AN OVERVIEW OF MULTIDIMENSIONAL POVERTY IN HONDURAS: GAPS, BARRIERS, AND OPPORTUNITIES FOR GROWTH

by

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ABSTRACT

INTRODUCTION: The Multidimensional Poverty Index (MPI) is a systematic measurement of the tools and resources an individual or a community has at its disposal to increase their public health capacity and promote Human Development (HD). This thesis seeks to describe the social, cultural, political, and governmental barriers to overcoming Multidimensional Poverty (MP) and to providing vulnerable populations with the necessary resources to reduce the burden of poverty and disease, particularly in the setting of rural Honduras.

METHODS: This thesis provides a review of the extant literature on this topic, focusing specifically on systematic reviews and citation snowball sampling for each of the MPI indicators. The databases Pubmed, Google Scholar, and JSTOR were used.

RESULTS: The ten indicators of the MPI are categorized into three main sections that are essential for poverty reduction: health, education, and standard of living. Health is measured by nutrition and child mortality, education is measured by years of schooling and attendance, and standard of living by sanitation, hygiene, floor, assets, cooking fuel, and electricity. Each of these components and subcomponents have adverse health effects as well as potential public health intervention strategies that have been evidentially supported in the literature.

DISCUSSION: Solutions to improve each of the indicated dimensions of multidimensional poverty are holistic and multifaceted, and interventions that are targeted to only one dimension can have spillover effects and affect another dimension. The importance of well-rounded growth and development is absolutely essential for the elimination of MP, particularly for those in rural Honduras who many times fight against barriers like corruption and environmental duress. The sister parish mission between Nuestra Señora de Suyapa in Honduras and St. Michael the Archangel Catholic Church in North Carolina, USA, is an applied example of how a third party institution can reduce MP; a solution that deserves further exploration.

CONCLUSION: There is plenty of evidence in the literature that suggests possibilities for reducing the MPI as measured by the indicators of health, education, and livelihood. While there are limitations to this thesis study design, it is apparent that, given one-fifth of Honduras remains in MP, the recommendations provided herein suggest intervention points that bear further exploration in the effort to reduce multidimensional poverty in Honduras.

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LIST OF ACRONYMS

BC - Black Carbon

BSF - Biosand Water Filter

CCSPM - Catholic Church sister parish mission

DALY - Disability Adjusted Life Years

GDP - Gross Domestic Product

HDI - Human Development Index

HDR - Human Development Report

HD - Human Development

MDA - Mass Drug Administration

MDG - Millennium Development Goal

MOE - Ministry of Education

MOH - Ministry of Health

MP - Multidimensional Poverty

NCSU - North Carolina State University

NTD - Non Tropical Diseases

POU - Point of Use

PROMESA - Proyecto Mejoramiento de Sostenibilidad Agricultura

SANAA - Servicio Autónomo Nacional de Aqueducts y Alcantarillados

SDG - Sustainable Development Goal

STH – Soil Transmitted Helminth

UN- United Nations

UNA - Universidad Nacional de Agricultura

UPE - Universal Primary Education

WaSH - Water, Sanitation, and Hygiene

YLL - Years of Life Lost

PREFACE

This thesis was inspired by the fifteen years of dedication, commitment, and planning that the Honduras sister parish mission committee of St. Michaels Church in Cary, North Carolina has invested in the parish of Nuestra Señora de Suyapa of Nueva Palestina, Honduras, and its surrounding *aldeas*. Additionally, this thesis is inspired by the hard work and the hospitality of the citizens of Nueva Palestina who have continuously been supportive and receptive of the mission; as none of the interventions would have been implemented without their local knowledge, capabilities and work ethic. Additionally, many thanks to all the families of St. Michael Church in Cary, North Carolina, whom have donated generously for the past fifteen years to financially support the mission in Honduras.

I would also like to thank my thesis committee for their support throughout this project, particularly Dr. Mary Hawk whose support and encouragement has never faltered. To my parents, for supporting me in all of my travels and my globe-trotting, particularly to my father who taught me that the most important thing in this human life is to make a difference in the world. Thank you to everyone who has challenged me, questioned me and doubted me. For as the ocean is characterized by its waves, my self-growth, too, is fueled through contradictions, hardships and unfamiliarity.

This thesis is a written depiction of the beautiful friendship that has arisen between the two parishes of St. Michael in North Carolina and Nuestra Señora de Suyapa in Honduras since

the year 2000. Hundreds, if not thousands, of lives have been positively changed as a result of this sister parish mission, both Honduran and North Carolinian alike. Most significantly, my own life has been dramatically altered and realigned as a result of my own travels to Honduras that began in 2005 when I was twelve years old. It has been a challenge to put a dozen years of my own personal experiences and close relationships into a structured document, as words can falter and paragraphs can shift. Through the challenges, however, my inspiration to share this success story with the world of academia has only grown stronger, in the hopes that fellow students and professors alike can learn about and recognize the potential of alternate intervention strategies in Latin America through the medium of the Catholic Church. This thesis reflects a real example of how a few dedicated individuals, fueled by the mission to alleviate or eliminate poverty, have contributed to the decline of multidimensional poverty for thousands of citizens in rural Honduras. This mission may not have changed the whole world, but for many Hondurans, their own worlds have been changed.

1.0 INTRODUCTION

1.1 HUMAN DEVELOPMENT IN A GLOBAL ECONOMY

With the turn of the 21st century and the rapid emergence of globalization, urbanization and connection, the concept of "development" is changing. Amidst the complexities of such a technological and globally connected era, the global community has recognized that there is more to a successful human life than solely income and wealth and there is more to a country's development than just gross domestic product (GDP) per capita. Realizing the depth and dimensions of what 'growth' means has led to global revitalization of what a country's 'development' status means, what poverty means, and what it takes for a country to successfully eradicate poverty and promote quality of life among their citizens.

The United Nations has used the term "human development" to acknowledge the importance of a holistic and healthy life, and emphasizes the need to enrich people's lives by expanding their opportunities, their choices, and ultimately their freedom. Human development is characterized by three major human capabilities: the ability to live a long and healthy life, the ability to receive adequate education, and the ability to acquire a decent standard of living (Haq 1993). Since 1989, the United Nations (UN) has released a Human Development Report (HDR) every year; all with the theme of promoting and expanding human capabilities to achieve HD and eliminate poverty. These HDR's have been the platform for the formation and execution of

the Millennium Development Goals (MDGs) and the Sustainable Development Goals (SDGs), which are designed to reduce global inequities and build sustainable growth in all corners of the planet.

Human development focuses on the person. It is a framework of development that is conducive to meeting people's needs and providing them with the resources necessary to be able to make their own choices to lead fruitful, productive, and happy lives (Haq 1993). Such resources are what the public health field often refers to as 'social determinants of health.' Yet, attaining and addressing these social needs is difficult for a remote proportion of the global population. Billions of people are currently being deprived of certain goods and services that have shown to be necessary for them to live a long and happy life. This deprivation, is poverty (Klugman 2011).

1.1.1 Honduras and Globalization

Human development is stratified into four categories: very high, high, medium, and low development. Honduras is currently in the medium-HD category with a human development index (HDI) of .606, it is ranked 131st out of 188 UN member states (UNDP 2015). Honduras is one of the countries that has found itself left behind in the rush of globalization due to this medium HD status, although they have made considerable progress in recent years in HDI gains of life expectancy, education, and income (See Figure 1). Nevertheless, there is still great need among vulnerable populations, particularly in the rural areas.

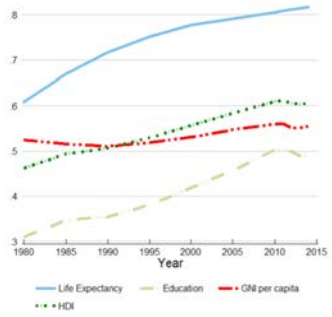

Figure 1. Trends in Honduras HDI Component Indices 1980-2014

One of the major themes of globalization is urbanization, which is occurring at an alarming rate in Honduras. Since 2010, the urban population has grown by 3.1%, now composing 53% of the total population, and the rural population has grown by only 0.8% (UNdata 2014). While Honduras has made significant public health gains in recent decades in health, education, and life expectancy, it is still plagued with poverty and there are large inequities between rural and urban public health (DHS 2012). For this reason, an analysis of this poverty is essential in order to better understand its root causes and to continue to look for culturally appropriate, poverty-reducing solutions that align with the human development framework.

1.2 PERSPECTIVES OF POVERTY

Through the human development lens, poverty is much more than just “low-income”; it is the denial of choices and opportunities that allow for a tolerable and enjoyable life. Some of the most basic deprivations of a low quality life that can be characterized by lack of basic education, and lack of public or private resources like food, water, and housing (Klugman 2011, UNDP 2015).

According to the 1993 HDR led by Haq, there are three basic perspectives, or theories, of poverty. The income perspective places financial status as the core reason for being above or below the poverty line. The basic needs perspective takes into account the population's ability to access basic goods and services like health and education. Finally, the capability perspective defines poverty on the individual's ability to be independent and the degree to which that individual has the opportunity to escape poverty. These opportunities can be physical - like being fed, clothed, housed properly, and in good health, but they can also be social like community participation in societies that are characterized by good governance. This capability perspective is what defines the concept of human sustainable development. The capability perspective and the basic needs perspective have morphed together to form what is considered multidimensional poverty (Haq 1993).

1.2.1 The Capabilities Approach

The human development approach was developed by the economist Mahbub Ul Haq and further characterized through Amartya Sen's work regarding human capabilities. Sen's approach to development is essentially a 'people-centered' approach that takes into account human capabilities through expansion of opportunity and freedom of choice. The human capability approach emphasizes the process of development just as much as the outcome. It emphasizes expanding health and well-being through the ability to "be" and to "do". For example, a person is able to "do" certain activities like go to a health clinic, but that does not necessarily mean that person will "be" healthy. Sen's theory of human capabilities suggests that the expansion of an individual's freedom and opportunities is essential in order to be able to "be" and to "do" desirable things in life in all dimensions and perspectives. This theory is essentially the

foundation for human development, which revolves around people's ability to be able to "achieve to the highest degree possible their own anticipated outcomes" (Sen 1999). This cannot be achieved when a person is suffering from a certain degree of poverty or deprivation.

1.2.2 Human Rights and the Remediation of Poverty

In order to refine human capabilities through the freedom of opportunity and choice, we must look at the social determinants of health, and what opportunities or resources an individual has access to. Many times, basic human resources are absent so that a person cannot even achieve good health. In 1948, the Universal Declaration of Human Rights produced a document that identified the basic rights that all human beings deserve, no matter their economic or social status. It was proclaimed in Paris by the United Nations General Assembly to be adopted by all nations and to be applied for all people: "that justice, peace, and freedom should be at the foundation of every human life" (UDHR 1948). Included in the thirty Articles are rights pertaining to health and housing (Article 25) education (Article 26), work (Article 23), religion (Article 18), and participation in the community (Article 27) (UDHR 1948). Without these fundamental human rights, the transformative process of human development and poverty reduction is stalled.

1.3 MULTIDIMENSIONAL POVERTY INDEX

The Multidimensional Poverty Index (MPI) is a measurement of human deprivations at the individual level regarding achieve health, education, and standard of living. The MPI is unique

because it measures both prevalence and intensity of poverty through various indicated deprivations. Also, it is based on a country's micro-level rather than macro-level data, which allows it to distinguish between population subgroups, like urban versus rural, and other geographical or political boundaries (Santos 2011). The MPI does not include income in its measurement, as the HDI does, but it is a good supplement to the HDI because it permits for the understanding of poverty on a deeper level, revealing gaps, barriers, and potential intervention points for specific settings (Santos 2011).

