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Poverty and Malnutrition in Haiti

Findings from Nord-Est and Centre Departments

Angelino Viceisza, Kodjo Aflagah, Atabanam Simbou, Dixita Gupta, Kodjo Koudakpo

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Executive Summary

The 2019 Global Hunger Index, a composite measure of undernourishment, child wasting, child stunting, and child mortality, ranks Haiti 111th of 117 countries included in the index. Fifty percent of the country's population were found to be undernourished, while 21.9 percent of children under the age of five were stunted and 3.7 wasted. Based on the index, the level of hunger in the country was considered serious/alarming. These problems are likely to be exacerbated by the COVID-19 pandemic.

The main purpose of this Food Security Desk Review and Data Analysis report is to provide an overview and synthesis of the poverty and food security situation in Haiti, with a particular focus on two of the country's ten administrative departments, Nord-Est and Centre. In Nord-Est, 49 percent of the population lives in the two lowest quintiles of the asset distribution, compared to 56.7 percent in Centre.

Section 1 of the report primarily relies on desk research (i.e., review of academic literature, project documents, and policy reports) and to some extent, stakeholder consultations. Section 2 quantitatively explores determinants of poverty and malnutrition using the 2017 round of the Haiti Demographic and Health Survey (HDHS).

Key findings (also summarized in Table 1) are:

Politics: After the 29-year autocratic dynasty of the Duvalier family fell in 1986, Haiti underwent a cycle of ill-fated presidencies and coups. In recent years, political leaders have attempted to establish a more democratic political system. Those efforts have been partly derailed by natural disasters, including the 2010 earthquake and Hurricane Matthew in 2016, and social unrest driven by corruption scandals and rising prices of fuel and other key commodities.

Socioeconomics: Key pillars of the Haitian economy, and thus sources of income for households (HHs), are: agriculture (as high as 51 percent if rural), commerce and petty trade (27 percent), tourism and travel (14 percent), and construction (8 percent). In Nord-Est, about 20 percent of HHs engage in professional/clerical jobs, 37 percent in sales, and 23 percent in agriculture. Eighteen percent are unemployed. In Centre, 18 percent of HHs engage in professional/clerical jobs, 46 percent in sales, and 14 percent in agriculture. Twenty-one percent are unemployed.

The nationwide unemployment rate of 13.5 percent continues to drive migration by a substantial part of the Haitian population, particularly from the areas of interest (AOIs). In Nord-Est, 13 percent migrate to other communes, 30 percent to other departments, 51 percent to the Dominican Republic, 10 percent to Latin America, and 10 percent to the United States. There is relatively little internal migration from Centre, but 32 percent migrate to the Dominican Republic, 46 percent to the US, and 15 percent to Latin America.

Land, Environment, Climate Change, and Natural Disasters: With 30 percent of Haitian HHs engaged in farming activities, access to land for cultivation and productive purposes is key. At the national level, 61 percent of HHs own or have access to agricultural land—37 percent in urban areas and 77 percent in rural areas. Sixty-five percent of HHs in Nord-Est and 69 percent in Centre have access to land usable for agriculture.

Gender: About 41 percent of HHs in Nord-Est are headed by women, as are 36 percent of HHs in Centre. At the national level, 12 percent of women reported having experienced domestic violence at

least once in their lives. Recent anecdotal evidence suggests this percentage may have increased, particularly in Nord-Est. In Centre, transit on the border with the Dominican Republic presents many risks to women, including violence (physical, sexual, economic, verbal/psychological), and illicit human smuggling and trafficking, including for purposes of forced sex work.

Youth: In Haiti, 54 percent of the population is under 25, with 31 percent between 10 and 24 years old. Of women between the ages of 15 and 19, 84.2 percent have not worked (likely for pay) in the last 12 months, while 60 percent of men have. Among women between the ages of 20 and 24, 58.4 percent have not worked, while 34.6 percent of men have not.

Livelihoods context: Most of our analysis utilizes the livelihood zones classification established by the Famine Early Warning Systems Network (FEWS NET) created by USAID in 1985. As established by FEWS NET, livelihood zones are geographic areas of a country where people generally share similar options for obtaining food and income and similar access to markets. In Haiti, the zones are numbered on the FEWS NET map from HT01 (Dry coastal maize and charcoal) to HT09 (Urban). Two such livelihood zones encompass the departments of interest to this analysis. Both departments contain zones designated as HT02 (North tubers and horticulture) and HT03 (Central Plateau maize and tubers). In Nord-Est, Fort-Liberte and Ouanaminthe are entirely designated as HT02, while the remaining arrondissements, Trou-du-Nord and Vallieres, are split across HT02 and HT03. The Centre department is entirely in the HT03 zone.

Agricultural production: HHs in HT02 areas engage in the production of tubers such as sweet cassava, yams, and sweet potatoes as staple crops and horticulture such as bananas, black beans, and pigeon peas as cash crops. HHs in HT03 areas engage in the production of tubers and maize as staple crops and some horticulture as cash crops. High elevation regions of Centre also produce citrus fruits and coffee.

Market and food access: The main local market in HT02 zones is Ouanaminthe, which is in Nord-Est. In HT03 zones, rugged terrain makes market access difficult, particularly during the rainy season.

Staple foods: The main staple foods in HT02 zones are maize, peas, and beans, yams and potatoes, rice and flour, and avocado. The main staple foods in HT03 zones are rice, maize, and beans.

Food insecurity: Based on the Consolidated Approach to Reporting Indicators of Food Security approach established by the World Food Programme (WFP), 50.7 percent of the Haitian population is either moderately or severely food insecure. In Nord-Est, 40.2 percent of the population is food insecure, compared to 54.1 percent of the population in Centre. This also translates into low food diversity, low intake of vitamin A, and low consumption of iron-rich foods.

Lessons from food security and nutrition programs: A diverse set of actors, both local and international, are conducting a range of interventions, among them are agricultural insurance, cash transfers, job training, and school feeding programs. Collectively, their findings offer insights into effectively designing interventions in Haiti. Main lessons learned stress the importance of building government capacity, being prepared for disasters, being ready to target and reach beneficiaries (e.g., rosters and financial inclusion/access through bank accounts or mobile wallets), engaging the community, being gender responsive, and enhancing coordination between all actors, stakeholders, and partners.

Poverty analysis: HHs defined as poor fall in the bottom quintile of the wealth-index distribution within a Department, based on the 2017 HDHS. Results from the econometric analysis suggest that:

- In Nord-Est, HHs who own radios or mobile phones are less likely to be poor, while those who own gas/petrol lamps or live in houses with dirt/mud walls are more likely to be poor.

- In Centre, HHs who own radios or mobile phones are less likely to be poor while those who live in houses with dirt/mud walls are more likely to be poor. Additionally, those who access drinking water from wells or live in houses with cane/palm walls or leaf roofs are more likely to be poor. The same holds for those who lack access to a fixed or mobile place for handwashing. Finally, HHs that own sheep or chickens, have more members above 65 years of age, and live in houses with cement walls or have access to solar energy are less likely to be poor.

Child malnutrition analysis: A child is considered stunted (wasted) if the z-score of height-for-age (weight-for-height) is below -2 standard deviations, based on the 2012 and 2017 HDHS.

Stunting: Econometric analysis suggests that in the Nord-Est and Centre departments, children are less likely to be stunted if their mother has a post-secondary education or they are boys. They are more likely to be stunted if their mother is married. In Centre, children in HHs headed by women are less likely to be stunted, whereas children with average birth size are significantly more likely to be stunted compared to those who were very large at birth.

Wasting: Pairwise comparisons suggest that children are more likely to be wasted if the mother is not literate or divorced or separated. They are less likely to be wasted if the father has a professional or managerial job.

Table 1. Summary of Findings

Theme	Nord-Est	Centre	Source
Poverty rate (HHs in lowest two quintiles)	49 percent of HHs	56.7 percent of HHs	2017 HDHS
Stunting	21 percent	30 percent	2017 HDHS
Wasting	1.5 percent	2.9 percent	2017 HDHS
Migration destination	Other communes (13 percent); other departments (30 percent); Dominican Republic (51 percent); Latin America (10 percent); United States (10 percent)	Dominican Republic (32 percent); United States (46 percent); Latin America (15 percent)	CNSA (2019)
Access to land usable for agriculture	65 percent	69 percent	DHS (2017)
Main production	Tubers, horticulture, maize	Tubers, horticulture, maize	FEWS NET (2015) and CNSA (2019)
Staple foods	HT02: Maize, peas, beans; yam and potatoes; rice and floor; avocado HT03: rice, maize, beans	Rice, maize, beans	FEWS NET (2015) and CNSA (2019)
Food insecure	40.2 percent	54.1 percent	CNSA (2019)

Theme	Nord-Est	Centre	Source
Food diversity and nutrition	Low food diversity Low intake of vitamin A Low iron-rich food consumption	Low food diversity Low intake of vitamin A Low iron-rich food consumption	CNSA (2019)
Poverty determinants	Radio, mobile phones, or gas/petrol lamps (-); dirt/mud walls (+)	Radio, mobile phones (-); dirt/mud walls (+); no hand-washing place (+); ownership of sheep or chicken (-); number of HH members over 65 (-)	2017 HDHS
Child malnutrition determinants: stunting	Mother has post-secondary education (-); mother is married (+); boys (-)		2017 HDHS
Child malnutrition determinants: wasting	Mother not literate (+); mother divorced or separated (+); Father has a professional or managerial job (-)		2017 HDHS

Note: HT02 stands for North tubers and horticulture livelihood zone and HT03 for Central Plateau maize and tubers livelihood zone.

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List of Acronyms

ACF	Action Contre La Faim International
AOI	area of interest
AVSF	Agronomes et Vétérinaires Sans Frontières
CLM	Chemen Lavi Miyò
CNSA	Coordination Nationale de la Sécurité Alimentaire
CRS	Catholic Relief Services
DHS (2017)	Report for the 2017 Demographic and Health Survey for Haiti (see reference list)
EFSA	Emergency Food Security Assessment
FAO	Food and Agriculture Organization
FDI	Industrial Development Fund
FEWS NET	Famine Early Warning Systems Network
FFP	Food for Peace
FTF	Feed the Future
GHI	Global Hunger Index
GII	Gender Inequality Index
GoH	Government of Haiti
2017 HDHS	Analysis based on the 2017 Demographic and Health Survey Data for Haiti
HH	household
HHH	head of household
HT	FEWS NET livelihood zone for Haiti
IFAD	International Fund for Agricultural Development
IFRC	International Federation of Red Cross
ILO	International Labor Organization
in	inches
IPC	The Integrated Food Security Phase Classification
KL	Kore Lavi
LOKAL	Limyè ak Organizasyon pu Kolekyivite yo Ale Lwen
MARNDR	Ministère de l'Agriculture des Ressources Naturelles et du Développement Rural
MBEP	Market-Based Emergency Program
MAST	Ministry of Social Affairs and Labor (*Ministère des Affaires Sociales et du Travail*)
Mt	metric ton
NGO	non-governmental organization

OLS	Ordinary Least Squares
pp	percentage point(s)
PRRO	Haiti Protracted Relief and Recovery Operation
RFEO	Rassemblement des Femmes Engagées de Ouanaminthe
SD	standard deviation
SYFAAH	System of Financing and Agricultural Insurance
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Fund
UNPF	United Nations Population Fund
USAID	United States Agency for International Development
VAC	Village Assistance Committee
WASH	water, sanitation, and hygiene
WFP	World Food Programme

1. Desk Review

1.1 Country and Regional Context

1.1.1 Overview and Politics

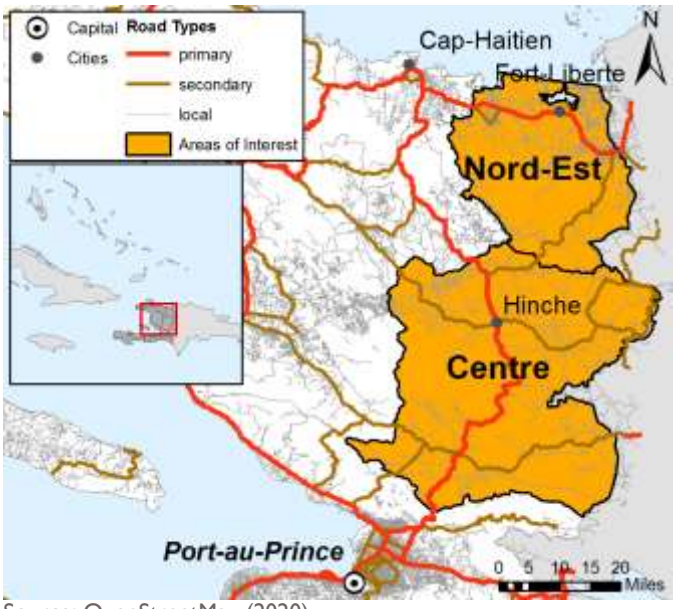
Haiti is a Caribbean country that shares the island of Hispaniola with the Dominican Republic. With an approximate population of 11.5 million people, Haiti is often lauded as the first country to abolish slavery and the only nation in history established as a result of a successful slave revolt (e.g., Matthewson 1996). In fact, the Haitian revolution (1791–1804) has been credited with spurring political activism in several other Caribbean nations around that time (e.g., Geggus 2001). Despite its successful beginnings in 1804 as an independent nation led by Black people, Haiti has struggled politically and economically, particularly in recent decades (e.g., Hauge 2018). For example:

- After the 29-year autocratic dynasty of the Duvalier family, characterized by state-sanctioned violence, fell in 1986, Haiti underwent a cycle of ill-fated presidencies and coups. Since then, Haiti has attempted to establish a more democratic political system; however, such efforts have partly been derailed by natural disasters including the 2010 earthquake and Hurricane Matthew in 2016, and by coup d'états in 1991 and 2004. Between 2011 and 2017, three presidents and ten prime ministers succeeded each other, creating political instability. In 2018–2019, protests related to corruption and misuse of public funds, particularly the PetroCaribe scandal, threatened the stability of President Jovenel Moise. Further exacerbated by rising petrol prices, high cost of living, and corruption allegations, the events known as "Pays lock" (i.e., country lockdown) led to interrupted water supplies, food price increases, decrease in daily incomes, and disrupted operations by hospitals, schools, humanitarian organizations, businesses, and government institutions, according to a 2019 report by the International Federation of Red Cross and Red Crescent Societies. Moise's government failed to hold scheduled parliamentary elections in October 2019, and the President has been ruling by decree with no seated parliament since January 2020. Now, the country faces potentially damaging consequences from the spread of the COVID-19 virus.
- With a Gross Domestic Product per capita of US$756 in 2019, Haiti is classified as the poorest country in the Western Hemisphere, according to the World Bank.[1] It ranked 111th of 117 countries included in the 2019 Global Hunger Index, jointly published by the International Food Policy Research Institute, Concern Worldwide, and Welthungerhilfe. According to the Global Hunger Index, almost 50 percent of the population is undernourished, 21.9 percent of children under five are stunted, and 3.7 percent of children under five are wasted. Haiti's level of hunger is classified as serious/alarming. This has led to significant migration, both from rural to urban areas and across international borders, in particular to the Dominican Republic and other Caribbean countries, the United States of America, and Latin America.

[1] See overview at https://bit.ly/31dTHyD. Accessed on August 3, 2020.

According to Léon (2019), local governments were formally established in Haiti between 1987 (with a constitutional change) and 1996 (through additional laws); although there are still movements in that direction (e.g., Laurent and Pierre 2012 and Hauge 2018). The country has 10 departments (Artibonite, Centre, Grand'Anse, Nippes, Nord, Nord-Est, Nord-Ouest, Ouest, Sud-Ouest, and Sud), distributed over 42 arrondissements and 140 communes/municipalities. A representative is appointed by the government in each department, and a mayor is elected in each municipality. Municipal councils are elected every four years. Figure 1shows the AOIs, which for this report are Nord-Est and Centre departments. Nord-Est has an approximate population of 367,038, according to the 2019 Integrated Food Security Phase Classification (IPC), with 49 percent living in the two lowest quintiles of the asset distribution (own calculations based on 2017 HDHS). The department has four arrondissements: Fort-Liberte, Ouanaminthe, Trou-du-Nord, and Vallieres. Centre has an approximate population of 707,601 (IPC 2019), with 56.7 percent living in the two lowest quintiles of the asset distribution (2017 HDHS). It too has four arrondissements: Cerca-la-Source, Hinche, Lascahobas, and Mirebalais.

