared their thoughts on how to increase the prevalence of exclusive breastfeeding in Léogâne.

It is useful to first contextualize these themes by exploring how the monitrices envision their role in promoting exclusive breastfeeding, and how they view the prevalence of exclusive breastfeeding in their communities.

The monitrices, who may be the only healthcare workers that many families encounter on a regular basis, reported a great sense of responsibility and pride in their work. They reported making frequent home visits both during pregnancy, to ensure that women are knowledgeable about exclusive breastfeeding, and after birth, to ensure that mothers are following their recommendations (Box 1).
The monitrices reported having some success in convincing women to practice exclusive breastfeeding. Across focus groups, they agreed that the proportion of mothers who practice exclusive breastfeeding, while still low in most communities, has markedly improved in the past few decades.

With regard to exclusive breastfeeding, back before we were on the ground providing education, there were a lot of mothers who didn’t even know what “exclusive breastfeeding” was, or who paid it no mind. But many of them, once they started learning about it, tried to understand it and practice it.
The monitrices reported that more mothers are being exposed to public health messages that explain the benefits of exclusive breastfeeding. As a result, most mothers are now aware of the recommendation to practice exclusive breastfeeding for six months. According to the monitrices, while the proportion of mothers who achieve this goal is still low, there is a growing proportion of mothers who choose to practice exclusive breastfeeding for two or three months before introducing other foods (Box 2).

**Box 2. Overall increase in prevalence of exclusive breastfeeding.**

I tell people that exclusive breastfeeding has a wealth of treasures in it. I tell them “if you don’t believe me, try it for yourself and you will see the value and importance of exclusive breastfeeding.” And some people are starting do that. They are starting to talk about what they have gotten out of it, what advantages they have found…They are starting to become aware, they are starting to realize the truth of it.

The exclusive breastfeeding problem is something we often still encounter, but because of all of this consciousness-raising we now come across some people who have decided to practice exclusive breastfeeding…In the beginning we used to encounter more problems, but now I think these problems are starting to diminish…now you will find that nearly the majority, even if they don’t practice exclusive breastfeeding for six months, they may wait to start giving food at four months. That is, we can see how it’s diminishing, the number of people who don’t practice exclusive breastfeeding in my community is slowly diminishing, meaning there are now more people who practice exclusive breastfeeding than those who don’t practice exclusive breastfeeding.

However, it is possible that this increase in the popularity of exclusive breastfeeding is not uniform. Many of the monitrices who work in more rural and isolated communities reported that exclusive breastfeeding is still uncommon in their communities (Box 3).
3.1 Benefits of Exclusive Breastfeeding

The monitrices identified the following six benefits of exclusive breastfeeding, based on what they have experienced themselves, heard from other women in their communities, and learned in their professional training.

3.1.1 Breast Milk is Best

The monitrices reported teaching mothers that breast milk contains all of the calories, nutrients, and water an infant needs. They believe that powdered milk and solid foods are nutritionally inferior, in addition to being “too strong” for an infant’s stomach (Box 4).
Box 4. Breast milk is best.

I always try to teach them that breast milk, mother’s milk, it is a complete food. It contains all the necessary nutrients. It contains water, food, everything. They don’t need to worry that the child is thirsty because the child finds water in the mother’s milk. I always tell them that, because most of the people you talk to about exclusive breastfeeding, they tell you “my baby is thirsty, he’s crying, he’s crying.” I tell them that if they see their baby crying, they should give him the breast. They should continue breastfeeding him.

We always talk with them, give them good advice, we always tell them that if they practice exclusive breastfeeding, they don’t need...the child will find everything in the milk. In the breast he will find everything, it has sugar, it has water...

An infant cannot find everything he needs in powdered milk.

The porridge that they feed the baby, what will that porridge do for him?

I tell them that the foods they are buying to prepare for their children, the milk - you can’t just give any type of milk to an infant who is barely one month old, it might not be good for his stomach.

Another example that I often give when I talk to people, I tell them that mothers who give their babies food too early, when they feed an infant too early do they not see that the baby throws it up? I give them this example, I met a mother the other day who did this, her baby was just born and she took a box of milk and gave it to him. And it upset the baby’s stomach. I said, “you see, what have I been telling you, the milk is fighting with the baby’s stomach because it’s too strong for him.” I told her it was too strong for him.

3.1.2. Exclusive Breastfeeding Saves Money

Infant formula is prohibitively expensive for many families in rural Léogâne.

Moreover, custom dictates that charcoal, not firewood, be used to prepare food for infants because it is a cleaner-burning fuel (Alvarez & Murray, 1981). In addition to the cost of powdered milk or formula, mothers must bear the cost of fuel and the opportunity cost of carrying and boiling water. One strategy the monitrices use to
convince mothers of the value of exclusive breastfeeding is to prove to them how expensive mixed feeding can be (Box 5).

Figure 16. Milk and infant formula on display at a grocery store in urban Léogâne. A 2500g tin of powdered milk costs 1000 gourdes ($22) and a 900g tin of formula costs 900 gourdes ($20).

Box 5. Exclusive breastfeeding saves money.

To buy a tin of milk might cost 750 or 1000 gourdes ($18-25). One tin won’t even last the baby eight days. Whereas with that same money, in the communities where we live, right now people have dried beans, they have greens, they could make some stew, some food, with 1000 gourdes they could make food for the whole house for a week.

When we explain to them the advantages of breastfeeding, we tell them that when they make porridge for the baby, that money could have bought them some bananas, which they could have eaten themselves.

We tell people that exclusive breastfeeding has many advantages both for the mother and for the baby. For example, we tell them that the mother will have more time. She won’t need to boil water, she won’t need to go buy milk, she won’t need to go buy charcoal.
Box 5. Exclusive breastfeeding saves money (cont).

We always inform them about what exclusive breastfeeding is, how they can nourish the child, that is, if they have five gourdes, with that money they can buy a tin of milk and some provisions to store at the house, and then when they wake up in the morning they can eat that, and then sit and breastfeed the baby. If they had bought some bread to make soup for the baby, with that bread, they could have eaten themselves and then breastfed the baby.