1.3.1 MPI Indicators

The MPI has ten indicators, categorized into health, education, and standard of living (See Figure 2) (HDR 2015). These indicators have been selected because data on these variables are widely available, thus allowing for cross-country comparison. They are also reflective of overall health capabilities in the public health sphere. Health is defined by nutrition levels and child mortality, education is measured by years of schooling and children enrolled, and standard of living

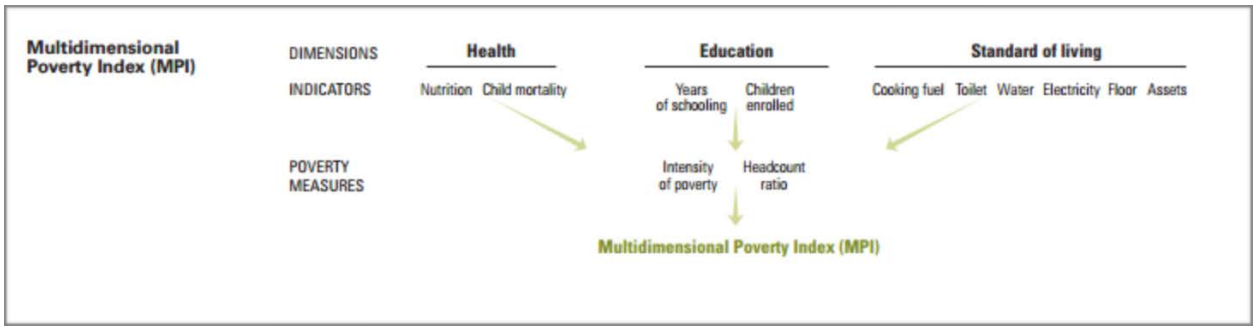

Figure 2. Multidimensional Poverty Index Indicators

includes access to improved sanitation, water, and housing as well as cooking fuel, electricity availability, and family assets (Santos 2011) (HDR 2015).

1.3.2 MPI Calculation

According to the MPI, a person experiences multidimensional poverty if they are deprived in at least one-third of the weighted measures. A person is considered living in extreme multidimensional poverty if they are deprived of over one-half of the indicators, and they are considered living near multidimensional poverty if they are deprived between one-fifth and one-third of the indicators (Santos 2011).

The MPI has been calculated for 104 countries, and in those countries a total of about 1.7 billion people are living in multidimensional poverty. This is higher than the estimated 1.4 billion people who are living under the poverty income level of $1.25 a day. Subsaharan Africa has the highest population incidence of multidimensional poverty (Santos 2011). For more information about the calculation of a country's MPI, please refer to Appendix A.

1.4 HONDURAS & THE MPI

According to the Human Development Country Report, Honduras has an MPI of 0.098. One-fifth of its population is considered to be living in multidimensional poverty, which is about 1.642 million people (UNDP 2015).

Table 1. Honduras and Nicaragua Comparison of MPI Indicators

	Survey year	MPI value	Head-count (%)	Intensity of deprivations (%)	Population share (%)			Contribution to overall poverty of deprivations in (%)		
					Near poverty	In severe poverty	Below income poverty line	Health	Education	Living Standards
Honduras	2011/2012	0.098	20.7	47.4	28.6	7.2	16.5	23.1	36.6	40.3
Nicaragua	2011/2012	0.088	19.4	45.6	14.8	6.9	8.5	12.6	37.8	49.6

About 7.2% of the population are living in severe multidimensional poverty, and 28.6% are living near multidimensional poverty. The intensity of deprivation, or the average of all deprivation scores from those living in multidimensional poverty, is 47.4%. (See Table 1). Deprivations in living standards contributes to the highest proportion of poverty at 40.3% (UNDP 2015)

1.4.1 Health

According to the MPI, the health index is measured by nutrition and child mortality (Santos 2011). As of 2012, the under-5 child mortality rate of Honduras was 26 per 1,000 live births, which is ranked 83rd in the world (WHO 2015). Below are the top ten causes for child mortality in Honduras (See Figure 3) (WHO 2015).

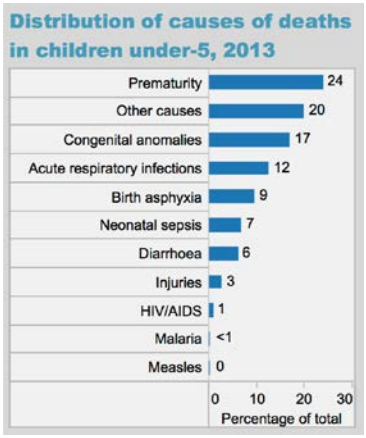

Figure 3. Top 10 Causes of Child Morality in Honduras

1.4.1.1 Respiratory Diseases

Acute respiratory disease is among the leading causes in children under five mortality in Honduras, comprising 12% of all deaths in children in this age group (WHO 2015). Respiratory diseases is also among the leading causes of mortality in Honduras. Lower respiratory infections comprises 4.4% of deaths and is the 5th overall cause of death countrywide, which has fortunately decreased between 2000 and 2012 (WHO 2015). Additionally, chronic obstructive pulmonary disease comprises 3.9% of total deaths, killing 1.4 thousand people in 2012 alone

(WHO 2015). Acute respiratory infections is also a leading cause of YLL (years of life lost), with about 90 YLL per 1,000 people (WHO 2015).

1.4.1.2 Diarrheal Diseases

Diarrhea, a fecal-related disease, is one of the leading causes of child mortality worldwide and is widespread throughout Honduras; 16.2% of total Disability Adjusted Life Years (DALYs) are due to diarrheal diseases alone (UNICEF 2013). Honduras is located in a region that is highly susceptible to hurricanes and flooding, which greatly increases oral-fecal contamination of water (Endesa 2013). As a result, diarrheal disease is a leading cause of under-five mortality. In 2010, 98,272 children under five died from diarrheal diseases, the second highest cause of DALYs lost behind neonatal disorders (UNICEF 2013). The highest rates of diarrheal diseases are found in undeveloped regions of Honduras with poor sanitation and high poverty such as Gracias a Dios (24.5%) and Yoro (23.5%) (DHS 2012).

1.4.1.3 Nutrition

Poverty is one of the leading causes of hunger worldwide and is inextricably linked with nutritional status, and undernutrition is arguably the root cause for many child deaths (Kristjansson 2015). There is a large correlation between nutrition and wealth; 8% of children in quintile 1 (the highest quintile) have stunted growth while 42% of children have stunted growth in quintile 5 (the lowest quintile) (DHS 2012).

Anemia is a significant health problem in Honduras. Over one quarter of children between ages 6 and 59 months have anemia, and 15% of women of reproductive age have anemia as well (See Table 2) (USAID 2014). Rates of anemia in women and children are decreasing thanks to iron-fortified food, but it is still a moderate public health problem in

Table 2. Honduras Nutrition Data

Honduras Nutrition Data		
Population		7.8 Million
Population under 5 years of age (0-59 months)		975,000
	2006[5]	2012[4]
Prevalence of stunting among children under 5 (0-59 months)	30%	23%
Prevalence of underweight among children under 5 (0-59 months)	8%	7%
Prevalence of wasting among children under 5 (0-59 months)	1%	1%
Prevalence of anemia among children aged 6-59 months	37%	29%
Prevalence of anemia among women of reproductive age (15-49 years)	19%	15%
Prevalence of thinness among women of reproductive age (15-49 years)	4%	5%
Prevalence of children aged 0-5 months exclusively breastfed	30%	31%
Prevalence of breastfed children aged 6-23 months receiving a minimum acceptable diet	n/a	59%

Honduras (Mujica-Coopman 2015). Additionally, prevalence of breastfed children aged 6-23 months receiving a minimum acceptable diet is 59% (Table 2) (USAID 2014). Progress must be made to increase rates of exclusive breastfeeding in order to combat childhood undernutrition.

1.4.1.4 Non Tropical Diseases

Soil Transmitted Helminth (STH) infection is a signficant public health problem in Honduras, particularly rural Honduras. One study demonstrated that a sample of 320 school-age children had an overall STH infection prevalence of 72.5%, the most common being *Ascaris*, *Trichuris*, and hookworm at 30%, 67%, and 16% respectively (Sanchez 2013). Many children suffer from polyparisitism, or infection of more than one STH (Sanchez 2013).

1.4.2 Education

Education is one third of the MPI measurement. Quality improvements in education expansion and adult literacy rates absolutely cannot be minimized amidst a growing and global society that emphasizes connectivity. Between 2008 and 2012, the primary school enrollment in Honduras

was 97%, with only 75% reaching the last grade of primary school. Secondary school enrollment was 43% for males and 52% females (UNICEF 2014).

The government of Honduras is committed to free, compulsory basic education and does not charge for enrollment, but children must be equipped with uniforms and textbooks if they want to attend school, a barrier for many rural, poor children. Additionally, many children cannot go to school as a result of direct and opportunity costs, and the need for child labor to earn wages. Sixteen percent of children in Honduras between the ages of 5-14 are engaged in harmful and strenuous child labor (CIA 2016) High repetition and dropout rates are also common in Honduras. While completion rate of primary school is 99.9% in the municipality of Olancho, the completion rate of lower secondary school is only 31.3% and 17.4% for secondary school for females and males respectively, lower than the national average. In the year 2011, only 6.8% of children ages 15 -24 completed secondary school (Center 2016). These high dropout rates are reflective of larger social and economic factors and are also largely due to the quality of education. Many times classes are not geared to address topics that children and young adults feel that they should be learning for preparation for the workforce (Van Dusen 2008).

1.4.3 Standard of Living

Also measured in the MPI is standard of living, which is composed of six components: cooking fuel, electricity, access to improved sanitation, water, housing, and other assets like farm land (Santos 2011). These components are largely aligned with public health social determinants of health, and targeting interventions to improve standard of living will help to reduce the burdens of multidimensional poverty.

1.4.3.1 Sanitation

While Honduras has hit the MDG sanitation goal of 75% sanitation coverage by 2015, which means over 75% of the population has access to improved sanitation, there are still significant disparities between access to improved sanitation between urban cities and rural villages; sanitation coverage is 74.4% in rural communities versus 86.3% in urban settings (UNICEF 2013). Additionally, there are significant disparities in sanitation coverage between the different quintiles of wealth (See Figure 4) (Michaud 2013).

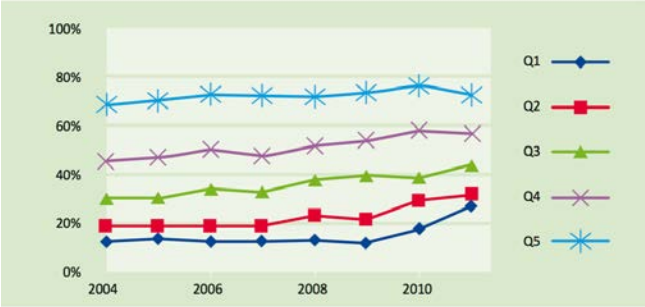

Figure 4. Sanitation Disparities in Honduras for Health Quintiles

Over 2.2 million people do not have access to any sanitation facilities in rural Honduras (Michaud 2013). In 2001, 30% of the rural population of Honduras had indoor plumbing, 43% had outdoor latrines, and 27% had no form of sanitation facilities at all (Angel 2002).

1.4.3.2 Water

In Honduras, 81% of the rural population has access to clean water as opposed to 96.5% in urban settings (UNICEF 2013). In rural areas, over 1 million people do not have access to an improved source of water for drinking and hygienic purposes (Michaud 2013).

1.4.3.3 Housing

According to the MPI, a floor is considered to be a human deprivation if it is made from dirt, sand, or dung (Santos 2011). In rural Honduras, 32% of the population has a floor made of dirt, and 47% has cement floors. In urban Honduras, these numbers are 5% and 42% respectively , which suggests that many houses are structurally fragile (DHS 2012). The tropical climate of Honduras and its geographical location makes it the third most climate-vulnerable country in the world (Nations 1999). After Hurricane Mitch hit in 1998, the official estimate for number of houses completely destroyed by the hurricane was 35,000 with another 50,000 houses seriously damaged, forcing 3.4% of the total population to permanently move. Another 3.5% remained in their houses, but suffered substantial structural damage and material loss due to flooding, landslides, mudslides, and land and house collapses (Nations 1999).