Figure 1. Areas of Interest



Source: OpenStreetMap (2020).

While some indicators suggest local governance across Haiti has improved or at least has the potential to improve (e.g., Hauge et al. 2015) as a result of programs such as the USAID-funded Limyè ak Organizasyon pu Kolekyivite yo Ale Lwen (LOKAL) program implemented by Tetra Tech ARD, which sought to strengthen local governments, previously mentioned developments have likely slowed such progress (e.g., Laurent and Pierre 2012; also see Section **Error! Reference source not found.**). For example, Hauge et al. (2015) report that the 2010 Haitian elections were marred by violence and irregularities. According to the report, 21.6 percent of ballots in Nord-Est and 8.2 percent of ballots in Centre were untallied in official election results (see Hauge et al., figure 1, p. 276). Given this and related electoral conflict, one of the study authors discusses the difficulties in institutionalizing elections in a separate paper (Gilles 2014).

1.1.2 Socioeconomics, Migration, and Remittances

According to CNSA (2019), key pillars of the Haitian economy, and thus sources of income for HHs, are: agriculture (as high as 51 percent if rural), commerce and petty trade (27 percent), tourism and travel (14 percent), and construction (8 percent). For urban HHs, 39 percent rely on petty trade, followed by salaried work at 29 percent. Only two percent of urban HHs appear to rely on agriculture. For rural HHs, agriculture is the main source of income (51 percent), followed by petty trade (33 percent). HHs also borrow quite significantly. Around one-third needed to borrow money in the year before the survey (CNSA 2019) and among those, 87 percent were able to borrow. They borrowed

from: friends and family (36 percent), local traders (24 percent), credit unions and informal groups (11 percent), banks (5 percent), and other formal financial institutions (13 percent). This seems consistent with Ministère de l'Agriculture des Ressources Naturelles et du Développement Rural (MARNDR) (2012a), which found that many communes have relatively high loan approval rates (greater than 50 percent), except for some parts of Nord-Est.

While the unemployment rate in Haiti has decreased in recent years to about 13.5 percent (World Bank, https://bit.ly/3agYL9z), concerns remain about labor-market prospects and economic security. As a result, a substantial part of the Haitian population continues to migrate, particularly from the AOIs:

- Based on the 2010 Census, the Haitian diaspora comprised approximately 20 percent of the country's population, primarily living in the United States, the Dominican Republic, and other Caribbean/Latin American countries, although evidence suggests this increased significantly after the 2010 earthquake (e.g., https://bit.ly/3hCq0NT). At the national level, about 66.2 percent of migrants move to other communes within the same department or to different departments. Others cross international borders, primarily to the Dominican Republic (19.2 percent), the United States (9.2 percent), and Latin America (5.7 percent). The main reasons cited for such migration are work/labor (40 percent), education (26 percent), security (4.6 percent), and health (3.9 percent).
- For the AOIs, people migrate internationally more so than the national average. This should not be surprising given both AOIs share a border with the Dominican Republic (recall Figure 1). Thirteen percent of migrants in Nord-Est migrate to other communes, 30 percent to other departments, 51 percent to the Dominican Republic, 10 percent to Latin America, and 10 percent to the United States. There is relatively little internal migration from Centre. There, 32 percent of migrants migrate to the Dominican Republic, 46 percent to the United States, and 15 percent to Latin America.
- The main reasons cited for migration in Nord-Est are work/labor (60 percent) and education (10 percent). For Centre, the main reasons cited are work/labor (90 percent), education (20 percent), and security (22 percent).

A key consequence of, and thus reason for, migration is the ability to send resources to support family and friends, a.k.a. remittances (e.g., Torero and Viceisza 2015). In fact, Amuedo-Dorantes et al. (2010) find positive effects of remittances on children's education in Haiti. There is also a substantial body of literature documenting the potentially positive effects of remittances on key development outcomes (e.g., Yang 2011 and the references within). According to CNSA (2019):

- Eighteen percent of HHs in Haiti received remittances in the six months prior to August 2019. Remittances are the main source of income for 20 percent of urban HHs and 13 percent of rural HHs. In Nord-Est, urban HHs constitute 49 percent and rural constitute 51 percent. In Centre, urban HHs constitute 22 percent and rural constitute 78 percent. Also see discussion further below related to COVID-19.
- For urban HHs, remittances from outside Haiti are sent primarily from North America (43 percent), Latin America (13 percent), and the Dominican Republic (10 percent). Internal remittances primarily come from the capital, Port-Au-Prince (18 percent), and other areas (12 percent). These remittances are used to pay for food (65 percent), education (11 percent), rent (five percent), and other basic needs (10 percent).
- For rural HHs, remittances from outside Haiti are sent primarily from North America (35 percent), Latin America (14 percent), and the Dominican Republic (14 percent). Internal remittances primarily

come from Port-Au-Prince (21 percent) and other areas (12 percent). These remittances are mainly used to pay for food (66 percent), education (14 percent), rent (two percent), and other basic needs (nine percent).

Particularly in light of COVID-19, there are several concerns for the economic security of Haitian HHs:

- The World Bank has estimated that certain countries may see declines of as much as 30 percent relative to their typical remittance receipts. In fact, the value of remittances to Haiti in March 2020 was 18 percent smaller than in the same month the year before (https://bit.ly/3hgEW3T). Jewers and Orozco (2020) further indicate that host countries with an elevated number of COVID-19 cases are home to the majority of migrants from Latin America and the Caribbean. The case counts in the United States and the Dominican Republic are of particular concern for Haiti, since those two countries host more than 70 percent of its migrants (Jewers and Orozco, 2020).
- While operational, the agricultural sector has been impacted by government restrictions limiting group gatherings to no more than five people, in place from March to mid-July (Cledo 2020). For example, the practice known as "konbit" combines a farm labor group with a tontine. Wages are paid to the group and members receive this pay to the group on a rotating basis. The group can also work on the land of members who may not pay in cash but by, for example, feeding the workers. Clearly, such constructs and practices continue to be at risk due to the pandemic.
- Similar concerns regarding the effect of limiting group size apply to other key industries such as construction.
- As is the case for most Caribbean countries, international travel restrictions have led to marked decline in tourism and travel.

These developments are in addition to pre-existing concerns with regard to potential political instability, climate change and natural disasters, and food insecurity.

1.1.3 Land, Environment, Climate Change, and Natural Disasters

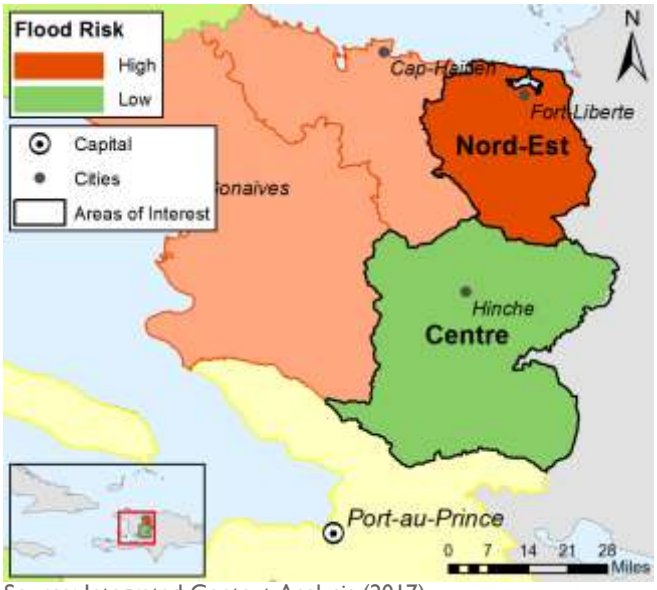
According to CNSA (2019), the major forms of land access in Haiti are: inheritance (35.3 percent), purchasing (24.1 percent), leasing (17.3 percent), and sharecropping/metayage (15.5 percent). Overall, male heads of household (HHHs) tend to engage more in sharecropping (17 percent versus 12 percent of women) whereas female HHHs tend to dominate when it comes to inherited plots (40 percent versus 33 percent of men). Despite this and the fact that formal law treats daughters and sons equally with respect to land property, Kelly et al. (2019) find that women feel relatively tenure-insecure on inherited land relative to men, particularly in Centre. Concerns about land tenure and property rights are further confirmed by initiatives such as "Securing Land Rights in Haiti: A Practical Guide," prepared by the Haiti Property Law Working Group in 2014 (https://bit.ly/2DLVH9w).

Given that close to 30 percent of Haitian HHs engage in farming activities (https://bit.ly/2FfpNTj), access to land for cultivation/productive purposes is key. At the national level, 61.1 percent of HHs own or have access to agricultural land, with 36.7 percent in urban areas and 77.4 percent in rural areas (DHS 2017 and CNSA 2019). Based on the 2017 HDHS, 65 percent of HHs in Nord-Est and 69 percent in Centre have access to land usable for agriculture. According to MARNDR (2012a), in most parts of Nord-Est and Centre, no more than one *carreau* (1.3 hectares) of agricultural land is available per farmer. This is consistent with an average farm size of 0.5 hectares across the country (e.g., World Bank 2017) and other developing countries—as suggested by, for example, Foster and Rosenzweig (2017), who argue that most farms/land plots around the world are too small to be efficient.

Environment and climate change drives the potential for natural disasters and further threatens livelihoods and economic security (also see Section 0). This occurs both directly (e.g., through displacement or destruction of property) and indirectly via degraded land quality and land erosion. For example:

- Major natural disasters have affected the country over the years, with the two most recent being the 2010 earthquake and the Hurricane Matthew in 2016. As is the case for most Northern Caribbean islands, hurricanes and tropical storms also remain an annual threat during the Atlantic hurricane season, which tends to occur from August through October.

Figure 2. Flood Risk for Nord-Est and Centre



Source: Integrated Context Analysis (2017).

- In 2018, Haiti suffered several natural disasters all at once: a period of severe drought, floods, and an earthquake (FAO, https://bit.ly/3fZgDHj). According to IPC (2019), 568,000 people live in areas at risk of being affected by such natural disasters, and 333,000 people are estimated to be affected by cholera.
- These volatile climatic events have been linked to the El Niño phenomenon in several areas of the country, particularly the AOIs, Nord-Est and Centre. Figure 2 indicates that Nord-Est is considered at high risk of flooding relative to Centre, which is at low risk. A more detailed map of 2012 agroecological zones is available through MARNDR at https://bit.ly/2Hfw7v7.
- While volatile weather is not unique to Haiti, the country's pre-existing conditions make it particularly vulnerable. Back-to-back crises have contributed to the degradation of livelihoods and living conditions of the most vulnerable populations, often the same people affected by several emergencies at once or in succession. In addition, Haiti retains less than one percent of its original primary forest, making it among the most deforested countries in the world (Hedges et al. 2018). This in turn threatens the country's biodiversity.
- From an agricultural and food security standpoint, the potential for environmental degradation and natural disasters is further exacerbated by limited irrigation in the AOIs (MARNDR, 2012a). In all communes of both departments, particularly Centre, less than five percent of agricultural land is irrigated. In Nord-Est, communes that border the Dominican Republic (e.g., Ferrier) seem to have more irrigation that the average. But in the remainder, irrigation is limited.

As Abel et al. (2019) argue, climate change can serve as a driver of conflict, further exacerbating economic and physical insecurity and migration. Continued exposure to negative shocks could impede Haiti's development and undermine potential benefits from social programs. According to CNSA (2019), 37 percent of HHs have experienced a negative shock in the last six months, either related to climate (e.g., drought and earthquakes), food and agriculture (e.g., rising food or input prices and livestock diseases), or other adverse events (e.g., deaths, accidents, and losses of income). Forty-two percent of HHs in urban areas and 22 percent of HHs in rural areas have experienced such shocks. While the Government of Haiti (GoH) has attempted to institute a weather index insurance system (World Bank

2013, https://bit.ly/2DLxSP6), it is unclear that this mechanism is functioning at scale (also see Section **Error! Reference source not found.**).

1.1.4 Gender

Based on the 2017 HDHS, about 41 percent of HHs in Nord-Est and 36 percent of HHs in Centre are headed by women. According to the United Nations Development Programme (UNDP, https://bit.ly/31Le5HF), Haiti ranked 150 out of 162 countries on the 2018 Gender Inequality Index, which measures gender-based inequalities on three dimensions: reproductive health (based on maternal mortality and adolescent birth rates), empowerment (based on the share of parliamentary seats held by women and attainment in secondary and higher education), and economic activity (based on the labor market participation rate of women and men). Based on these and other measures, there are some concerning trends with respect to gender:

- About three percent of parliamentary seats in Haiti are held by women (https://bit.ly/3bUiXP7).
- The percentage of women without any level of education is 13 percent and for men, it is nine percent. Six percent of men and only four percent of women have completed secondary school (DHS 2017).
- In 2012, Haiti's female labor force participation rate was about 47 percent, while its male labor force participation rate was about 60 percent (https://bit.ly/2E0reom and https://bit.ly/33oCrYz). A 2015 World Bank study found wages among women to be 32 percent lower than wages among men.
- According to MARNDR (2012b), 25 percent of plots representing 20 percent of land in Haiti belong to women. This suggests relatively small representation of women in agriculture and that women's plots are smaller on average than those of men (0.75 versus 1 ha). About 40 percent of plot owners produce principally for their own consumption on plots that represent 32.7 percent of all plots. As expected, women are overrepresented among plot owners who produce primarily for their own consumption (28 percent), compared to the share of the plots they own.
- Women struggle to gain access to credit, extension services, and inputs (World Bank 2015). Also, they often do not meet criteria for enrollment into microfinance programs, which in turn prevents them from obtaining funds to help their small businesses thrive. Furthermore, since government extension services fail to include women, they are unable to obtain the same agricultural knowledge or inputs as men (Venort and Calixte 2019).
- Forty percent of girls older than five have received no formal education, relative to 34.5 percent of boys (IHSI 2019, https://bit.ly/3fOEiKp).
- Based on DHS (2017), 39.8 percent of women in Nord-Est and 39.5 percent in Centre control their own earnings. And only 4.5 percent of women in Nord-Est and eight percent in Centre independently own their dwelling.
- At the national level, 12 percent of women between the ages of 15 and 49 have experienced domestic violence at least once in their life (DHS 2017). In Nord-Est, this number is 9.9 percent, and in Centre, it is 12.6 percent. Recent anecdotal evidence suggests this number may be even greater, particularly in Nord-Est. According to Rassemblement des Femmes Engagées de Ouanaminthe (RFEO), the number of reported domestic violence cases between March and April 2020 in Ouanaminthe, an arrondissement in Nord-Est, increased from the typical 4 to 13. RFEO attributes this to the economic downturn.
- Petrozziello et al. (2012) found migrant women in transit on the Dominican Republic–Haiti border to be at risk of physical, sexual, economic, and verbal/psychological violence as well as illicit human

smuggling and trafficking, including for purposes of forced sex work. The market in Comendador (the Dominican Republic), which shares a border with Belladère (Centre, Haiti) appeared of particular concern. In response to increased concerns about violence against women, the RFEO has been implementing initiatives to combat violence against women and support survivors. The organization has also set up a database to record cases in Ouanaminthe. There also seem to be broader Nord-Est-based initiatives as suggested by a relatively recent terms of reference drafted by the Subgroup on Gender-based Violence in collaboration with the GoH and United Nations Population Fund (UNPF, https://bit.ly/2XTwQaM).

On a slightly more positive note:

- Women's organizations appear actively involved in the fight against COVID-19, particularly in the Ouanaminthe, the shared border with the Dominican Republic and frequent back-and-forth travel increases risk of spread. According to Reliefweb, the Women's Voice and Leadership project in Haiti has increased its support to six women's organizations (including the RFEO) in Nord-Est, in an attempt to strengthen awareness of COVID-19 prevention measures. With well-established ties to the communities in which they work, these organizations enjoy great credibility with the local population. That makes them particularly well positioned to transmit health advice to the respective communities in an effort to change behavior and attitudes (https://bit.ly/36QmgnV).
- Quellhorst et al. (2020) find that, for a sample of 214 farmers across Artibonite, Centre, and Ouest, postharvest management practices were gendered at the lower end of the value chain, where women played a key role in marketing. They argue that addressing postharvest management challenges through targeted interventions to increase food availability can improve food security in Haiti. One way to interpret this is that with proper support women could play an even more substantive role in food security.