We always try to help the mothers understand that when they do not practice exclusive breastfeeding, they will spend more money. Why will they spend more money? With a baby, you can’t just wake up in the morning and cook him some cornmeal and greens. But you, the mother, you can eat that. I wake up in the morning, I go pick some greens, I cook some cornmeal, and I make a stew for myself to eat. I might eat some plantains too, and then I breastfeed my baby. So I ask them, “can you just wake up and cook a little cornmeal to give to a baby who was just born?” I say, “that’s one advantage.” I say, “One, you are going to spend more money because you can’t just give a baby any type of food. For a baby, you have to buy a tin of milk for 1000 gourdes.” They say “that’s so much!” I say, “and with that money, you could eat well, and then breastfeed your baby.” I tell them, “now compare when you prepare food for yourself to eat, versus for your baby to eat, and tell me if you think they both cost the same.” Now, they begin to reflect. Now they say, “oh, she’s not lying, because when you have to spend 1000 gourdes on just one tin of milk for the baby, if you went to the market, how much food could you buy? It is beyond our means to buy food for the baby. Instead, we should buy food for the house, for us to eat.”…Now the gears are turning. “We need charcoal to prepare food for the baby, we can’t make it over a wood fire for the smoke to contaminate it. It’s true. Don’t you know it, what this person is saying is true. She says there are advantages to exclusive breastfeeding. Because with 1000 gourdes, I could either buy some milk for the baby or I could go to the market and buy some cornmeal, some millet, some barley, even some rice, and I could also buy carrots, potatoes, greens, a little oil, and then everyone in the house could eat, and I could also eat and then I would breastfeed my baby. My dear, I see the truth in it!” After all of these maneuvers to convince the person, they finally come around. They come around because when they start to think about what they spend on the baby, just on the baby alone, with that same money they could buy food, and then they have these two big “jugs” of milk for the baby, which are even better for him! You have to make all of these maneuvers in order to convince the mother, and then she will see all the advantages, and moreover once she sees the results with her own eyes, she will never go back. She will reflect. And later, when you talk to her, she will say “yes, what you said, I see it has some truth to it.” Because all the money I was spending to feed the baby, I now see that I can take that money to buy food for the house, for us to eat, and besides when you prepare food for a baby, it isn’t the same as preparing food for an adult. I could go buy some cornmeal and cut up some greens to cook with it, and while I’m out picking the greens I could gather some firewood, put the firewood out back, and put the food on the fire for myself to eat. But for a baby, I couldn’t do that. Because the baby would be exposed to microbes, because when you boil water for a baby you must cover it, but even if it is covered, the wood smoke could enter underneath the cover, and it could be contaminated. All of this is dangerous to a baby."
The monitrices reported that many mothers gave their infants unmodified powdered milk instead of infant formula. According to the monitrices it is not ignorance, but financial hardship that precludes many mothers from purchasing formula.

It’s because Celia [a brand of infant formula] is more expensive than Greenland [a brand of unmodified powdered milk]. If I have 200 gourdes (approximately $4.25), I can buy a small tin of Greenland, but I can’t buy a tin of Celia. It’s more expensive.

3.1.3 Exclusive Breastfeeding Supports Physical and Cognitive Development

The monitrices also reported that exclusive breastfeeding facilitates better physical and cognitive development. Children who are exclusively breastfed are believed to perform better in school, learn to walk and talk more quickly, and maintain a healthier weight relative to other children (Box 6).

**Box 6. Exclusive breastfeeding supports development.**

Some places you go, people thank you and tell you that exclusive breastfeeding is good for them, because their child is developing well, especially in the case of school, when the child starts going to school they see the advantages of exclusive breastfeeding, they see a difference between what people used to do and what they are doing today. There are others who say that the child never falls behind, they see the child calling out for them, they see that the child is learning words, is starting to speak, and his little language is more advanced than that of other children who were not breastfed exclusively.

There are people who say “when I look at my child, she seems older than her age.” And there are others who say “when I send my child to school, I see him speaking a few words that he learned from the teacher, starting to repeat them, and when I look at the other children they are not the same way, so I see that exclusive breastfeeding is a good thing, I can practice exclusive breastfeeding.”

There is a mother near my house who has three children, and she breastfed all of them exclusively, and her children are doing very well. One of them has not yet turned two, and he is always talking, running, running around everywhere, there is nothing he can’t say. When other people see that, it encourages them to practice exclusive breastfeeding.
The monitrices stressed that failure to practice exclusive breastfeeding can have long-term effects. They note that “when a child grows up with an infirmity,” although “some people like to blame it on a werewolf or say that a neighbor put a curse on him,” the cause is more likely to be a lack of exclusive breastfeeding.

I also tell them that if they don’t practice exclusive breastfeeding now, they will pay later. “When the child goes to school, you better not say he has a learning disability, because it has to do with everything you used to give him when he was little. When you don’t practice exclusive breastfeeding, it will come back to haunt the child.” I explain to them...
that when a child is not exclusively breastfed, all of these problems can appear when the child starts to grow up. Because jou yon fèy tonbe nan dlo, se pa jou a li koule (“the day a leaf falls in the water is not the same day it sinks”). When the child starts to grow up, you will see that he starts to have problems.

3.1.4 Exclusively Breastfed Infants Get Sick Less Often

The monitrices also reported that children who are exclusively breastfed are less likely to develop diarrhea, skin rashes, and other health problems (Box 7).

**Box 7. Exclusively breastfed infants get sick less often.**

Children who are exclusively breastfed don't get sick easily.

[Quoting woman who practiced exclusive breastfeeding]: “My other children were often sick. When I gave them food, I had to visit the doctor all the time. But the one that I breastfed exclusively for six months, I never went to the doctor with her. Even though I often had diarrhea, she rarely had diarrhea.”

When we talk about the advantages for the baby, we say that the baby will not get sick easily, he won’t get diarrhea easily, we also say that the baby will get something from the mother when he is born, as soon as he comes out, when she gives him her first milk. We say that in the first milk, he will find vitamin A for one, and for two it will clear...it will help the child clear skin infections. We explain all of these advantages that they will find if they practice exclusive breastfeeding. There are others too.

The most important thing for me, the advice that I would give to the other monitrices, just as the program made us aware that breast milk has a substance in it that the child cannot get from any other source, which is only in breast milk, we should always teach people that it is only found in breast milk, even if the child were to find all the other nutrients he needs elsewhere, it is only in breast milk that he can find that substance that develops his immune system, so that he can have a good system of defense.

A breastfed child will not catch microbes easily, but when the mother does not practice exclusive breastfeeding he can come into contact with microbes, which can cause the child to be plagued with a number of things, the child can fall ill.
Box 7. Exclusively breastfed infants get sick less often (cont).

There are some mothers who do not practice exclusive breastfeeding, for example if Johanne and I are both mothers and I breastfed my baby exclusively but Johanne did not, Johanne will always provoke me, saying “what does exclusive breastfeeding really do for you?” as a way to discourage me, but in spite of this there are mothers who practice exclusive breastfeeding. And they call me on the phone to ask me to talk to the people who are discouraging them from practicing exclusive breastfeeding and get them to stop. Because they see the advantages, they call me to tell me “my child never has diarrhea, he never has anything.” That is someone who practices exclusive breastfeeding. But those who do not practice exclusive breastfeeding, when their children are three days old they start giving them food, and on the day the child is born or the day after I go to weigh him and his weight is normal, but then when he is one month old, two months old, because of the food they are giving him he starts to fall behind, he becomes weak and sick.