1.4.3.4 Assets

Assets can be defined as the material, emotional, physical, and spiritual gifts an individual owns (Santos 2011). This can take on various forms of capital: natural, social, human, physical, and financial (Sherbinin 2008) (See Appendix B). Included in physical capital is the ownership of land, tools, and oxen (Sherbinin 2008), which is of particular importance in rural Honduras, where 36% percent of Hondurans are agriculturally employed as subsistence farmers (UNdata 2014). Land is considered a “productive” asset, because it can put food on the table, potentially generate financial income, and open opportunities for the trade of goods and services (Sherbinin 2008). All of these assets are dependent to a certain degree on larger cultural, economic, institutional, political, and environmental factors (Sherbinin 2008). This thesis will concentrate on the physical asset of land because of its importance to life in rural Honduras.

1.4.3.5 Cooking Fuel

A person is considered deprived of clean cooking fuel if they use unsustainable biomass like dung, charcoal, or wood as their main domestic source for preparing food. The main form of cooking fuel in rural and peri-urban settings of Honduras is firewood, which can also be used in the form of energy and heating as well in absence of other electricity sources (FHIA 2009). Unimproved cooking fuel, according to the MPI, is a deprivation due to its negative health and environmental effects.

1.4.3.6 Electricity

Not having access to electricity is a deprivation that can lead to lower quality of life. About 54% of rural Hondurans do not have any access to electricity, which is an estimate 386,000 households and almost 2 million rural citizens lacking access (DHS 2012). Houses without access to electricity use approximately 525 kg of firewood per year (FHIA 2009). When this is multiplied by how many people in Honduras lack electricity, it is estimated that 11 million m^3 of per year of firewood is used for cooking fuel, which increases country-wide demand for firewood to 2.96% per year (FHIA 2009).

Cooking fuel and electricity for heat can be categorized similarly because in many rural households, the same source is used for both: fuelwood. The burning of fuelwood has shown to have adverse environmental impacts (HDR 2011). As climate concerns are rising to the forefront of the global society, it is more crucial than ever to investigate not only the health outcomes of burning fuelwood, but also the environmental outcomes (Klugman 2011).

1.5 BARRIERS TO MULTIDIMENSIONAL POVERTY REDUCTION

With the help of the MPI, patterns of poverty have emerged globally. One consistent pattern is inadequate and unreliable governance and its associated levels of corruption (Jain 2001). Another is the effect that the environment has on poverty, particularly for those who rely on the land for their livelihoods (Klugman 2011). Sustainable solutions exist that can help mitigate such barriers and promote poverty reduction amidst a tenuous climate, but cannot be implemented without global action and international awareness combined with small-scale, culturally appropriate interventions.

1.5.1 Corruption & Need for New Governance

Needs-based and service-delivery approaches to sustainable development have shown to be unsuccessful in substantially reducing poverty, particularly because they are frequently carried out by corrupt governmental authorities who have a history of been insensitive to the basic needs of the poor (Jain 2001) (Schwaller 2011). According to Transparency International's "corruption perceptions index", Honduras is in the second-highest tier of governmental corruption in the public sector with a score of 29 on a scale from 0 (very corrupt) to 100 (very clean). It ranks 126th out of 175 countries (CPI 2015). A poor score is likely a result of illegal bribery, lack of transparency and accountability, and most importantly reflects the inability for the public sector to meet the needs of their citizens (Jain 2001).

Corruption can directly affect human development and multidimensional poverty to a large degree by limiting income inequality and slowing economic growth (Akcay 2006). As of 2009, the household income in Honduras by percentage share in the lowest 10% of the

population is 0.4% and in the highest 10% it is an overwhelming 42.4% (CIA 2016). This income inequality leaves many people without excess wealth that could potentially be used as investments and funneled back into the economy (Gower 2012). It is perpetuated by deep governmental corruption and its negative effects are most severely felt in poor, rural communities. High income inequality leads to stark contrasts in health, education, and nutrition between the top and bottom quintiles of wealth (HDR 1989). Corruption both stems from income inequality and perpetuates this inequality (Jain 2001).

Most significantly, though, corruption in the Ministry of Education (MOE) and the Ministry of Health (MOH) results in less governmental spending on education and health for the rural poor (Akcay 2006). One example of the rural-urban inequities is in the Honduran water sector (See Figure 5) (Michaud 2013). Urban water receives the most funding, an average of 46% per year, while allocation of funds to rural sanitation is only 13% per year. These urban-rural inequities in fund allocation for water and sanitation coverage can explain as to why over 2.2 million rural Hondurans without access to any form of improved sanitation and over 1 million rural Hondurans without access to improved water (Michaud 2013).

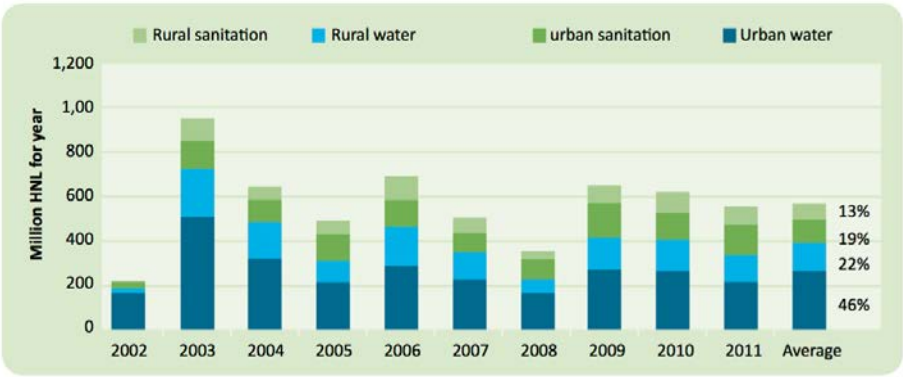

Figure 5. Fund Allocations for he Honduras Water Sector

1.5.4 Corruption and Health

According to the World Bank, corruption is defined as “the abuse of public office for private gain.” A study conducted by Gupta, Davoodi and Tiongson in 2000 found that high corruption increases the child mortality rate by 1.1 to 2.7 deaths per 1,000 live births from its baseline value. Additionally, corruption increases the primary student dropout rate between 1.4 to 4.8%. A 1997 study by Tanzi and Davoodi found that corruption leads to a 2.2-3.9% decrease in paved roads of good condition. A 1998 study by Gupta, Davoodi, and Alonso-Terme found that corruption leads to income growth of the poor between -2 and -10 percent. A 1998 study conducted by Mauro associated corruption with decreasing public education spending between 0.7 and 0.9 percent, and decreasing public health spending to GDP by 0.6 and 1.7 percent (Akcay 2006). These evidential links between corruption and health are crucial for understanding why millions of rural Hondurans still do not have access to basic public health necessities, due to the high levels of corruption in the Honduran government and the inability for the government to fill the gaps and meet the basic needs of all of their citizens. For this reason, other venues of public health implementation strategies are necessary.

1.5.5 Corruption & Violence

The UNDP has correlated rising levels of income inequality to rising levels of violence, which is the case in Honduras (Gower 2012). A significant challenge to the economic development and population health of Honduras is the recent upsurge in violence, particularly in the cities Tegucigalpa, San Pedro Sula, and La Ceiba. In 2011, the homicide rate was 82 per 100,000 people, the highest in the world. This violence puts a strain on the health and education systems,

and also restricts third party health workers and other outsiders from engaging in community outreach (Government 2012). Ultimately, the violence is theorized to have stemmed from large-scale governmental and institutional corruption that underlies every political move and public health decision in Honduras (Gower 2012). To overcome such drastic inequality and promote social justice requires the willing participation of large institutions as well as improved forms of governance, which includes democratic decision-making, transparency and accountability (Leckie 1999).

1.5.6 Decentralization

In order to promote societies characterized by peace and focused on HD and MP reduction, the UN suggests decentralization of governmental services, which can increase accountability, transparency, and social action from governments (Jolly 2000). According to the HDR of 2000: People's Participation, decentralization of governance is one possibility to reduce health disparities and inequities among the low-income and vulnerable populations, like rural Honduras. Decentralization promotes participation as well as efficiency. In high income countries, local government decentralization ratios are between 20-35% for government spending, with some countries like Finland close to 40%. In low-income countries, like Honduras, this ratio is much lower, and only about 15% of government expenditure is decentralized and aggregated in local economies (Jolly 2000).

Decentralization can lead to more economic participation through increased public expenditure, higher-quality services, and more support for local entrepreneurs. Projects that are managed locally tend to be more cost-effective and efficient, and can address the specific needs of the population (Jolly 2000). Additionally, actions being taken at the local level can promote

community strengthening and participation. In the most recent decades, land reform has been one method for increasing economic participation in rural Honduras (Marenya 2006). Decentralization, however, is not a panacea to mitigate governmental corruption and to fill basic population needs. Like any institution, local governance must plan and execute projects with just authority, good reasoning and strong leadership. Ultimately, the success of decentralization is dependent on larger reform of political and governmental factors (Haq 1993).

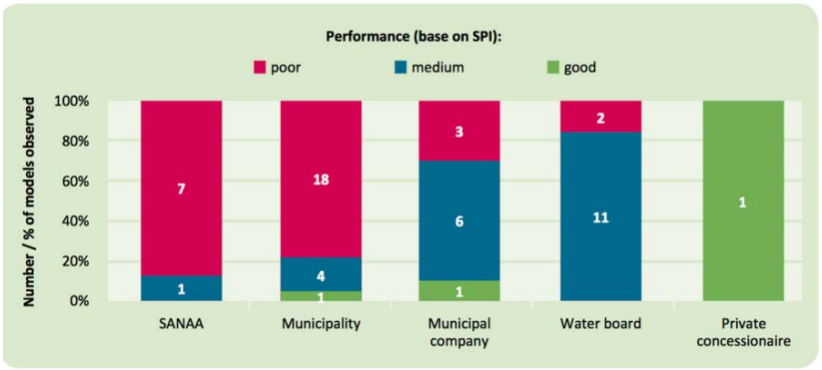

Figure 6. Public Water Service Provider Perceptions

1.5.6.1 Honduras & Decentralization of the Water Sector

In 2003, Honduras adopted a national law that call for the decentralization of water supply: Drinking Water and Sanitation Sector Framework Law. This was reinforced by two subsequent national laws in 2005 and 2011 that promote strategic plans for decentralization from the country's major water and sanitation service, called Servicio Autónomo Nacional de Aqueducts y Alcantarillados (SANAA). Currently, only 60% of municipalities have governed in accordance to the Framework Law, and 40% of the country still relies on SANAA (Michaud 2013). It was hoped that cost-efficiency and implementation efficiency would have increased as a result of this decentralization, yet there is no evidence for immediate increase in service quality. Additional by-products of this decentralization, however, have been increased SANAA operation and

management costs as well as increased SANAA salaries by up to 95%. Approximately 55% of all SANAA costs have been allocated to salaries since 2007, more than the normal 35-40% (Michaud 2013). This type of fund allocation decreases sustainability, as well as the cost of severances that will be paid for future decentralization. For many rural families, taxes from sanitation and water are now 3% of their annual income (Michaud 2013). Despite some of the negative effects from decentralization, there is evidence that decentralized water boards and municipal companies perform better than SANAA and the municipalities (See Figure 6) (Michaud 2013). Also, decentralization can be an explanation for the increase in rural sanitation coverage that began in 2010 (See Figure 4).

1.6 MOVING FORWARD

Community participation and inclusive, informed decision making that focuses on empowering individuals and reducing poverty is the key to not only preserving HD but also promoting sustainable, de-centralized development in rural communities of extreme poverty. With a focus on HD, global health officials, political parties, and other large entities who have a presence in Honduras can shift their poverty reduction strategies from centralized and broad solutions to specific and decentralized solutions tailored to the population. Eradicating MP, ultimately, requires smaller-scale and focused interventions that target the ten MPI indicators while simultaneously promoting community capacity and sustainability (Klugman 2011).

