

SEX AND GENDER DIMENSIONS OF NEGLECTED TROPICAL DISEASES IN
WOMEN'S HEALTH IN SUB-SAHARAN AFRICA

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DEDICATION

For all the women who are changing the world,
And for all the women who have already changed mine.

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ABSTRACT

With over a billion people infected worldwide, neglected tropical diseases (NTDs) are so named not just because of inadequate research and resources but also because of the populations they infect. These are often the poorest of the poor, living on less than US\$2 a day. NTDs cripple the poor through social and economic oppression, creating a vicious cycle of neglect. As a particularly vulnerable population, women (both as a sex and as a gender) have distinct challenges. While these diseases have a physical impact on a woman's body, their roles and expectations within a society can further exacerbate the burden of NTDs. With proposals focused on human rights and the Millennium Development Goals, the cycle of neglect can be broken through empowering women medically, politically, economically, and socially. This project presents an analysis of the literature regarding the relationship of women, poverty, and neglected tropical diseases.

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ABBREVIATIONS

ACC	Administrative Committee on Coordination
CDC	Center for Disease Control and Prevention
CMD	Community Medicine Distributor
DALYs	Disability-Adjusted Life Years
DNDi	Drugs for Neglected Diseases Initiative
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome
MDA	Mass Drug Administration
MDG	Millennium Development Goals
MSF	<i>Médecins Sans Frontières</i> (Doctors Without Borders)
NTDs	Neglected Tropical Diseases
OOP	Out-of-Pocket
PLoS	Public Library of Science
R&D	Research and Development
SSA	Sub-Saharan Africa
UN	United Nations
USAID	United States Agency for International Development
WASH	Water, Sanitation, and Hygiene
WHO	World Health Organization

CHAPTER I

INTRODUCTION

Globally, one billion people are infected with neglected tropical diseases (NTDs), killing approximately 534,000 people every year (*Médecins Sans Frontières* [MSF], 2012). Mortality rates alone do not reflect the true burden of these diseases. Increased risk of HIV/AIDS, blindness, stigma, and deformities has devastating effects, perpetuating a cycle of neglect (Rilkoff, Tukahebwa, Fleming, Leslie, & Cole, 2013). Composed of a variety of pathogens including bacteria, viruses, protozoa, and helminthes, these diseases are so named not just because of inadequate research and resources but also because of the population they infect, often the poorest of the poor, living on less than US\$2 a day (Hotez & Kamath, 2009). While this degree of poverty can certainly exist in the city, this population is more commonly found in the rural areas that have inadequate resources. Neglected tropical diseases (NTDs) act as a clear demarcation between the rich and the poor, disproportionately affecting those in poverty and suggesting a deeper injustice rooted in structural violence. These diseases physically, politically, economically, and socially cripple the poor.

As a sub-set of this vulnerable population, women—both as a sex and as a gender—have distinct challenges in the face of NTDs. While sex is a biological determinant, gender is a social construct that develops and evolves over time (Vlassoff & Moreno, 2002). Some of these diseases have particular biological relevance to the sex of women. For example, lymphatic filariasis is often manifested in the breast or vulva of women (Hotez, 2009), and certain drugs are unsafe when women are pregnant or breastfeeding (Rilkoff et

al., 2013). In addition to the biological factors, the roles and expectations of women in society can compound their health outcomes, much like social class (Vlassoff & Moreno, 2002). Women may be expected to suffer in silence (Vlassoff & Moreno, 2002), to purchase bed nets for their entire household (Clemmons et al., 2009), or to merely bear children (World Health Organization Regional Office for Africa [WHO Africa], 2012). With these vulnerabilities in mind, medical interventions can take a more defined and targeted approach. To prevent overgeneralizations among patients, understanding the risks and impacts of sex and gender on diseases is an important first step in providing quality healthcare.

In terms of disease intervention, programs must pass through different stages. Molyneux (2006) describes this process. Initially, the goal is control, or simply reducing the rate of transmission and incidences of infection. After the incidences of infection are reduced to zero in certain regions, the disease is considered eliminated in that region, but it may still require certain intervention strategies to prevent new infections. The ultimate goal of most NTD programs is eradication, or reducing worldwide infection to zero so that intervention strategies are no longer needed (Molyneux, 2006).

While mass drug administration and community medicine distributors are the primary strategies to control NTDs, inadequate training, inconsistent delivery, and community protests pose problems (Rilkoff et al., 2013). Furthermore, since NTDs seem to stem from social and economic disparities, solutions must extend beyond the biomedical approach. Empowering women (Hotez, 2009), targeting equality through health policies (Gazzinelli, Correa-Oliveira, Yang, Boatman, & Kloos, 2012), improving technology and infrastructure (Wood, 2008; International Development Research Centre of Canada [IDRC], 2004), and

forming coalitions with water, sanitation and hygiene programs (Freeman et al., 2013) provide promising, comprehensive solutions.

Though the control and eradication of NTDs is a complex problem, it is not a problem that can be ignored. According to Articles 25 and 27 in the United Nations Universal Declaration of Human Rights (1948), everyone has the right to adequate healthcare and the right to share in scientific advancement, respectively. Furthermore, the control and eradication of NTDs can contribute to the achievement of the Millennium Development Goals (MDGs), which the United Nations established in 2002 to end poverty by 2015. Some of these goals include combating “other diseases,” improving maternal health, promoting gender equality, and empowering women. As men and women have different social determinants of health, solutions for effectively eradicating neglected tropical diseases in Sub-Saharan Africa depend on a clear understanding and evaluation of the risks and impact of gender inequalities.

CHAPTER II

CYCLE OF NEGLECT: POVERTY AND DISEASE

Appropriately, neglected tropical diseases (NTDs) are considered “neglected” for two major reasons: (1) the majority of the population affected are vulnerable populations living in conditions of poverty, and (2) research and development initiatives are relatively underfunded and underdeveloped compared to more popular diseases. This creates a vicious cycle of neglect. NTDs act as oppressive forces that prevent individuals from obtaining higher social or economic statuses, constraining them to the conditions of poverty. Meanwhile, the social and economic elements of poverty create a feedback loop that allows NTDs to thrive.

As poverty is the leading cause of mortality and suffering, efforts in eradicating NTDs must also contribute to the eradication of poverty. While eradicating NTDs may relieve suffering, it does not treat the underlying root problem. It is like treating a brain tumor with Advil: it might relieve the headache for a short time but it does nothing to cure the cancer in the long run. A new NTD will always metastasize. When someone dies from a preventable and treatable disease, like many of these NTDs, it is more than social injustice. As these deaths are concentrated within the lowest socioeconomic group, then something must be said of the larger context and system that is allowing these persistent injustices to occur. This larger oppressive force is known as structural violence.