We also tell mothers that when they don’t practice exclusive breastfeeding, they may encounter difficulties, because the child may develop rashes, the child may start to smell bad, and at that point they see that this is very serious matter. People who practice exclusive breastfeeding will tell them, “my child has no rash, his teeth are coming in, he has no rash, nothing.” And then they start thinking, “shit, maybe it is true.” Because they start to compare their children to children who are exclusively breastfed. Because they truly don’t develop the same way. They don’t develop the same way.

3.1.5 Exclusive Breastfeeding Promotes Mother-Child Bonding

A few of the monitrices mentioned that exclusive breastfeeding helps mothers bond with their babies (Box 8).

Box 8. Exclusive breastfeeding promotes mother-child bonding.

People who practice exclusive breastfeeding, they spend all their time taking care of the child, so they have more time together, the child is attached to the mother, their spirits are connected together, there is a good bond when people practice exclusive breastfeeding.

We tell people that they will have more time to give their babies affection. Their babies will receive more affection.

We tell people that the child will have a better bond with the mother.
3.1.6 Exclusive Breastfeeding is a Natural Method of Family Planning

One monitrice mentioned that exclusive breastfeeding is a natural method of family planning.

I tell people that when a mother breastfeeds her baby exclusively, it is a family planning method for the mother. That means that she won’t be having babies one right after the next. During the first six months, she is on birth control.

3.2 Barriers to Exclusive Breastfeeding

To understand why the prevalence of exclusive breastfeeding lags behind awareness of its benefits, it is necessary to examine the factors that may prevent or discourage women from practicing exclusive breastfeeding. These factors are both socio-cultural and institutional.

3.2.1 Socio-Cultural Barriers

Perhaps because exclusive breastfeeding is not part of the cultural tradition of rural Haiti, the monitrices report greater skepticism of exclusive breastfeeding among the older generation in Léogâne. 9 of the 32 monitrices who responded to the written survey indicated that this skepticism prevents many mothers from practicing exclusive breastfeeding, especially those who live with their parents or grandparents (Box 9).
The advice of the older generation may have even greater weight in rural communities where mothers are likely to live in the same home or *lakou* (“courtyard”) as their parents and grandparents. This is especially true in the case of *timoun k’ap fé timoun*, or “children having children” (Box 10).
Box 10. “Children having children.”

Sometimes you have children having children, and they live with their parents and grandparents, who in their time did not practice exclusive breastfeeding. They always say “when I was growing up, I had ten children, I had however many children, and I never used to breastfeed them exclusively, I gave them food. What is going on these days? All they ever talk about is exclusive breastfeeding, and when I had children I gave them maskriti oil and miskat, and now they tell us that these things we used to give our children, if you give them these things they will die of a stomachache.”

These days there are children having children. You yourself, the monitrice, you could truly win them over, you understand, you could give them advice, you could give them advice until they practice exclusive breastfeeding. But they live at their mother’s house, their father’s house. It took a lot of convincing, a lot of education to stop them from using lok. They don’t use lok any more. Because you’ve told them, ”don’t give babies lok, it hurts their stomachs. The doctors are against it, as well as us monitrices.” We taught them not to give babies lok any longer, to the point that in every community where I work, if you went there you wouldn’t find two people who give babies lok. But, because the parents of the mother are taking care of her, she won’t practice exclusive breastfeeding. Because from the time she gets pregnant, her parents are asking her ”aren’t you going to make some manioc flour to put here for the baby, to leave for the baby?” Even if the mother wanted to practice exclusive breastfeeding, she wouldn’t do it because of the parents. From the time the baby is born she will put water to boil over the fire to give the baby.

From the time he is born, the mother will be grating miskat to give the baby. Because of her parents who are taking care of her. That’s why she won’t practice exclusive breastfeeding. Because she is a young child. That is, there are many things that used to happen in the past, when our grandparents were young, and they still hold on to those principles, they want to raise their children the same way…meaning there is a system, ever since the forties when they themselves were having children, in which they want to keep the mother, so that when her baby is born he will be raised the same way. That’s why today, even if the mother wanted to practice exclusive breastfeeding, because of her parents she isn’t able to practice exclusive breastfeeding.

That can cause people to not practice exclusive breastfeeding, because they are children who have not yet reached the age for having children. Meaning they are not yet ready, they aren’t ready to have a baby. So when they have the baby, they are still in the care of their grandparents, so even if they wanted to practice exclusive breastfeeding, they do what they are told. So that is one reason why people don’t practice exclusive breastfeeding.

Near my house, there are many mothers who practice exclusive breastfeeding. But most of them are the older mothers. The young mothers don’t want to practice exclusive breastfeeding. They receive the education, but they don’t want to do it. Why? Because when they have their baby, they have it in their parents’ house, and their parents give them trouble.
In addition to the parents and grandparents of the mother, the monitrices reported that the father of the infant can influence the feeding decision, especially if he lives with or provides for the mother. He may discourage the mother from practicing exclusive breastfeeding; however, his influence is not always deterministic. In some cases, the father encourages the mother to practice exclusive breastfeeding (Box 11).

**Box 11. Input of the father.**

There are fathers who say that they are the ones providing for their babies, so their babies have to eat.

If the mother does not have a solid plan to practice exclusive breastfeeding, if she does not know what it can do for her, how it can help her child develop, she might just follow the advice of her husband, because she is under his roof, she is in his care. But even in those cases, there are some mothers who do it anyway behind their husband’s back, when the husband thinks they are giving the baby food they are actually making a little food for themselves to eat and then breastfeeding the baby.

I find some parents near my house who, even if the baby’s father wants the mother to practice exclusive breastfeeding, the mother does not agree.

For me, I have two children whom I breastfed exclusively. I found that there are a lot of advantages to exclusive breastfeeding. I have one child who is now 17. My husband, he is a health agent, and he told me to breastfeed her exclusively. I told him I would give it a try for myself. In my experience, I found many advantages.

Traditionally in Haiti, infants are given a purgative after birth and before the initiation of breastfeeding. This purgative, called lôk, is made with castor oil, grated nutmeg, sugar and garlic, and typically administered for the first three days after birth in order to expel the meconium (Alvarez & Murray, 1981). Whether or not most parents still give their babies lôk was a subject of debate among the monitrices. In the written survey, each monitrice was asked to estimate how many people in their communities...
practice giving infants lòk after birth. 25 (81%) of the monitrices responded that “few” or “very few” people practice giving lòk. According to most of the monitrices, lòk is becoming “a thing of the past.” They believe its popularity has diminished due to greater awareness that lòk can be harmful and that colostrum is the best food for newborns (Box 12).