1.1.5 Youth

In Haiti, 54 percent of the population is under 25, with 31 percent between the ages of 10 and 24 (CNSA, 2019). Based on DHS (2017), 84.2 percent of women and 60 percent of men between the ages of 15 and 19 have not worked (likely for pay) in the last 12 months. For Haitians between the ages of 20 and 24, 58.4 percent of women and 34.6 percent of men have not worked. These numbers compare to a range from 14.6 to 18.9 percent for women in the 35–49 age group and a range from 2.9 to 5.4 percent for men in the same age category. This is consistent with arguments made previously. For example, Justesen and Verner (2007) found that female youth in Haiti need special attention because they are more likely than their male peers to drop out of school and be unemployed or inactive. The difference seems to be due to potential risk factors such as lack of role models, guidance, and expectations, early marriage and/or pregnancy, and domestic violence.

An August 2019 poll by U-Report (https://haiti.ureport.in), a digital tool that allows for the anonymous and free collection of views (particularly of young people), found 44 percent of youth in Haiti believe their opinion is not considered in their community, 26 percent believe they are discriminated against or excluded from decision-making, and 44 percent are concerned about unemployment (https://bit.ly/2UjwYyz). This is consistent with Eustache et al. (2017), who find a high mental health burden among Haiti's youth, with many not accessing mental health care.

Since a substantial part of the Haitian population is relatively young and more likely than their elders to migrate, many development programs emphasize investing in and creating opportunities for young

people (e.g., Pluim 2014 on participation). Some examples include (also see Section **Error! Reference source not found.**):

- Rural development programs, particularly focused on young people. Consistent with Feed the Future and International Labor Organization guidelines (e.g., https://bit.ly/31X1C3L), Food and Agriculture Organization (FAO), International Fund for Agricultural Development, and WFP seem to be implementing such initiatives (https://bit.ly/2Y1qlCJ).
- Skill-building programs, particularly focused on digital jobs and women. Consistent with this, the Ayitic Goes Global program sought to enhance participation among young Haitian women in the global economy (https://bit.ly/33ZAfsb).
- Ad hoc forums on adolescent and youth employability, e.g. by UNICEF (https://bit.ly/2UjwYyz).

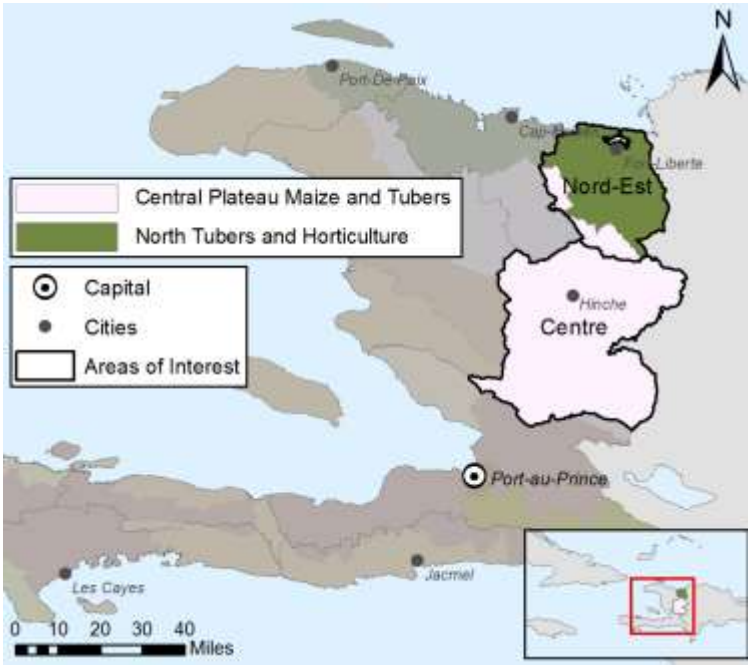
1.2 Food Security Context

1.2.1 Agricultural Production

Agriculture is a main source of income for rural HHs who, not surprisingly, are among the poorest in Haiti. At the national level, the main risks to agricultural production are drought, lack of seed supply, predatory birds/pests for crops, diseases and lack of veterinary services for livestock and other animals, and rising prices, e.g., of imported rice, which affect food security and people's ability to engage in agricultural activities. According to Oxfam (2012) and World Bank (2015), the main constraints inhibiting growth of the agricultural sector are neglected rural infrastructure, weak research and extension, poorly defined land tenure, limited access to credit and technical training, soil erosion, under-investment in human capital, and climate change. About 60 percent of HHs in Nord-Est and 70 percent in Centre are engaged in agriculture. In Nord-Est, less than two percent of HHs participate in fisheries. In Centre, there seems to be no such activity, likely because the department does not border the Caribbean Sea.

Figure 3 shows the livelihood zones (and their corresponding key crops) for the AOIs. Based on FEWS NET's 2015 livelihood classification, some parts of Nord-Est fall into two zones, also apparent from the figure. Specifically, Fort-Liberte and Ouanaminthe are entirely in HT02 (North tubers and horticulture), which means that they engage in the production of tubers as staple crops (e.g., sweet cassava, yams, and sweet potatoes) and horticulture as cash crops (e.g., bananas, black beans, and

Figure 3. Main Livelihood Zones in Nord-Est and Centre Departments



Source: FEWS NET (2015).

pigeon peas). The remaining arrondissements, Trou-du-Nord and Vallieres, are split between HT02 and HT03 (central plateau maize and tubers). The southern parts of Trou-du-Nord and Vallieres are considered HT03, similar to Centre. They engage in the production of tubers and maize as staple crops and some horticulture as cash crops. Some highly elevated parts of Centre also produce citrus fruits and coffee.

The parts of Nord-Est that are classified as HT02 can further be characterized by:

- A typical tropical climate, with unstable conditions due to atmospheric currents.
- Areas at higher altitudes (e.g., Northern Mountains) get more rain (40–60 inches per year), but low hills and plains get less (30–40 inches per year).
- Dense river networks, e.g., Rivière du Trou du Nord and the Rivière Marion as well as Ferrier and Massacre along the Haiti–Dominican Republic border.
- Rainy season from April to November.
- Lean season from March to May.
- Charcoal production between April and June, in September, and again, between December and January.

The HT03 areas, in particular Centre, can further be characterized by:

- Rainy season from April to November.
- Land preparation in March and April in time for the first rain.
- Lean season from April to mid-June.
- Some mango varieties may be grown as they have high demand in Port-au-Prince and DR.

In addition, Centre can further be characterized by:

- Central Plateau, which is a basin in a mountainous area with altitude ranging from 1,640 to 6,560 feet.
- Average rainfall of 40 inches per year.
- Reduction in soil fertility due to deforestation. This is particularly noticeable along the border with Dominican Republic, which has more tree cover.
- Goats as a form of livestock and, in the case of wealthier HHs, some animals being used in agricultural production.
- Year-long migration to work on farms, in construction, or in domestic service jobs. Such migration is often to earn money that funds agriculture, e.g., during the growing season. Migrants tend to leave between January and March or May and July after their land has been prepared (recall Section 0).

1.2.2 Market and Food Access

As discussed in Section 0, Nord-Est has HT02 and HT03 zones, and Centre is exclusively HT03. Market access depends on these livelihood classifications. In both HT02 and HT03 zones, being close to the Dominican Republic (in particular border areas) has pros and cons. On the negative side, border markets are flooded with agricultural and other commodities from neighboring areas with the Dominican Republic, thus reducing the competitiveness of local products. On the plus side, proximity to the Dominican Republic is also an opportunity, since local products can cross the border. In addition, the Dominican Republic offers opportunities for paid work, e.g., in construction, as domestic workers, and in schools and

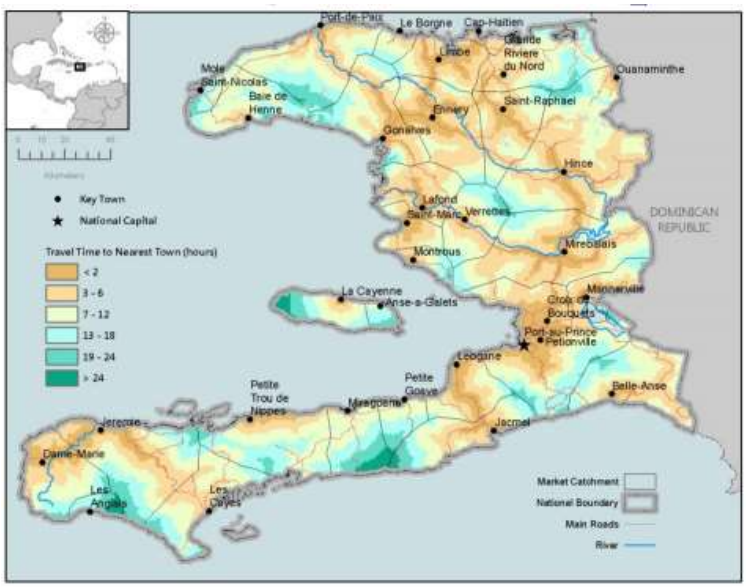
hospitals. The main local market in HT02 zones is Ouanaminthe, which is in Nord-Est. In HT03 zones, rugged terrain makes market access difficult. This is particularly true during the rainy season. In fact, poor road conditions make market access difficult across the board (Figure 4). While there are local markets and collection sites for local crops, a trip to a major market such as Port-au-Prince can take anywhere from 24 to 48 hours (Figure 5).

Figure 4. Primary and Secondary Roads in Haiti and AOIs

Source: OpenStreetMap (2020).

Based on FEWS NET 2015, the main staple foods in HT02 zones are: maize, peas, and beans (own production from January to February and May to September and purchased otherwise), yams and potatoes (own production from May to September and purchased otherwise), rice and flour (purchased year-round), and avocado (purchased year-round). The main staple foods in HT03 zones are rice (purchased year-round), maize (own production from July to January and purchased otherwise), and beans (own production from June to July and December to January and purchased otherwise).

Figure 5. Market Accessibility



Source: WFP (2016).

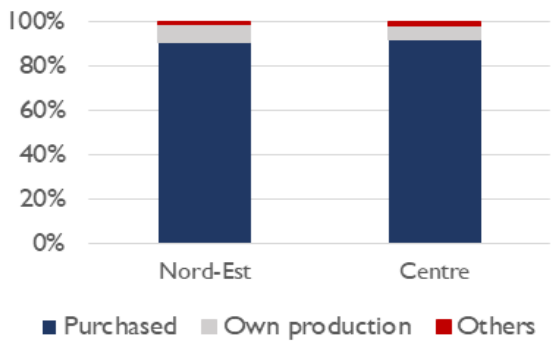
Based on CNSA (2019), 89 percent of food at the national level is purchased (with about 10 percent on credit) and seven percent is from own production. The majority of purchased food comes from local markets (68 percent) and 28 percent from other markets, i.e., markets or stores outside of the AOI. The main reasons cited as barriers for getting to markets are robbery (66 percent), weapon assaults (39 percent), physical assaults (19 percent), accidents during transport (14 percent), health risks (six percent), and sexual aggressions (one percent). In rural areas, the main reasons are robbery (65 percent), weapon assaults (23 percent), physical assaults (30 percent), accidents during transport (17 percent), health risks (eight percent), and sexual aggressions (three percent). In urban areas, the main reason is weapon

assaults (64 percent). The most common modes of transportation are walking (60 percent), public transport (20 percent), or some combination (10 percent).

In Nord-Est, 91 percent of food is sourced from purchases and eight percent is from own production. Eighty-three percent of purchased food comes from local markets and 15 percent from other markets. The most common modes of transportation are walking (72 percent), public transport (10 percent), some combination (13 percent), and owned vehicle (four percent). In Centre, 92 percent of food is sourced from purchases and six percent is from own production. Seventy-six percent of purchased food comes from local markets and 23 percent comes from other markets. The most common modes of transportation are walking (47 percent), public transport (18 percent), some combination (21 percent), and owned vehicle (five percent). These statistics are further captured by Figure 6.

Given their high dependence on purchases to meet basic food needs and the large share of food imports (70 percent), Haitian HHs are highly susceptible to both global and local food price fluctuations (Latino et al. 2016,Table 2). Moreover, the country lacks strong resilience structures and is vulnerable to other shocks, particularly, natural disasters, which often lead to a rise in local food prices due to low production or rising transport and fuel prices (Glaeser et al. 2011). These shocks often impact HHs' livelihoods, due to their dependence on agriculture, for income or direct consumption. All of this has an impact on food security. For instance, El Niño's dry spells negatively impacted both food availability and food access. Drought reduced domestic production and increased the country's dependence on imports and the poor's dependence on markets. At the same time, crop losses and increasing costs of inputs compromised the livelihoods of agricultural wage workers, subsistence farmers, and local food traders. Income losses and the increases in food prices ultimately stressed the purchasing power of HHs, in turn reducing purchases of both local and imported foods. According to the 2015 Emergency Food Security Assessment, HHs resorted to negative consumption-based coping strategies. Eight-one percent reduced meal portions, 78 percent reduced the number of meals, and 83 percent secured cheaper food items.

Figure 6. Mode of Accessing Food in Nord-Est and Centre



Source: CNSA (2019).

Table 2. Surplus/Deficit of Food Production by Food Group and AOI

Cereals					Pulses				Tubers			
Dept.	Prod. ('000 Mt)	Demand ('000 Mt)	Surplus/ Deficit ('000 Mt)	Demand covered by production	Prod. ('000 Mt)	Demand ('000 Mt)	Surplus/ Deficit ('000 Mt)	Demand covered by production	Prod. ('000 Mt)	Demand ('000 Mt)	Surplus/ Deficit ('000 Mt)	Demand covered by production
Artibonite	89.0	141.1	-52.1	63%	15.3	39.1	-23.8	39%	21.8	226.5	-204.8	10%
Centre	19.2	61.0	-41.8	31%	36.5	16.9	19.6	216%	21.9	97.9	-76.0	22%
Grand'Anse	6.7	38.3	-31.5	18%	11.6	10.6	1.0	109%	87.1	61.4	25.7	142%
Nippes	7.5	28.0	-20.5	27%	5.0	7.8	-2.8	64%	8.3	44.9	-36.6	18%
Nord	5.6	87.2	-81.6	6%	8.9	24.2	-15.3	37%	86.2	139.9	-53.7	62%
Nord-Ouest	5.9	32.2	-26.3	18%	11.1	8.9	2.2	125%	41.1	51.7	-10.5	80%
Nord-Est	6.6	59.5	-53.0	11%	8.8	16.5	-7.7	53%	24.4	95.6	-71.2	26%
Ouest	20.5	329.2	-308.7	6%	25.6	91.2	-65.6	28%	35.3	528.4	-493.1	7%
Sud	27.1	63.3	-36.3	43%	12.8	17.5	-4.8	73%	34.0	101.6	-67.7	33%
Sud-Est	7.1	51.7	-44.6	14%	8.6	14.3	-5.7	60%	7.0	83.0	-75.9	8%
Total	**195.3**	**891.5**	**-696.3**	**22%**	**144.1**	**247.0**	**-102.9**	**58%**	**367.2**	**1430.9**	**-1063.7**	**26%**

Source: Latino et al. (2016).

A review of the impact of the 2008 food crisis on the world's poor found that high food prices increased malnutrition (especially in young children) and poverty (Compton et al. 2010). Poor net food importing countries such as Haiti were among the first to feel the effects of rising world food prices. The poorest HHs — including many headed by women and those with large numbers of dependents — were worst hit everywhere. These HHs spend a higher proportion of their income on food and have less access to credit and savings. Increase in prices thus leads to negative behavioral changes. During the 2008 crisis, HHs resorted to eating less preferred food (reducing dietary diversity, reducing meat/fish/milk consumption, substituting the main staple, etc.), cutting back quantities of food eaten, increasing consumption of street food, buying food on credit or getting credit in cash to buy food (more than a quarter of HHs in Haiti also reported using savings to buy food), and cutting back expenditure on health and education. WFP uses the Food Consumption Score to measure the diversity and frequency of food consumed within a 7-day recall period (Brinkman et al. 2010). After examining the correlation between food prices and the Food Consumption Score, Brinkman et al. (2010) found that households' food security, as measured by the Food Consumption Score, reduced by 23 percent in Haiti due to increased food prices (highest among the three countries - Haiti, Nepal, and Niger).