Vulnerable Populations

The word ‘poverty’ contains many different definitions, some of which are more overt and quantitative than others. One’s economic status or income level is a common way

to try to standardize the definition. A relative poverty line, such as using a percentage of the national median income, can vary from place to place and time to time, creating challenges when trying to analyze the evolution of poverty. The data is hardly standardized. As such, the World Bank uses an absolute poverty line, which is only adjusted for inflation, to allow for better tracking of poverty (Haughton & Khandker, 2009). When one is below the income level required to meet the daily needs of living, such as food, water, and shelter, then one is considered to be in poverty (Vidyasagar, 2006).

The World Health Organization (WHO) draws this line at the cost required to purchase 2200 calories per day per person (Vidyasagar, 2006). In the past, the World Bank has used two different absolute poverty levels: US\$2 per day and US\$1.25 per day. Using these estimates, 73% of the population (556.7 million people) in Sub-Saharan Africa (SSA) lives on less than US\$2 per day, and 51% (390.6 million people) lives on less than US\$1.25 per day (Hotez & Kamath, 2009). However, it is hard to draw meaning from daily income or the cost of calories. These numbers are only numbers; they do not reflect the true condition of poverty.

Economic deprivation only represents a portion of the definition of poverty. The United Nations defined poverty much more broadly. In May 1998, the Administrative Committee on Coordination (ACC) issued the following as part of a “Statement of Commitment for Action to Eradicate Poverty”:

ACC emphasizes that fundamentally, poverty is a denial of choices and opportunities, it is a violation of human dignity. It means lack of basic capacity to participate effectively in society. It means not having enough to feed and clothe a family, not having a school or a clinic to go to, not having the land on which to grow one's food or a job to earn one's living, nor having access to credit. It means insecurity, powerlessness and exclusion of individuals, households and communities. It means susceptibility to violence and it often implies living on marginal and fragile

environments, not having access to clean water and sanitation (Administrative Committee on Coordination [ACC], 1998).

The ACC is now known as the Chief Executives Board for Coordination, and it acts as the principal coordinator for the United Nations with executive heads representing every UN agency, organization, and fund. While this definition does contain connotations of one's economic status, the language also indicates a certain amount of social oppression. In fact, it can be argued that up to 13 components of poverty are contained in this definition alone. However, definitions of words like "choice," "dignity," "powerlessness," and "exclusion" remain almost impossible to operationalize.

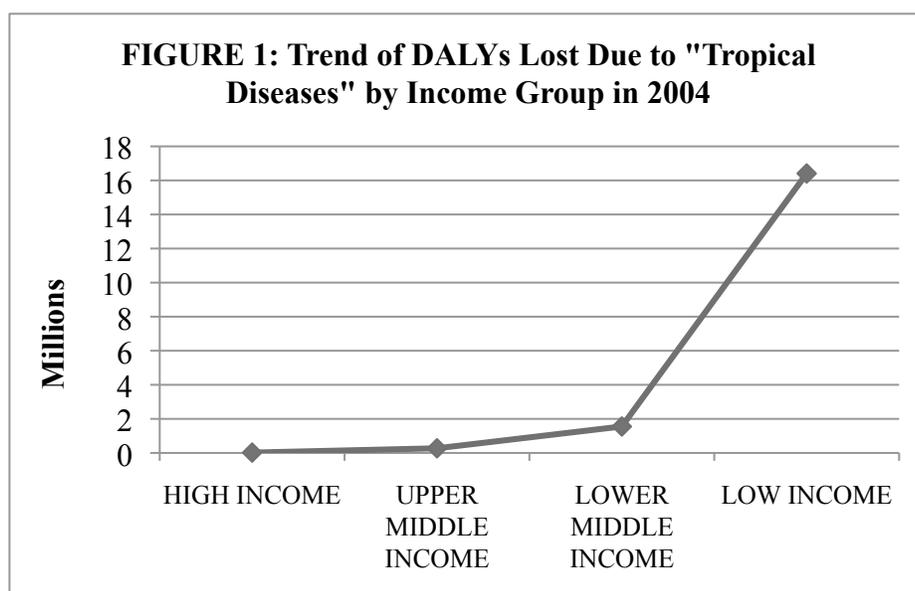
Whether social or economic, all of these components are intricately intertwined with neglected tropical diseases (NTDs). In fact, many of the conditions that define poverty are the same conditions that place individuals at particular risk for contracting NTDs, such as unclean water, poor hygiene, inadequate housing, lack of nutrition, and weak immune systems (Gazzinelli et al., 2012). Of the one billion people who are infected by NTDs, poverty is the common link between all of these infections, acting as a sort of co-requisite for the existence of NTDs (Bergquist & Whittaker, 2012). Colloquially, the population that is infected by these diseases is referred to as the "bottom billion."

The bottom billion is at risk for more than just death. An unhealthy physical body can lead to an unhealthy social body. For example, hookworm infection and schistosomiasis, two common NTDs, have been known to cause anemia, which can decrease productivity, impair growth, and delay cognitive development (Bergquist & Whittaker, 2012). Accordingly, the WHO and scholarly journals reference the disability-adjusted life year (DALY), which is a tool to measure the overall burden of disease. In its most simple form, one DALY is the

equivalent to the loss of one year of healthy life, which can be due to either disability or premature death (WHO, 2014a). For example, if the life expectancy of a woman in a specific country is 60 years, and she develops blinding trachoma at age 40 and dies at age 50, then a total of 20 DALYs are lost: ten because of disability and ten because of premature death.

In Sub-Saharan Africa, 8.6 to 21.2 million DALYs are lost annually due to NTDs (Hotez & Kamath, 2009). Using data from the WHO's Global Health Observatory Data Repository (2013), Africa lost almost 13.5 times as many DALYs as North and South America combined and over 1,000 times as many DALYs as Europe due to "tropical diseases" in 2004. It is important to note that this category does not include all NTDs, as diseases such as trachoma and hookworm have their own category. Figure 1 represents the data a bit differently by examining the data by the level of income as opposed to geographical relevance. The low income group appears to carry a significantly heavier burden of the diseases. The relationship between income level and infection is obvious.

While it would be easy to assume that poverty is the cause of NTDs, the relationship is far more complicated. Which came first, poverty or disease? Was it the conditions of



poverty, like poor sanitation and lack of clean drinking water, which caused the disease? Or was it the symptoms of the disease, such as blindness or cognitive impairment, which inhibited people from thriving and forced them into poverty? In this sense, NTDs and poverty are best understood as correlational, not causal. While a lower income may contribute to a greater rate of NTD infection, it is just as likely that a greater rate of NTD infection may contribute to a lower income.