Box 12. Practice of administering lòk.

The people you see who do it, they are usually people who never go to the health posts, who won’t listen to anyone, who are very private, who are not interested in attending group meetings, either the women’s group or the health committee, they just keep to themselves, they stay at home, they see socializing as a waste of time…but not everyone uses it, what they call lòk, because some people know it’s no good, it can give the child a stomachache.

With regard to lòk, some mothers may not practice exclusive breastfeeding but even they don’t use lòk. If you know someone who does, it is probably because that person doesn’t participate in any activities at all. Because I think that if they participated in any activities we would have had a chance to share even a few words with them…where I work I am always questioning people, for example if I wasn’t there when the baby was born, I ask them “what are you giving him,” and they say “only breast milk.” I tell people that lòk can give children microbes. Whereas breast milk cleans out the intestines, and it doesn’t transmit microbes. I always tell people that. In the past you could have observed this practice, but the majority of people these days, even if they don’t practice exclusive breastfeeding they don’t use lòk.

We explain to people that long ago, when exclusive breastfeeding did not exist, when a baby was born the great-grandparents always made them throw out the first milk, which contains vitamin A, which is called the colostrum, and we explain to them the value and importance of the first milk, that they shouldn’t throw it out anymore, as soon as the baby is born they should put the breast in her mouth so that she can find the first milk.

However, 6 (19%) of the monitrices reported that “more than half” or “most” families in their communities give infants either lòk or boiled water for three days postpartum to “clean out” their intestines. In these cases, lòk replaces the colostrum, which is viewed as inferior because of its yellow color and sticky texture.
Near my house, as soon as the baby is born, as soon as he comes out of the mother, unless the mother is practicing exclusive breastfeeding she feeds him lòk.

Another reported concern is that breast milk does not satisfy the infant. Crying children may be perceived to be crying for food or water. 17 of the 32 monitrices who responded to the written survey mentioned that this perception discourages many women from practicing exclusive breastfeeding (Box 13).

**Box 13. Perception that breast milk is insufficient.**

There are those who tell you that ever since the child is born, he is hungry. The child is thirsty, the child needs to eat, the child keeps crying and crying for you to feed him, and they are afraid...they say they don't really believe that the child is not hungry, they say the child is always thirsty. They say they need to give the child a little water.

Those who lie about practicing exclusive breastfeeding, they say the child is crying for food, they don't really think that exclusive breastfeeding is good for the child.

Everyone in my community, when I talk about exclusive breastfeeding, when I ask them how they are doing, they say “oh, my child needs food, he is three months old now, I can’t keep doing this, I’m going to give him food.” They say “I can’t continue like this because my child is crying.”

When you ask them why, they say that when they breastfeed the baby he cries a lot, he isn’t finding what he needs, breast milk doesn’t do anything for him, his stomach is empty, he is hungry. So they choose to give him food.

When the child is hungry and thirsty breast milk is not enough for him, but when they give him food he stops crying.

A few of the monitrices reported hearing mothers say that exclusive breastfeeding could give babies gas. Cases of mothers who could not breastfeed because of a physical problem such as inverted nipples were reported by very few monitrices. Aesthetic
reasons were also uncommon, and were usually attributed to very young mothers who wanted to “stay young.”

3.2.2 Institutional Barriers

In the focus groups, the monitrices described how financial hardship prevents many mothers from practicing exclusive breastfeeding. Several monitrices adamantly stated that *problem ateman se pa gen mwayen*, or “the exclusive breastfeeding problem is not having enough money.” All of the monitrices who responded to the written survey indicated that not having enough money to eat well was a significant barrier to exclusive breastfeeding. Mothers were reported to be especially vulnerable if they were not receiving any financial support from the father of their baby or other family members (Box 14).

The monitrices reported that many mothers worry that exclusive breastfeeding will make them hungry, weak and emaciated unless they have enough money to eat well. Hunger pains were a common complaint reported in the written surveys.

There are also some people who don’t practice exclusive breastfeeding, like a woman who had a baby for his father, but the father isn’t taking care of the mother or the baby. The mother has no one to give her anything, in that sense she is hungry, and as they say *chen grangou pa jwe* (“hungry dogs don’t play”), so she doesn’t practice exclusive breastfeeding. If the father doesn’t take care of the mother or her baby, if he leaves them, and if the mother has no one else to help her, she says in that sense, she says she can’t practice exclusive breastfeeding.

Some of the monitrices knew mothers who had difficulty producing enough milk to breastfeed, which they associated with a poor diet.
Box 14. Financial hardship.

People are always saying that they don’t have the means to practice exclusive breastfeeding, the baby breastfeeds so much, they don’t have enough food to eat in order to breastfeed exclusively, things like that.

I know some parents who say they don’t have the means to practice exclusive breastfeeding. Meaning, if they were to practice exclusive breastfeeding, they would have to find food 24/7, so that they could eat themselves and then breastfeed...The mothers in my community, I always talk to them about exclusive breastfeeding, and they always say they don’t have the money to breastfeed exclusively, they have to give the baby food.

That can happen, people saying they have financial difficulties...When I list for them all of the advantages of exclusive breastfeeding, they say they would have to find a lot of food for themselves to eat, they would have to have money to be able to breastfeed exclusively.

There are those who say “I don’t have money. Only big shots can breastfeed for six months. Myself, I have no money.”

Some mothers say they can’t breastfeed their children exclusively for six months, because it would make them weak, because they don’t have regular access to food.

It would make them emaciated. They would have no money to eat if they spent six months sitting at home.

Some mothers don’t have the means, especially if they don’t have their own garden where they could find nourishment.

The monitrices often referred to the problem of not eating well as a lack of *fós* (“strength”) or *kouraj* (“courage”) The lack of *fós* and *kouraj* was directly linked to economic deprivation (Box 15).
Box 15. Lack of *fós* and *kouraj*.

There are those who say, "If I were to practice exclusive breastfeeding, where would I find the *fós* to give my child the breast? I don't have the *fós* for that."

When I talk to them about exclusive breastfeeding, they always say they don't have the *fós* for it.

There are those who say they'll waste away.

There are those who tell you they don't have the *kouraj*, they don't have the *fós* to breastfeed exclusively for six months, so at four months they start giving food.

I often encounter this in my community. There are people who start but don't finish. There are many who tell you “oh, I can do it for two months, but I don't have the *kouraj* to breastfeed for six months.”

There are people who say, "I really would like to, but I don't have the *kouraj* to breastfeed.”