According to CNSA's assessment, the price of the food basket grew from 1,698 gourde in December of 2018 to 1,928 gourdes in December 2019, an increase of 40 percent. The central, western, and southern geographic regions of Haiti were the main drivers of that food-price inflation. During the first quarter of 2020, the price of a food basket rose by 25 percent, surpassing 1,960 gourdes by March 2020. In addition, social unrest as well as political and economic instability have caused the value of the gourde to go down over the years. This loss of value has become sharper since 2016: One US dollar was worth 59.45 gourde on January 31, 2016. By June 30, 2020, its worth was 113.31 gourde, a significant devaluation. This is important to note because WFP (2016) found that despite the gourde's deprecation against the US dollar and the Dominican peso, import prices played a marginal role in driving food-price inflation. At the time, WFP concluded that the price in gourde of the main US import, rice, had remained stable across all markets due to a favorable international environment. While that may have been the case in 2016, the current international environment is quite unfavorable, raising concerns about the potential negative impacts of continued gourde devaluation on food prices and food insecurity.

1.2.3 Food Utilization and Nutrition

According to the Consolidated Approach to Reporting Indicators approach established by the WFP, 50.7 percent of Haiti's population is food insecure, either moderately or severely (reported in CNSA, 2019). Based on intake and frequency in a seven-days recall period, 51.5 percent of HHs in the country can be classified as having an inadequate level of food consumption, 20 percent have severely inadequate food consumption, and 31 percent have moderately inadequate food consumption. Twenty-nine percent of HHs report never consuming food rich in Vitamin A, 46 percent report sometimes, and 25 percent report such intake on a daily basis. As for iron-rich foods, 32 percent never consume them, 58 percent consume them sometimes, and 10 percent consume them on a daily basis. Food security increases with education. Just three percent of HHHs with post-secondary education experience food insecurity. But 21 percent of HHHs with no education are food insecure. Table 3 shows that while food insecurity does not vary much by sex, food diversity does.

Table 3. Food Security and Food Diversity by Sex of the Household Head

Food security related indicators	HHH's sex	
	Female	Male
Food security		
Severely insecure	21	20
Moderately insecure	31	31
(Marginally) food secure	48	49
Food-group consumption		
2 food groups	8	7
3-4 food groups	27	26
5 or more food groups	65	67
Vitamin A intake consumption		
Never consume	31	28
Consume sometimes	45	46
Consume daily	24	26

Source: CNSA (2019).

In Nord-Est, 40.2 percent of the population is severely or moderately food insecure. Three percent of HHs in the department consume only two food groups, 26 percent consume 3-4 food groups, and 71 percent consume five or more food groups. Thirty-two percent of Nord-Est households report never consuming foods rich in Vitamin A, while 43 percent sometimes consume such foods, and 25 percent consume such foods on a daily basis. As for iron-rich foods, 35 percent never consume them, 54 percent consume them sometimes, and 10 percent consume them on a daily basis.

In Centre, 54.1 percent of the population is severely or moderately food insecure. One percent of HHs consume only two food groups, 21 percent consume three to four food groups, and 77 percent consume five or more food groups. Seventeen percent of HHs report never consuming foods rich in Vitamin A, while 55 percent sometimes consume such foods; and 28 percent consume such foods on a daily basis. As for iron-rich foods, 23 percent never consume them, 72 percent consume them sometimes, and five percent consume them on a daily basis.

The above statistics are further captured by Figure 7, **Error! Reference source not found.**, and **Error! Reference source not found.** (CNSA, 2019).

Figure 7. Food Diversity in Nord-Est and Centre Departments (# of food groups)

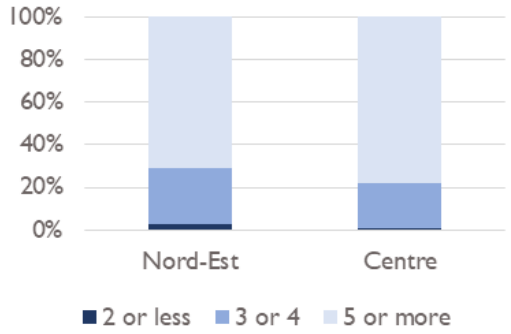


Figure 8. Frequency of Vitamin A Intake in Nord-Est and Centre Departments

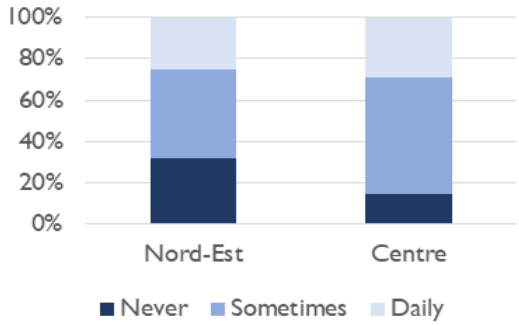
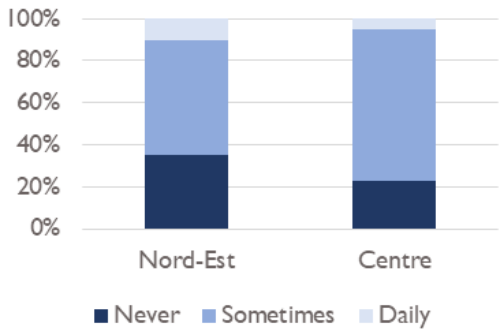


Figure 9. Frequency of Iron-fortified Food Consumption in Nord-Est and Centre Departments



The IPC (2019) projected that 1.07 million people in Nord-Est and Centre combined would be food insecure by June 2019—367,038 in Nord-Est and 707,601 in Centre. In Nord-Est and Centre respectively, 40 percent and 35 percent of the population are considered to be either in food-security crisis or emergency.

1.3 Lessons Learned: Programs and Initiatives

This section reviews the main objectives and activities associated with select implemented programs and initiatives, and assesses key lessons learned. Most programs were implemented across the country and thus apply to several departments as opposed to just the AOIs.

1.3.1 Programs and Initiatives: Overview

This section is organized according to the main outcome targeted. However, most programs tend to span multiple outcomes. In other words, the sections below are not mutually exclusive per se.

1.3.1.1 Food Security and Nutrition

The GoH is developing social safety nets to ensure the poor can meet basic needs for food security and nutrition. However, implementation still relies heavily on the support of donors and partners (WFP 2017). For example, WFP is one of the main actors implementing both emergency and non-emergency programs, coordinating with the government to achieve long-lasting policy changes. WFP's Food for Education and Child Nutrition Program provided primary school children, mostly in public schools, with daily hot meals, primarily in Nord, Nord-Est, Centre, Ouest, and Artibonite between 2016 and 2019 (Mailloux et al. 2019 and https://bit.ly/3hrHuMO). It also conducted activities to raise awareness of hygiene practices and distributed water chlorine purifying kits, tablets, and deworming tablets. WFP has also been working to enhance government management capacity of school feeding programs at the national, regional, and local levels. By 2030, GoH aims to build a strong public school system together with a nationally owned, funded, and managed school feeding program linked to local agriculture. To this end, WFP has supported development and advocacy of the National Policy and Strategy of School Feeding approved by GoH in 2016. Under its National School Feeding Program and in accordance with the government's objectives, WFP provided nutrition-sensitive school meals in nine out of ten departments. The Home-Grown School Feeding model, which used locally produced food such as fresh vegetables bought directly from smallholder farmers, fed 13,500 children in 2017.

WFP's Haiti Protracted Relief and Recovery Operation (PRRO), implemented in eight out of ten departments including Nord-Est and Centre, aimed to strengthen emergency preparedness and resilience, treat acute malnutrition in children younger than five and pregnant and lactating women, prevent chronic malnutrition and micronutrient deficiencies, and develop a targeting system for the national social safety net program (Genequand et al. 2016). Key activities in this program involved food distribution, cash for assets activities, moderate acute malnutrition treatment and stunting prevention activities, and capacity development or technical assistance initiatives. These initiatives included WFP support to CNSA with the purpose of strengthening its network and capacity, providing training and equipment to the Civil Protection Directorate to improve early warning systems, and helping the Ministry of Social Affairs and Labour (MAST) develop its vulnerability database.

The initiatives also included WFP support of the six-year Kore Lavi program based at the Ministry of Public Health and Population. The program, which means "Supporting Life" in Creole, was implemented from 2013 to 2019 by CARE International and its partners Action Contre La Faim International and WFP in five departments including Centre (ICF 2016). The main objectives of the Kore Lavi program included: establishing and institutionalizing an objective, equitable, and effective mechanism to select vulnerable HHs within MAST, institutionalizing a food voucher-based safety net program in MAST to target extremely vulnerable households and promote women's empowerment and the purchase of

locally produced food, assisting and training 150,000 HHs with pregnant and lactating women or children under two years to practice targeted behaviors for ensuring that infants and children are born healthy and nurtured effectively, and assessing and facilitating key government institutions, local partners, and women in using expanded decision-making capacities to support food security, disaster risk management, and social assistance programming.

1.3.1.2 Emergency Assistance

As discussed earlier in the report, Haiti's proclivity to natural disasters and volatile weather conditions, along with its pre-existing economic conditions, has contributed to continued degradation of the livelihoods of its most vulnerable. Hence, a number of relief operations, emergency assistance initiatives, and resilience and preparedness building activities have been implemented over the years.

World Vision, in its response to the 2010 earthquake, assisted two million people during the 90 days following the disaster by providing food assistance, shelter, and water, sanitation and hygiene (WASH) services, school kits, school feeding programs, and cholera prevention and treatment services (World Vision 2014). From 2012 to 2013, World Vision supported 19,950 families in Centre affected by prolonged drought, Tropical Storm Isaac, and Hurricane Sandy, as part of its Multi-Year Assistance Program. The program's efforts led to increased immunization coverage, enhanced micronutrient consumption, improved feeding practices, decreased malnutrition, and enhanced behavior changes for the adoption of best practices in nutrition and hygiene. In addition, the program facilitated the adoption of better agricultural techniques, diversified crops and animal production, and enhanced integration of maternal and child health and nutrition activities with agriculture production.

From March to December 2016, WFP implemented an Emergency Response to Drought Operation that complemented GoH's Drought Emergency Response and Recovery Plan which targeted one million people (WFP 2016). WFP provided general food assistance through cash transfers using an innovative targeting approach that involved the community, nutrition support to prevent acute malnutrition, and food assistance for assets through activities such as restoration of agricultural land through watershed management.

Several other programs have been implemented in Haiti to provide food and other forms of assistance to vulnerable HHs in times of emergency (Cuellar et al. 2018). These include programs funded under the Emergency Food Security Program such as cash for work and agricultural vouchers to promote agricultural recovery by Action Contre La Faim International, food vouchers by World Vision, and UCTs and cash for assets by CARE in response to the extended drought.

1.3.1.3 Gender

Two primary initiatives have had a particular focus on gender. First, Fonkoze, one of Haiti's leading microfinance institutions, initiated a multi-pronged livelihoods protection and promotion scheme, called Chemen Lavi Miyò (CLM), to help extremely poor women in rural Haiti rise out of poverty. CLM is an 18-month graduation program that combines livelihoods support (asset transfer, training, veterinary services, value chain support), social protection (cash stipend, health, social network development, insurance etc.), financial inclusion (savings and credit), and the guidance of regular case-manager visits (Shoaf et al. 2019). CLM is the first of a four-step poverty alleviation program that Fonkoze has dubbed Staircase out of Poverty (https://bit.ly/2QFMRgp). CLM is followed by 1) Little Credit - a 3-month microfinance program, 2) Solidarity - a core microfinance program, and 3) Business Development.

Fonkoze also provides education and health services as well as business skills training to support women during their ascent out of poverty. Its health program, Boutik Sante, trains microfinance clients to become Community Health Entrepreneurs. They learn to conduct basic health screenings (including screening children for malnutrition), deliver health education sessions, and procure health products from Fonkoze, which they resell in the community.

Second, Ayitic Goes Global was a program aimed at enabling youth to gain employment in the digital economy (Simpson et al. 2019). Specifically, it taught technology skills to 316 young women, facilitating their placement in remote digital and data-related jobs, i.e., in overseas markets.

Aside from the above-mentioned programs specifically designed for women, few other programs discussed in this report had a gender component. This said, within its PRRO activities, WFP targeted a higher proportion of women/girls as compared to men/boys. Seventy-nine percent of its targeted beneficiaries under the prevention of chronic malnutrition activities were women/girls. Gender considerations were integrated in each of the four strategic objectives of Kore Lavi through training on gender equality and gender-based violence and promotion of gender equality and women's empowerment activities in all components of the program (Absolute Options LLC 2016). The program was also credited with increasing participation by women in local governing bodies. During its emergency response to drought, WFP and its partners systematically put in place requirements for more gender-balanced management committees. This was an effort to promote women's participation and leadership as well as to ensure women would be, when possible, the primary recipients of cash transfers. In addition, UNDP, in its post-Matthew cash intervention, encouraged all municipalities to enroll women within the list of beneficiaries by suggesting a desirable female quota of 40 percent. In the municipality of Abricot, UNDP carried out a social experiment by targeting only women. In its 2017 report of the National School Feeding Program, WFP noted that since women primarily harvest, process, store, transport, and sell products as well as prepare and cook food, the 2018 school feeding program would make a greater use of women's expertise in its supply chain (WFP 2017).

1.3.1.4 Governance

While capacity building efforts have been a part of the food security and emergency assistance programs of the international community, LOKAL was a four-year program specifically designed to improve local governance and decentralization in Haiti (Laurent et al. 2012). LOKAL worked closely with the Ministry of Interior and Local Government to finalize the legal framework on decentralization, accepted by GoH and submitted to parliament. It also facilitated municipal decision making, increased the capacity of elected municipal authorities through training and technical assistance, helped re-establish authority of local government, increased municipal revenue bases, and designed and implemented a communal development plan and process model that could be extended to other communities. LOKAL benefitted from some externally favorable factors. Among them were the emphasis placed by Prime Minister Michèle Duvivier Pierre-Louis on decentralization reform as a major public policy priority and the larger role assumed by the Ministry of Interior and Local Government in coordinating reforms and capacity building.

1.3.1.5 Agriculture and Insurance

While food security, nutrition, and livelihood protection programs are much needed, Haiti's agricultural sector also requires attention. After the Emergency Food Security Assessment in December 2015, WFP Haiti found that in Centre, Artibonite, and Nippes, 56-80 percent of traders lacked capacity to handle an increase in demand (Latino et al. 2016). Small retailers—e.g. itinerant vendors and madam sara (a local term for women traders)—expressed concerns about their response capacity, as lack of financial resources and higher producer prices would limit their possibility to replenish stocks. In fact, among all traders interviewed, only 21 percent were confident that re-stocking would take less than a week. Twenty percent said it could take as long as a month. This was particularly the case in Sud-Est, Nippes, and Nord-Est. It has been suggested that in case of emergencies, in-kind food transfers complement cash-based transfers to mitigate pressure on local prices.

Poor infrastructure, in particular road accessibility, and restrictions on movements due to political instability also appear to be key constraints to trade. In fact, the majority of traders in earthquake-affected areas and the Southern peninsula ranked transportation and poor road conditions as their two major constraints. In the medium and long run, improvements in infrastructure and production capacity are needed to be prepared for emergencies.

Agronomes et Vétérinaires Sans Frontières has been working in Haiti to support production and trade by smallholders (https://bit.ly/32CwLtn). It supports smallholder irrigation in the plains and mountain regions and has created innovative methods for the development and participative reforesting of drainage basins, which are often highly degraded. It also works with smallholder organizations involved in fair trade export chains (for coffee, cocoa, and fruit) and local supply chains (for plant and animal food products, milk, etc.), local smallholder dairy producers and organizations of associated livestock farmers, and young smallholders.

FAO and the European Union developed farmer field schools in Nord-Est to strengthen the production, processing, and marketing capacity of family farming systems (https://bit.ly/3j6Sz73). More than 70 such schools have been set up in Nord-Est, each involving producers in different areas and sectors, including groundnuts, cassava, horticulture, milk, and aquaculture. The project has trained four communities in aquaculture cage production of red tilapia. It has also assisted targeted communities in establishing their own ponds for the production of fingerlings (i.e., young or small fish).