Figure 2 best simplifies the complexity of poverty and neglected tropical diseases, as both seem to be defined and connected by social and/or economic oppression. The cycle of neglect is similar to that of a circle; it has no beginning or end. Individuals may enter into this cycle at any point and then continue in any direction. Accordingly, individuals should be able to exit the cycle at any point. Trying to funnel one billion people out of a single exit

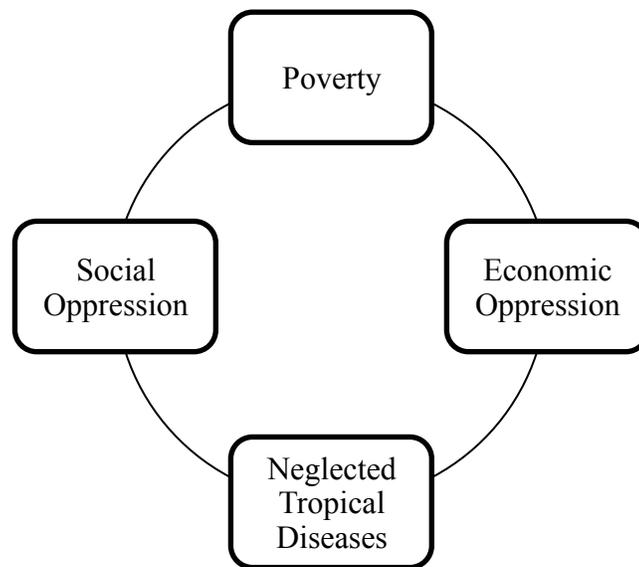


FIGURE 2: Cycle of Neglect

This figure demonstrates that both social and economic oppression contribute equally to poverty and neglected tropical diseases.

would take too much time, and too many people would die trying to get to the front of the line. Elimination of poverty and NTDs therefore require not just a break in the cycle but a complete shattering of it, allowing for exits at any point.

Women are especially at risk of entering into this cycle. The ACC (1998) identifies women as a particularly vulnerable population that are often the main victims of poverty. Bergquist and Whittaker (2012) also emphasize gender bias as a risk factor for NTDs. Finally, Peter Hotez (2009), Co-Editor-in-Chief of the Public Library of Science Neglected Tropical Diseases journal and Dean of the National School of Tropical Medicine at Baylor College of Medicine, highlights the need and urgency for social science research in regards to gender inequalities and NTDs. Thus, this research will specifically analyze the risk factors and impacts of this cycle of neglect on women.

Underfunded and Underdeveloped

The other component of neglect in defining these diseases deals with how they are managed. Adopting a clinical analogy, their management can be broken down into four different levels: diagnosis, prognosis, treatment, and delivery. The diagnosis level mainly deals with trying to name and define NTDs, while the prognosis level focuses on research of a disease's progression. Treatment is largely based on pharmaceutical companies' production of medications. Delivery can take multiple approaches, but it largely exists as mass drug administration. All four of these levels are underfunded and underdeveloped.

At the diagnosis, or definition level, the diseases that are considered "neglected" vary from organization to organization. As seen in Table 1, a total of 55 diseases are identified across the selected organizations, though not all of these diseases are endemic to Sub-Saharan Africa. These particular stakeholders were chosen because they represent a wide

TABLE 1: Diseases Identified as "Neglected" Sorted by Organization

This table summarizes the NTDs of primary focus across seven different agencies.

	PLoS NTD	WHO	London Declaration	Gates Foundation	USAID	DNDi	MSF
Amebiasis	■						
Balantidiasis	■						
Bartonella	■						
Bovine Tuberculosis in Humans	■						
Buruli Ulcer (Mycobacterium ulcerans)	■	■		▨			■
Chagas disease (American trypanosomiasis)	■	■	■	▨		■	■
Cholera	■						
Chronic suppurative otitis media (CSOM)		▨					
Dengue	■	■		■			
Dracunculiasis (guinea-worm)	■		■	■			
Echinococcosis	■	■					
Enteric pathogens (Shigella, Salmonella, E. coli)	■						
Foodborne trematodiasis	■	■					
Giardiasis	■						
Human African Trypanosomiasis (sleeping sickness)	■	■	■	■		■	■
Human Papillomavirus (HPV)				■			
Japanese encephalitis	■			■			
Jungle yellow fever	■						
Leishmaniasis	■	■					
cutaneous leishmaniasis		■				■	
mucocutaneous leishmaniasis		■					
visceral leishmaniasis (kala-azar or black fever)		■	■	■		■	■
Leprosy	■	■	■				
Leptospirosis	■						
Loiasis	■					■	
Lymphatic Filariasis (elephantiasis)	■	■	■	■	■	■	
Mycetoma	■	▨					
Myiasis	■						
Nodding Syndrome (NS)		▨					
Onchocerciasis (river blindness)	■	■	■	■	■	■	

TABLE 1 continued: Diseases Identified as "Neglected" sorted by Organization

	PLoS NTD	WHO	London Declaration	Gates Foundation	USAID	DNDi	MSF
Other arboviral infections	■						
Paracoccidiomycosis	■						
Podoconiosis		▨					
Rabies	■	■		▮			
Relapsing Fever	■						
Rift Valley fever	■						
Scabies	■	▨					
Schistosomiasis	■	■	■	▮	■		
Snakebite		▨		▮			
Taeniasis-Cysticercosis (tapeworm)	■	■		▮			
Toxocariasis and other Larva Migrans	■			▮			
Trachoma	■	■	■	▮	■		
Treponematoses	■						
Bejel	■						
Pinta	■						
Syphilis	■						
Yaws	■	■					
Soil-transmitted helminths	■	■	■		■		
Ascariasis	■			▮			
Hookworm	■	■		■	■		
Roundworm		■			■		
Strongyloidiasis	■	▨					
Trichuriasis	■			▮			
Whipworm		■			■		
Viral Hemorrhagic fevers	■						

Legend:

■	Positively Identified
▨	Other Neglected
▮	Transition Diseases
▮	Newly Identified

range of perspectives: *Public Library of Science Neglected Tropical Diseases* (PLoS NTD) is an academic journal; World Health Organization (WHO) is an international health agency; the London Declaration is an agreement between many pharmaceutical companies; the Gates Foundation is a general grant-providing agency for research and development; United States Agency for International Development Neglected Tropical Diseases Program (USAID) is a domestic program that provides aid to developing regions; Drugs for Neglected Diseases Initiative (DNDi) is a non-profit agency that focuses on policy-making and research and development; and *Médecins Sans Frontières* (MSF) is an international medical agency.

With so many stakeholders, it becomes difficult to consistently define which diseases can actually be classified as “neglected.” In some cases, overlap and agreement exist. In others, gaps exist. In fact, not one single disease is identified across all seven organizations. Furthermore, some agencies have separated their NTDs into different categories based on funding or some other unknown characteristic. Diseases that are identified as “transitional” by the Gates Foundation are soon no longer going to receive funding, while “new” diseases will receive new or increased funding (Bill & Melinda Gates Foundation, n.d.). Meanwhile, WHO gives no explanation as to why seven conditions are separated into a distinct “other” category.

Malaria, tuberculosis, and HIV, sometimes referred to as the “Big Three” of mortality-causing diseases, generally receive more resources and commercial support for research and development (R&D) than the “most neglected” diseases discussed here, which receive little to no resources and R&D activity (Drugs for Neglected Diseases Initiative & *Médecins Sans Frontières* [DNDi & MSF], 2012). In 2008, 72.8% of the global funding went to the Big Three, while a mere 12% went to fund 15 NTDs (Moran, 2011). Despite this, in

terms of DALYs, the total disease burden of NTDs in Africa has been estimated to be twice that of tuberculosis and half that of malaria (Hotez & Kamath, 2009). While the Big Three are explicitly mentioned in the Millennium Development Goals (MDG), NTDs are still brushed aside in a general, nondescript category called “other diseases” (Gazzinelli et al., 2012). As such, the Big Three are excluded from much of the literature describing NTDs and intentionally omitted from the scope of this study.