There are people who don't have the *fós*, you understand, who don't have enough *fós* to sit there and breastfeed a baby.

In my community we always teach about exclusive breastfeeding, but they always tell me that they don't have the *kouraj* to breastfeed a child for six months without giving him food, without giving him water.

When I talk to them about exclusive breastfeeding, they always say they don't have the *fós* for it.

There are those who say they'll waste away.
Unfortunately, the same mothers who are under financial stress are reportedly unable to buy powdered infant formula, which is much more expensive than powdered milk.

Often when we encounter this problem, the mothers know what type of milk they ought to give a baby. But the economic problem, it counts more. Meaning, when they buy a little can of Celia [a brand of formula], it won’t even last them four days. When they buy a big can of Alaska, a big can of Greenland [brands of powdered milk], that gives them more time. That’s one of the reasons why the economic problem crushes them, because the milk for them to give their babies, whatever lasts longer, whatever gives them a few more days, that’s what they use.

The monitrices often explain to these mothers that exclusive breastfeeding is the least expensive way to feed a baby. With the same amount of money she would spend on powdered milk and baby food, a mother could feed herself and the rest of her family. However, they note that some mothers are reluctant to accept this message. “When you

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**Box 15. Lack of fòs and kouraj (cont).**

They say "it makes me weak, so I’m going to give him food."

They say that if they had fòs and kouraj they would practice exclusive breastfeeding...They have no fòs, they have no food to eat to give them fòs so they can make milk to give the child."

People are always saying that they have no food, so they can’t breastfeed...Another problem we often encounter, there are people who say "Oh, I am already anemic, I can’t breastfeed my baby, I myself don’t have any food, so I can’t give my baby the breast." We often encounter these problems.

These mothers, the problem that prevents them from breastfeeding exclusively, there are those who say they lack nourishment, and this is something we have observed, sometimes we can confirm that it’s true, that the mothers wake up, and while we are doing home visits we may arrive around nine or ten, and we find that the mother has not yet lit the cooking fire, and she is breastfeeding her baby, and if we don’t have anything to give her, that really touches us.
try to tell people that, there are some who accept but there are others who will never accept what you say, the myth is still stuck in their heads.”

Related to the problem of poverty is the need to work to support oneself, as well as older children and other family members. Women in rural Léogâne often cultivate family jaden (“gardens” or “fields”) where they grow seasonal produce such as peanuts, beans, coffee, corn, manioc, mangoes, bananas and sugarcane. Women also run the network of thousands of outdoor markets in Haiti, where they sell packaged goods, secondhand clothes, prepared foods, and produce from their jaden. In Haiti, it is not culturally acceptable to bring a baby to the market, a space that can be hot, crowded, and dirty (Alvarez & Murray, 1981). As a result, infants are left at home in the care of older siblings or grandparents while mothers go to the market to sell or shop. This means that mothers who have work responsibilities related to farming or selling are often prevented from practicing exclusive breastfeeding. 27 of the 32 monitrices who responded to the written survey reported that work responsibilities were a significant barrier to exclusive breastfeeding in their communities (Box 16).
Box 16. Work responsibilities.

There are mothers who have such a great burden on their backs, sometimes they have children and they would really like to spend time admiring them, truly breastfeeding them for six months, but there is a problem. They have other children they are responsible for, older ones, and they have to go sell at the market, if they have a garden they have to tend to it, so they have to leave the child in the care of another older one in order to make a life for them. Sometimes they aren’t even together with the father, and that promises a lot of difficulties.

Mothers say they can’t spend six months at home. They have to leave home in order to sell or to work in the garden. They don’t have enough money to sit at home.

They say they are responsible for working in the garden, going to the market, doing business, once they finish giving birth they leave the baby in the care of his grandmother, his older sister, his older brother or his father, because they say they must beat the pavement so that their children can eat.

There are people who say, “oh, I don’t have time to sit around breastfeeding the baby, to sit at home all day, I don’t have time for this ‘exclusive breastfeeding’ thing.”

They can’t spend six months at home neglecting their businesses, because when they don’t sell the house doesn’t eat, there is no money coming in so they have to go sell, which means they need to leave food for the baby when he cries.

And there are some people, on account of their activities, who don’t have time to breastfeed their babies, because they need to leave the child at home from seven in the morning until seven at night.

There are some communities where if the mother is a market seller, she leaves during the night and returns in the afternoon, so she can’t sit around to breastfeed her baby exclusively, she has to give him food. Working in the garden and going to the market. Those are the things that prevent people from wanting to practice exclusive breastfeeding. Working in the garden and going to the market.

Near my house, where I work, there are parents who don’t practice exclusive breastfeeding, and some of them say that they can’t just sit around at home, they have gardens, they have businesses, and some of them have to leave one day to come home the next day, God willing.

Working in the gardens and going to the market are the reasons why people don’t practice exclusive breastfeeding. They don’t have time.
The link to poverty is evident as single mothers, mothers who have multiple children to support, and mothers who receive less financial support from their families and social networks are under the most pressure to work.

The monitrices also reported that mothers who suffer from serious illness might have difficulty breastfeeding. However, they identified very few physical illnesses that could make it difficult or impossible for a mother to breastfeed; those included breast cancer, tuberculosis, and breast abscesses. Mothers who have “lost control” due to mental illness are also reported to have difficulty breastfeeding.

There is a young woman who just gave birth near my house. But people like her, when you teach them about exclusive breastfeeding, it’s like you are wasting your breath. Because something isn’t right with their heads, they just leave the baby on the ground and run off. She might leave at five in the morning and not get back until five at night...If she had her head on straight, I could sit her down and give her advice, tell her that a fifteen-day-old baby needs to be breastfed, needs to be given breast milk and no food. But the mother is never there. The grandmother has taken on the responsibility of caring for the baby. She has to put food in the sun to dry to give the child, and I can’t tell her not to do that, because the baby can’t stay healthy without eating. The only thing I can tell her is, “with everything you are preparing for the child, try to do it in a sanitary fashion, so that the child isn’t exposed to more microbes. You see? Because if the child is not
breastfeeding exclusively, he can catch microbes. Take precautions with the food you are preparing for the child, don’t put it just anywhere to grind it.”

### 3.3 Strategies for Promoting Exclusive Breastfeeding

In the written surveys, the monitrices were asked to suggest ways in which Kore Timoun could encourage more mothers to practice exclusive breastfeeding in rural Léogâne. 58% (18/31) of the monitrices suggested that Kore Timoun continue to provide education, both through the monitrices and through support groups for breastfeeding mothers. Another 58% (18/31) mentioned that education alone was not enough to motivate behavior change, because “for some people, if they don’t go out and work every day they won’t eat.” They suggested that a food assistance program or other financial incentive might make it possible for more mothers to practice exclusive breastfeeding (Box 17).