1.6.1 The Quest for Peace

Human development is illustrated by the promotion of peace and human dignity and so should poverty reduction strategies be characterized by social justice and reducing inequity. Building inclusive societies characterized by trust is essential in reducing MP and sustaining inter-generational justice and peaceful societies (UNICEF 2007). Anti-corruption strategies, led by third-party institutions, is a potential strategy to achieve HD growth. Global health officials must expand support for HD through new governance that emphasizes and integrates human rights, human security and human equity. Interventions designed to reduce multidimensional poverty should be characterized by the same qualities.

1.6.2 The Catholic Church Takes Action

One third-party entity that has a strong presence in Honduras is the Catholic Church. Over 97% of the Honduran population is Roman Catholic, with higher percentages concentrated in the rural areas (CIA 2016). The Catholic Church is of particular significance in Latin America due to its rich history in liberation theology.

At the Medillin Conference in 1962 in Medillin, Colombia, the Catholic Church made official its recognition of the needs of the poor; their struggles firmly settled in the consciousness and actions of priests and bishops throughout Latin America. The conference of Medellin represented a change in the practical ideology of the Catholic Church's support for the poor and bishops began to openly challenge skewed social structures. The Church publicly addressed issues of social justice and human rights through a strong pastoral presence and theologically based theory. Their goal was to expand the "preferential option for the poor", which evolved into

anti-corruption campaigns, denouncement of dictatorships and support for democracy, and involvement on all levels with social and political issues, in both formal and informal settings (Klaiber 2009). The Church played a pedagogical role by educating poor peasants about their human rights, and empowered them to defend their rights. The overall message that emerged from the conference of Medellin was the idea of “liberation theology”, which was to promote human rights for the vulnerable populations throughout South and Central America amidst the presence of corrupt government officials (Klaiber 2009) (Dominguez 1994). Their strong and trustworthy presence still exists among some Latin American communities today, and their contribution to improvements in public health has been noteworthy and must be examined closer.

2.0 METHODS

A comprehensive literature synthesis of the published literature was used to identify and examine empirical studies for each component of the MPI. The primary databases used for this literature synthesis were Pubmed, Google Scholar, and JSTOR. Articles were included if they were (1) published after 1975, (2) preferably in the setting of Honduras or a similar setting of rural & low-income, (3) in either English or Spanish and (4) systematic reviews or meta-analyses or (5) primary data collection, in the instance when systematic reviews were unable to be located. Citation snowball sampling occurred once the systematic reviews were identified, and articles found via snowball sampling had to (1) be published after 1990, (2) be original data, and (3) be either a randomized controlled trial, cross-sectional study, analysis, or another form of primary data collection from a low-income or rural setting. All other articles were rejected.

In accordance with the indicated components of the MPI, as identified in the Human Development Report of 2011, the search topics of this literature synthesis had already been identified before the literature search began. They are the following: health (nutrition and child mortality), education, and livelihood (water, sanitation, housing, electricity, fuelwood, and assets).

Search criteria MeSH terms varied for each different index of the MPI components. Below are the search methodology for each of the MPI indices for PubMed: “((shared sanitation) AND improved sanitation) AND systematic review” “((household water) AND health) AND

systematic review", "Poverty" "Honduras" "cooking fuel", "((improved sanitation) AND helminth infection) AND systematic review", "Honduras AND (respiratory disease)", "Honduras AND respiratory disease AND housing", "Education AND Systematic Review", and "Education and Enrollment and Health".

The JSTOR database was used particularly for the agricultural research, which used "Honduras AND (sustainable agriculture)", "(((nutrition) AND health) AND Honduras) AND systematic review", "(((breastfeeding) AND nutrition) AND child health) AND systematic review."

Since this thesis focuses on ways to increase MPI of a country, articles were prioritized if they had an intervention component to them. The following section is a review of the literature search and potential, evidence-based intervention strategies that have been shown to reduce multidimensional poverty in significant ways supported by the evidence. Strengths and limitations of this methodology can be found in the conclusion.

3.0 RESULTS

3.1 HEALTH

3.1.1 Anemia

Anemia is a moderate public health problem in Honduras, with a 37.3% prevalence of anemia in children under 6 years of age and 18.6% in childbearing women (See Figure 7) (Mujica-Coopman 2015). These are among the highest rates in all of Latin America. Anemia can is caused by the deficiency of iron, vitamin B12, and folate in the blood and can lead to lowered neurological development in children. Additionally, anemia can increase the risk for maternal and infant mortality and can decrease productivity in adults. Anemia can also permit for easier transmission of various disease vectors like the malaria vector, increasing the rates of infectious diseases in vulnerable populations (Mujica-Coopman 2015).

In order to combat childhood anemia, many foods in Honduras like rice and corn have been fortified with iron. This has shown to have positive effects on childhood nutritional status, but only with the proper implementation strategy (Kristjansson 2015). A Honduran study showed that when children are fed iron-enriched food at school, they retain 85% of the energy in the nutrition supplement. If the fortification is delivered to their home, they only retain about 36% of the energy due to sharing with family members (Kristjansson 2015).

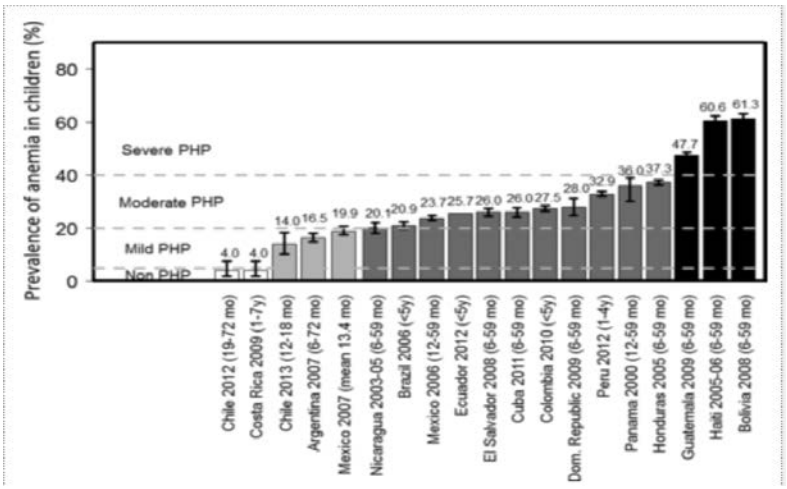

Figure 7. Prevalence of Anemia in Latin America

Undernutrition is one of the underlying reasons for child mortality (Kristjansson 2015). There is evidence that nutrition can have positive effects on a child's mental health, but not without substantial sanitation and hygiene measures in place (Dangour AD 2013).

3.1.2 Breastfeeding

Breastfeeding is arguably the most optimal feeding method for infants. Breast milk provides adequate nutrition for the infant, and is serves as extra protection against the contraction of preventable infectious diseases. Additionally, infants who are breastfed are less likely to have allergies and their risk of sudden infant death syndrome is reduced (Balogun 2015). Long-term cognitive effects are associated with prolonged breastfeeding as well (Balogun 2015).

Breastfeeding is the single most cost-effective intervention to reduce child mortality, particularly when the infant is breastfed exclusively for 6 months then weaned off through a combination of nutritionally adequate food and intermittent breastfeeding until age 2 (Balogun 2015). While widely accepted in the literature as beneficial for the infant, there are many social,

cultural, and other external variables as to why a mother may not breast feed her child or may ween her child off of breast milk too soon. The main barriers, as identified in Balogun's systematic review, are maternal employment, the mother's perception of insufficient supply of breast milk, and mortality either by the mother, the infant, and resulting lactation problems. Other common socio-cultural barriers to breastfeeding are personal beliefs and peer pressure, and concerns about body image (Balogun 2015). Many times myths about breast feeding and barriers to adaptability can be rectified through proper health education training from health care professionals (Balogun 2015).

3.1.3 Maternal Education & Child Nutrition

In Honduras, maternal education is a large indicator of a child's nutritional status as indicated by stunting. Eleven percent of the children who are stunted have mothers with a secondary education, and 48% of the children who are stunted have mothers with no formal education (DHS 2012).

3.2 EDUCATION

Education is arguably one of the most important elements of the MPI. Eliminating multidimensional poverty is virtually impossible without gains in education enrollment and quality and reduction of illiteracy rates. Not only does increased years of education serve to directly increase the MPI, but it also has countless positive health and economic effects, of which are identified below.

3.2.1 Female Education and HIV

Higher achievements in years of schooling is correlated with lower rates of HIV, particularly among women (Alsan 2013)(Davey-Rothwell 2012). Evidence from studies in Uganda showed that higher rates of female secondary schooling coincided with a dramatic decrease in country-wide HIV incidence in the 1990s. Such advances in female schooling were due to a governmental affirmative action policy that gave women a 1.5 point advantage over men on university applications. As a result of this increased access to education, evidence shows that the women who received more years of education were less likely to engage in risky sexual behaviors. Ultimately, this macro-level education intervention curtailed the national HIV prevalence, with particular decreases among women ages 15-24 (Alsan 2013). Additionally, education can increase knowledge regarding transmission of the virus. Aslan et al revealed that in Uganda, 85% women between ages 15-24 with secondary education knew that HIV was spread through sexual intercourse versus 25% of women without secondary education (Alsan 2013).

There is growing evidence that there is a link between individual economic circumstances and engaging in high risk HIV behaviors (Davey-Rothwell 2012). Many women are reliant upon sexual exchange for resource acquisition and income generation, particularly those of low SES, therefore they are more inclined to partake in risky sexual behaviors (Davey-Rothwell 2012). For many women, education is the door to autonomy, increased job opportunities, and independent decision-making, ultimately lowering their dependency on males for income and well-being (Abadian 1996). One of the most crucial aspects of the human development capability approach to reducing poverty is the ability for a person to be self-dependent (Haq 1993).

3.2.2 Education and Fertility

An analysis conducted by Osili et al. has established a causal relationship between increased education and decreased fertility in the country of Nigeria (Osili 2008). A national change in education policy in Nigeria, known as the Universal Primary Education (UPE) program, was introduced in 1976 to give tuition-free primary education to everyone and thus increased the number of primary school classrooms by 1.4-fold, creating 150,995 new classrooms. As a result, the gross primary female enrollment rate increased from 40.3 in 1974 to 104.7 in 1981 (Osili 2008). These increases in primary-level education have resulted in lower fertility rates nationwide; for each year of extra schooling the fertility rate decreased by 0.26 for women under 25 years of age (Osili 2008).

There are three main economic theories as to why education can lead to decreased fertility. The first is that increasing years of schooling can reduce the opportunity costs of having a child at a young age (Basu 2002). Secondly, improvements in women's education lead to lower levels of child and infant mortality, suggesting that women will have less pregnancies and less births to achieve her desired family size (Basu 2002) (Osili 2008). For each year of schooling that a woman attends, the probability of infant mortality for her child decreases 5-10% (EFA 2011). Children are 50% more likely to survive past age 5 if their mother is able to read (EFA 2011). A mother's literacy level is strongly correlated with lower levels of chronic malnourishment, with a 20% decrease of risk for her child's malnourishment if the mother is able to read (Burke 2013).

Thirdly, increased education can affect fertility through increased knowledge of contraceptive methods and effective utilization of such methods (Rosenzweig 1989). The more education a women receives, the more exposed she is to mass media, external information and

modern products. This consumerism theory suggests that the more knowledge a woman has regarding material goods and economic opportunities, the more she will take advantage of such opportunities. This exposure can lead to increased autonomy and aspirations, contraceptive use, and ultimately lower fertility rates (Basu 2002) (Rosenzweig 1989). On the grand scale, acquiring higher levels of schooling can decrease fertility through the medium of gender equality promotion that comes with extra years of female education (Basu 2002).

3.2.3 Dropping Out of School

Many times due to lack of financial resources and work obligations, men and women are forced to discontinue their education and find a job. A study by Maclean showed that for every 1% increase in the national unemployment rate for men who have left school prior to graduation, there is up to an 18% reduction in their measured health outcomes at age 40 in both physical and mental health (Maclean 2013). These men are at higher risk for experiencing negative outcomes regarding income, occupational prestige, productivity, and ultimately worse career outcomes compared to their counterparts who completed schooling (Maclean 2013). On the other hand, there is evidence that dropping out of school for women in a bad economy can be a protective factor against depression and mental illness (Maclean 2013). With each extra year of schooling, any individual is likely to increase their earnings by 10% per year and the GDP of a country will grow an average of 0.37% (EFA 2011).