Of the most common 17 NTDs identified by the WHO, the Centers for Disease Control and Prevention (CDC, 2011) recognizes six as “tool-ready,” meaning that from detection to treatment, every level necessary to effectively complete mass drug administration (MDA) has been developed. The remaining eleven NTDs are considered “tool-deficient,” which means at least one of these levels is not fully developed. The USAID’s NTD Program focuses on these tool-ready diseases (CDC, 2011) and emphasizes the importance of controlling these diseases through an integrated approach because of the geological overlap for co-infections (USAID, 2012). However, a limited focus on only six diseases hardly seems integrated. Meanwhile, MSF has taken the opposite approach, claiming that tool-deficiency should not and cannot stop quality care from being delivered to patients infected by one of these diseases (MSF, 2012). Unfortunately, MSF only recognizes four NTDs, a small fraction of all the identified diseases.

Whether tool-ready or tool-deficient, funding for NTDs is often mismanaged and insufficient (Moran, 2011). While the United States’ pledge to increase their current NTD program to combat and eradicate 10 NTDs by the end of the decade is commendable (Uniting to Combat Neglected Tropical Diseases, 2012), the budgetary funds in 2013 were reduced by 25% (MSF, 2012). Furthermore, according to the WHO’s proposed budget for

2014-2015, tropical disease research was reduced by more than 52% compared to the 2012-2013 budget. Research that is being conducted and funded is often not a reflection of actual need and tends to focus on basic research that is unlikely to yield any practical treatments for patients (Moran, 2011). While research that is aimed at deepening the understanding of the prognosis of these diseases can certainly lead to practical outcomes, research dedicated to product development and treatment plans are arguably more effective.

At the treatment level, pharmaceutical companies have also underinvested in the battle with NTDs. Between 1975 and 2004, of the 1556 new drugs developed, only 10 treated neglected tropical diseases (MSF, 2012). As pharmaceutical drugs exist in a market-driven economy, these companies often develop products that will guarantee them a large return on investment (Moran, 2011). Furthermore, these products are often developed with the intent of being delivered in resource-rich conditions, which is hardly effective in developing countries (DNDi & MSF, 2012). However, in the case of NTDs, the target population cannot afford expensive medications or complicated treatment plans. As a result, pharmaceutical companies have little incentive to increase investments in research and development for a market that cannot pay. When the profit-driven market controls essential medical interventions, only the rich stand to benefit, leaving the poor neglected and sick (Pérez-Casas, Herranz, & Ford, 2001). Instead, pharmaceutical companies have taken a different route: donations. Some companies, such as Pfizer, Sanofi, and Novartis, have made commitments to donate unlimited quantities of drugs for select diseases, namely human African trypanosomiasis, lymphatic filariasis, onchocerciasis, and leprosy (World Health Organization Department of Control of Neglected Tropical Diseases [WHO NTD], 2013).

As a result, companies donate and deliver millions of drugs annually. A large

component of current strategies to control NTDs is through the delivery of these drugs, known as mass drug administration (MDA). Community medicine distributors (CMDs) play a key role in MDA. CMDs are trained community members who distribute medicines and educate other members of the community on disease through either a door-to-door approach or through a centralized location (Rilkoff et al., 2013). As an example of the scale of MDA, every year since 2012, approximately 700 million children received preventative medicine for trachoma and helminthiases (WHO NTD, 2013). While this is certainly a large portion of the population, the number only represents two of the diseases. Other diseases are also treated by MDA, and often, one drug can prevent multiple diseases, indicating a heavy reliance on a particular chemical compound.

Conventional MDA may look good on paper because of its ability to deliver large amounts of preventative medicine to a vast amount of people at once, but they are also a cause for concern. While a fairly cost-effective method, it often relies on unpaid, local volunteers, who receive not much more than a brief training, to deliver medicines to outlying villages and schools, (Allen & Parker, 2011). One study in Uganda found that CMDs were so inadequately trained that they could not answer questions about the side-effects or long-term consequences of the medications they were distributing and that community members requested “experts” to better inform them (Rilkoff et al., 2013). With incomplete or inaccurate information, community members may be less likely to take medications that they think are unsafe.

The Uganda study also found that incomplete courses of treatment were distributed to villages and that CMDs in seven out of eight communities were unsure which medications were safe to deliver to pregnant and breastfeeding women (Rilkoff et al., 2013). In effect,

CMDs may unknowingly distribute medication in an ineffective or harmful way.

Furthermore, some countries not only have undertrained CMDs, but the general attitude towards preventative medications is negative. Attempts at MDA have even erupted in violent protests and conspiracy theories about the medications making healthy children sick (Allen & Parker, 2011).

In its current state, NTD management is ineffective and insufficient. Ultimately, this *mismanagement* feeds into the cycle of neglect and perpetuates poverty. At the diagnostic level, with no clear, focused definition of which diseases are considered neglected, resources are being spread too thinly. Research efforts, at both the prognosis and treatment levels, are underfunded and under-incentivized. Finally, the delivery method is full of complications and misinformation. Neglect exists at every level. The current management of NTDs itself is arguably a form of social and economic oppression that solidifies the cycle of neglect, trapping a billion people in its center.

CHAPTER III

SEX AND GENDER DIMENSIONS

In their simplest definitions, sex is a biological determinant, and gender is a social construct (Vlassoff & Moreno, 2002). When it comes to health, social and biological factors can affect one's risk for infection and one's options for treatment. Sometimes, these factors overlap. For example, it may be unsafe for pregnant women to take a certain medication for biological reasons, but the fact that a safe alternative does not exist could be attributed to a social factor.

Though gender biases and expectations vary greatly across cultures, their social burden cannot and should not be underestimated. Gender roles in a society can determine if a woman will receive higher education, inherit land, or be susceptible to violence (WHO Africa, 2012). It is important to note that the Administrative Committee on Coordination's (ACC, 1998) definition of poverty includes all of these potential consequences. Ultimately, sex and gender can play an influential role in the way that women access healthcare, their vulnerability to diseases, and the impact of those diseases on their lives—physically and socially (Gazzinelli et al., 2012).

Biological Factors

Different diseases affect the body in different ways. As men and women have distinct biological structures and functions, it follows that the symptoms, severity, and treatment of diseases are going to vary between the sexes. Most obviously, these differences are seen in the reproductive system, primarily in regards to genitalia, menstruation, pregnancy and childbirth (Vlassoff & Moreno, 2002).