The infrastructural bottlenecks faced by Haitian farmers are exacerbated by their limited access to formal financial services. The agricultural sector receives a small proportion of formal credit – 0.78 percent of outstanding loans according to the Credit Information Office database (2018). Moreover, financial services offered are not diversified and despite high exposure to risks, only 1.6 percent of adults in rural areas have insurance (World Bank 2019).

The program that could potentially impact agricultural financing in Haiti is the System of Financing and Agricultural Insurance, a project financed by the Canadian Cooperation. It developed a comprehensive approach for strengthening expertise and reducing risk in agricultural finance. By establishing an agricultural loan insurance fund and an index insurance pilot project, it mitigates farmer credit risk and risk of loss. However, the program remains a small-scale project with limited replicability.

In addition, the Microinsurance Catastrophe Risk Organization – a reinsurance company specializing in the design of risk transfer solutions for natural catastrophes to the unserved and underserved population – was founded by Mercy Corps and Fonkoze after the 2010 Haiti earthquake (GIZ 2018).

From 2012 to 2015, it operated as a reinsurer for its insurance program in Haiti, providing an innovative structure aimed at minimizing basis risk for Fonkoze's policyholder/borrowers. Between 2011 and 2013, around 36,700 clients received US$ 8.8 million in insurance benefits as a result of various climatic events.

1.3.2 Programs and Initiatives: Challenges and Lessons Learned

1.3.2.1 Government Capacity Building

Several evaluations and reports discussed above highlighted the lack of government capacity as a major concern for long-term sustainability of social development programs in Haiti. The final evaluation of WFP's Food for Education and Child Nutrition Programme found that GoH lacks the institutional or financial capacity to manage the program independently, even partially, until crucial governance issues are resolved at the national level (Mailloux et al. 2019). Similarly, the mid-term evaluation of the PRRO noted that MAST faces several challenges that might make independent ownership of its information system difficult (Genequand et al. 2016). These challenges include limited financial resources for staff retention, lack of a transition plan, identification of capacity building as a separate objective rather than crosscutting, and insufficient capacity building. Frequent natural disasters, chronic underfunding and political instability, marked by frequent changes in leadership, staff and responsibilities, also make implementation of social safety net programs dependent on the support of donors and implementing partners (WFP 2016).

Given those challenges, increased emphasis on capacity building efforts and decentralized government structures is recommended. LOKAL identified several challenges, including lack of municipal capacity in enforcing ordinances, collecting fees and taxes, and addressing local safety and security needs, lack of harmony between central and local governments over the extent of decentralization, gaps in how the role of local authorities is perceived by themselves and the public, and lack of municipal-level law enforcement mechanisms (Laurent et al. 2012). LOKAL recommended increased support for local government functions and processes, in particular, resource mobilization, capacity building, information management, and improved service delivery.

1.3.2.2 Disaster Preparedness, Resilience, and Pre-Positioning

There is agreement across the previously discussed programs and organizations that Haiti lacks the required level of disaster preparedness and resilience to confront the risks it faces. A 2018 review of Food for Peace Market-Based Emergency Programs found the lack of a disaster preparedness law in Haiti to be a significant obstacle to food assistance programming. The government is taking steps toward improving institutional and legal frameworks to address this challenge (Cuellar et al. 2018). In its Hurricane Matthew response, Catholic Relief Services (CRS) faced challenges due to inefficient functioning of local systems such as Comité de Protection Civile and their lack of training on cash-based programming (Ward 2018). In order to improve preparedness, CRS recommended developing a local focal point for emergency response. In its response to the 2010 earthquake, World Vision found that the capacity of GoH to respond to a crisis of such a magnitude was extremely low (World Vision 2014). In fact, the earthquake caused large-scale destruction of official records and infrastructure, leading to a lack of clarity on policies and strategies for coordination between government agencies and non-governmental organizations. This problem was exacerbated by the fact that more than 1,000 non-governmental organizations and private initiatives responded to the earthquake.

Investments in preparedness and pre-positioning on the part of humanitarian actors are also important. For example, through its Hurricane Matthew response, WFP learned that pre-existing ties to the private sector regarding local and regional purchases facilitate quick availability of commodities for emergency response (WFP 2017). It introduced a new modality in 2017 based on standby contracts. Cuellar et al. (2018) suggested continued investments in pre-positioned assistance and supply chains for multiple food assistance modalities in order to ensure timely response mechanisms. In addition, market assessments conducted before emergencies to prevent delays in implementation immediately after are necessary, including at sub-national levels.

1.3.2.3 Targeting of Beneficiaries

Most development and emergency programs in Haiti have faced challenges in effectively targeting the most vulnerable. WFP's Food for Education and Child Nutrition Programme did not systematically consider vulnerability as a criterion and risked excluding the most vulnerable children (Mailloux et al. 2019). Changes to and slow functionality of the PRRO database severely impacted achievement of targets (Genequand et al. 2016). The PRRO evaluation noted that an additional criterion ensuring continuity in geographical targeting from relief to recovery assistance is important and should be strictly implemented.[2]

Effective targeting is particularly important in the case of Haiti because of the scale of poverty and unmet needs. Most evaluations recommend developing some form of national identification list/database of the most vulnerable and strengthening links between humanitarian relief and development activities. Cuellar et al. (2018) note that such a registry should be flexible enough to accommodate changing circumstances as HHs' vulnerability status changes over time. In 2015, MAST's social safety net information system (SIMAST), supported by WFP under the Kore Lavi program, was used to target households in the Kore Lavi project areas. It proved useful as a targeting mechanism in slow-onset disasters (Genequand et al. 2016). WFP has started using its beneficiary data management platform, SCOPE, for its cash-based interventions (WFP 2017). SCOPE is a digital tool that helps WFP manage beneficiary lists and payments and facilitate reconciliation of beneficiary payments. With their consent, beneficiaries also receive individual cards with their photo to facilitate identification. SCOPE informs WFP who the beneficiaries are and to what they are entitled, issues instructions to banks and service providers, and receives feedback about assistance given.

1.3.2.4 Financial Inclusion

Several cash transfer programs discussed previously used different modalities for different components based on the preferences of beneficiaries and available infrastructure. However, most found lack of financial inclusion and mobile money to be a challenge. According to the 2017 HDHS, about 22 percent of HHs in Nord-Est and 16 percent in Centre have bank accounts. Moreover, not owning a mobile phone is positively associated with poverty. This suggests that mobile money would not be a meaningful way to target or access the poor, i.e., program beneficiaries. Cuellar et al. (2018) recommended

[2] Prior work in other contexts has found that community targeting can result in higher satisfaction than say proxy means tests or hybrid approaches (Alatas et al. 2012). Also see Hanna and Olken (2018).

improving digital distribution mechanisms by partnering with the private sector (i.e., mobile service providers) and investing in digital literacy and mobile coverage, particularly in rural areas.

Another aspect of financial inclusion, as highlighted by the evaluation of Fonkoze's CLM program, is the lack of sustainable savings behavior, particularly among Haitian women (Huda et al. 2010). In fact, the program's pilot was unsuccessful at establishing a formal savings culture and increasing cash deposits in a savings account. This was partly due to external factors such as food price increases and internal factors such as logistical issues with accessing and depositing savings. A study of CLM by Institute of Development Studies found that savings were an important means for women to cope with negative shocks (Shoaf et al. 2019). Among surveyed women, levels of cash savings were very low and levels of asset savings through livestock were much higher.

1.3.2.5 Participation of Civil Society Groups and Community Engagement

Varying levels of community engagement and involvement of civil society groups have either hindered or contributed to the progress of various programs. Indeed, one factor behind the lack of achievement of PRRO targets was the gap in outreach, in particular a slow start to community-based screening. LOKAL found that civil society advocacy for decentralization is virtually nonexistent and political will for decentralization, consequently, limited. Participation of civil society groups is important to inform and mobilize public opinion and support the efforts of local leaders to lobby the central government.

In the case of WFP's Food for Education and Child Nutrition Programme, the involvement of school principals, parents, and school feeding committees contributed to the achievements of outputs and outcomes. At the same time, insufficient cash or in-kind contributions of parents also proved detrimental to ensuring long-term sustainability of the program. During the Kore Lavi program, having local civil society leaders paired with enumerators increased access, buy-in, and willingness of venerable HHs to participate. Fonkoze's CLM benefited from Village Assistance Committees comprised of leaders and local elite, which provided additional resources, support, and buy-in from local communities. The pilot evaluation recommended Village Assistance Committees be sustained post CLM as well. The LOKAL program also recommended higher citizen engagement in the decision-making process, as this would empower citizens, promote responsiveness, facilitate local buy-in, and help ensure these programs are locally owned. LOKAL further recommended building political support for and ensuring the economic sustainability of Fédération Nationale des Associations des Maires d'Haiti and strengthening the capacity of civil society organizations. Finally, the Food for Peace Review (Cuellar et al. 2018) recommended continued partnerships with local community-based organizations and faith-based groups to ensure programming is community-driven, responsive, accountable to the most vulnerable, and reflects the idiosyncrasies of the Haitian socio-political environment and culture.

1.3.2.6 Gender Responsiveness

As previously discussed, some programs have addressed gender issues in their design and implementation, either through direct targeting or by increasing female representation. But there is more to be done. Women in Haiti remain more vulnerable than men, especially in situations of natural calamities. They therefore need more support and resources. WFP (2016) found that male HHHs had better ways of coping with food insecurity and recovering from drought than female HHHs. The findings of the first two rounds of the Ayitic Goes Global program showcase that deep-seated gender perceptions and restrictive gender norms in Haiti contribute to inequitable access for women to education and employment opportunities in the field of digital technologies. Finally, Fonkoze's CLM

implementation suspected that sustaining positive change might be challenging in the context of extreme vulnerability of CLM members.

According to Cuellar et al. (2018), little focus has been given to monitoring the impact of Market Based Emergency Programs on women's overall well-being. WFP's Food for Education and Child Nutrition Programme identified the need for both a gender transformative strategy for community engagement and awareness raising and training on gender equality for government counterparts. Evaluation of PRRO found sustainability of achievements is a concern as WFP's support was not guided by comprehensive and gender-sensitive assessments of needs.

Fonkoze's CLM is a notable example that programs targeting women can bring positive change (Huda et al. 2010). The activity noticed two major cognitive changes—increased self-confidence and knowledge/skills of managing an enterprise—and behavioral changes such as sending children to school and engaging in family planning. Survey results also found that women with cooperative partners did significantly better on outcome indicators than women with no partners. Another example is Ayitic Goes Global. In its third training round, the program took a gender transformative approach. The findings indicate that digital training and gender workshops enabled graduates to challenge gender inequalities and exercise transformative agency. Over the course of the program, trainees experienced gradual improvements in knowledge, self-perception, behavior, gender roles, and relationships with friends and family members.

1.3.2.7 Support to Local Organizations and Producers

Development and emergency programs that support local producers are important in Haiti. In impacting agriculture, a disaster directly affects rural livelihoods. In its 2016 market analysis, WFP noted that in the medium term, reprise of agriculture is required to restore HHs' livelihoods and incomes (Latino et al. 2016). This process includes facilitating farmers' economic access to scarcely available inputs such as seeds.

Cuellar et al. (2018) argued for continued investment in the capacity of a network of vendors and suppliers to support the ability of local markets to respond to emergencies. They also recommended promotion of local food production in program design, especially since local market-based actors in Haiti are often responsive immediately following disasters.

WFP's final evaluation of the Food for Education and Child Nutrition Programme noted that local purchases benefited both school children and local producers, in particular women (Mailloux et al. 2019). It therefore recommended increasing local purchases and supporting local producer organizations, especially those managed and run by women. In addition, it identified the need to promote complementary activities related to nutrition and food production. This would provide an opportunity for children and their families to learn agricultural practices such as the use of greenhouses, which are better suited to current climatic challenges.

1.3.2.8 Enhanced Coordination

Given the large number of humanitarian actors working in Haiti, coordination among them and between them and GoH is crucial to prevent duplication of efforts and ensure efficient use of resources. Linking development programs to emergency assistance is also necessary. WFP's drought response in 2016 benefited from partnerships that contributed to decentralizing services and allowed for a transparent and open dialogue with administrative authorities and local communities (WFP 2016). Cooperating partners' previous work in communities also brought a more in-depth understanding of local dynamics. Indeed, one factor behind the lack of achievement of PRRO targets was inconsistent communication between Kore Lavi consortium partners at the central and decentralized levels.

WFP's final evaluation of the Food for Education and Child Nutrition Programme suggested establishing strategic education partnerships so schools served by WFP could also be supported by programs aimed at strengthening the quality of instruction.

Cuellar et al. (2018) suggested more efforts between USAID and other donors that provide emergency assistance in Haiti to strengthen national-level management of programs. They also suggested implementing partners layer and sequence development and emergency interventions following the onset of a disaster to meet the changing needs of the population over time. This is particularly necessary in Haiti, where coherence between various programs will mitigate the risk that people are worse off after a disaster.

2. Data Analysis

2.1 Poverty in Nord-Est

In this analysis, poverty is defined as a HH in the bottom quintile of wealth-index distribution within a specific department based on the 2017 HDHS. [3] Since the wealth index is defined at the country level, but the bottom quintile is within the department, 20 percent of HHs by definition are poor. A review of the literature on poverty determinants—in particular for Haiti (e.g., Jadotte 2010 and Échevin 2014)—suggests the following characteristics may be associated with HH poverty: 1) characteristics of the HH (including those of the HHH), 2) characteristics of individuals within the HH, and 3) characteristics of the place of residence.

The poverty analysis for Nord-Est is based on survey data for 929 HHs. For brevity, only key tables are presented in this report. Other tables can be generated based on the source code, the Stata .do file, available from RTAC or the authors upon request. All tables other than those reporting regressions present pairwise comparisons. For example, the first row in Table 4 should be read as follows: "On average, 43.52 percent of HHs own a radio; 49.87 percent of nonpoor HHs own a radio while 18.27 percent of poor HHs do. 29.05 percent of HHs without a radio are poor while 8.43 percent of HHs with a radio are. The p-value in the last column tests whether HHs with and without a certain

[3] The analysis has also been conducted for the 2012 HDHS and the results are robust, unless otherwise noted. Also see select tables in the annex, which combine the two rounds.

characteristic are equal in terms of poverty. According to typical thresholds, a p-value below 0.10 indicates a statistically significant difference."

2.1.1 Comparing Poor and Non-Poor HHs

2.1.1.1 Assets/Animals, House Materials, and Water/Sanitation/Hygiene

Table 4 suggests poor and nonpoor HHs differ significantly in terms of their asset ownership. For example, poor HHs are less likely to have modes of communication (e.g., radios, TVs, mobile phones, landlines/house phones, computers, and Internet), modes of transportation (e.g., cars, motorcycles, and bicycles), and other assets such as fridges, gas or petrol lamps, watches, and bank accounts. Interestingly, although poor HHs are more likely to own livestock, they do not seem to differ in ownership of or access to agricultural assets such as animal-drawn carts and land or cows, horses, and goats.

Table 5 compares poor and nonpoor HHs with regard to the house construction materials and characteristics. The poor are more likely to reside in houses with dirt or mud walls, sand floors, and metal or leaf roofs. They are also more likely to access drinking water via wells or unprotected springs, and less likely to have access to a toilet (e.g., flushed to septic tank or latrine with slab) and a dedicated place for handwashing (Table 6).

Table 4. HH Assets and Poverty in Nord-Est (2017 HDHS)

HH has ...	All	Nonpoor	Poor	HH without	HH with	p
Radio	43.52	49.87	18.27	29.05	8.43	0.00
TV	23.05	28.25	2.36	25.48	2.06	0.00
Mobile phone	72.28	77.17	52.80	34.19	14.66	0.00
Landline	0.74	0.92	0.00	20.23	0.00	0.02
Computer	2.64	3.12	0.73	20.47	5.58	0.02
Fridge	7.04	8.80	0.00	21.60	0.00	0.00
Internet	12.18	14.57	2.67	22.25	4.40	0.00
Cuisiniere	5.31	6.46	0.76	21.04	2.88	0.00
Gas or petrol lamp	58.37	55.05	71.59	13.70	24.62	0.00
Solar energy	17.64	18.65	13.63	21.06	15.51	0.12
Bicycle	8.64	10.21	2.39	21.45	5.55	0.00
Motorcycle	15.68	17.77	7.36	22.06	9.43	0.00
Car	2.25	2.72	0.38	20.46	3.41	0.00
Boat, no motor	0.37	0.47	0.00	20.15	0.00	0.09
Boat	0.37	0.47	0.00	20.15	0.00	0.09

HH has ...	All	Nonpoor	Poor	HH without	HH with	p
Animal-drawn cart	0.26	0.32	0.00	20.13	0.00	0.16
Watch	19.17	22.24	6.95	23.11	7.28	0.00
Bank account	22.16	25.80	7.67	23.81	6.95	0.00
Land usable for agriculture	64.80	63.55	69.81	17.22	21.63	0.13
Livestock	59.68	57.97	66.47	16.69	22.36	0.05
Cows	22.85	23.30	21.08	20.54	18.52	0.53
Horses	11.63	10.94	14.36	19.46	24.79	0.25
Goats	31.88	31.37	33.89	19.48	21.35	0.54

Source: Authors' calculations.