3.3 STANDARD OF LIVING

3.3.1 Improved Sanitation

Access to sanitation is reflective of larger socio-economic factors, and gaps in sanitation can reveal the presence of widespread health inequities (Acharya 2013). Access to "improved" sanitation has numerous health benefits, particularly for infants and children (Heijnen 2014) (Kumar 2012) (Esrey 1991). Unsafe disposal of human excreta can lead to increased incidence of diarrheal disease (Kumar 2012), increased incidence and severity of STH infection (Esrey 1991), and enteric fevers and trachoma (Bartram J 2010). Additionally, the lack of access to sanitation is related to many negative non-health, human developmental outcomes, such as lack of security, decreased school attendance, and lowered human dignity particularly for women and girls (International 2010).

"Improved sanitation" is defined as facilities with one or more of the following characteristics: pour flush toilet, latrine connected to a piped sewer system or septic system, a simple pit latrine with a concrete slab, a ventilated improved pit latrine, or a composing toilet. Methods that are not considered "improved" are facilities such as an open pit latrine, a bucket latrine, a hanging latrine, a flush latrine that is not connected to a sewage system and open defecation. Only "improved" sanitation methods are counted towards the MDG sanitation target, which was to halve the worldwide proportion of those without access to improved sanitation methods. This goal was not reached by the target year of 2015 (2013).

A systematic review of the difference in health outcomes between shared sanitation and individual sanitation was published by Heijnen et al. in 2014 to determine whether or not shared sanitation is considered an "improved" method of sanitation (Heijnen 2014). Common arguments

against shared sanitation are decreased access and cleanliness (2013). Heijnen et al. concluded that diarrheal disease in shared sanitation had a pooled odds ratio of 1.44 (95%CI: 1.18-1.76) as compared to individual sanitation, suggesting an increased risk of diarrheal disease in environments with shared sanitation (Heijnen 2014). Research has found a direct correlation between the number of people using the sanitation environment and the severity of *Ascaris lumbricoides* infection (Tshikuka JG 1995). Additionally, with the more people who share a sanitation facility, the odds ratio of contracting helminth infection is 1.95 (95% CI: 1.38-2.75) and of contracting protozoan parasites is 1.65 (95% CI: 1.06-2.53) (Mahfouz AAr 1997). There was no increased risk of *trachoma* associated with shared sanitation versus individual sanitation (Heijnen 2014). Other health outcomes such as prematurity, antepartum fetal death, and perinatal death were also positively associated with shared sanitation (Heijnen 2014). Ultimately, studies have consistently shown that improved sanitation facilities significantly reduce the morbidity of diarrhea and the severity of STH infection (Esrey 1991). These improved methods do not include shared sanitation (Heijnen 2014).

3.3.2 Improved Water

The need for clean water has been addressed in every HDR published since 1989. Improved water includes piped water, public taps, standposts, tubewells, boreholes, protected dug wells, protected springs, and rainwater. “Unimproved” water includes unprotected springs or dug wells and surface water ((UNICEF) 2014). These water sources can be either at the household level or at the community level, depending on local resources, governance, and community capability (Bartram J 2010).

Water quantity has also been shown to affect health when used for health-related purposes (Esrey 1991, Fewtrell 2005, Stelmach 2015). Stelmach's systematic review demonstrated that an increased supply of water used for personal hygiene is associated with reduced incidence of trachoma. Additional water used for drinking and consumption has shown to be associated with reduced gastrointestinal infection and diarrheal disease as well as improved growth in children (Stelmach 2015). A systematic review conducted by Esrey et al. found similarly positive findings: that increasing the supply of water for hygiene related purposes is important to reduce rates of *ascariasis*, diarrhea, *schistosomiasis*, and *trachoma* (Esrey 1991). Fewtrell et al. found that increased water supply led to a relative risk of 0.75 in reducing overall illness (95% CI: 0.62-0.91)(Fewtrell 2005).

Additionally, Esrey et al. has shown that improved water quality is essential for reducing the incidence of dracunculiasis and has a minimal impact on the reduction of diarrheal disease (Esrey 1991). While water can be purified at both the communal and the household level, data has shown that purifying the water immediately before consumption has the highest effect on reducing diarrheal disease and other water-related diseases, known as "point of use" (POU) water systems (Fewtrell 2005).

3.3.2.1 Point of Use Water Systems

Improving the microbial safety of the water immediately before consumption is essential for providing clean household drinking water and for providing water in emergencies. This "point of use" (POU) filtration is optimal particularly in rural, remote areas that experience challenges in water availability and do not have access to large scale water purification (Elliott 2007). The World Health Organization (WHO) recommends the following POU methods as some of the most safe and effective measures in purifying water: straining, aeration, storage and settlement,

filtration such as the simple up-flow sand filters, charcoal filters, and ceramic filters, as well as disinfection by boiling, chlorination, or solar disinfection, and other water treatment chemicals (Kayaga 2005).

One of the most effective point-of-use technologies that has increased in use in the recent decades is the biosand water filter (BSF) (Aiken 2011) (Duke WF 2006). The BSF has been successful first in its filtration rate; laboratory testing has shown that the BSF has reduced microbial indicators of fecal contamination between 90-99% for bacteria, 90% for viruses, and over 99.9% for protozoan parasites (Aiken 2011). Secondly, the BSF has shown to be successful in its consistent usage and sustainability. A RCT in Bonao, Dominican Republic revealed that 90% of the BSFs were still in use one year after implementation (Aiken 2011). Further studies reveal continued use of 98.1% in Haiti after 2 years and 87.5% in Cambodia after 8 years (Duke WF 2006, Liang KR 2009). These continued use rates are impressive, particularly when compared to other forms of POU technology such as ceramic filtration, solar disinfection, chlorination, and coagulant flocculant disinfectant which range from 5% to 80% for continued use (Aiken 2011).

3.3.3 Housing

A study done in Honduras and El Salvador concluded that wheezing and recurrent wheezing in an infant between 0 to 12 months is strongly associated with an unpaved floor in the home, with an odds ratio of 1.55 p=0.036 for wheezing and 1.72 p=0.054 for recurrent wheezing (Bueso A 2010). Other risk factors for infant wheezing were the presence of dust in the house from the street, living in a heavily polluted area, and mold stains on the wall (Bueso 2010). Additionally,

there is evidence that poor housing and living environments have led to decreased cognitive and socio-emotional development in children (Ferguson KT 2015).

Although many adverse health effects are associated with suboptimal housing conditions, the causal relationship between housing and health has yet to be firmly established (Thomson 2001). A systematic review regarding housing interventions found that most housing studies are designed cross-sectionally or observationally, thus methodologically weak and therefore subject to bias (Thomson 2001). There is, however, sufficient evidence in the literature to provide a causal relationship between indoor environment and the exacerbation of asthma (Richardson G 2005). Additional barriers to housing research and intervention lies within the implementation nature of community-based housing interventions in low-income families, which many times has barriers to strategic planning and successful follow through (Krieger JK 2002).

3.3.4 Assets

An integrated natural resources management approach as well as an integrated soil fertility management approach are both essential strategies for optimizing productivity of land assets. Such investments in soil fertility and soil quality are of particular importance in resource-poor settings, like the rural hillsides of Honduras, as to sustain the quality of the farmland (Marenya 2006). Many subsistence farmers who do not practice soil conservation methods are thus faced with low soil fertility and therefore lower crop yields, which ultimately means less food for them and their families and overall decreased livelihood (Dougill 2002). Resource and nutrient management and soil optimization strategies are critical to enhance nutrient availability and avoid potentially harmful losses or crop cut-backs. Strategies include the application of compound fertilizers, particularly NPK (nitrogen, phosphorus, potassium) as well as regular

manure inputs and practicing slash-and-mulch methods rather than slash-and-burn methods (Smaling 1993, Dougill 2002).

3.3.4.1 The Downfalls of Slash-and-Burn

Slash and burn is one of the main contributors to deforestation in Central America. It increases greenhouse gas emissions and negatively affects evapotranspiration and rainfall and diversity of animal species (Neill 2001). Slash-and-burn also indirectly affects farmers who rely on such wood for fuel, and their soils and watersheds are also jeopardized due to poor land management (Neill 2001). While the technique of slash-and-burn itself is not the main contributor to soil nutrient depletion, it is the main contributor to land misuse (Neill 2001). The slash and burn method is reflective of poor resource management and can be problematic for farmers, their land, and their families. If not followed by a sufficient recovery time, known as 'fallow', the soil does not recover appropriately and consecutive crop yields are adversely affected (Neill 2001). Due to the amount of landless farmers and the demand for land in Honduras, the pool of nutrient rich and available land available has declined. As a result, the farmers are more intensely cultivating their crops in nutrient poor soil. Without access to fertilizers to enrich their exhausted land, crop cultivation has become unsustainable and farmers' crops have suffered immensely in recent decades, negatively affecting the availability of food as well as the income from selling that food (FHIA 2009). To combat such issues, the slash-mulch technique is gaining popularity in which the farmers plant their following crops directly in the decaying nutrient-rich plant matter that would have otherwise been burned (Neill 2001).

3.3.4.2 Farmer Groups

Group discussions and farmer-to-farmer feedback has been shown to be positively associated with the dissemination of proper soil conservation and resource management practices in the face of land degradation and soil nutrient depletion (Dougill 2002). Whether or not a farmer implements a particular agriculture technique or method is largely dependent upon what nearby farmers are also doing with their parcels of land and the way they share information about these techniques (Wollni 2014). Most significantly, this spillover effect is due to social conformity, which reinforces the importance of social networks among farmers at the village level in expanding agricultural knowledge (Ruben 2004, Wollni 2014).

Researchers found that in the rural villages of La Paz, Honduras, 47% of farmers receive information about sustainable farming practices from farmer organizations or development projects, 32% receive information from family and friends, and 21% rely on their own experiments. Only 6% of farmers receive new information and techniques through agriculture marketing (Wollni 2014). Farmers are 27% more likely to adopt a particular farming practice if it conforms to that of their neighbors, which strengthens the argument of social conformity (Wollni 2014).

3.3.5 Cooking Fuel and Electricity

The main form of cooking fuel and electricity in rural and peri-urban settings is firewood. For this reason, these two MPI components are interlinked and will be examined together. Firewood can be used for cooking, as well as a source of electricity to create light and heat. The sheer amount of firewood that is consumed for household purposes has contributed to Honduras' fast rate of deforestation (Sherbinin 2008). Between 1990 and 2005, 37.1% of the Honduran forests

have disappeared. Since the close of the 1990s and the beginning of the new millennium, deforestation has increased by 9%, which has led to lower soil fertility and other negative agricultural outputs (Butler 2006).

Cooking with fuelwood or other unsustainable biomass products can negatively affect the climate due to inefficient fuel combustion (Lewis 2012). Biomass cookstoves can emit up to 22% of global black carbon (BC) emissions, the second highest contributor to climate change (Lewis 2012).

According to the research, deaths related to indoor air pollution are strongly correlated with a country's MPI (Klugman 2011). Burning fuelwood and other forms of biomass like dung and crop residues for domestic purposes is one of the major causes for indoor air pollution because it leads to incomplete fuel combustion which releases methane and carbon dioxide rather than carbon monoxide (Bruce 2000). In homes with poor ventilation, this fine particulate matter is released into the air with little to no escape and is inhaled by humans. Exposure is higher among those who spend more time inside cooking and cleaning, particularly women and children (Bruce 2000).

There exists consistent evidence that indoor air pollution can increase the risk for the development of respiratory diseases, including obstructive pulmonary disease and childhood acute respiratory infections (Bruce 2000). Additionally, there are correlational links between unsustainable fuelwood burning and low birth weight, higher levels of infant mortality, pulmonary tuberculosis, nasopharyngeal and laryngeal cancer, cataracts, and lung cancer (Bruce 2000).