<table>
<thead>
<tr>
<th>Box 17. Strategies for promoting exclusive breastfeeding.</th>
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<tr>
<td>Kore Timoun can continue providing good education so that women start practicing exclusive breastfeeding, so that they become aware of all the advantages they could find in exclusive breastfeeding.</td>
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<tr>
<td>There needs to be more education for the mothers about exclusive breastfeeding to encourage them, to help them understand the value of exclusive breastfeeding.</td>
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<tr>
<td>People ask us whether we are going to give them food, that’s what they need to be able to practice exclusive breastfeeding.</td>
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<tr>
<td>Education cannot convince many of the mothers; they always ask us what we will give them. If Kore Timoun sponsored a small food assistance program, or some other incentive, I think they would be willing to make the effort.</td>
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In the focus groups, some of the monitrices expressed their frustration that certain mothers in their communities expected financial assistance, which the monitrices are unable to give (Box 18).

**Box 18. Expectation of financial assistance.**

There are some mothers who tell you that in order for them to practice exclusive breastfeeding, you have to give them some food to eat. You have to give them some food to eat so they can have courage. If we want to advise them to practice exclusive breastfeeding, we must first give them food to eat so that they can have the courage to practice exclusive breastfeeding.

There is a mother who always asks me, every month when I come to weigh her child, “If the child’s weight is not normal, are you going to give me food to feed him so that his weight becomes normal?” I say, “well, I can’t give you food to feed him, but there is one way I can help. If his weight is not normal every time I come to weigh him, I can refer him to a place where Kore Timoun will help both of you find care until he gets better. That’s one way I can help you, but other than that I can’t help. Even if I were to give you a little support today, I can’t help you all the time.

When you go on home visits, it’s difficult…because you have no food to give the child, or to give his mother. That is why this message about exclusive breastfeeding, only people who are very conscientious, who sit and listen, will accept it. Other than that, if you want to convince someone to practice exclusive breastfeeding, every month you need to give them a little food, or a little money to buy food.

The monitrices attribute this expectation of financial assistance or food partly to poverty and partly to the practice, common among NGOs in Haiti, of handing out food or small gifts as an incentive for participating in health education programs, attending clinic appointments, etc.

They used to have an exclusive breastfeeding meeting every Wednesday, where every mother would bring her children, and they would sit and eat. But [name of organization] was responsible for that program. Every month they would give the mothers gifts of wash basins, mosquito nets, etc. Every Wednesday they had a meeting in a big room, and everyone would come.
One monitrice told a story about a mother who asked her, after she had exclusively breastfed for six months, how she would be paid. The monitrice found out that the mother’s sister, who lived in Port-au-Prince, had been receiving small gifts of flour, oil, and baby toys every month from the clinic she was attending because she was practicing exclusive breastfeeding. Such handouts of food items like flour and oil are called *manje sinistre*, named for the food aid of questionable quality distributed to natural disaster victims.

The monitrices also acknowledged the important role of peer feedback in the decision to practice exclusive breastfeeding. They reported that women who have positive experiences with exclusive breastfeeding are inclined to share their experiences with other women in their networks, who are in turn more likely to practice exclusive breastfeeding (Box 19).
Box 19. Role of peer feedback.

Sometimes when you are explaining to people the values and advantages to be found in exclusive breastfeeding, they don’t really believe you. For them to truly believe, they need to see it for themselves, not just hear you say it. But people who do practice exclusive breastfeeding, they never regret it, you understand, because they have experienced its advantages for themselves. Those mothers truly believe.

In the women’s group and the health committee, especially the women’s group, if there is one person among them who has breastfed exclusively, she will tell the others “exclusive breastfeeding is good,” when you are teaching them about exclusive breastfeeding. “exclusive breastfeeding is a good thing, I have a baby that I breastfed exclusively, I didn’t even give her water, and I found that it has a lot of advantages.”

There are those who encourage the other mothers - ‘this is how I did it, this is why it was a good choice for me’ - and the others take that as a lesson.

There are people who have begun to see the truth of it. Near my house, there are many people who have started to practice exclusive breastfeeding. Because one interests the next. One interests the next. She becomes a role model, the one who practices exclusive breastfeeding. She presents her child, she says “look, here he is.”

[Talking about a woman who practiced exclusive breastfeeding] After she had her first child, that gave her confidence, she knew that if she had another child she would also breastfeed that child exclusively. You see, people who practice exclusive breastfeeding, you never have to speak another word about exclusive breastfeeding to them. Because they now have the baton in their own hands, they are now preaching to others. They become like pastors, preaching the message to others. Telling them what advantages they will find in exclusive breastfeeding. Both for themselves and for their children.

The way I see it, the mothers who have experience with exclusive breastfeeding...even if it lasted for ten months they would still do it. Those who have already done it. They say that even if they had to do it for ten months, without eating or drinking, they would do it because they have come to recognize its importance. They have come to recognize its importance.
4. Discussion

This study contributes a deeper understanding of the cultural beliefs and institutional barriers that may discourage mothers from practicing exclusive breastfeeding in rural Haiti. It corroborates previous findings that most mothers who have had some exposure to biomedicine know that doctors and community health workers want them to practice exclusive breastfeeding (Dornemann & Kelly, 2012). More widespread awareness has likely led to an increase in the prevalence and duration of exclusive breastfeeding in rural Haiti. However, efforts to promote exclusive breastfeeding may have had the unintended effect of reinforcing a “reluctance to discuss traditional beliefs,” and consequently a lack of awareness of those beliefs among biomedical health professionals (Dornemann & Kelly, 2012). Furthermore, efforts to educate women about the benefits of exclusive breastfeeding have largely ignored the very real socio-economic barriers that may prevent them from practicing exclusive breastfeeding, such as malnutrition and separation due to work.

Consistent with previous research conducted in rural Haiti (Alvarez & Murray, 1981), the monitrices reported that most mothers in rural Léogâne start giving their infants porridges (labouyi) within a few days to a few months after birth. However, the practice of feeding infants a purgative (lòk) immediately after birth may have declined in some communities in recent decades. This finding is corroborated by the three most recent Demographic and Health Surveys, which find that the percent of breastfed infants in rural Haiti who receive anything other than breast milk within three days postpartum declined from 53.5% in 2000 to 32.8% in 2006, and to 20% in 2012 (Cayemittes et al., 2007,
This trend may reflect greater exposure to public health messages regarding recommended infant feeding practices. Indeed, most of the monitrices reported that more and more mothers in their communities are becoming aware of the benefits of exclusive breastfeeding.