Table 5. House Materials and Poverty in Nord-Est (2017 HDHS)

House has ...	All	Nonpoor	Poor	HH without	HH with	p
Cane/palm walls	12.36	11.40	16.17	19.20	26.26	0.13
Dirt or mud walls	25.19	19.56	47.61	14.06	37.94	0.00
Cement walls	43.28	48.30	23.30	27.15	10.81	0.00
Stone walls	6.63	7.25	4.15	20.61	12.58	0.11
Other types of walls	12.54	13.48	8.77	20.94	14.05	0.07
Sand floor, or other materials	50.41	45.25	70.94	11.76	28.25	0.00
Cement floor	45.25	49.32	29.06	26.02	12.89	0.00
Ceramic floor	4.34	5.43	0.00	20.99	0.00	0.00
Leaf roof	1.60	1.13	3.50	19.69	43.80	0.06
Roof: tents	1.06	0.49	3.33	19.62	62.80	0.06
Metal roof	84.99	83.45	91.11	11.89	21.52	0.00
Cement roof	10.91	13.48	0.67	22.38	1.23	0.00
Other types of roofs	2.50	1.94	4.73	19.62	37.99	0.13

Source: Authors' calculations.

Table 6. Water Access, Sanitation, Hygiene, and Poverty in Nord-Est (2017 HDHS)

HH has …	All	Nonpoor	Poor	HH without	HH with	p
Drinking water: piped water	4.19	3.78	5.85	19.73	28.00	0.29
Drinking water: public tap	12.97	12.17	16.17	19.34	25.02	0.22
Drinking water: protected spring	6.31	6.45	5.74	20.20	18.27	0.71
Drinking water: unprotected spring	15.79	14.36	21.49	18.72	27.32	0.02
Drinking water: wells	19.83	17.02	31.03	17.27	31.41	0.00
Drinking water: water selling kiosk	35.81	40.53	17.01	25.96	9.54	0.00
Drinking water: other sources	5.09	5.69	2.72	20.58	10.71	0.05
Toilet: flushed to septic tank	4.58	5.73	0.00	21.04	0.00	0.00
Toilet: ventilated improved pit	5.66	5.18	7.56	19.67	26.80	0.29
Toilet: pit latrine with slab	40.01	43.17	27.44	24.28	13.77	0.00
Toilet: open pit	27.48	26.89	29.85	19.42	21.81	0.46
Toilet: other	3.38	3.67	2.24	20.31	13.29	0.31
Toilet: none	18.88	15.36	32.91	16.61	34.99	0.00
Fixed place for hand washing	13.94	15.03	9.60	21.09	13.82	0.06
Mobile place for hand washing	68.61	69.70	64.25	22.86	18.80	0.19
No place for hand washing	17.45	15.26	26.15	17.96	30.09	0.00

Source: Authors' calculations.

2.1.1.2 Other Characteristics

Table 7 compares different demographic characteristics of poor and nonpoor HHs. Poor HHs are more likely to be headed by women, older, less educated, and widowed. They also have a greater proportion of HH members over 65 years of age. Accordingly, poor HHs also have a higher dependency ratio. These demographic predictors appear to be consistent with findings from prior literature, in particular Jadotte (2010) and Échevin (2014).

Table 7. HHH Characteristics, HH Structure, and Poverty in Nord-Est (2017 HDHS)

Characteristic	All	Nonpoor	Poor	HH without	HH with	p
HHH is a woman	41.46	39.79	48.12	17.79	23.30	0.06
HHH age	48.04	47.13	51.69	--	--	0.00
HHH education: no schooling	39.42	35.57	54.76	14.99	27.89	0.00
HHH education: primary	34.27	35.12	30.89	21.11	18.10	0.31
HHH education: secondary	21.60	23.42	14.35	21.93	13.34	0.01
HHH education: higher	4.47	5.59	0.00	21.01	0.00	0.00
HHH is single	4.30	4.53	3.39	20.27	15.81	0.51
HHH is married	68.76	69.96	63.97	23.15	18.68	0.16
HHH is widowed	14.45	12.73	21.28	18.47	29.57	0.01
HHH is divorced	12.49	12.77	11.36	20.34	18.26	0.63
HH size	4.75	4.78	4.62	--	--	0.49
# of HH members below 15 years	1.81	1.80	1.81	--	--	0.98
# of HH members above 65 years	0.28	0.24	0.42	--	--	0.00
Dependency ratio of the HH	0.41	0.39	0.47	--	--	0.00

Source: Authors' calculations.

2.1.2 Disaggregated Analysis by Rural and Urban Areas

For this disaggregated analysis, poverty is defined within rural and urban areas. For example, poor urban HHs are the 20 percent poorest in urban areas according to the wealth index, with a similar definition for poor rural HHs. Unless otherwise noted, characteristics are associated with poverty of urban and rural HHs in a similar way. The tables are not shown, but available from the authors upon request.

Gender and Other Characteristics. Consistent with cultural norms that tend to be more prevalent in rural areas, only 34 percent of rural HHs are headed by women, as opposed to 49 percent of urban HHs. However, both in rural and urban areas, there is no association between the sex of the HHH and poverty.

Assets. Poor and non-poor HHs are equally likely to own livestock in rural areas, whereas urban HHs owning livestock are more likely to be poor. This is particularly true for ownership of horses and rabbits. Although such ownership is lower in urban areas, it is significantly more likely to be associated with poverty of urban HHs. This seems in line with the fact that access to land usable for agriculture is significantly associated with poverty in urban areas, but not in rural areas (although only marginally). For

non-agricultural assets, living in a house with cane/palm walls is associated with poverty of urban HHs, whereas living in a house with a leaf roof is associated with poverty in rural areas.

WASH. Poor and non-poor HHs in urban areas are equally likely to have drinking water from pipes, whereas poor HHs in rural areas are less likely to. Similarly, poor rural HHs are less likely to have access to ventilated improved pits.

2.1.3 Disaggregated Analysis by the Sex of the HHH

Male HHHs who are younger are more likely to be poor than those who are older. Meanwhile, female HHHs who are widowed are more likely to be poor. There do not seem to be significant differences in asset ownership across poor and non-poor HHHs, be they male or female.

WASH. Access to drinking water from unprotected springs is significantly higher among poor female HHHs, but not among male HHHs. Similarly, female HHHs who use open pits as toilets are more likely to be poor, but not male HHHs who use such facilities. Male HHHs without a fixed place for handwashing are significantly poorer, but such a difference is not observed among female HHHs. For both female and male HHHs, poor HHHs are significantly less likely to have a fixed place for handwashing.

2.1.4 Individual-level Characteristics and Poverty

The individual-level characteristics discussed here are based on men aged 15-54 and women aged 15-49. Among these individuals, 17 percent have no education, 46 percent have a secondary education, and seven percent hold a post-secondary education. 18 percent are unemployed, and for those working, the main occupations are sales (37 percent) and agriculture (28 percent).

There is no significant difference in the average age or sex composition of poor and non-poor individuals. They do, however, differ on education and occupation. Poor individuals are more likely to have no formal education, be literate, read newspapers, and listen to the radio. Poor individuals are most likely to be unemployed (28 percent vs 16 percent) and less likely to be employed as professionals or clerks.

2.1.5 Econometric Analysis of HH Poverty

Table 18 presents the coefficients for an OLS regression of poverty on the full set of characteristics previously considered for pairwise comparisons, by department (Nord-Est in column 1 and Centre in column 2) and pooled across both departments (column 3). In short, the following characteristics are predictive of poverty: HHs who own radios and mobile phones are less likely to be poor while those who own gas/petrol lamps are more likely to be poor. Those who live in houses with dirt/mud walls and those who live in tents are more likely to be poor.

2.2 Poverty in Centre

The poverty analysis for Centre is based on 1,134 HHs. As previously indicated, all tables other than those reporting regressions present pairwise comparisons.

2.2.1 Comparing Poor and Non-Poor HHs

2.2.1.1 Assets/Animals, House Materials, and Water/Sanitation/Hygiene

Table 8 suggests that poor and nonpoor HHs differ significantly in asset ownership. For example, poor HHs are less likely to have modes of communication (e.g., radios, TVs, mobile phones, computers, and Internet), modes of transportation (e.g., cars, motorcycles, and bicycles), and other assets such as fridges, watches, and bank accounts. Contrary to Nord-Est, poor HHs do not seem to differ on any agricultural assets.

Table 8. HH Assets and Poverty in Centre (2017 HDHS)

HH has ...	All	Nonpoor	Poor	HH without	HH with	p
Radio	35.50	40.45	15.71	26.14	8.85	0.00
TV	16.41	19.67	3.37	23.12	4.11	0.00
Mobile phone	60.50	65.42	40.82	29.97	13.49	0.00
Landline	1.25	1.35	0.84	20.08	13.45	0.59
Computer	2.81	3.40	0.43	20.49	3.07	0.00
Fridge	8.35	10.33	0.43	21.73	1.03	0.00
Internet	10.98	12.71	4.05	21.56	7.37	0.00
Cuisiniere	4.50	5.62	0.00	20.94	0.00	0.00
Gas or petrol lamp	51.97	51.20	55.08	18.71	21.20	0.34
Solar energy	12.53	14.80	3.42	22.08	5.46	0.00
Bicycle	3.25	3.95	0.43	20.58	2.65	0.00
Motorcycle	10.68	12.23	4.48	21.39	8.40	0.00
Car	2.69	3.36	0.00	20.55	0.00	0.00
Boat, no motor	0.25	0.31	0.00	20.05	0.00	0.06
Animal-drawn cart	1.07	1.23	0.43	20.13	8.04	0.15
Watch	12.87	15.44	2.57	22.37	3.99	0.00
Bank account	15.88	18.92	3.74	22.89	4.71	0.00
Land usable for agriculture	69.29	69.83	67.12	21.41	19.38	0.49
Livestock	72.32	72.16	72.97	19.53	20.18	0.83
Cows	23.66	22.95	26.48	19.26	22.39	0.32
Horses	19.07	18.39	21.81	19.33	22.87	0.31
Goats	39.02	39.29	37.93	20.36	19.44	0.73

Source: Authors' calculations.

Table 9 compares poor and nonpoor HHs with regard to the house construction materials and characteristics. The poor are more likely to reside in houses with cane/palm walls or dirt/mud walls, sand floors, and leaf roofs. Contrary to Nord-Est, poor HHs are more likely to live in houses with metal roofs, although the difference is marginally significant. Poor HHs are also more likely to access drinking water via wells or unprotected springs, and less likely to have access to a toilet (e.g., flushed to septic tank, ventilated improved pit, or latrine with slab) and a dedicated place for handwashing (Table 10).

Table 9. House Materials and Poverty in Centre (2017 HDHS)

House has ...	All	Nonpoor	Poor	HH without	HH with	p
Cane/palm walls	29.72	25.69	45.85	15.41	30.86	0.00
Dirt or mud walls	17.70	15.45	26.72	17.81	30.18	0.00
Cement walls	30.05	35.76	7.22	26.53	4.81	0.00
Stone walls	8.66	8.56	9.06	19.91	20.91	0.84
Other types of walls	13.86	14.54	11.16	20.63	16.10	0.20
Sand floor, or other materials	60.51	55.70	79.73	10.26	26.36	0.00
Cement floor	36.86	41.01	20.27	25.26	11.00	0.00
Ceramic floor	2.63	3.29	0.00	20.54	0.00	0.00
Leaf roof	11.80	8.73	24.10	17.21	40.84	0.00
Roof: tents	1.20	1.37	0.52	20.14	8.65	0.18
Metal roof	74.54	75.80	69.52	23.95	18.65	0.08
Cement roof	7.30	9.13	0.00	21.58	0.00	0.00
Other types of roofs	6.35	6.34	6.38	19.99	20.10	0.98

Source: Authors' calculations.

Table 10. Water Access, Sanitation, Hygiene, and Poverty in Centre (2017 HDHS)

HH has ...	All	Nonpoor	Poor	HH without	HH with	p
Drinking water: piped water	13.68	12.01	20.35	18.46	29.75	0.01
Drinking water: public tap	22.27	25.37	9.85	23.20	8.85	0.00
Drinking water: protected spring	10.55	12.22	3.88	21.49	7.35	0.00
Drinking water: unprotected spring	33.29	28.89	50.89	14.72	30.58	0.00
Drinking water: wells	7.82	6.67	12.38	19.01	31.69	0.06
Drinking water: water selling kiosk	9.23	11.42	0.48	21.93	1.03	0.00

HH has …	All	Nonpoor	Poor	HH without	HH with	p
Drinking water: other sources	3.16	3.41	2.17	20.21	13.74	0.27
Toilet: flushed to septic tank	3.33	4.16	0.00	20.69	0.00	0.00
Toilet: ventilated improved pit	3.59	4.18	1.22	20.49	6.82	0.01
Toilet: pit latrine with slab	31.59	33.95	22.16	22.76	14.03	0.00
Toilet: open pit	22.70	22.85	22.13	20.15	19.49	0.83
Toilet: other	2.09	2.20	1.67	20.09	16.00	0.68
Toilet: none	36.70	32.67	52.81	14.91	28.78	0.00
Fixed place for hand washing	14.19	15.22	10.07	20.96	14.19	0.05
Mobile place for hand washing	64.32	65.35	60.17	22.33	18.71	0.21
No place for hand washing	21.49	19.43	29.77	17.89	27.70	0.01

Source: Authors' calculations.

2.2.1.2 Other Characteristics

Table 11 compares demographic characteristics of poor and nonpoor HHs. Contrary to Nord-Est (as presented earlier), poor HHHs are less likely to be women and about the same age on average as nonpoor HHHs. Poor HHs also have a lower proportion of members who are older than 65 years of age. That said, poor HHHs are less likely to have attended secondary school.

Table 11. HHH Characteristics, HH Structure, and Poverty in Centre (2017 HDHS)

	All	Nonpoor	Poor	HH without	HH with	p
HHH is a woman	36.10	37.47	30.66	21.71	16.98	0.08
HHH age	47.76	47.96	46.92	--	--	0.40
HHH education: no schooling	40.83	40.11	43.71	19.03	21.41	0.37
HHH education: primary	35.79	34.95	39.15	18.95	21.88	0.30
HHH education: secondary	19.88	21.10	14.99	21.22	15.08	0.05
HHH education: higher	3.50	3.84	2.15	20.28	12.30	0.15
HHH is single	6.56	6.62	6.33	20.05	19.31	0.89
HHH is married	70.58	70.73	70.02	20.39	19.84	0.85
HHH is widowed	13.11	13.24	12.58	20.12	19.19	0.81
HHH is divorced	9.75	9.41	11.07	19.71	22.72	0.49
HH size	4.59	4.59	4.59	--	--	0.98

	All	Nonpoor	Poor	HH without	HH with	p
# of HH members below 15 years	1.95	1.89	2.18	--	--	0.07
# of HH members above 65 years	0.27	0.29	0.18	--	--	0.00
Dependency ratio of the HH	0.45	0.45	0.46	--	--	0.58

Source: Authors' calculations.

2.2.2 Disaggregated Analysis by Rural and Urban Areas

For this disaggregated analysis, poverty is defined within rural and urban areas. Poor urban HHs are the 20 percent poorest in urban areas according to the wealth index, with a similar definition for poor rural HHs. Unless otherwise noted, similar characteristics are associated with poverty of urban and rural HHs. The tables are not shown but available from the authors upon request.