3.3.5.1 Improved Cookstoves

Improved Cookstoves (ICS) is one solution that can address the negative health and environmental impacts from burning fuelwood as a source for cooking (Lewis 2012). ICS decreases the amount of firewood used by up to 70% in comparison to traditional stoves. They can generate heat more efficiently, reduce indoor air pollution, and can improve household hygiene (FHIA 2009). In a systematic review conducted by Lewis et al, adoption of ICS was correlated with higher levels of financial income, and female-head of households also had higher adoption rates of ICS. Female education was positively associated with the adoption of ICS, while male education was inversely related (Lewis 2012).

A study conducted in two rural communities of Honduras compared the fine particulate matter and carbon monoxide levels in households with traditional stoves and households with ICS. The women who had ICS had lower particulate matter concentrations by 63%, lower indoor particle matter concentrates by 73%, and lower indoor carbon monoxide levels by 90% (Clark 2010). Excess levels of this particulate matter can potentially lead to respiratory diseases, therefore adopting ICS can reduce the risk for contracting these diseases and can promote better individual and public health (Bruce 2000, Clark 2010).

4.0 DISCUSSION

4.1 CATHOLIC CHURCH SISTER PARISH MISSION

As the literature synthesis elaborated on the gaps, barriers, and an array of evidence based intervention strategies that can potentially alleviate multidimensional poverty, this section will also provide a potential strategy for the implementation of the MPI evidence-based solutions in a rural village. Such strategy is through the the Catholic Church sister parish mission (CCSPM) between the parishes of St. Michael the Archangel in Cary, North Carolina, USA, and Nuestra Señora de Suyapa in Patuca, Olancho, Honduras.

In the year 2000, the Catholic parish of St. Michael the Archangel Catholic Church in Cary, North Carolina, formed a partnership with the parish of Nuestra Señora de Suyapa in the small rural town of Nueva Palestina, located in the Patuca region of the municipality of Olancho, Honduras. This sister parish relationship was established as a result of the efforts of the parish leader of St. Michaels, Monsignor John Wall, and the bishop of Honduras, Bishop Zubek. The course of development of this sister parish relationship and the process measures of the public health interventions have yielded incredible anecdotal results and process outputs.

The following discussion of the MPI in Honduras will include applied examples of how the CCSPM has helped to alleviate the MPI deprivations in the region of Patuca, Olancho, Honduras. These examples will be woven throughout the discussion to provide an applicable and

real-life scenario of its intervention strategies in action and for potential replication of their implementation style and underlying theory. See Table 3 for the CCSPM product outputs as a reference for the following discussion, based on CCSPM collected data. The estimated reach is measured by multiplying by the average rural family size in Patuca, which is 5 people per family.

Table 3. CCSPM Product Outputs

Intervention	**Product Outputs**	**Estimated Reach (persons)**
Biosand Water Filter	958	5,000
Concrete Pit Latrine	538	2,700
Educational *Becas*	585 (2016)	585
Roofs & Floors	390	1,900

4.2 THE ENVIRONMENT AND THE MPI

A combination of factors and multiple deprivations from the MPI are reflective of the worsening agriculture and environmental conditions in Honduras, which can cause delays in public health gains among the rural communities. These delays are particularly concentrated in the MPI livelihood indices of “assets”, “cooking fuel” and “electricity”. The source for cooking fuel and electricity in rural Honduras many times overlap, as fuelwood is used for both cooking food and generating heat and light (Bruce 2000, Lewis 2012). Only 58% of rural Hondurans has access to grid electricity, and a majority of the others rely on burning wood for heat and other electricity purposes (FHIA 2009). Burning this fuelwood can lead to high levels of indoor air pollution and

is one of the reasons as to why respiratory diseases are among the top 5 causes of child mortality as well as in the top ten causes of death country-wide in Honduras (Bruce 2000). Additionally, burning this fuelwood for energy and food purposes increases its consumption and usage, which requires chopping down trees (Lewis 2012). Deforestation in Honduras is occurring at a rapid rate due to the need for fuelwood by rural families, but more so due to large scale logging and agricultural usages (Sherbinin 2008).

Agriculture is the human activity that is most reliant on the environment. While it is also a contributor of climate change, agriculture is the most vulnerable to the effects of climate change because it is completely dependent on annual rain fall, sun exposure, temperature, and other climate characteristics. Therefore, many times agriculture outputs worsen as a result of global climate change, which means more subsistence farmers and their families are unable to produce sufficient food or income as a result of lame agricultural yields (Sherbinin 2008). This can negatively affect health, livelihood, and human developmental growth as a whole. For these reasons, environmentally themed indices are included in the MPI, and the relationship between the environment, poverty, and health is being more closely examined on a global scale.

Diverse solutions are available on both micro and macro-level scales to improve agricultural sustainability and to minimize the negative effects that burning fuelwood has on the environment and health. To improve agricultural sustainability amidst a changing climate requires the collaboration of farmer education, farmer groups and their willingness to adopt different strategies. Such strategies can focus on soil conservation and optimizing the soil nutrient value, which can be done most cost-effectively through the use of NPK enriched fertilizer (Dougill 2002). Additionally, the adoption of other methods that will protect the quality of the soil are crucial for agricultural sustainability and environmental protection, such as the

strategy of slash-and-mulch (Neill 2001). The slash-and-burn technique has been practiced in Honduras for decades as a way to optimize land use. Slash-and-burn requires sufficient fallow time, of about 2 years, before the soil is prepared for planting. Due to the high number of landless farmers in Honduras - desperation for land increases, and crops are planted in soil that will not allow for sufficient provision of nutrients that a crop needs to grow. Slash and mulch is one potential solution to prevent the over-use of land and retain the nutritious top-layer organic matter of the soil for future crops (Neill 2001).

There are solutions, as well, to minimize the adverse health effects that burning fuelwood has on humans who rely on it as a source for energy and food preparation. ICS and better ventilation are two options decrease both the severity and the quantity of indoor air pollution (Lewis 2012). In doing so, a smaller amount of women and children will suffer from inhalation of harmful air-products, which can largely impact the rates of acute respiratory disease and obstructive pulmonary disease (Lewis 2012). Ultimately, finding alternate solutions to cooking fuel is one of the most effective and sustainable practice to decrease adverse health effects from incomplete carbon combustion and BC matter, and to reduce levels of deforestation (Lewis 2012).

Undernourishment can lead to higher susceptibility to infectious diseases and higher risk of child and infant mortality. While the urban-rural gap in nourishment in Latin America is narrowing, Honduras remains one of the countries that experiences highest disparity between rural and urban child nourishment according to height-for-age and weight-for-age indicators (Paciorek 2013). This is a result of many different social, environmental and other health care determinants, as well as community determinants like the access, price, availability of food (Paciorek 2013). Access to safe and healthy food is one of the most basic human rights, and a

child's development of social and cognitive processes rely on adequate nourishment. Eliminating malnourishment is one of the key targets in all published HDRs. POU food fortification methods have shown to have limited but real positive effects on child nourishment (De-Regil M 2013). Programs that target local food production and food supply have shown to be most sustainable in combatting malnourishment and its associated negative health outcomes (Andrade 2013) .

4.2.1 PROMESA

As seen in the literature synthesis, the importance of agriculture expertise and farmer groups is important in environmental sustainability and maximizing crop yields. This is particularly necessary in an environment like Honduras that is subject to overactive land use, soil nutrient depletion, deforestation, and overall unsustainable practices that are shown to be detrimental to the livelihoods of rural subsistence farmers. In 2011, the CCSPM collaborated with the agriculture department of North Carolina State University (NCSU) and Universidad Nacional Agricultura (UNA) to support small-scale subsistence farmers in Patuca, Honduras called Proyecto Mejoramiento de Sostenibilidad Agricultura (PROMESA).

PROMESA has a variety of projects and functions, which are overseen by a specialized and UNA-educated coordinator, who is employed by the CCSPM. PROMESA is currently involved with 46 subsistence farmers dispersed throughout the *aldeas* of the region of Patuca, Olancho, Honduras. As a part of the CCSPM contract, these farmers receive NPK enriched fertilizer for a two- year, four-harvest time period. In acknowledging the importance of soil quality, soil samples have been taken and tested among ten demonstration farms in ten different locations. These samples were analyzed at a local laboratory and have helped the UNA coordinator match the most beneficial fertilizer with the soil. As a result, the fertilizer NPK2 has

been recommended for the next growing season. This is of particular importance to optimize soil nutrient levels which can in turn optimize crop yields and quality for the participating farmers of PROMESA.

Not only do the PROMESA farmers receive agriculture expertise regarding soil management and nutrient availability, but they also have the opportunity to form farmer groups and discuss best methods among themselves. This connectivity is shown to be of upmost importance in such settings (Wollni 2014). Many farmers feel a sense of belonging and importance due to their involvement with PROMESA. To avoid dependence, however, PROMESA has designed a two-year contract with the farmer groups. This also allows a greater proportion of famers to partake in the activities and benefits that PROMESA will offer in the upcoming years. Since Patuca is a rural and mountainous setting filled with over 70 different *aldeas*, there are hundreds, if not thousands, of farmers who rely on the land for their livelihoods. Each *aldea* has a "delegado" or a 'delegate of the word' who has been appointed by the priest as a leader in their community. Many of these delegados are also PROMESA farmers and they have been crucial to the credibility and the sustainability and the increased social connectivity of PROMESA since its birth in 2011.

4.3 EDUCATION

Education is one of the most important components of the MPI, comprising one third of its measurement. The literature shows that higher education can lead to decreases in maternal, infant, and child mortality, lower fertility rates, and lower rates of sexually transmitted and other infectious diseases like HIV, particularly for women. For men, dropping out of school can lead to

poor long-term economic effects for both the individual, his family, and society (Alsan 2013) (Maclean 2013) (Osili 2008).

The good news: primary and secondary education enrollment and attendance is expanding worldwide among low-income countries. This is a result of four major global themes. The first is demographic momentum, meaning that through the different stages of demographic transition, low-income countries are finding themselves with large cohorts of young children, particularly in the countries characterized by low mortality and high fertility, like Honduras where children under the age of fourteen compose 34.18% of the population (CIA 2016). This category of population growth increases the demand for primary and secondary education. This is fueled in part by the second reason for education expansion: globalization. Growing is the global emphasis on literacy and mobility and the need for more than only primary level education to find employment. The third reason also has a global twist and that is the international recognition of the need for education and resources among low-income countries. The MDG's and the SDG's both include increasing rates of primary and secondary education as its targets goal. There has been an upheaval of support from the international community in increasing capacity of local NGOS and third-party institutions to advocate for donor and recipient institutions to enhance education. The fourth, and perhaps the most precarious is the government's commitment to education expansion. Many low-income countries' governments have actively expanded their education, while other governments' efforts are being mitigated by corruption and lackluster of support (Van Dusen 2008).

4.3.1 The CCSPM Influences Education Enrollment and Attendance

To address some of the barriers to receiving an education, the sister parish mission has worked to increase the number of educational scholarships, *becas*, throughout the Patuca region. Since the program started, over 1,000 children have been financially supported through primary school, and in 2016 alone a record number of 585 *becas* were distributed. These *becas* help relieve families of the economic burden and the psychological burden of not being able to invest in their children's education and their children's futures, as it is well shown in the evidence that education is correlated with a variety of positive health outcomes (Maclean 2013).

