EXECUTIVE SUMMARY

Project Introduction

This past summer, we conducted a health assessment in four rural Haitian communities—Susui, Leon Riche, Lagun, and Alejan—located near the border with the Dominican Republic. The framework of our project was rooted in the concept of sustainability in a human sense. That is, we sought to ascertain the conditions of several factors that contribute to the sustainability of a community’s wellness: the health of mothers and their infants; the nutritional status of infants; and households’ access to sanitation.

The University of Michigan faculty advisor of this project was Dr. Frank Anderson, MD, MPH (Clinical Associate Professor, Obstetrics and Gynecology; Clinical Associate Professor, Health Behavior and Health Education). Under his direction, we included in our research three different data collection tools: the USAID KPC Rapid Core Assessment Tool on Child Health (CATCH) survey for infant and maternal health (modified slightly for the context of our study); the World Health Organization’s survey on sanitation; and Dr. Anderson’s Reproductive Age Mortality Survey. By collecting data on issues such as sanitation, access to clean water, proximity to latrines and a water source, maternal education level, and access to quality nutrition, we could investigate their potential relationship to maternal health and child malnutrition and mortality. These surveys yielded substantial data that help to discern and elucidate disease burdens among these four communities and also point toward the social determinants of ill health. It is our hope that these results may contribute to the development and deployment of sustainable interventions that will help to improve health outcomes in this border region of Haiti and other communities facing similar challenges.

Key Findings

As was the purpose of this project, we have succeeded in gathering data relevant in describing the health and well-being of these Haitian border communities. Of the 122 households we interviewed in these communities, we found seven deaths of women of reproductive age, four of which were potentially maternal mortalities. Of the 126 infants who we were born within the past five years, 13 infants died, revealing an infant mortality rate of 10%. For the 54 births within the past two years, 74% of these births happened in the home under the care of a presumably untrained “matrone” or midwife, where 19% took place in a health care facility and 7% were unassisted births. The average distance traveled, at a minimum calculated with Google Earth mapping software, is 9 km to the hospital that was claimed to be used by mothers for antenatal care, childbirth, and postnatal care. Of the 55 living infants we interviewed, it is worth noting here that none of them ate dairy nor fish, about half of them ate vegetables, about half of them ate meat and less than half ate eggs on a daily basis. 88% of these children were breastfeeding. A more detailed table with nutrition statistics can be seen later on in this report. In regards to the health of these children, within the past two weeks 75% of them had a fever, 55% had diarrhea, and 67% had cough or difficulty breathing.

Of the 122 households we interviewed, 19% used a pit latrine with a concrete slab, 34% used an open pit or hole, and 47% had no bathroom facilities and defecated outside. Each household gathered their drinking water from an unprotected spring or river, taking about one hour on average to retrieve this water. Less than half (48%) of these households treat their water with chlorine tabs. All of these houses were mapped out with a GPS mapping software and we have obtained maps of the community’s houses, any latrines present, and the water sources we encountered in these communities.

Key Partners and Stakeholders

By nature of working right on the border of the Dominican Republic and Haiti, we have partners and stakeholders on both sides of the border. On the Dominican side, Fundación Mariana San Isidro Labrador (FUMSIL), the Dominican aid foundation that provided the resources for us to live in the DR, has a vested interest in these Haitian communities, as this organization works in the surrounding area and
sometimes received Haitians from these communities who are seeking health care. On the Haitian side, we have Partners in Health and Zanmi Lasante Hospital. PIH has the potential to provide a program to train and utilize community health workers, and in a sense this organization is a key factor in moving these communities towards a life unhindered by unnecessary death and illness. The main stakeholders of this project, however, are those in the Haitian communities themselves. They are the ones benefitting from our research, and their health is what we sought to observe and are seeking to perhaps improve and sustain.

**Project Goals**
After having done a more necessary and in-depth assessment on these Haitian border communities, we wish to implement a before-used accompaniment model of care, where trained community health workers make visits to these communities to check in on the mothers, infants and children. These CHWs can then also organize and train women’s groups in maternal and infant health, while also training a *matrone* for each community. The future funds we are requesting, which is 20,500 USD in total, would go towards training our CHWs, paying the CHWs a monthly salary and travel costs for training the women’s groups and *matrones*, and for doing a two-month and six-month checkup on these communities.