Gender and Other Characteristics. Female HHHs seem less poor than male HHHs, but this difference is significant only among rural HHs. One possible explanation might be the proximity of Centre to the Dominican Republic and thus, the ensuing migration and remittances. Getting a primary level of education seems to improve living conditions for poor HHs, but more so in rural areas. Single HHHs are significantly poorer in urban areas while such difference is not observed in rural areas. Finally, poor HHs seem to be larger in rural areas whereas the opposite is true in urban areas. Poor urban HHs have significantly more members under 15 years of age, but no such difference is observed in rural HHs.

Assets. Livestock ownership seems to differentiate poverty more among urban areas. In particular, owning cows, horses, and rabbits is more prevalent among poor urban HHs than non-poor urban HHs. No such difference exists among rural HHs. Poor rural HHs are more likely to live in houses with stone walls and non-poor are more likely to live in a house with a metal roof. No such differences exist in urban areas.

WASH. Rural non-poor HHs are more likely to access drinking water through pipes than poor HHs. In urban areas, there is no such difference. Similarly, access to drinking water through unprotected springs is significantly more prevalent among poor rural HHs than non-poor HHs. However, no such difference exists among urban HHs, in part because there is only a small share of HHs that drink water from this source (4 percent in urban areas compared with 41 percent in rural areas).

2.2.3 Disaggregated Analysis by the Sex of the HHH

A larger share of female HHHs have no formal schooling (50 percent compared to 36 percent). Male HHHs who do not have a formal education are more likely to be poor. However, no such association exists for female HHHs. Single female HHHs are more likely to be poor, but no such difference exists among male HHHs.

Assets. Male HHHs who have access to solar energy seem to be poor. Similarly, living in a house with dirt or mud walls is associated with being poor, whereas living in a house with a metal roof is associated with being nonpoor. These associations only hold among male HHHs.

2.2.4 Individual-level Characteristics and Poverty

The individual-level characteristics discussed here are based on men aged 15-54 and women aged 15-49. Twenty-two percent have no education, 39 percent have secondary education, and five percent have a post-secondary degree. 22 percent are unemployed, and the main occupations are sales (46 percent) and agriculture (13 percent).

Neither gender nor age differs across poor and non-poor individuals. Poor individuals are less educated and less likely to be literate, read newspapers, listen to the radio, and watch TV. Unemployment is only marginally different between poor and non-poor individuals. The results seem to suggest that non-poor tend to be more unemployed, which seems to be in line with the fact that individuals employed in services, the main occupation, are significantly poorer. Conversely, individuals employed as professionals or clerks are significantly less likely to be poor.

2.2.5 Econometric Analysis of HH Poverty

Returning to Table 18, the following characteristics are predictive of poverty. Similar to Nord-Est, HHs who own radios and mobile phones are less likely to be poor, while those who live in houses with dirt/mud walls are more likely to be poor. However, in Centre, several other characteristics seem to be significantly associated with poverty, possibly due to the larger sample of HHs. In particular, those who access drinking water from wells or live in houses with cane/palm walls or leaf roofs are more likely to be poor. The same holds for those who do not have access to a fixed or mobile place for handwashing. However, those who live in houses with cement walls are less likely to be poor. Finally, HHs that own sheep or chickens and have more members older than 65 are more likely to be poor.

2.3 Child Malnutrition

In this analysis, a child is considered stunted if the z-score of height-for-age is below -2 standard deviation. A child is considered wasted if the z-score of weight-for-height is below -2 standard deviation. The z-scores have been computed in terms of standard deviation from the median of the World Health Organization reference population (see the 2017 HDHS documentation for additional detail). The datasets for child malnutrition (539 children in Nord-Est and 679 children in Centre) are significantly smaller than those for poverty. Accordingly, the stunting and wasting analyses will pool across both departments. Even so, the regression results are globally insignificant (results not reported). To attempt to gain statistical power, data from the 2012 and 2017 HDHS were pooled. The results presented in this section are thus pooled across departments and across rounds of HDHS. The final sample size for the analysis is 1,452 children—648 children in Nord-Est and 804 children in Centre. Even so, regressions for wasting are not significant, whereas results for stunting are globally significant once pooled (Table 18 and Table 19). The findings discussed below primarily rely on pairwise comparisons of parent and child characteristics as well as regression results for stunting. Since the results for wasting are globally insignificant, they are not discussed.

2.3.1 Correlates of Stunting

Pairwise comparisons of mother, father, and child characteristics with regard to stunting are presented in Table 12, Table 13, and Table 14 respectively. The findings suggest children are more likely to be stunted if the mother or father works in agriculture or has no formal education. Mothers with no literacy skills are also more likely to have stunted children, and girls are less likely to be stunted than

boys. Children who were very large at birth are less likely to be stunted. Fathers who have a secondary education are less likely to have stunted children. Although not shown, children are also more likely to be stunted if the HHH is a man, drinking water comes from a (protected or unprotected) spring (marginally significant), the HH has no access to a proper toilet (e.g., flushed, pit, or latrine), and the house has dirt/mud walls, sand floors, or leaf roofs. Children who live in houses with metal roofs or drinking water from pipes are (marginally) less likely to be stunted. Finally, those living in houses with drinking water from public tap are more likely to be stunted.

Table 12. Mother's Characteristics and Stunting in Nord-Est and Centre (Pooled) Departments

Characteristic	All	Non-stunted	Stunted	HH without	HH with	p
Mother is HHH	22.19	24.45	21.01	26.96	23.28	0.17
Mother is HHH's wife	50.25	47.95	54.80	23.46	28.75	0.02
Mother is HHH's daughter	15.94	16.84	12.59	27.06	20.88	0.03
Mother is HHH's daughter-in-law	4.16	4.86	4.23	26.22	23.50	0.56
Mother is HHH's sister	1.97	1.71	2.29	25.97	32.18	0.52
Mother and HHH: other relationship	3.28	2.63	3.90	25.84	34.38	0.21
Mother has no relationship with HHH	2.20	1.58	1.18	26.17	20.84	0.51
Mother's education: none	28.26	24.85	37.41	22.72	34.70	0.00
Mother's education: primary	44.70	43.14	44.01	25.79	26.48	0.76
Mother's education: secondary	25.52	30.20	16.86	29.60	16.47	0.00
Mother's education: post-secondary	1.52	1.81	1.71	26.11	25.04	0.90
Mother never married	76.67	77.34	77.00	26.37	26.01	0.89
Mother is married	12.51	11.92	15.12	25.38	30.93	0.13
Mother lives with partner	1.24	1.42	1.50	26.07	27.24	0.90
Mother is separated, divorced, or widowed	4.93	4.11	2.17	26.48	15.74	0.03
Mother's occupation: none	35.76	36.78	36.34	26.22	25.86	0.88
Mother's occupation: professional or managerial	2.37	3.17	1.71	26.38	15.99	0.10
Mother's occupation: sales	44.88	44.94	42.53	26.92	25.04	0.41
Mother's occupation: agriculture	11.58	10.06	15.14	24.98	34.69	0.01
Mother's occupation: domestic	2.56	1.94	1.79	26.12	24.51	0.84
Mother's occupation: manual	2.86	3.10	2.49	26.21	22.08	0.51

Characteristic	All	Non-stunted	Stunted	HH without	HH with	p
Mother works all year	34.62	34.44	33.33	26.42	25.46	0.69
Mother works seasonally	13.52	11.79	14.09	25.58	29.68	0.23
Mother works occasionally	16.10	16.98	16.23	26.26	25.23	0.73
Mother's literacy: none	45.81	41.26	54.72	21.39	31.89	0.00
Mother's literacy: partial	14.35	15.70	15.76	26.07	26.17	0.98
Mother's literacy: fully	39.84	43.05	29.52	30.40	19.49	0.00

Source: Authors' calculations.

Table 13. Father's Characteristics and Stunting in Nord-Est and Centre (Pooled) Departments

Characteristic	All	Non-stunted	Stunted	HH without	HH with	p
Father's education: none	28.06	24.62	36.35	23.42	34.83	0.00
Father's education level: primary	39.72	38.80	39.39	26.39	26.88	0.84
Father's education level: secondary	28.67	31.40	23.01	28.90	20.97	0.00
Father's education level: higher	3.54	5.18	1.25	27.38	8.01	0.00
Father's occupation: none	2.43	2.69	3.14	26.00	29.22	0.63
Father's occupation: professional or managerial	7.77	10.01	4.45	27.26	13.56	0.00
Father's occupation: sales	13.67	13.30	11.05	26.59	22.68	0.23
Father's occupation: agriculture	50.39	46.39	58.26	21.56	30.72	0.00
Father's occupation: domestic	1.50	1.88	1.25	26.21	18.96	0.32
Father's occupation: manual	17.32	17.82	16.30	26.44	24.41	0.50

Source: Authors' calculations.

Table 14. Child's Characteristics and Stunting in Nord-Est and Centre (Pooled) Departments

Characteristic	All	Non-stunted	Stunted	HH without	HH with	p
Child is a girl	49.83	52.76	43.12	29.83	22.39	0.00
Pregnancy wanted then	46.88	44.57	44.64	26.07	26.12	0.98
Pregnancy wanted later	28.01	30.62	28.49	26.68	24.72	0.43
Pregnancy not wanted	24.99	24.77	26.87	25.55	27.69	0.41
Child at birth was very large	9.91	10.31	7.31	26.73	20.02	0.06
Child at birth was larger than average	13.92	13.53	15.28	25.70	28.51	0.41
Child at birth had average size	44.23	45.91	46.16	26.00	26.19	0.93
Child at birth was smaller than average	15.29	15.76	16.10	26.01	26.51	0.87
Child at birth was very small at birth	16.64	14.49	15.15	25.94	26.96	0.75
Vitamin A in last six months	40.46	39.28	36.91	26.84	24.91	0.40
Child had diarrhea recently	22.75	22.24	23.72	25.72	27.35	0.55
Child had fever recently	33.04	35.92	32.92	26.98	24.45	0.29
Child had cough recently	54.82	57.24	58.32	25.60	26.45	0.71
Child had shortness of breath recently	44.79	40.79	41.74	26.46	27.23	0.77

Source: Authors' calculations.

2.3.2 Econometric Analysis of Stunting

Results from the econometric analysis of stunting (Table 19) show that children whose mothers have post-secondary education are less likely to be stunted. Girls are less stunted than boys. Children with married mothers are significantly more stunted. The mother's occupation has no impact on stunting.

Results for Centre offer insights particular to that department. Children who live in HHs headed by women, be it their mother or not, are less likely to be stunted. Children with average birth size are significantly more likely to be stunted compared to those who were very large at birth.

2.3.3 Correlates of Wasting

Pairwise comparisons of mother, father, and child characteristics with regard to wasting are presented in Table 15, Table 16, and Table 17. The findings suggest children are more likely to be wasted if the mother is not literate or divorced or separated. They are less likely to be wasted if the father has a professional or managerial job. Otherwise, most characteristics are not significantly associated with wasting. Although not shown, children are also more likely to be wasted if the HHH is married.

Table 15. Mother's Characteristics and Wasting in Nord-Est and Centre (Pooled) Departments

Characteristic	All	Non-wasted	Wasted	HH without	HH with	p
Mother is HHH	22.19	23.83	15.80	3.66	2.23	0.15
Mother is HHH's wife	50.25	49.33	62.34	2.49	4.16	0.06
Mother is HHH's daughter	15.94	15.94	9.92	3.55	2.09	0.11
Mother is HHH's daughter-in-law	4.16	4.56	8.69	3.18	6.14	0.32
Mother is HHH's sister	1.97	1.85	2.32	3.30	4.13	0.84
Mother and HHH: other relationship	3.28	2.98	0.94	3.39	1.07	0.05
Mother has no relationship with HHH	2.20	1.53	0.00	3.37	0.00	0.00
Mother's education: none	28.26	27.95	32.25	3.13	3.81	0.49
Mother's education: primary	44.70	43.22	48.15	3.04	3.68	0.48
Mother's education: secondary	25.52	26.98	19.60	3.64	2.43	0.20
Mother's education: post-secondary	1.52	1.85	0.00	3.38	0.00	0.00
Mother never married	76.67	77.03	84.73	2.23	3.64	0.15
Mother is married	12.51	12.78	10.62	3.40	2.77	0.66
Mother lives with partner	1.24	1.49	0.00	3.37	0.00	0.00
Mother is separated, divorced or widowed	4.93	3.69	1.25	3.40	1.15	0.07
Mother's occupation: none	35.76	36.37	44.50	2.91	4.03	0.24
Mother's occupation: professional or managerial	2.37	2.78	2.88	3.32	3.42	0.97
Mother's occupation: sales	44.88	44.54	38.20	3.68	2.86	0.35
Mother's occupation: agriculture	11.58	11.32	13.43	3.24	3.91	0.65
Mother's occupation: domestic	2.56	1.97	0.00	3.38	0.00	0.00
Mother's occupation: manual	2.86	3.01	1.00	3.39	1.13	0.06
Mother works all year	34.62	34.57	22.40	3.91	2.18	0.03
Mother works seasonally	13.52	12.28	15.74	3.19	4.21	0.48
Mother works occasionally	16.10	16.78	17.35	3.30	3.43	0.91
Mother's literacy: none	45.81	44.34	56.49	2.61	4.19	0.08

Characteristic	All	Non-wasted	Wasted	HH without	HH with	p
Mother's literacy: partial	14.35	15.69	16.58	3.28	3.50	0.87
Mother's literacy: fully	39.84	39.97	26.93	4.01	2.26	0.04

Source: Authors' calculations.

Table 16. Father's Characteristics and Wasting in Nord-Est and Centre (Pooled) Departments

Characteristic	All	Non-wasted	Wasted	HH without	HH with	p
Father's education: none	28.06	27.70	27.75	3.41	3.42	0.99
Father's education level: primary	39.72	38.74	45.68	3.04	4.00	0.33
Father's education level: secondary	28.67	29.36	24.15	3.66	2.82	0.43
Father's education level: higher	3.54	4.20	2.42	3.47	2.00	0.47
Father's occupation: none	2.43	2.90	0.00	3.41	0.00	0.00
Father's occupation: professional or managerial	7.77	8.77	2.42	3.54	0.94	0.00
Father's occupation: sales	13.67	12.64	13.58	3.28	3.56	0.84
Father's occupation: agriculture	50.39	49.20	58.67	2.72	3.93	0.18
Father's occupation: domestic	1.50	1.78	0.00	3.38	0.00	0.00
Father's occupation: manual	17.32	17.32	20.68	3.19	3.94	0.59

Source: Authors' calculations.

Table 17. Child's Characteristics and Wasting in Nord-Est and Centre (Pooled) Departments

Characteristic	All	Non-wasted	Wasted	HH without	HH with	p
Child is a girl	49.83	50.14	52.60	3.16	3.48	0.72
Pregnancy wanted then	46.88	44.41	49.04	3.05	3.65	0.51
Pregnancy wanted later	28.01	30.37	21.72	3.72	2.40	0.14
Pregnancy not wanted	24.99	25.19	29.24	3.14	3.83	0.51
Child at birth was very large	9.91	9.60	7.71	3.39	2.68	0.58
Child at birth was larger than average	13.92	14.13	9.81	3.48	2.33	0.36
Child at birth had average size	44.23	46.25	37.14	3.86	2.68	0.18
Child at birth was smaller than average	15.29	15.63	22.57	3.05	4.72	0.22
Child at birth was very small at birth	16.64	14.39	22.76	3.00	5.15	0.15
Vitamin A in last six months	40.46	38.53	43.05	3.08	3.69	0.51
Child had diarrhea recently	22.75	22.34	31.19	2.95	4.57	0.16
Child had fever recently	33.04	34.80	45.58	2.78	4.30	0.12
Child had cough recently	54.82	57.62	53.90	3.60	3.11	0.59
Child had shortness of breath recently	44.79	40.76	51.94	2.28	3.54	0.18

Source: Authors' calculations.