4.3.2 The CCSPM Influences Education Quality

In addition to the *becas*, the CCSPM developed a very unique agriculture program in the high school of Nueva Choluteca to increase the quality of agricultural education in the rural setting. When PROMESA was initiated in 2011, the organization leaders noticed that the students in the agriculture sector of the high school were learning about best agriculture practices online through the use of computers. PROMESA funded and developed a large demonstration field for the agricultural students so that they are able to use their hands and tools to learn the best growing and harvesting practices. They learn how to sow and reap a growing bed, which vegetables are most adaptable for which seasons, how to space the seeds of vegetables, how many seeds to sow, how to level a bed, what the best irrigation practices are and other important successful agricultural strategies. The students work in the field side-by-side with the PROMESA coordinator for two days a week and by the end of the semester not only have they learned hands-on how to plant properly, they have also harvested their own crops for consumption and

selling. The agriculture students have expressed tremendously positive feedback on their experiences in the field. Promesa has also invested in two pigs for the high school, a boar and a sow, so that they reproduce and their piglets can be sold as a method for income generation. In a rural farming village like Patuca, the importance of high-quality agriculture training is of the upmost importance, so that students who will one day be farmers can perform better in their own fields and increase their crop yields and crop quality, food availability and nutrient consumption.

4.4 HEALTH

4.4.1 STH Infections

The MOH of Honduras and the MOE, Pan American Health Organization (PAHO), and Operation Mama have collaborated to expand deworming coverage to children in Honduras through mass drug administrations (MDA). This program reached just over 1 million students in 11,576 primary schools country-wide and 700,000 children under 5 who attend preschool; yet another reason of the importance of receiving an education (Network 2016).

Valiant in nature, these biyearly MDAs are not comprehensive enough to completely eliminate the burden of non-tropical diseases and STH infection in Honduras, which has a prevalence of almost 73% in a sample of 320 school age children (Sanchez 2013). MDA is merely a supplement to the true problem which lies within prevention gaps in sanitation and hygiene coverage. Decreasing prevalence and morbidity of STH will happen at a much faster pace when preventative measures are structurally in place (Esrey 1991, Fewtrell 2005). The evidence has consistently shown that improved sanitation and improved water sources are

directly associated with the decrease in incidence and severity of NTDs, specifically helminth infections which are endemic in Honduras (Esrey 1991). Interventions like the concrete slab pit latrines and the BSFs are shown to effectively prevent sanitation related diseases through breaking the pathogenic life cycle and avoiding contamination and infection from bacteria and parasites (Aiken 2011)(Liang KR 2009).

4.4.2 CCSPM Influences STH

Over 538 simple concrete pit latrines have been dug out and constructed for an estimated 2,700 people in the region of Patuca. Additionally, 958 BSFs have been distributed to improve water quality and quantity. In total, it is estimated that over 5,000 families are receiving appropriate products for improved sanitation and hygiene. These forms of improved sanitation have been shown through a wide variety of studies that these interventions have the capacity to significantly reduce the rate of helminth infection as well as diarrhea (Esrey 1991, Fewtrell 2005, Heijnen 2014). While the CCSPM does not have evaluative outcome data regarding rates of morbidity and disease, recipients have expressed satisfaction with their improved forms of sanitation, and given what we know about the impact of sanitation on public health outcomes, it is likely that efforts in this area have produced positive effects as well.

4.4.3 CCSPM Influences Housing

To address housing issues, the CCSPM has provided roofs and floors to 390 families. Evidence reveals that implementation style of housing interventions are just as crucial as the house itself, and that community collaboration is essential for structural housing improvements (Krieger JK

2002). The presence of a cement floor and a tin roof can be associated with lower levels of asthma and respiratory disease and are contingent as well upon external environmental and community factor (Bueso A 2010).

4.5 HOLISTIC GROWTH

The concept of human development is not static, as it is a broad term encapsulating the necessary capabilities that foster both human welfare and economic progress. The essence of what human development captures is a mixture of many other global ideological core components, such as health and economic equity, poverty reduction, human capability expansion, environmental sustainability, human rights and human security and happiness, all of which are not mutually exclusive (Alkire).

HD is about holistic growth that focuses on a person's capabilities to achieve good health (Sen 1999). MP is the measurement and the analysis of the tools and resources a person has available to achieve such growth. Both concepts are inextricably linked, as are all of their potential interventions. Child mortality cannot decrease if there is not a change in a child's nutrition. Food availability cannot change without guided and sustainable agriculture practices. These advanced agriculture practices cannot be achieved without education, manpower, energy, and general health. Disease morbidity and mortality cannot be avoided without improved housing, sanitation, and hygiene. And education encompasses it all. Public health needs and basic human rights must first be met in order for people to have the opportunity to achieve good health and live a long and happy life free from of MP.

Additionally, none of the above human needs can change without community capacity and willingness to work and adapt. Unfortunately, barriers to expanded economic development do exist, many times in the form of larger forces like corruption (Jain 2001). Other institutions need to step up to promote sustainability and health equity in order to reduce country-wide poverty and to meet the population's basic public health needs.

4.5.1 Holistic Growth and the CCSPM

While the MPI encompasses holistic growth in addressing multiple intervention strategies for a population's public health needs, the CCSPM between Nuestra Señora de Suyapa and St. Michael experiences barriers to promoting such growth for everyone in the recipient parish. While the ideal situation is to provide every family with all of the tools to completely eliminate multidimensional poverty, the reality is that only some families receive a few of the indicated interventions. Nevertheless, poverty reduction can have a compounded effect, and therefore improvements in one MPI component can potentially lead to advances in other MPI components (Klugman 2011). So while not all MPI components are addressed for all recipient families, a large proportion of them now have access to clean water, sanitation, hygiene, housing and education, which can have ripple health effects in other spheres of daily living. Without the assistance of the CCSPM, thousands of people would not have access to such tools and resources that can help reduce their multidimensional poverty level.

4.6 THE STRENGTHS OF THE CCSPM

The Catholic Church is a promising institution for the expansion of public health needs because it already has an existing presence in Honduras, particularly in the rural areas where the public health needs are the greatest (Klaiber 2009). The Church can offer certain benefits to human development and poverty reduction that the government cannot, just as the government can offer solutions that the Church may not be authorized to do. There is promising formative evidence that the Catholic Church can cater to some of the most marginalized populations who suffer from multidimensional poverty and whose needs have fallen through the cracks of their own government. While there are limitations and skepticism regarding the involvement of the Catholic Church, it is nevertheless a culturally appropriate and a community-engaging method for public health implementation practices, particularly in the setting of Patuca in the municipality of Olancho, Honduras.

4.6.1 Trust in Leadership

The Church has built a strong community of trust, reliance and respect in some parts of Latin America, including Honduras (Klaiber 2009). This respect that the community members have for religious authority has allowed the CCSPM between Nuestra Señora de Suyapa and St. Michaels to flourish. The community members hold a very high respect for the priests and Franciscan sisters who are seen as leaders in the community of Nueva Palestina, therefore it is considered an honor for one to help implement these projects and to receive one or some of the outputs. The priest's involvement and leadership is so crucial to gaining trust and credibility of the CCSPM, which is ultimately under his authority (Klaiber 2009). As a result, the interventions have had

extremely successful uptake rates and have resulted in overall positive implementation experiences. While the priest is regarded as the main leader in the community of Patuca, he has appointed *delegados* to be leaders in their individual *aldeas*. The *delegados* have an established reputation of respect, and have been particularly crucial in the success of PROMESA and its associated farmer groups.

4.6.2 Continuity

The Catholic Church already has an established organizational structure and hierarchy. For this reason, the CCSPM projects have been able to sustain in the last 15 years despite changes in priests and other hierarchal alterations, largely due to the employment of permanent staff known as *promotores*. Both donor and recipient parishes have experienced changes in authority through priest exchanges, yet the strong CCSPM infrastructure and the expertise of the *promotores* have permitted the programs to continue despite such hierarchal changes, although it must be noted that priest transitions are a disruption to overall functioning capacity of the CCSPM. Sustainable development, however, has flourished as a result of the health promoters and the CCSPM infrastructure. This sustainability is absolutely essential to truly reduce or eliminate the burdens of multidimensional poverty and disease and to promote human development centered growth (Haq 1993).

4.6.3 Strategic Partnerships

The 15-year continuity of the programs has earned the CCSPM a reputation of respect and credibility, which has attracted large and resourceful institutions and organizations. As a result of

the continued success of program outputs and community involvement, the Shelton Leadership program at NCSU spearheaded the development of PROMESA, which led to valuable partnerships with UNA and the Rotary Club in Danli, Honduras. These organizations' involvement have been crucial in the continued development and expansion of both the agriculture program PROMESA and the regular supply of the BSFs and the concrete pit latrines. Their contributions are particularly noteworthy because their functioning capacity does not directly depend on the existence of the CCSPM. UNA and the Rotary Club both are rooted in Honduras and are sustainable and reliable sources for knowledge and expertise for the village, if one day the CCSPM were to cease. Both personal and professional relationships have been established between the Danli Rotary Club, UNA and the *delegados*, *promotores*, and the priests.

The relationship between the two churches is a strategic partnership in itself as well. The recipient parish consistently receives funds from the donor parish to complete the indicated projects, while the donor parish has been actively involved, reliable, and passionate for promoting culturally appropriate global public health since the birth of the CCSPM in 2000. Their partnership is rooted in a common faith, Catholicism, and is sustained by personal relationships, friendships, and frequent visits in both directions. While many other sister parishes and global scale institutions have discontinued their involvement with Honduras in recent years due to high levels of country-wide violence, this particular CCSPM has instead flourished.

4.6.4 Funding

The donor parish holds one parish-wide collection per year to be able to fund the projects as well as pay salaries to the employed *promotores.* These fundraisers have increased steadily in donations in the past years; in 2015 over $100,000 was collected. A very minimal amount of

these funds are lost in overhead costs, as all members of the CCSPM committee are volunteers. While these funds may one day cease, they have been consistent in their growth and are used towards the supply of sustainable resources for the citizens of the recipient parish in Patuca, Honduras. Strategic partnerships with local institutions and the provision of local resources is a way for the recipient parish to gain sustainability, as well.

4.7 THE LIMITATIONS OF THE CATHOLIC CHURCH

While the CCSPM is able to fill the gaps and help reduce multidimensional poverty of Nueva Palestina, there are still many public health targets yet to be achieved to sustain long-term and independent growth in the community. Many barriers to health and education services stem from larger forces like the government (Jain 2001). While the Catholic Church can influence politics to a certain degree, it is not allowed to take a formal stance on politics during presidential elections, and is therefore one step removed from government action. Although the Church can educate and engage the public, their influence is not to a substantial degree and they too are often subject to governmental corruption (Klaiber 2009).

One of the solutions to reducing multidimensional poverty on a large scale in Honduras is through improving the provision of governmental funds and increasing the government's budget on health and education (Schwaller 2011). While short term MPI gains can be made on increasing education enrollment and preventative WaSH measures in individual communities through *becas*, BSF, and latrines, the true solution for promotion of health and education lies within increased capacity of teachers and doctors in Honduras. The government of Honduras is a barrier to its own quantity and quality of native teachers and doctors, who are commonly subject

to low wages, job instability and overall poor educational facilities (Schwaller 2011). Long term gains in education and health are therefore largely dependent on legislation and increased budget for the MOH and MOE. This legislative action is not within the control of the Catholic Church, and certainly not the CCSPM.

Additionally, the decentralization of point-of-use water filters like the BSF to individual families is greatly effective in providing clean water to households who would otherwise have none, but it does not solve the greater issue of the need for comprehensive water management and better supervision of municipal and industrial wastewater systems in Honduras (Organization 2001).

Rural access to grid electricity is reliant upon government action as well. The adverse environmental and health effects of burning fuelwood for energy are widely researched and supported in the systematic review by Lewis et al. While small scale solutions do exist, like ICS, they have difficulty in implementation (Lewis 2012). The CCSPM has been unsuccessful in distributing and implementing ICS to the families of the recipient parish. Until the government can stabilize and establish country-wide, large-scale public health programs, the Catholic Church will remain involved in filling the gaps and reducing poverty as much as possible, even if it is on a small scale.