The most widely recognized benefits of exclusive breastfeeding in Léogâne were that breast milk is safer and more nutritious than other foods, exclusive breastfeeding is less expensive than mixed feeding, and infants who are exclusively breastfed get sick less often and develop better than other children. According to the monitrices, greater awareness of these benefits has led more mothers to attempt exclusive breastfeeding, even if only for two or three months. It is important to note that the monitrices viewed exclusive breastfeeding as affecting child health not only during infancy but throughout the life course, as demonstrated by a proverb used by one of the monitrices to explain how a lack of exclusive breastfeeding could negatively impact child development: jou fèy tonbe nan dlo se pa jou a li koulé, or “the day a leaf falls in the water is not the day it sinks.”

Unfortunately, despite greater awareness of the benefits of exclusive breastfeeding, there are still several barriers to its adoption in rural Léogâne. Some of these are socio-cultural; for example, the monitrices reported that community elders often deter young women from practicing exclusive breastfeeding. Many women in rural Haiti live with their mothers and grandmothers, who may discourage them from practicing exclusive breastfeeding because “when exclusive breastfeeding didn't exist, children still survived.” This suggests that, especially in rural Haiti, efforts to promote
exclusive breastfeeding may need to target influential elder community members in addition to women of childbearing age.

While there may be other cultural perceptions that deter women from practicing exclusive breastfeeding, the majority of the barriers to exclusive breastfeeding reported by the monitrices were institutional. These barriers are related to socio-economic status, particularly the need to work and the lack of food security experienced by mothers of low socio-economic status. To illustrate this, one reason that many mothers give for early supplementation is their belief that breast milk is not enough to satisfy a hungry infant. This is noted elsewhere in the literature (Dornemann & Kelly, 2012; Laterra et al., 2014), but is typically treated as a “myth” or faulty cultural perception that can be changed through education. One study concludes that “continued promotion of recommended [infant and young child feeding] practices is crucial, along with adaptation of messaging to address common misunderstandings and concerns” (Laterra et al., 2014). While the monitrices stressed the importance of continuing to provide health education, they acknowledged that behavior change is often impossible in the face of material deprivation. Many mothers lack confidence in their breast milk because they do not have the means to eat well. They perceive their socioeconomic status and nutritional status as inextricably linked.

In addition to undermining the confidence women have in the quality of their breast milk, poor diet can interfere with exclusive breastfeeding by exacerbating the hunger and weight loss that accompany lactation. Currently, the biological effects of malnutrition on lactation are not well understood. A recent meta-analysis concluded
that “[m]aternal undernutrition has little effect on the volume or composition of breast milk unless malnutrition is severe” (Black et al., 2008). However, what constitutes “severe,” and what additional factors might influence this relationship, are questions as yet unexplored. There is some evidence that the energy and nutrient drain associated with lactation may be more pronounced among women of lower socio-economic status, whose poor nutritional status preceded their pregnancies (Allen et al., 1994). A process known as maternal depletion occurs in many low-income populations, whereby closely spaced cycles of pregnancy and lactation can severely reduce energy and nutrient reserves. A negative association between breastfeeding and maternal nutritional status has been found in rural Kenya (Gewa, Oguttu, & Yandell, 2012). It is important to note that exclusive breastfeeding can provide some protection against iron depletion and related adverse nutritional outcomes during the period of lactational amenorrhea. However, limited evidence on the potential negative effects of lactation on maternal nutritional status suggests a need for further research on the mechanisms that may expose breastfeeding mothers in low-income, food-insecure populations to greater risks of malnutrition.

Hunger is also likely to play a role in the ability and willingness of mothers to practice exclusive breastfeeding. Lactating women have even greater energy and nutrient needs than pregnant women. In the first 4-6 months of life, infants double their birth weight, and breastfeeding mothers need an additional 700 calories per day, 200 from pregnancy-related fat stores and 500 from diet, to support this rapid growth (Katz, 2001). The level of hunger in Haiti is classified as “extremely alarming” (IFPRI, 2012).
More than 50% of the population is malnourished (IFPRI, 2012). Further research is needed to explore how, in a food-insecure population, hunger may affect the ability and willingness of mothers to practice exclusive breastfeeding.

More is known about the effects of psychological stress on lactation, although the underlying biological mechanisms are still poorly understood (Lau, 2001). However, less attention has been paid to the effects of chronic, environmental stress such as that experienced by mothers living in poverty. We do not know how such chronic stress might affect the biological process of milk production, or how it might limit the mental and emotional capacity of mothers to keep up with the demands of exclusive breastfeeding.

Another way in which socio-economic status may prevent women from practicing exclusive breastfeeding is through the need to work to support their families. Work interferes with exclusive breastfeeding when mothers must travel far from home, and sometimes sleep away, in order to take goods to the market. Many of the monitrices reported that the need to work was a common barrier to exclusive breastfeeding, because mothers “don’t have enough money to sit at home.”

The fact that many mothers are aware of the recommendation to practice exclusive breastfeeding for six months, but so few do so, indicates that education is only part of the solution. Another example of this is the finding that many mothers give their infants unmodified powdered milk instead of infant formula. A previous study conducted in urban Léogâne found that few mothers were aware of the difference between powdered milk and formula (Dornemann & Kelly, 2012). While it is true that
powdered milk is often stocked alongside formula at grocery stores and pharmacies, the monitrices in this study reported that most mothers in rural Léogâne are aware that the two are different. Yet, while they are aware of the availability and the superiority of fortified cereals and infant formula, they do not have access to these types of supplements because of their socio-economic status.

4.1 Implications for Policy and Practice

The suggestions that the monitrices shared may be useful to organizations seeking to improve the health of mothers and infants in Haiti. Their testimony highlights the importance of structural change to allow all women access to the information they need as well as the ability to choose how to feed their infants. The seemingly paradoxical attitude toward breastfeeding among many mothers in rural Léogâne, who believe on the one hand that "breast is best,” but are still reluctant to practice exclusive breastfeeding, points to underlying issues of poverty, food security, and the autonomy of women over their own bodies and surrounding physical and social environments. The common practice of incentivizing exclusive breastfeeding with gifts is likely unsustainable, and only scratches the surface of the problem of hunger in Haiti. Organizations dedicated to improving maternal-child health should work not only to spread awareness about the benefits of exclusive breastfeeding, but also to remove the institutional barriers to its practice, such as poverty and food insecurity.
4.3 Implications for Further Research

This study reveals a need for further research on the biological effects of malnutrition and maternal depletion on lactation, as well as research on the environmental effects of food insecurity and stress on the ability to breastfeed.