First, some neglected tropical diseases (NTDs) manifest their symptoms on the primary and secondary sex characteristics of females. For example, a symptom of lymphatic filariasis is lymphedema, or swelling caused by the buildup of fluid, which can affect the breast and vulva (Hotez, 2009). While this is a biological factor, social factors are also at play as some cultural practices only allow for the examination of women's arms and legs, which may lead to an under-reporting of lymphatic filariasis and an underestimation of its disease burden on women (Hotez, 2009).

Schistosomiasis is another NTD that can cause infection in the reproductive and urinary systems. About 93% of the global cases of schistosomiasis are localized in Sub-Saharan Africa (SSA), particularly near bodies of water, as snails are the intermediate host of the parasitic worms that cause infection (Hotez & Kamath, 2009). The public health impact of schistosomiasis is second only to malaria in parasitic infections (Kjetland, Leutscher, & Ndhlovu, 2012) with an estimated annual DALY burden of 1.6 to 4.2 million in SSA (Hotez & Kamath, 2009). For women, lesions and infections commonly occur on the vagina, Fallopian tubes, and cervix, the latter of which is thought to be the main site of acquisition for HIV (Kjetland et al., 2012). Indeed, associations of co-infection between schistosomiasis and HIV have been found, and in the case of female genital schistosomiasis, the risk of HIV transmission is three-times as likely (Hotez, 2009).

Menstruation creates a high demand of blood for a woman's body, and the loss of too much blood can cause an iron deficiency and anemia. Essentially, anemia is a condition in which not enough oxygen is delivered to the body due to lack of red blood cells or a defective oxygen-binding protein in red blood cells called hemoglobin. While anemia can be a symptom of schistosomiasis, hookworm infections are the more common culprit, as they

cause intestinal bleeding (Hotez & Kamath, 2009). Therefore, hookworms create a compounding risk for the development of anemia in women, which can have disastrous effects. In fact, anemia is responsible for approximately 20% of maternal mortality and can result in low birth rate and infant mortality (Hotez, 2009).

Hookworms directly impact the third biological factor: pregnancy. However, pregnant women have other unique burdens in the face of NTDs. Treatment of certain NTDs become difficult for women who are breastfeeding or currently pregnant because of the side-effects from current medications. For example, the WHO has deemed Zithromax, used to treat trachoma, and Ivermectin, used to treat onchocerciasis and lymphatic filariasis, to be unsafe for pregnant women (Rilkoff et al., 2013). This complicates the typical delivery method for NTD preventive medications through MDA.

Eradication of onchocerciasis in communities is possible if Ivermectin is distributed annually over a period of 10-15 years (Clemmons et al., 2009). Since MDA is the main effort to control onchocerciasis, women will often wait until the next year to receive treatment instead of seeking out individual treatment from health centers as soon as they are eligible again, which for Ivermectin is a month after the start of breastfeeding (Rilkoff et al., 2013). As one study in Sierra Leone found, only about 1.2% of breastfeeding women followed the recommended guideline for treatment after becoming eligible because of insufficient resources and information (Vlassoff & Moreno, 2002). Compounding these insufficiencies, women may spend up to 25% of their reproductive years pregnant and 60% of those years breastfeeding, indicating a large portion of their life without treatment (Rilkoff et al., 2013). Onchocerciasis is a long-term health issue for communities, which is made longer when pregnant women are excluded from treatment.

While “biological oppression” is not explicitly included in the cycle of neglect, biology certainly impacts the vulnerability of women. NTDs’ comorbidity with other diseases and disorders, such as HIV and anemia, can certainly affect one’s productivity and, ultimately, economic status. The economic burden of seeking treatment becomes heavier with the increased burden of sickness. Furthermore, until pharmaceutical companies develop medications that are safe for pregnant and breastfeeding women, many individuals will be excluded from MDA and not necessarily by choice. Individuals do not have a choice in determining their sex, but that does not mean that they should not have a choice in accessing healthcare that is designed to limit risk of infections and increase safe, viable treatment options.

Social Factors

Social constructs of the way women should behave and interact with their environment also impact their health outcomes. Many factors contribute to gender roles. For women in SSA, family, community, and education are particularly defining, overarching many areas of life. Concerning health more specifically, traditional medical practices, stigmatization, and gender-based violence also play important roles. All of these factors have direct and clear implications for the cycle of neglect. By the same token, social oppression is more difficult to solve because it is a long-term issue built into the fabric of society. Unlike the biological factors, simply increasing resources and information will not break the cycle. These constructs solidified over time, and therefore they must be broken down incrementally.

According to a WHO report on “Addressing the Challenge of Women’s Health in Africa (2012), women are the foundation for family and community life, but they may be vulnerable to decreased healthcare if viewed as mere child bearers or household maidens.

Indeed, women play a crucial role in informally managing the health of their children and other household members, particularly in the areas of nutrition, sanitation, and immunizations. However, immunizing children or rehydrating a child with diarrhea are time consuming and burdensome tasks, which can prevent women from seeking jobs outside of the house (Vlassoff & Moreno, 2002). Furthermore, women do not have to be the sole caretaker in a family. A study in Ghana found that when fathers took an active role in the immunization of children, more children were immunized in a time-efficient manner (Vlassoff & Moreno, 2002). While raising children and attending to a family is no doubt a noble and respectable cause, it can interfere with or even limit other opportunities, especially if women are *expected* to be the primary caregivers of a family.

In the larger community, men are often in charge of the village meetings that make decisions about the control of diseases, while women are more often selected as the actual distributor and executer of these decisions (Clemmons et al., 2009). It is important to note that even though women are left out of the decision-making process, they largely agree with the men and do not voice dissatisfaction in their decisions (Clemmons et al., 2009). However, their lack of voice may extend into other areas of life. Women in rural parts of Kenya, Nigeria, and Sierra Leone are expected to labor in the fields in silence and without complaint despite health problems (Vlassoff & Moreno, 2002). Without a voice, women are left powerless and in subordinate positions.

A hierarchy also exists within the healthcare system and workforce. Men often inhabit the highest ranked positions, such as doctors or journal editors, while women occupy subordinate positions, such as nurses and authors of journal articles (Vlassoff & Moreno, 2002). Women thus receive less financial and transportation support than their male

counterparts, even though they may have a more direct responsibility to the people in their care (Clemmons et al., 2009). Even in maternalistic cultures that highly value the role of women in society, customary inheritance laws still exist, which prevent women from inheriting land and, with it, gaining their independence (Vlassoff & Moreno, 2002). Once again, women are placed in a socially and economically subordinate position compared to men, increasing their higher risk for entering into the cycle of neglect.

Even though these general gender roles exhibit some similarities to those of the developed world, the implications of these roles still affect women's health and risk of poverty. Whether by choice or not, women are often left out of participating within their community, and women's voicelessness in society is symbolic of their lack of power. Taken together, women are expected to be quietly complicit to the word of men; their authority within the community is undermined. Furthermore, with denied access to land rights, women rely on their male counterparts. Women may bear the brunt of the work in the field, but they cannot own the field. In all, these gender roles act as components of the ACC's definition of poverty and are a violation of human dignity.