4.7.1 Limitations of the CCSPM

While there has been considerable success in the Honduras sister parish mission between St. Michaels and Nuestra Señora de Suyapa, there are also limitations due to its nature of development. The first and foremost is the lack of hard data for quantitative evaluative purposes. While all process outputs have been recorded such as number of latrines installed, number of

roofs and floors installed, and number of scholarships given, there is no data to support that rates of disease have gone down as a result of these specific interventions. Although all interventions are evidence-based and have been shown in other studies to decrease incidence of disease and increase quality of life, as depicted in this literature synthesis, it is unknown as to what extent the sister parish mission has improved public health outcomes quantitatively. The CCSPM has, however, received positive qualitative feedback regarding each intervention due to the participatory nature of implementation, community building strategies, and the human-centered approach.

Another limitation is how to address the question of who will receive the interventions. The primary recipients of the housing, sanitation and hygiene, and agricultural interventions are all Catholic families and participants of the Catholic parish of Nuestra Señora de Suyapa. While the majority of the rural population is Catholic, particularly in the *aldeas*, there are still many non-Catholics living in Nueva Palestina who are not members of the Catholic Church and therefore are not under the jurisdiction of the diocese. These people are not preferred to receive the interventions simply because they are not registered as a member of the Church and therefore are harder to locate. Many receiving families have pre-existing relationships with the priests, the nuns and the *delegados*, therefore meeting their needs are of higher priority and locating them is easier. Non-Catholic families have been receivers of the interventions in the past, yet the vast majority is Catholic due to convenience, personal relationships, and the underlying nature of the sister parish mission which is to share in faith and religious communion.

Finally, another barrier is the frequent change in priests. Since 2000, the recipient parish has seen five priests, the most recent replacement in February of 2016. While working with the priests has been an overall positive experience, there have been barriers to continuing to

implement the projects normally when there is a change in authority. Because all of the projects are a reflection of the parish and the Church, they are a reflection of the priest. Therefore, each project undergoes slight changes when there is a shift in priests. While this can disrupt daily functioning, the CCSPM has built a positive reputation among the whole diocese of Olancho, and most religious leaders have been exposed to the North Carolinian delegates at some point. Additionally, the three *promotores* have been consistently employed for the past 12 years and have kept their same organizational and distributional patterns. Nevertheless, there have been issues with shifts in authority as the public health interventions are being carried out.

4.8 FUTURE RESEARCH

While the CCSPM has shown to be a promising venue for the expansion and promotion of human development and poverty reduction, there is a very limited body of related research on this method, specifically. The methodology of the sister parish mission deserves further exploration because of its universality. There are an estimated 1.2 billion Roman Catholics in the world, 40% being in Latin America, a unique quality that can potentially be the basis for future public health interventions and multidimensional poverty reduction. While there has been support for other Catholic and health based institutions like Catholic hospitals, there is little to no evidence regarding the effectiveness of the CCSPM method specifically. Moving forward, it is crucial that future CCSPMs are not only implemented but also evaluated to determine to what extent it can contribute to lowering a particular region's MPI. Additionally, not all CCSPMs may have the internal capability to produce external outcomes that will reduce the MPI of a region. Therefore, an analysis of organizational structure and strategic capabilities is essential in

strengthening internal capacity, which can translate into positive outcomes for the recipient parish.

While the CCSPM referenced to in this thesis has had positive program outputs and program sustainability, it has nevertheless had its challenges in conclusively reducing the MPI of Patuca, Olancho, Honduras, as mentioned previously. All of the CCSPM interventions, however, have been shown in this literature synthesis to have positive health outcomes in similar settings. In moving forward with future CCSPMs, it is absolutely necessary to collect quantitative measurements of health outcomes as well as qualitative-outcome data collection. Such evaluation is crucial to understanding the depth, the limitations, and the strengths of the CCSPM to improve a population's public health. Without doing so, the potential for the CCSPM to truly reduce multidimensional poverty and enhance human development remains nameless.

5.0 CONCLUSION

Just as the global community has realized there is more to a country's development status than GDP per capita, it is also recognized that there is more to poverty than just personal income. The recognition of the diversity and the complexity of those needs has been introduced into the global arena as the term Multidimensional Poverty (MP).

Global health has seen stark contrasts in health and patterns of poverty. Many of these contrasts are a result of overpowering forces and governmental corruption is a barrier to HD growth and MP reduction in Honduras (Jain 2001). Marginalized populations are being denied basic human rights and needs that are necessary to sustain a high quality life. These needs range from health and education, to environmental sustainability, and the procurement of assets. Successful implementation strategies of evidence based public health measures are essential in order to avoid preventable diseases and to prolong life, and to give every person the opportunity to have the capability to achieve good health. While overall public health has made positive gains in Honduras in recent decades, there is still extreme inequity between urban and rural, and a fifth of the country finds itself in multidimensional poverty.

As seen in the literature synthesis, there are many evidence-based interventions that can reduce the burden of MP that are culturally appropriate in the setting of rural Honduras. This thesis was primarily a collection of systematic reviews for the MPI components. Systematic reviews are beneficial for overarching methods of data collection, because they systematically

pool quantitative data on the whole body of evidence regarding a certain health topic, and they can pinpoint weaknesses in individual primary studies (Biondi-Zoccai G 2011). There are limitations, as well, to relying on systematic reviews, as they can combine conflicting data collection methods, “mixing apples and oranges” (Biondi-Zoccai G 2011). Also, many systematic reviews and meta-analyses can combine data from both small and large studies, permitting the potential of bias regarding significance level. Many times they only include studies in English, which can exclude potentially important work from other parts of the world in other languages. The last critique is that they are not original research (Biondi-Zoccai G 2011).

Despite the drawbacks of systematic reviews, they were appropriate for this thesis in order to gain a comprehensive understanding of the scope of public health problems as well as the most evidence-based and culturally appropriate solutions to decrease MP. Such solutions are to increase education enrollment and quality to promote the expansion of knowledge and indirectly yet positive affect health outcomes. Additionally, to take proactive measures to avoid respiratory diseases, diarrhea, helminth infections and other preventative and infectious diseases through establishing better WaSH methods and ICS, and improving housing. Food insecurity, malnutrition and environmental problems can be rectified through sustainable agriculture methods. While MP is a broad view of poverty, their respective solutions are broadly interlinked as well. MPI reduction is measured through three categories: health, education, and standard of living, yet HD growth is ultimately designed to be holistic.

In order to promote human-centered development, MPI interventions should be culturally appropriate, easily accessible, and evidence-based. The Catholic Church has seen success in being a potential venue for such development, although it is hard to quantitatively measure long-term impact of the sister parish mission and its long-term health effects.

While limitations and barriers do exist with the CCSPM, the public health gains that the sister parish mission has spearheaded, and the sheer coverage of people benefiting from these interventions, is impressive and unparalleled. Each year, the programs expand to work to reduce both the incidence and intensity of multidimensional poverty in the region of Patuca - to fill the health gap that is currently not being filled by any other organization or the government. The Catholic Church has been shown to be a potential venue to implement public health based interventions while simultaneously promoting community bonding, religious participation, and cultural exchange when governments are unable to efficiently do so, and it deserves further examination as a method of HD growth and MP reduction. The Catholic Church is helping to reduce poverty through meeting people's basic needs and promoting the capability to "be" healthy, as HD theorist Amartya Sen would argue.

HD is about more than just economic indicators: it is about giving an individual the capability to live a satisfying and fruitful human life. To benefit a person holistically; to promote equality and health, existential needs; to promote environmental sustainability and address the basic human rights that every living person deserves. The CCSPM between St. Michaels Catholic Church and Nuestra Señora de Suyapa has done exactly that, and will continue to do so. Change has manifested as a result of friendship, humanitarian need, and shared faith. The lives of thousands of people have been changed for the positive, and little by little the Catholic Church has worked to fill the gap to address the needs of some of the world's most impoverished people.

APPENDIX A: MPI MEASUREMENT

Calculating the Multidimensional Poverty Index (MPI) (Santos 2011)

Each person is assigned a deprivation score according to his or her household's deprivations in each of the 10 component indicators. The maximum deprivation score is 100 percent with each dimension equally weighted; thus the maximum deprivation score in each dimension is 33.3 percent. The education and health dimensions have two indicators each, so each indicator is worth 33.3 / 2, or 16.7 percent. The standard of living dimension has six indicators, so each indicator is worth 33.3 / 6, or 5.6 percent.

To identify the multidimensionally poor, the deprivation scores for each indicator are summed to obtain the household deprivation score, c. A cutoff of 33.3 percent, which is equivalent to *1/3* of the weighted indicators, is used to distinguish between the poor and nonpoor. If the deprivation score is 33.3 percent or greater, that household (and everyone in it) is multidimensionally poor. Households with a deprivation score greater than or equal to 20 percent but less than 33.3 percent are considered to be near multidimensional poverty. Households with a deprivation score of 50 percent or higher are severely multidimensionally poor.

The **MPI** value is the product of two measures: the multidimensional poverty headcount ratio and the intensity of poverty	***MPI = H * A***
The **multidimensional headcount ratio, *H***, is the proportion of the multi-dimensionally poor in the population, where *q* is the number of people who are multidimensionally poor and *n* is the total population**.**	$H = \frac{q}{n}$
The **intensity of poverty**, ***A***, reflects the proportion of the weighted component indicators in which, on average, poor people are derived. For poor households only (deprivation score *c* greater than or equal to 33.3 percent), the deprivation scores are summed and divided by the total number of poor people, where c1 is the deprivation score that the *with* poor individual experiences	$A = \frac{\sum_i^q c_i}{q}$
The deprivation score c_i of the i^{th} poor person can be expressed as the sum of deprivations in each dimension	***j (j=1,2,3), $c=c_i1 + c_i2 + c_i3$***
The **contribution of dimension, *j,*** to multidimensional poverty is expressed by	$Contrib_j = \frac{\sum_1^q c_{ij}}{n} / MPI$

Dimensions of Poverty: Indicator Thresholds and Relative Weight (HDR 2015)

Education (1/3)	• School attainment (1/6): no household member has completed at least six years of schooling • School attendance (1/6): a school-age child (up to grade 8) is not attending school (3)
Health (1/3)	• Nutrition (1/6): a household member (for whom there is nutrition information) is malnourished, as measured by the body mass index for adults (women ages 15-49 in most of the surveys) and by the height-for-age *z* score calculated using WHO standards for children under age 5 • Child mortality (1/6): a child has died in the household within the five years prior to the survey

Standard of living (1/3)	• Electricity (1/18): not having access to electricity • Drinking water (1/18): not having access to an improved source of clean drinking water or if the source of clean drinking water is located more than 30 minutes away by walking • Sanitation (1/18): not having access to improved sanitation or if improved, it is shared • Cooking fuel (1/18): using 'dirty' cooking fuel (dung, wood or charcoal) • Floor (1/18): Having a home with a dirt, sand or dung floor • Assets (1/18): not having at least one asset related to access to information (radio, TV, telephone) and not having at least one asset related to mobility (bike, motorbike, car, truck, animal cart, motorboat) or at least one asset related to livelihood (refrigerator, arable land, livestock)

MPI Data Sources (Santos 2011)

The MPI relies on three main datasets that are publicly available and comparable for most developing countries:

1. The Demographic and Health Surveys

http://www .measuredhs.com/aboutsurveys/dhs/start.cfm

2. The Multiple Indicators Cluster Survey http://www.childinfo.org/mics.html

3. The World Health Survey http://www.who.int/healthinfo/survey/en/

In the countries in which none of these internationally comparable surveys was available, country specific surveys that contained information on the MPI indicators were used; in 2010 for example, special surveys were used for Mexico and for urban Argentina.

APPENDIX B: FORMS OF CAPITAL

Forms of Capital, as proposed by (Sherbinin 2008)

Natural Capital	The natural resource stock, or local environmental endowment (water, wind, soil, forest resources, etc)
Social Capital	Social resources (interpersonal networks, group memberships, relationships of trust, access to wider institutions of society
Human Capital	Formal and informal education, local ecological knowledge, the ability to work, good health
Physical Capital	Productive assets held by the household (land, tools, oxen etc) and communal assets to which they have access (roads, communication, infrastructure, radio broadcasts etc)
Financial capital	Cash savings, supplies of credit, or regular remittances and pensions

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