**METHODS**

**Survey Selection**
The USAID Rapid CATCH survey is a tool for quickly gaining a large breadth of data about the health of infants in a community. This survey collects data on maternal and newborn care, breastfeeding and infant/young child feeding, vitamin A supplementation, child immunizations, treatment of fever among children, control of diarrhea, illnesses having to do with a cough, water and sanitation, and anthropometrics (mid-upper arm circumference and weight).

We used the World Health Organization’s set of questions titled “Core questions on drinking-water and sanitation for household surveys” to quantify the sanitation in these border communities. This survey addresses communities’ sources of water, whether or not they treat the water, how long it takes to retrieve water from their respective water sources, how community members dispose of their bodily waste, with whom they share their bathroom, and what they do with their children’s excrement.

Dr. Anderson’s data collection tool, the Reproductive Age Mortality Survey, is designed to assess and address maternal mortality in a community. A maternal death is defined as the death of a woman of reproductive age due to complications with pregnancy or her reproductive system. The goal of this study is to properly document maternal deaths in order to develop interventions that can help to reduce maternal mortality around the world. Hence, this study is designed to firstly identify cases of women’s deaths, and then to determine whether or not such cases can be classified as maternal deaths.

All surveys were conducted and documented with the QuickTapSurveys application for Apple products. This tool allowed for manual input of data while asking survey questions and separated out the data into comma-separated values for later processing.

**GPS Mapping**
We used GPS mapping to establish the locations for where our work was being carried out. We also collected quantifiable data on the distances community members need to travel in order to reach the nearest medical centers, water sources, and latrines. These data helped to investigate what relationship might exist between maternal/child health and proximity to such resources. The software used was Backcountry Navigator Pro for Android, as we needed to find a GPS software that had offline navigation capabilities.

**Data Collection**
Our data collection process involved initially crossing the border to Haiti from our residence at Fundacion Mariana San Isidro Labrador (FUMSIL) in the Dominican Republic. We were accompanied by a Dominican Creole-Spanish interpreter, a Dominican guide familiar with the communities in question, and a Dominican man employed as a security guard.

Our guide led us to each household in the four Haitian border communities of Susui, Leon Riche, Lagun, and Alejan. We only interviewed those individuals who we encountered at their house; if we came upon a house that did not have someone who could answer our questions or if nobody was home, we would document the GPS location of the house and move on to the next house. Due to timeline constraints of our project, we were not able to return to these houses at a later time. Upon encountering a household, we greeted the residents and explained our work and surveys to them. We obtained verbal consent to interview participants and include their information in our surveys.

**Distribution of anti-parasite medications**

Dr. Angel, the medical director for FUMSIL with whom we were collaborating, wished that during our visits to these communities we distributed an initial round of anti-parasite medication to all children six years old and younger. In 2015, he had detected three forms of stomach worms present among children residing in Susui. We asked for parental consent after explaining what the medication was and how it functioned, and distributed medications to 200 children in this area. Dr. Angel will return to these communities to distribute three more rounds of anti-parasite medication to these children.

**RESULTS**

**Maternal Mortality**

Of the 122 households included in our survey (out of approximately 200 total households), we were told of seven women of reproductive age who had died. Four of these mothers were pregnant a year before they died and one of them was pregnant while she died. Of the other three mothers, one was not pregnant nor was pregnant a year before she died, another was said to have died of breast cancer, and the third was said to had died from cholera. For the mothers who were pregnant during or a year before they died, three were said to be swollen and feverish at the time of their death, while one died immediately after giving birth to twins. One of these women died in the hospital in Belladère, Haiti.

**Infant Mortality**

We gathered data on infant mortality, calculating total deaths of children 24 months and younger in the past five years as our numerator and the total live births in the past five years as our denominator. Of the 126 infants who were born within the last five years, 13 infants died, leaving our infant mortality rate calculated at 10%. The infant mortality rate in Haiti nationally, as published in the 2012 DHS report *Enquête Mortalité, Morbidité et Utilisation des Services* (EMMUS-V), is 59 deaths per 1000 live births (5.9%).

**Maternal Health**

We found that among the communities surveyed 43% of women of reproductive age (ages 15-49) and their sexual partners use some form of contraception, where the national average is 31%. Our data collection included 56 mothers. Most mothers in these communities had antenatal care (ANC), with an average of four ANC visits. Only 48% of these mothers received the recommended greater than 4 ANC visits; nationally, 67% of mothers have >4 ANC visits. Of the 54 births that took place within the past two years, three out of four infants were reported to have been protected against neonatal tetanus, which

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2 Ibid.