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4. Annexes

Table 18. Predictors of Poverty in Nord-Est and Centre Departments Based on OLS Regression (2017 HDHS)

Characteristic	Nord-Est (1)	Centre (2)	Both Departments (3)
HHH is a woman	0.041	-0.004	0.008
	(0.042)	(0.028)	(0.023)
HHH age	0.001	0.002	0.001
	(0.002)	(0.001)	(0.001)
HHH education: primary	-0.007	0.024	0.016
	(0.048)	(0.029)	(0.025)
HHH education: secondary	0.045	0.112	0.077
	(0.063)	(0.043)***	(0.035)**
HHH education: higher	-0.002	0.206	0.111
	(0.109)	(0.083)**	(0.065)*
HHH is married	-0.003	-0.009	-0.021
	(0.099)	(0.057)	(0.048)
HHH is widowed	0.010	-0.022	-0.017
	(0.115)	(0.071)	(0.059)
HHH is divorced	-0.038	-0.003	-0.025
	(0.110)	(0.066)	(0.056)
HH size	0.012	-0.005	0.006
	(0.014)	(0.010)	(0.008)
# of HH members below 15 years	-0.011	0.019	0.002
	(0.020)	(0.014)	(0.011)
# of HH members above 65 years	0.028	-0.085	-0.038
	(0.045)	(0.029)***	(0.024)
Radio	-0.127	-0.102	-0.103
	(0.042)***	(0.028)***	(0.023)***
TV	-0.067	-0.013	-0.045
	(0.057)	(0.042)	(0.033)
Mobile phone	-0.086	-0.116	-0.101
	(0.049)*	(0.029)***	(0.025)***
Landline	-0.154	0.057	-0.011
	(0.217)	(0.109)	(0.097)
Computer	0.031	0.012	0.041
	(0.126)	(0.090)	(0.071)
Fridge	-0.013	-0.015	-0.024
	(0.086)	(0.058)	(0.046)
Internet	-0.028	0.011	-0.007
	(0.066)	(0.048)	(0.038)
Cuisiniere	-0.059	-0.034	-0.042
	(0.096)	(0.068)	(0.055)
Gas or petrol lamp	0.094	0.021	0.046
	(0.039)**	(0.024)	(0.020)**
Solar energy	0.015	-0.075	-0.031
	(0.051)	(0.038)**	(0.030)
Bicycle	-0.076	-0.080	-0.072
	(0.070)	(0.070)	(0.048)
Motorcycle	-0.001	-0.045	-0.032
	(0.058)	(0.042)	(0.033)

Characteristic	Nord-Est (1)	Centre (2)	Both Departments (3)
Car	0.055	0.028	0.029
	(0.152)	(0.083)	(0.071)
Boat, no motor	-0.201	-0.262	-0.229
	(0.000)	(0.000)	
Animal-drawn cart	0.126	-0.067	-0.083
	(0.658)	(0.114)	(0.114)
Watch	-0.041	-0.044	-0.043
	(0.052)	(0.040)	(0.031)
Bank account	-0.002	-0.046	-0.030
	(0.052)	(0.040)	(0.031)
Land usable for agriculture	-0.013	-0.017	-0.015
	(0.043)	(0.028)	(0.024)
Cane/palm walls	0.083	0.140	0.130
	(0.076)	(0.039)***	(0.034)***
Dirt or mud walls	0.188	0.095	0.138
	(0.065)***	(0.043)**	(0.035)***
Cement walls	0.067	-0.081	-0.026
	(0.071)	(0.046)*	(0.038)
Stone walls	0.058	0.044	0.036
	(0.092)	(0.052)	(0.045)
Cement floor	0.005	0.026	0.020
	(0.056)	(0.035)	(0.029)
Ceramic floor	-0.021	-0.030	-0.011
	(0.113)	(0.088)	(0.068)
Leaf roof	0.127	0.168	0.161
	(0.212)	(0.062)***	(0.060)***
Roof: tents	0.560	-0.062	0.127
	(0.238)**	(0.120)	(0.105)
Metal roof	-0.020	0.030	0.020
	(0.154)	(0.054)	(0.051)
Cement roof	-0.066	-0.044	-0.049
	(0.169)	(0.079)	(0.067)
Drinking water: piped water	0.147	0.249	0.191
	(0.124)	(0.074)***	(0.059)***
Drinking water: public tap	0.064	-0.056	-0.060
	(0.097)	(0.071)	(0.056)
Drinking water: protected spring	-0.080	-0.109	-0.137
	(0.116)	(0.077)	(0.061)**
Drinking water: unprotected spring	-0.004	0.064	0.018
	(0.100)	(0.071)	(0.056)
Drinking water: wells	0.144	0.164	0.137
	(0.094)	(0.080)**	(0.059)**
Drinking water: water selling kiosk	0.019	0.080	0.058
	(0.089)	(0.082)	(0.058)
Toilet: flushed to septic tank	0.018	0.009	0.016
	(0.144)	(0.112)	(0.087)
Toilet: ventilated improved pit	0.178	-0.129	0.010
	(0.127)	(0.105)	(0.079)
Toilet: pit latrine with slab	0.026	-0.070	-0.019
	(0.106)	(0.086)	(0.065)
Toilet: open pit	0.045	-0.086	-0.018

Characteristic	Nord-Est (1)	Centre (2)	Both Departments (3)
	(0.106)	(0.088)	(0.067)
Toilet: none	0.110	0.005	0.053
	(0.111)	(0.088)	(0.067)
Fixed place for hand washing	-0.035	-0.095	-0.072
	(0.072)	(0.042)**	(0.036)**
Mobile place for hand washing	-0.081	-0.110	-0.093
	(0.051)	(0.030)***	(0.025)***
Cows	-0.033	0.052	0.030
	(0.052)	(0.032)	(0.027)
Horses	0.031	0.046	0.035
	(0.064)	(0.034)	(0.030)
Goats	-0.012	-0.003	-0.002
	(0.047)	(0.028)	(0.024)
Sheep	-0.028	-0.361	-0.202
	(0.190)	(0.146)**	(0.115)*
Chickens	-0.049	-0.049	-0.051
	(0.047)	(0.028)*	(0.024)**
Rabbits	0.011	0.049	0.032
	(0.059)	(0.029)*	(0.026)
Boat			0.235
			(0.387)
R^2	0.23	0.26	0.21
Adjusted R^2	0.12	0.22	0.17
F-statistic	2.05	5.58	5.97
Global significance (p-value)	0.00	0.00	0.00
N	929	1,134	2,063

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

Table 19. Predictors of Stunting in Nord-Est and Centre Departments Based on OLS Regression (2017 and 2012 HDHS)

Characteristic	Nord-Est	Centre	Both Departments
	(1)	(2)	(3)
HHH is a woman	0.069	-0.148	-0.086
	(0.091)	(0.072)**	(0.056)
HHH age	0.004	-0.003	-0.001
	(0.003)	(0.002)	(0.002)
HHH education: primary	0.017	-0.041	-0.023
	(0.060)	(0.044)	(0.034)
HHH education: secondary	0.072	-0.083	-0.035
	(0.081)	(0.059)	(0.047)
HHH education: higher	-0.104	-0.163	-0.182
	(0.163)	(0.148)	(0.106)*
HHH is married	-0.282	0.028	-0.058
	(0.242)	(0.178)	(0.138)
HHH is widowed	-0.307	0.028	-0.058
	(0.262)	(0.195)	(0.150)
HHH is divorced	-0.315	0.033	-0.077
	(0.254)	(0.193)	(0.148)
HH size	-0.015	0.006	-0.002
	(0.017)	(0.014)	(0.011)
# of HH members below 15	0.041	0.004	0.018
	(0.023)*	(0.020)	(0.015)
# of HH members above 65	-0.041	0.043	0.009
	(0.060)	(0.050)	(0.037)
Child is a girl	-0.073	-0.077	-0.074
	(0.044)*	(0.032)**	(0.025)***
Pregnancy wanted later	0.017	-0.023	-0.008
	(0.056)	(0.039)	(0.031)
Pregnancy not wanted	-0.046	-0.026	-0.028
	(0.057)	(0.044)	(0.034)
Child at birth was larger than average	0.016	0.123	0.075
	(0.090)	(0.068)*	(0.053)
Child at birth had average size	0.049	0.062	0.056
	(0.081)	(0.056)	(0.045)
Child at birth was smaller than average	0.105	0.039	0.056
	(0.093)	(0.064)	(0.052)
Child at birth was very small at birth	0.146	0.062	0.083
	(0.096)	(0.064)	(0.053)
Vitamin A in last 6 months	-0.019	0.009	0.005
	(0.049)	(0.034)	(0.027)
Child had diarrhea recently	0.008	0.011	0.010
	(0.055)	(0.038)	(0.031)
Child had fever recently	-0.000	-0.052	-0.031
	(0.051)	(0.037)	(0.029)
Child had cough recently	-0.008	0.029	0.016
	(0.047)	(0.037)	(0.028)
Mother is HHH	0.104	0.015	0.044
	(0.183)	(0.172)	(0.123)
Mother is HHH's wife	0.201	-0.030	0.038
	(0.172)	(0.158)	(0.114)
Mother is HHH's daughter	0.049	-0.060	-0.009

Characteristic	Nord-Est	Centre	Both Departments
	(1)	(2)	(3)
	(0.158)	(0.157)	(0.110)
Mother is HHH's daughter-in-law	0.155	-0.037	0.034
	(0.181)	(0.168)	(0.121)
Mother is HHH's sister	-0.167	0.087	0.075
	(0.270)	(0.194)	(0.148)
Mother and HHH: other relationship	0.201	0.046	0.109
	(0.193)	(0.179)	(0.129)
Mother's education: primary	-0.026	-0.042	-0.048
	(0.084)	(0.051)	(0.042)
Mother's education: secondary	-0.102	-0.099	-0.110
	(0.109)	(0.075)	(0.060)*
Mother's education: post-secondary	0.215	-0.022	0.081
	(0.203)	(0.193)	(0.136)
Mother is married	0.083	0.124	0.100
	(0.075)	(0.054)**	(0.043)**
Mother lives with partner	0.019	0.139	0.057
	(0.173)	(0.156)	(0.114)
Mother is separated, divorced or widowed	0.025	-0.042	-0.034
	(0.115)	(0.103)	(0.075)
Mother's occupation: professional or managerial		0.030	
		(0.160)	
Mother's occupation: sales	-0.032	0.109	0.015
	(0.159)	(0.120)	(0.090)
Mother's occupation: agriculture	0.041	0.131	0.054
	(0.178)	(0.130)	(0.099)
Mother's occupation: domestic	0.088		-0.010
	(0.220)		(0.127)
Mother's occupation: manual	0.021	0.221	0.021
	(0.173)	(0.195)	(0.113)
Mother works all year	-0.060	-0.068	-0.019
	(0.159)	(0.122)	(0.089)
Mother works seasonally	-0.050	-0.089	-0.022
	(0.170)	(0.131)	(0.098)
Mother works occasionally	-0.086	-0.111	-0.036
	(0.171)	(0.124)	(0.095)
Mother's literacy: partial	-0.036	0.007	-0.010
	(0.083)	(0.054)	(0.044)
Mother's literacy: fully	-0.043	-0.015	-0.030
	(0.073)	(0.054)	(0.042)
Year: 2017 (base = 2012)	0.008	0.066	0.041
	(0.050)	(0.035)*	(0.028)
R2	0.09	0.07	0.06
Adjusted R2	-0.02	0.02	0.02
F-statistic	0.79	1.35	1.58
Global significance (p-value)	0.80	0.07	0.01
N	648	804	1,452

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

Table 20. Predictors of Wasting in Nord-Est and Centre Departments based on OLS Regression (2017 and 2012 HDHS)

Characteristic	Nord-Est (1)	Centre (2)	Both Departments (3)
HHH is a woman	0.020	0.009	0.017
	(0.037)	(0.031)	(0.023)
HHH age	0.000	-0.000	-0.000
	(0.001)	(0.001)	(0.001)
HHH education: primary	0.003	0.005	0.001
	(0.024)	(0.019)	(0.014)
HHH education: secondary	0.024	0.035	0.026
	(0.033)	(0.025)	(0.019)
HHH education: higher	-0.024	0.071	0.019
	(0.067)	(0.061)	(0.044)
HHH is married	0.039	0.070	0.029
	(0.099)	(0.070)	(0.057)
HHH is widowed	0.034	0.073	0.038
	(0.107)	(0.078)	(0.062)
HHH is divorced	0.014	0.054	0.007
	(0.104)	(0.077)	(0.061)
HH size	0.009	-0.003	0.006
	(0.007)	(0.006)	(0.004)
# of HH members below 15	-0.012	0.004	-0.005
	(0.010)	(0.009)	(0.006)
# of HH members above 65	-0.008	0.016	-0.008
	(0.025)	(0.021)	(0.015)
Child is a girl	0.008	-0.013	0.000
	(0.018)	(0.014)	(0.010)
Pregnancy wanted later	0.011	-0.010	-0.010
	(0.023)	(0.017)	(0.013)
Pregnancy not wanted	0.003	-0.001	0.005
	(0.023)	(0.019)	(0.014)
Child at birth was larger than average	-0.043	0.016	-0.004
	(0.037)	(0.029)	(0.022)
Child at birth had average size	-0.032	0.014	0.002
	(0.033)	(0.024)	(0.019)
Child at birth was smaller than average	-0.030	0.046	0.021
	(0.038)	(0.028)	(0.021)
Child at birth was very small at birth	-0.023	0.033	0.020
	(0.039)	(0.028)	(0.022)
Vitamin A in last 6 months	0.012	-0.007	0.002
	(0.020)	(0.015)	(0.011)
Child had diarrhea recently	0.015	0.010	0.013
	(0.023)	(0.016)	(0.013)
Child had fever recently	0.035	0.007	0.022
	(0.021)*	(0.015)	(0.012)*
Child had cough recently	-0.020	-0.005	-0.010
	(0.019)	(0.020)	(0.012)
Mother is HHH	0.024	0.016	0.015
	(0.075)	(0.075)	(0.051)
Mother is HHH's wife	0.061	0.047	0.047
	(0.070)	(0.068)	(0.047)
Mother is HHH's daughter	0.037	0.018	0.027
	(0.065)	(0.067)	(0.045)
Mother is HHH's daughter-in-law	0.004	0.034	0.065

Characteristic	Nord-Est	Centre	Both Departments
	(1)	(2)	(3)
	(0.074)	(0.073)	(0.050)
Mother is HHH's sister	0.033	0.083	0.041
	(0.110)	(0.083)	(0.061)
Mother and HHH: other relationship	0.041	-0.004	0.012
	(0.079)	(0.077)	(0.053)
Mother's education: primary	-0.051	0.023	0.009
	(0.034)	(0.022)	(0.018)
Mother's education: secondary	-0.056	0.015	0.004
	(0.045)	(0.032)	(0.025)
Mother's education: post-secondary	-0.074	-0.065	-0.038
	(0.083)	(0.083)	(0.056)
Mother is married	-0.009	0.016	0.006
	(0.031)	(0.023)	(0.018)
Mother lives with partner	-0.011	-0.009	-0.031
	(0.071)	(0.074)	(0.047)
Mother is separated, divorced or widowed	0.036	-0.024	0.001
	(0.047)	(0.046)	(0.031)
Mother's occupation: professional or managerial		0.060	0.063
		(0.064)	(0.053)
Mother's occupation: sales	-0.053	0.025	0.022
	(0.065)	(0.047)	(0.039)
Mother's occupation: agriculture	-0.046	0.006	0.022
	(0.073)	(0.051)	(0.042)
Mother's occupation: domestic	-0.062		
	(0.090)		
Mother's occupation: manual	-0.047	0.037	0.029
	(0.071)	(0.085)	(0.049)
Mother works all year	0.045	-0.065	-0.043
	(0.065)	(0.048)	(0.039)
Mother works seasonally	0.050	-0.018	-0.023
	(0.069)	(0.052)	(0.043)
Mother works occasionally	0.013	-0.017	-0.029
	(0.070)	(0.049)	(0.040)
Mother's literacy: Partial	-0.008	-0.004	-0.012
	(0.034)	(0.023)	(0.018)
Mother's literacy: Fully	-0.018	-0.012	-0.027
	(0.030)	(0.024)	(0.017)
Year: 2017 (base = 2012)	-0.011	-0.018	-0.022
	(0.020)	(0.018)	(0.012)*
Child had shortness of breath recently		0.015	
		(0.016)	
Adjusted R^2	0.07	0.05	0.03
F-statistic	-0.05	-0.02	-0.01
Global significance (p-value)	0.57	0.66	0.78
Global significance	0.99	0.96	0.85
N	648	804	1,452

* $p<0.1$; ** $p<0.05$; *** $p<0.01$