Women also lag behind men in opportunities for higher education—another qualifying component for ACC's definition. For example, in Cameroon, the national literacy rate is close to 72%; among women it is only 52% (Fongwa, 2002). This finding is consistent across the continent. In a statistical report compiled by the World Health Organization Regional Office for Africa (WHO Africa, 2014), only nine out of 43 African nations surveyed had a higher literacy rate among women than men. In the same report, women consistently showed lower enrollment in all levels of education (WHO Africa, 2014). According to the United Nations International Children's Emergency Fund (UNICEF, 2014),

barriers of gender equality in education exist because of school fees, cultural favoritism towards boys, and inadequate or non-existent sanitation facilities for girls.

Education also plays a role in the way one communicates. With higher education, language becomes more sophisticated and grammatical. As a result, those who can manipulate language are perceived to be more powerful. In Nigeria, Cameroon, and Tanzania, a study by Clemmons et al. (2009) found that the language men and women use to describe their encounters with their diagnosis and treatment had larger implications for their autonomy. While men often used an active voice, women used a passive voice, indicating that men *adhere* and that women *comply* with medical advice. Further supporting this notion, a study in Uganda showed that men often asked CMDs difficult questions about the medications they were given, wanted to know more information, and were hesitant in taking the medications (Rilkoff et al., 2013). Women, on the other hand, accepted the medications and the programs distributing them more readily (Rilkoff et al., 2013). This poses potential risks for women, as an unquestioning compliance can make them vulnerable to misinformation or unsafe medications. Finally, language can be a reflection of one's understanding and attempts at ownership. Men often try to name their disease, while women often describe their symptoms (Clemmons et al., 2009).

Perhaps as a result of an education gap, women and men often seek treatment for their diseases from different sources. Women try to self-heal and utilize traditional medicine more often than men (Vlassoff & Moreno, 2002). In and of itself, this cultural practice may not have a bearing on the overall health of an individual. Multiple approaches to healthcare exist, and just as not all traditional methods are harmful, not all modern methods are beneficial (WHO Africa, 2012). In Western cultures, disease and health are often viewed under the lens

of a microscope, quite literally. Individuals displaying certain symptoms and who test positive for specific pathogens are deemed diseased, while those who are asymptomatic and test negative are healthy. The definition of health is based on the biology of the individual. Physicians thus diagnose and treat accordingly. African cultures, on the other hand, view health through the lens of a telescope. Looking outward, individuals place themselves within a larger social context. One achieves true health by not only finding the balance between the mind and the body but also between the individual and the community (WHO Africa, 2012).

As women are considered primary caregivers and the center of family life, it makes sense that they seek the advice of the community or cultural tradition, rather than seek an individualized diagnosis. Women often do not go to health centers for the diagnosis and treatment of many of their health problems, which contributes to underestimating the total burden and morbidity of a disease (Vlassoff & Moreno, 2002). As Peter Berger and Thomas Luckmann pointed out, health and illness are as much part of the physical reality of diseases as part of the socially and culturally constructed idea of them (Kleinman, 2010).

For example, schistosomiasis from a biomedical perspective is a parasitic worm that can cause bloody urine or stool, enlargement of the liver, increased risk of bladder cancer, and in some cases neurological problems. However, the lack of health education and resources has resulted in an inaccurate view of the etiology and treatment course for this parasite, even among healthcare professionals (Allen & Parker, 2011). In some countries, these symptoms may be attributed to witchcraft and spiritual possession in which case biomedical intervention may be perceived to exacerbate the problem (Allen & Parker, 2011). Furthermore, some of these diseases also carry a social stigma, causing individuals to avoid employment and medical attention (Hotez, 2008). Women may not seek treatment if it is at

the cost of being socially ostracized.

Stigmatization and the exclusion of individuals is another social factor that feeds into the cycle of neglect and the definition of poverty. Onchocerciasis, which is a skin disease transmitted by blackflies that can also cause blindness or skin disease, exemplifies this process. Men and women perceive the impact of onchocerciasis differently (Vlassoff & Moreno, 2002). Women are often concerned about their appearance and opportunities in life with the visible skin disease, while men tend to focus on the sexual and reproductive implications of the disease (Vlassoff & Moreno, 2002). For women, this concern is not unmerited as onchocerciasis can cause disfigurement, threatening marriage prospects (Rilkoff et al., 2013). Hookworm and schistosomiasis infection can also cause infertility, which may carry a complex social stigma, especially in a society that values women as child-bearers (Hotez, 2009). Even if onchocerciasis, hookworm, or schistosomiasis do not cause immediate mortality, the social death from the disease's stigma has far reaching consequences. Women may perceive the consequences and symptoms of the disease as worse than the disease itself, especially if it affects their appearance, marriage prospects, or child-rearing ability.

Women are particularly susceptible to violence, another component of the definition of poverty. While men are often victims of violence on the streets, women often experience violence in the home, causing long-term physical, psychological, and economic damage (Vlassoff & Moreno, 2002). Gender based violence often manifests in overt, physical terms, such as kicking, hitting, or rape. However, the social and economic oppression caused by gender roles is violence in itself.

Structural violence is defined as causing harm to an individual or population via a normalized social structure, such as political, economic, cultural, religious, or even gender

systems (Farmer, Nizeye, Stulac, & Keshavjee, 2006). Within the framework of structural violence, the distribution of NTDs is not random but rather systematic, targeting those with little political voice, marginalized from society, and in an impoverished environment (Farmer, 2004). When women cannot participate in society, attend school, own land, and have a voice, violence is happening. Disease itself is violent. Blindness, disfigurement, and intestinal bleeding all become acts of violence perpetuated by society when the women of Africa carry a larger portion of global disease (WHO Africa, 2012).

With poverty as the common factor, these diseases clearly discriminate against the marginalized, and women are particularly vulnerable to this discrimination. In the end, no matter how clever and wonderful medical treatments may be, if the social and economic determinants of these diseases are not understood and addressed, the medicine will fail (Farmer et al., 2006). In Sub-Saharan Africa, achieving health equality goes beyond just the eradication of disease and must address poverty and structural violence as deeper pathologies.

CHAPTER IV

PROPOSALS: BREAKING THE CYCLE OF NEGLECT

The 2015 deadline for accomplishing the Millennium Development Goals (MDG) draws closer. Though substantial progress has been made in all 8 MDGs since their conception in 2002, these ambitious goals will still require attention far beyond 2015. As such, literature on neglected tropical diseases (NTDs) often cites that control of NTDs is not only a means to an end but also an end itself (Hotez, 2009). Clearly some of the MDG outlined in Table 2 will be directly impacted by NTD control, namely MDGs 1, 4, 5, and 6. However, through innovative approaches that particularly focus on women's health, contributions towards achieving the other MDGs are possible.