3 Ibid.
is in line with the national average of 76%.\textsuperscript{4} The majority (74\%) of births happened at home under the care of a “matrone” or midwife, 19\% took place in the hospital under the care of a doctor or nurse, and 7\% of these births were at home and unassisted. Most women (59\%) did not have a post-natal checkup within 41 days after giving birth, which is close to the national average: 61\% of women across Haiti do not receive post-natal care within the recommended time frame after giving birth.\textsuperscript{5} The following charts compare assisted delivery data collected from our surveys compared to the national statistics given by the EMMUS-V 2012 report. (It is important to note that EMMUS-V includes five-year data, while our data involve only the past two years.)

Regarding access to health care, we found that a mother must travel an average of 9 km from the communities in our survey to reach the hospital in Belladère. The majority of participants reported that they traveled to this particular hospital to receive antenatal care. Some mentioned that they traveled to the town of Baptiste, which is approximately 5 km away. We calculated these distances using the Ruler tool in Google Earth, and measured them “as the bird flies.” Considering that this region of Haiti is very mountainous and that most routes are not linear, these distances are surely underestimates of how far one must travel to get to either of these two towns from the border communities.

\textit{Infant Health}

There were 55 infants documented in this study, all under 24 months of age. The Rapid CATCH assessment helped us gather data on the health and nutrition of these babies. Below is a list of key nutrients and foods included in these infants’ diets.

<table>
<thead>
<tr>
<th>Type of nutrient</th>
<th>Percent of children who eat/drink this nutrient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breast milk</td>
<td>88%</td>
</tr>
<tr>
<td>Infant formula</td>
<td>10%</td>
</tr>
<tr>
<td>Oatmeal</td>
<td>20%</td>
</tr>
<tr>
<td>Cheese/milk (non-breast milk)</td>
<td>0%</td>
</tr>
<tr>
<td>Vegetables</td>
<td>53%</td>
</tr>
<tr>
<td>Mangos/Papayas</td>
<td>51%</td>
</tr>
<tr>
<td>Eggs</td>
<td>44%</td>
</tr>
<tr>
<td>Meat</td>
<td>58%</td>
</tr>
<tr>
<td>Fish/Seafood</td>
<td>0%</td>
</tr>
</tbody>
</table>

\textsuperscript{4} Ibid.
\textsuperscript{5} Ibid.
Only 14% of these infants received a dose of vitamin A in their lifetime. The majority of these infants (60%) had received a measles vaccination. Within the two weeks prior to this survey, 75% of them had a fever, 55% had diarrhea, and 67% had a cough or difficulty breathing. Of those infants who had a fever, 67% of their parents sought traditional medical help from the nearest hospital or clinic at least two days after the commencement of the fever. For those infants who had a cough or difficulty breathing, 50% of their parents sought traditional medical help from the nearest hospital or clinic. For those infants who had diarrhea, 21% of them received fluid replacement.

Of the infants on whom we performed the mid-upper arm circumference (MUAC) test and of those we also weighed, none showed significant signs of malnourishment. Below are three histograms detailing the distribution of MUAC numbers, weights, and ages for the infant population of these communities. These histograms were generated using MATLAB’s histogram function, with auto-picked bins and axis intervals.

Sanitation
Of the 122 households studied, all of them gathered drinking and cooking water from an unprotected spring or river, depending on their proximity to each water source. On average, it took individuals approximately one hour to retrieve water for their households. Less than half (48%) of these households treat their water, and everyone who treated their water used bleach or a chlorine tab.

In regards to bathroom usage, 19% of households used a pit latrine with a concrete slab, 34% used an open pit or hole, and 47% had no bathroom facilities and defecated outside.

Using MATLAB’s corrcoef function, we calculated linear correlation to see if the type of latrine (of the three mentioned previously) was at all related to infant mortality or infant sicknesses. Below is a table summarizing the results of this correlational study, showing that the relationships were not significant.

<table>
<thead>
<tr>
<th>Relationship</th>
<th>R-coefficient</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latrine type vs. infant mortality</td>
<td>-.0317</td>
<td>.7888</td>
</tr>
<tr>
<td>Latrine type vs. Fever</td>
<td>-.1043</td>
<td>.4757</td>
</tr>
<tr>
<td>Latrine type vs. Diarrhea</td>
<td>.2298</td>
<td>.1121</td>
</tr>
<tr>
<td>Latrine type vs. Cough</td>
<td>-.0821</td>
<td>.5708</td>
</tr>
</tbody>
</table>

GPS
Below are maps of the four communities we surveyed. They show only those households which included
children we interviewed, for the sake of uncluttering the map and giving a general idea of the location and shape of the communities. The flags each represent a house: Susui has white/light blue flags, Lagun has blue flags, Leon Riche has brown flags, and Alejan has green flags. Latrines are denoted with an “L,” and water sources are denoted by a water/sea icon. The water source labeled “Susui, Alejan” is a shared water source between Susui and Alejan, and acts as the only water source for those residing in Susui. Alejan has multiple water sources, as this community stretches down the mountain and the river/spring surfaces in multiple spots along the mountainside. Leon Riche and Lagun share a water source as well.