4.4 Study Strengths and Limitations

The benefit of enlisting community health workers as informants is the ability to consolidate a breadth of experiences across communities. However, their opinions may be biased because they actively work to promote exclusive breastfeeding in their communities. In addition, the results of this study may not be applicable to other areas of rural Haiti.
5. Conclusion

In recent decades, greater awareness of the benefits of exclusive breastfeeding has likely led to an increase in the proportion of mothers who attempt exclusive breastfeeding in rural Haiti. Unfortunately, there are still several barriers to its widespread adoption. Some of these barriers are cultural; for example, many community elders are wary of exclusive breastfeeding, which is seen as a modern phenomenon. Yet more often, the inability to practice exclusive breastfeeding is related to socio-economic status. Many women travel far from home to sell goods at the market. Those who stay home lack confidence in their breast milk because they do not have the means to eat well. In a low-resource setting, socioeconomic status and nutritional status are inextricably linked. The fact that many mothers are aware of the recommendation to practice exclusive breastfeeding for six months, but so few do so, indicates that education is only part of the solution. Future efforts to promote exclusive breastfeeding as a means to combat child morbidity, mortality and malnutrition in Haiti should pay attention to underlying issues of poverty and food security, and the effects of the physical and social environment on the choices women make regarding infant feeding.
Appendix A: Survey Instrument

Dat Ankèt la Fèt:  _________ / _________ / 2014

Mwa  Dat  Ane

# : __________________________

Abitasyon: ________________

Sèks: ______

A. Kesyon sou Sante ak Nitrisyon Tibèbe a

A8. Nan ki dat tibebe ou fèt?

Mwa  Dat  Ane

A9. Èske li te fèt anvan nèf mwa?

Wi / Non

A10. Ki kote ou te akouchè?

______________

A11. Konbyen tibebe a te peze lè l te fèt?

______________

A12. Èske ou kapab di m ki kalite manje ou konn bay tibebe ou?

______________

A13. A ki laj tibebe ou te komanse manje manje sa yo?

______________

A14. Èske ou pa jann bay tibebe a tete?

Wi / Non

A15. Kilè ou te komanse bay tibebe a tete?

______________

A16. Èske w ap toujou bay tibebe a tete?

Wi / Non

A17. Kilè ou te sevve tibebe a?

______________

A18. Poukisa ou te sevve?

______________

A19. Èske ou panse yon tibebe kapab pran tout vitamin li bezwen nan lèt manman l?

Wi / Non

A20. Èske ou kwè ou manje ase manje pou ou kapab bay tibebe ou tout vitamin li bezwen nan alètman, san bay li lòt manje?

Wi / Non

A21. Ki laj ou panse se yon bon laj pou komanse bay tibebe ou dlo?

______________

A22. Ki laj ou panse se yon bon laj pou komanse bay tibebe ou manje?

______________
A23. Ki laj ou panse se yon bon laj pou komanse bay tibebe ou fōmila oswa lèt? 

A24. Ki lèt ou bay tibebe a?

A25. Ëske ou bay tibebe ou te?

A26. Nan semèn ki fèk pase a, konbyen jou tibebe ou te gen dyare?

B. Kesyon sou Sante ak Nitrisyon Manman an

B1. Lè ou te ansent, èske ou panse ou te manje plis, oubyen pi piti, oubyen memm kantite manje chak jou konpare ak anvan gwosè la?

Plis Pi Piti Menm Kantite

B2. Kijan ou te jwenn plis manje?

B3. Èske ou te konn bwe vitamin lè ou te ansent?

Wi / Non

B4. Si non, poukisa?

B5. Aprè tibebe a te fèt, èske ou panse ou te manje plis, oubyen pi piti, oubyen memm kantite manje chak jou konpare ak anvan gwosè la?

Plis Pi Piti Menm Kantite

B6. Èske ou konn bwe vitamin kounyeya?

Wi / Non

B7. Nan kat semèn ki fèk pase a, èske yon jou te rive ou pa t gen manje memm lakay ou paske ou pa t gen kòb pou achte manje?

Wi / Non

Chak kilè sa te rive nan kat semenn ki fèk pase?

1 = Pa souvan (1-2 fwa)
2 = Tanzantan/kèk fwa (3-10 fwa)
3 = Souvan (plis pase 10 fwa)

B8. Nan kat semèn ki fèk pase a, èske ou pa t jann al dòmi grangou paske ou pa te manje ase manje pandan jounen an?

Wi / Non

Chak kilè sa te rive nan kat semenn ki fèk pase?

1 = Pa souvan (1-2 fwa)
2 = Kèk fwa (3-10 fwa)
3 = Souvan (plis pase 10 fwa)
B9. Nan kat semèn ki fèk pase a, èske ou pa t janm pase yon jou san manje paske pa te gen ase manje?

Wi / Non

Chak kilè sa te rive nan kat semenn ki fèk pase?
1 = Pa souvan (1-2 fwa)
2 = Kèk fwa (3-10 fwa)
3 = Souvan (plis pase 10 fwa)

B10. Èske ou soufri feblès?

Wi / Non

B11. Kouman ou santi sante w kounyeya?

C. Kesyon Demografik

C1. Ki laj ou genyen?

C2. Nan ki ane ou fèt?
C3. Èske ou te al lekol?

Wi / Non

C4. Nan ki klas ou te rive?

C5. Kisa ou fè pou w antre lajan?

C6. Èske ou mennen tibebe ou avèk ou pandan w ap travay?

Wi / Non

C7. Nan men kimoun ou jwenn kòb pou achte manje?
   1 = ou mem
   2 = mari/papa timoun nan
   3 = fanmi
   4 = zanmi

C8. Èske ou gen moun lòt bò ki konn voye kòb ba ou souvan?

Wi / Non

D. Kesyon Ekonomik

D1. Konbyen granmoun ak timoun viv ansann avèk ou lakay ou?

D2. Èske gen moun ki viv ansann avèk ou ki ede ou avèk tibebe a?

D3. Konbyen timoun ou genyen?
D4. Pi souvan, ki kote ou jwenn dlo pou w bwè?
   1   achte
   2   pi
   3   tiyo
   4   kaptaj
   5   larivyè/sous

D5. Êske ou trete dlo a anvan ou bwè l?
   0   pa trete
   1   bouyi l
   2   mèt klowòks
   3   mèt aquatab
   4   filtre l

D6. Êske medanm nan viv anba yon tant?

   Wi / Non

D7. Avèk kisa atè kay la fèt?
   1   li simante
   2   mozayik
   3   tè
   4   bwa

D8. Avèk kisa tèt kay la kouvri?
   1   tôl
   2   beton
   3   pay

D9. Êske gen yon latrin nan lakou a?

   Wi / Non

E. Mezi

<table>
<thead>
<tr>
<th>Manman</th>
<th>Tibebe</th>
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<tbody>
<tr>
<td>Pwa:</td>
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References