TABLE 2: Millennium Development Goals
This table provides a brief description of the 8 MDG (United Nations, 2002).
1. Eradicate extreme poverty and hunger
2. Achieve universal primary education
3. Promote gender equality and empower women
4. Reduce child mortality
5. Improve maternal health
6. Combat HIV/AIDS, malaria, and "other diseases"
7. Ensure environmental sustainability
8. Global partnership for development

It is important to note that these proposals are hardly exhaustive. Numerous other possibilities may exist. These "solutions" are simply recommendations that offer potential for breaking the cycle of neglect. Many of the following proposals are neither mutually exclusive nor unidirectionally benefit a single MDG. For example, through the control of NTDs, especially those that can cause cognitive or developmental delays, children will be able to

attend school and learn more, improving education. Child mortality will also decrease. Conversely, education is commonly regarded as a means of achieving gender equality and empowerment. Education can also reduce infection rates by increasing people's understanding about how diseases spread. The Millennium Development Goals are vastly intertwined with their own objectives, the cycle of neglect, and the definition of poverty. As such, solutions should be just as integrated.

Action plans should also address short and long term problems. Dr. Paul Farmer (2004), a physician-anthropologist and co-founder of Partners in Health, emphasizes the importance of pragmatic solidarity, which is not only identifying the needs of people and empathizing with them but also taking practical steps to fulfill those needs. Through a two-pronged approach, pragmatic solidarity can be achieved by addressing the immediate medical concerns of NTDs and the larger issue of socioeconomic inequalities. Addressing the immediate medical need and the long-term socioeconomic need should not be viewed as competing approaches, but as complementary (Farmer et al., 2006).

Instead of simply waiting for countries to develop in order to see a decline in NTDs, an active approach to NTD control can contribute to the development of countries by increasing socioeconomic growth and upholding MDGs (Allen & Parker, 2011). Co-intervention will yield the best results of breaking the cycle of neglect. If NTDs cause poverty and that poverty causes NTDs, then no solution will work by focusing on either one separately. The dynamic between NTDs and poverty interconnect to such an extent with political voice, economic opportunities, and environmental hardships that they may best be understood as inseparable (Kleinman, 2010). Therefore, it is only appropriate for policies to have a wide-ranging approach in terms of medicine, politics, economics, and society.

Medically

In the spirit of pragmatic solidarity, actions must be taken to immediately address the issue of disease. Essentially, access to healthcare is access to life. If the physiological needs of a person are not met, then social and political rights are weakened. The right to vote is meaningless if one is not alive to do so. Therefore, medical solutions are obviously essential to healthcare problems, especially for those who are suffering from disease right now.

First, the conventional mass drug administration (MDA) method of delivery must be reconsidered. While MDA certainly reaches millions of people annually, others are still left out of the process. Indeed, for programs that treat lymphatic filariasis, 79% of the global, at-risk population is left untreated (Ottesen, 2006). MDA is also complex. Mapping of the disease; logistical planning; advertising and raising social awareness; training community medical distributors (CMDs); acquiring, storing and administering drugs; and measuring health outcomes and cost-effectiveness must all take place in order for MDA to occur in a community (Ottesen, 2006).

If endemic countries invested more time and money in the training of CMDs, some of the attitudinal problems of MDAs could be resolved. Additional measures could be taken to ensure effective delivery methods, such as direct-observation therapy, which has been relatively successful in the administration of tuberculosis medications (Allen & Parker, 2011). With extra training, these volunteers could become paid employees of the government. This creates jobs in which the poor could conceivably work, improving the socioeconomic status of these individuals. Women, as caretakers for their families and healthcare distributors for their communities, would prosper in this job market.

MDA can create pressure on pathogens to mutate and develop resistance against

widely used drugs (WHO NTD, 2013). Therefore, strategies based on the individual may provide more targeted treatment, reducing the risk of drug-resistance and reaching populations, such as pregnant and breastfeeding women, that miss the annual drug distribution day. Door-to-door delivery of medications offers an effective way to target women who spend part of their day at home completing household chores, but may be ineffective for men who work outside of the house (Rilkoff et al., 2013). As a compromise, women in one village suggested that a centralized location replace the door-to-door model, which would allow community members to take a more active approach and seek preventative treatment themselves on their own time and under their own terms (Clemmons et al., 2009).

MDA, door-to-door, and centralized locations all have their pros and cons. Clearly, a single approach is not going to work for every community. In the end, communities and individuals must have agency over this issue. It is imperative that communities have an active voice and are the ultimate decision makers in which approach works best for them. With a greater emphasis on communication, information sharing, and increased autonomy in the decision-making process for the way drugs are distributed, women move from compliance to adherence. While the former represents an authoritarian model built on silence, the latter emphasizes the important of partnerships in medicine. This ideological shift symbolizes the importance that partnerships have on women's empowerment (Clemmons et al., 2009).

Preventative medicine can achieve much, but other practical medical approaches are also needed. For example, water, sanitation and hygiene (WASH) are key factors in the prevention and elimination of diseases such as trachoma, schistosomiasis, and helminth

infections, yet mass drug administration dominates the focus of current strategies (Freeman et al., 2013). Without proper control and maintenance of water sources, reinfections will continue to occur, reliance on MDA will develop, and these diseases will begin to resist treatment by current medications. Ensuring water free of contaminants such as human feces or urine could reduce the rate of infection. In fact, through implementation of a WASH program, one village in Ghana completely eradicated three water-borne NTDs: schistosomiasis, yaws, and scabies (Fisher, 2006).

Historically, WASH and NTD programs have failed to cooperate despite the fact that they could mutually benefit each other and they share a common target population: the poor and marginalized (Freeman et al., 2013). Social and economic developments form central components of both of these programs' long-term goals. Furthermore, NTDs and WASH programs both take a human rights approach, as they have direct effects on the health of the individual and the community.

Finally, women are particularly vulnerable to not only the burden of NTDs but also the burden of water access. As the primary caregivers of a household, women and girls in the developing world can spend up to 40 billion hours every year fetching water, often at the risk of their personal safety and at the cost of educational and vocational opportunities (Fisher, 2006). Thus, women play a vital role in the development of these programs. With women's participation in the planning, controlling, and educating stages, these programs are six to seven times more likely to succeed than programs without women's participation (Fisher, 2006). The health of the community depends on recruiting women as an invaluable resource.

As some of these diseases are not transmitted directly through the water supply, water, sanitation, and hygiene programs are not sufficient to control all NTDs (Gazzinelli et

al., 2012). However, water remains a life-source, not only for humans but also for many vectors that carry disease. Mosquitos cause dengue and lymphatic filariasis, water fleas cause dracunculiasis, and flies cause trachoma and onchocerciasis (Freeman et al., 2013). Though water sanitation might indirectly affect these vectors, a direct approach would be more effective.

Without proper vector control, reinfection will continue to happen (WHO NTD, 2013). Despite this, in 2008, R&D on vector-control for kinetoplasts, pathogens that cause human African typanosomiasis, visceral leishmaniasis, and Chagas disease, received no reported funding (Moran, 2011). Typical vector control relies on pesticides, corresponding largely with the agricultural sector (WHO NTD, 2013). In the case of lymphatic filariasis, these pesticide treatments have also proven expensive and ineffective (Ottesen, 2006). Communication satellites have also been used as a more high-tech solution by tracing the flies that cause onchocerciasis in order to kill their larvae (Wood, 2008). While the latter approach is more targeted and therefore more likely to be effective, the expense poses difficulties for much of the developing world.