Center: Map of all four communities. Upper left: Enlarged map of Leon Riche (brown) and Lagun (blue). Upper right: Enlarged map of Alejan. Bottom right: Enlarged map of Susui.

DISCUSSION
The information gathered from the Reproductive Age Mortality Survey portion of this study is striking. According to Dr. Anderson, results from elsewhere globally do not show as high a rate of maternal mortality. These data from Haitian border communities will contribute to Dr. Anderson’s growing data set on documenting maternal mortalities globally.

Mothers in this region of Haiti rely heavily on traveling to the Belladère hospital (approximately 9 km away) to receive quality antenatal care. This walk can be made, but is very arduous, especially for a woman in the late stages of pregnancy. The barriers of distance and transportation may be contributing to why only about 50% of the women surveyed had more than the recommended four ANC visits, as well as to why the majority of births took place in the home under the care of a local matrone. In summer 2015, a year before this study was conducted, we had a chance to interview the matrone for these communities. This man is local, in his 40s, and has not actually trained as a midwife. He claimed to have learned how to practice midwifery in a dream, and practiced on his wife. He does not use gloves or other sterile items; women give birth on the dirt or cement floor of their homes. The matrone heats up a machete in a flame to cut the umbilical cord after a woman gives birth. Mothers in this remote area of Haiti have few other options. It should be noted that community members all were very aware of maternal deaths, even when not in their own home. This awareness shows promise for any future reporting and subsequent documentation of maternal mortality.

The infants across these communities seemed to consume much of the same food groups (if they were past the point of solely breastfeeding), including vegetables, mangos/papayas, beans/lentils, meats, oils
and fats, and coffee or tea. The lack of major protein sources like dairy, fish, and eggs may be contributing to undernourishment. The majority of infants (88%) consumed breast milk. It seems that mothers extend the breastfeeding time for children past the recommended age (6 months), since feeding a child breast milk may be easier than trying to obtain other food under resource constraints such as poverty and geographic isolation. The prevalence of cough, diarrhea, and/or fever among these children is high. Just as striking was the lack of adequate treatment. Seeking out medical care for these sicknesses may not be simple, given such barriers as the sheer remoteness of these communities, the distance to health centers, and economic challenges.

We originally sought to investigate the possible correlation between not only the type of latrine present at a household, but also the proximity to a latrine. Based on our fieldwork from the year before, we were under the impression that there were only a few latrines present in these four communities and that bathroom facilities were mainly communal and could thus be mapped out in relation to households. However, we found this year that latrines are really only used by one or two families and are not seen as public bathrooms. Nonetheless, our data on latrines showed no significant relationship between type of latrine and infant sickness nor infant mortality.

**Possible Interventions**

Our study revealed many alarming health outcomes, particularly regarding maternal mortality, that relate to the remoteness of these mountain communities. Individuals living in Susui, Leon Riche, Lagun, and Alejan must travel long distances to access basic resources like water and health care. Social and economic factors also play an important role, as many families cannot afford medical treatment, ante- and postnatal care, transportation fees, food, education, water chlorination tabs, and so on.

Many of the alarming health outcomes revealed by our study relate to the remoteness of these mountain communities. We could, as we mentioned in our initial proposal, consider using additional funds to build a clinic that is nearer to these communities. However, there already exists a health center in Belladère that is sufficient, as is shown by some of the community members’ travels to Belladère for medical care. We recognize that a sustainable intervention necessitates working with local, well-established partners to improve the health and wellness of these mountain border communities.

We believe that an intervention that could best advance the well-being of these communities would be to use any future funds to hire and train community health workers (CHWs) to accompany the members of these communities. Partners In Health (PIH) and the Belladère hospital, run primarily by its Haiti sister organization Zanmi Lasante (ZL), have not only the resources to train CHWs, but also an evidence-based model for such accompaniment in these and similar settings. As demonstrated by the work PIH has done with those dealing with HIV/AIDS in rural Rwanda, PIH has already shown that an accompaniment program employing CHWs to keep in contact with rural communities benefits the health of those communities. More specifically, PIH has shown that this system with CHWs protects against death, increases retention and follow-up of necessary drug implementation (for HIV in this case), and objectively retains the suppression of new viruses emerging in subjects due to the presence of HIV. A CHW program also improves the psyche and mental health outcomes of participants in rural communities, as shown by PIH in rural Rwanda.

Given these data and the results of our assessment, our proposed intervention involves partnering with PIH-ZL to employ CHWs who would work with these border communities to improve the health of

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infants, children, and mothers, paying particular attention to infants’ nutritional status and proper antenatal and post-natal care for mothers. The PIH-ZL CHWs would also be well-positioned to implement a training program for local women’s groups as well as matrones. Trained matrones would greatly benefit a community whose births generally happen in the home and not at a health care facility. The CHWs working with these matrones and other community members would have themselves also been trained as skilled birth attendants and would be a key resource for these communities into the future.

Our proposed intervention would involve a month-long training program in each of the four communities surveyed in our project, implemented by four CHWs employed by PIH-ZL. These CHWs would be responsible for training and accompanying the members of local women’s groups and community matrones. CHWs would implement a four-week training course, followed by a two-month follow-up visit and another after six months. Through this process, the CHWs would develop a relationship with these communities and function as reliable contacts to liaise between community members and the Belladère hospital. These direct, human connections in an accompaniment-based model have had proven results in improve health outcomes in Haiti. Extensive focus group research in the Artibonite Department of Haiti showed that that door-to-door visits by CHWs are the best way to reach community members, which is imperative to those living in an extremely remote area of Haiti for gaining information on keeping their children and families healthy. 

While pursuing this CHW program, we must also acknowledge the poor access to latrines and sanitation in these border communities and how it impacts maternal and child health, as revealed through our research. Given the legal and ethical questions surrounding the subsidization of private latrines in Haiti, we would need to approach this problem carefully. The first step would be definitely identify latrine-building as a primary objective of community members, by holding forums and focus groups. These discussions would be best facilitated by the CHWs working in these respective communities. Indeed, focus group research from the Artibonite Department of Haiti has shown that those community members with poor hygiene or access to sanitation are very aware of their situation, as are the CHWs working in these areas. These focus groups also specifically revealed a strong desire for more latrines in the communities. These data also demonstrated that the very presence of CHWs in these communities influenced behavior change of community members, such as the presence of better sanitation practices and more latrine usage; the major barrier identified by focus groups was the financial burden of maintaining these practices. Part of the funding for our proposed intervention could be directed toward low-cost interventions in communities to promote hygiene.

**FUTURE WORK: Budget and Timeline**

The costs that our project would incur would come from the transportation and salary costs for a CHW. Our plan is to have a CHW train the women’s group once every week for four weeks, have one two-month checkup with the communities and have another six-month checkup. With four communities, we would have four CHWs. These CHWs would also remain ‘on-call’ for these communities and would need to be available throughout the months of the implementation of this project for the community members, hence we would pay them for the full nine months of the implementation. A normal salary for a CHW in Haiti is said to be around 300 USD/month, so to give extra incentive for CHWs to work in these communities, we have decided to offer 500 USD/month for these CHWs.

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8 reference to powerpoint?
We plan to start the CHW training in the month of January, 2017, with a total run-time of nine months. In January, the CHWs will visit the communities one time per week, for four weeks (that entire month). Two months later at the end of March / beginning of April, the CHWs will visit for a two-month checkup to see how the women’s group and matrones are doing. A final checkup will take place in September, eight months after the training has finished. Assuming this checkup has gone well, these communities will have shown a proficiency in creating self-sufficient, organized groups for the purpose of retaining the health of these communities into the future.

Budget:
- CHW salary
  - 500 USD / CHW / Month – 2000 USD / Month
  - 18,000 USD total for CHW salaries
- Transportation for CHW
  - 15 USD / visit / CHW – 60 USD / visit
  - At 24 visits minimum, 1440 USD minimum for travel
  - Any extra visits will be 15 USD / visit
  - Extra allocated funds for potential visits: 1000 USD
- Total requested funds: 20,500 USD

At 50% of the proposed project funds, we would not be able to add an extra monetary incentive to prospective CHWs, giving them a monthly salary of 300 USD/month, and the check-ups would need to be done sooner so the CHWs are paid only for eight months and not nine months.