Pesticides may largely eliminate vectors in the field, but women face additional risks in the home. Women raising children are three to four times more likely than men to develop trachoma, and the burden of domestic chores, such as collecting water, places women at high risk for contracting dracunculiasis (WHO NTD, 2013). However, bed nets, polystyrene beads, and residual spraying in the home reportedly have tremendous value in reducing transmission of lymphatic filariasis and the overall density of the mosquito population (Ottesen, 2006). As primary caretakers, women are in a position to play a direct role in vector control. Even though men are often in charge of a family's finances, women will often use

their personal funds to purchase bed nets for the entire family (Clemmons et al., 2009).

However, current strategies at marketing specifically to these gender differences to promote the use of bed nets are insufficient (Vlassoff & Moreno, 2002). Encouraging women to use bed nets in their house and increasing their understanding of the transmission of diseases may position them to move vector-borne neglected tropical diseases from elimination to eradication.

Finally, the overall healthcare infrastructure must improve in order to effectively control NTDs. Sub-Saharan Africa carries 24% of the global burden of disease, but it only has 10% of the population, 3% of the medical personal, and 1% of the economy (Kaschula, 2013). Obviously, a vast health disparity exists between SSA and the rest of the world. While nothing will quite replace the “simple” solution of training more local physicians and increasing the number of available hospitals and clinics, other options may offer more immediate relief.

Technological support through increasing satellite power could provide real-time communication between doctors and field workers in the diagnosis, treatment, and prevention of diseases. As the cost of bandwidth for Internet access is 10-100 times more expensive in Sub-Saharan Africa than in the US or most of Europe, the cost would have to be reduced (IDRC, 2004). Many African countries have limited budgets, lack of infrastructure, and inhibiting policies, which make increasing satellite power difficult (IDRC, 2004; Wood, 2008). However, start-up companies and non-profit organizations are beginning to see the potential of increasing Internet connections. The *New York Times* reported that Google has sponsored the installation of a solar-powered satellite dish in rural Africa, which has reduced travel cost for farmers and created support groups for people with disabilities (Nicholson,

2009).

Telecommunication can improve economies (IDRC, 2004) and increase food security, both of which are important in supporting the poor and controlling NTDs, through crop evaluations (Wood, 2008). In Nigeria, for instance, employment increased as a direct result of embracing policy reform to accommodate satellite use (IDRC, 2004). By expanding satellite use, doctors and health professionals in the developing world could communicate in real-time with doctors in the developed world who have readily available resources (Wood, 2008). This type of support cannot be underestimated. “Brain drain” can lead otherwise qualified individuals to leave under-resourced and under-supported jobs for more well-paying positions in other countries. In the case of pathology, for instance, consultations via satellites may provide the necessary support and encouragement for pathologists to stay in under-resourced areas (Kaschula, 2013). Internet access also brings information, news, and journal articles, allowing medical professionals to remain up-to-date with current practice (Kaschula, 2013). Ultimately, telemedicine brings expertise where expertise is lacking.

In summary, women can play a vital role in reforming mass drug administration, strengthening water, sanitation, and hygiene programs, and reducing vector-borne diseases in the home. Increasing satellite power and telemedicine also present promising solutions for controlling neglected tropical diseases. While these proposals focus on reducing poverty and combatting diseases, MDG 1 and MDG 6 respectively, they most directly affect MDG 6, specifically targeting the “other” diseases.

By combatting diseases, maternal health (MDG 5) is improved. The reduction of hookworm infections through partnerships with water, sanitation, and hygiene programs would likely decrease the severity of anemia among pregnant women. Furthermore,

household chores that unequally burden women would pose less health risks for them and the rest of their household. Vector control within the house would also reduce the rate of infection among the household, reducing child mortality (MDG 4). In addition, child mortality is further reduced when women share the burden of child immunization with men and have more choices aside from MDA. Finally, access to clean water fulfills MDG 7, ensuring environmental sustainability. Solar powered satellites that improve farming techniques and reduce the demand on valuable resources also alleviates the pressure on the environment.

In relation to eradicating extreme poverty (MDG 1), medical interventional addresses many of the factors mentioned in the ACC's definition of poverty. Specifically, by increasing medical resources, individuals have greater access to clinics and healthcare. While satellite technology may not increase women's land rights, it can improve the ability to grow crops, save money by reducing travel expenses, and ultimately increase their power to feed their family. Together, these increase the security of women, their households, and their communities.

Politically

Political will *and* commitment are prerequisites for the success of any widespread initiative or program (WHO Africa, 2012). Government involvement can provide investment, sustainability, and at the very least, a symbolic blessing for a program. However, in order for policies to succeed in reducing poverty, impact analyses must examine the way these policies affect both men and women (ACC, 1998). Without a gender analysis, the health gap between men and women may continue to widen. The ACC states that the poor must take active roles in judicial and political systems as a method to protect their rights and reduce their poverty.

As women stand as a population particularly vulnerable for poverty, this statement must be understood to include women.

Political action should first be developed in countries where these diseases are endemic. To emphasize the importance of taking preventive treatments against NTDs, some have suggested a requirement via local legislation (Allen & Parker, 2011). Cultural interpretation of medicine and disease may hinder treatments, but legislation is symbolic of local governments' investment and commitment to address NTDs. Theoretically, citizens will participate in taking preventive drugs to not only follow the law but also because the government essentially deemed these drugs as harmless and beneficial. Laws would have to be carefully crafted to ensure that the intent of the policy is actually being achieved and that laws do not cause unintentional harm. For instance, if a policy induced a fine or stated that a child could not go to school without receiving preventive treatments, then impoverished populations might be further oppressed.

Health policies must specifically address gender equality with reference to the status of women and their access to healthcare in order to reduce the gender gap and improve efficiencies of health resources (Gazzinelli et al., 2012). As previously discussed, women differ from men in their expectations of and interactions with the healthcare system. As society often defines their roles differently, it follows that health policies should also target these populations separately. In terms of health, equality does not necessarily mean "the same." In order to have equal outcomes, the inputs may be different (Vlassoff & Moreno, 2002). For example, since women are at higher risk for anemia when infected by hookworms or schistosomiasis, they may require additional supplements in order to achieve the same health outcome as men (Vlassoff & Moreno, 2002). These types of policies and practices are

not meant to exclusively favor women but rather bridge the gender gap and promote equality across health outcomes.

Despite this, women remain consistently underrepresented in the political process across Africa. Due to social stereotyping and gender discrimination that leaves girls uneducated and at home, women represent less than 10% of the parliament in most countries (WHO Africa, 2012). In order for women's issues to be on the agenda, women need to be represented. Increased political involvement allows women to participate more effectively in society by giving them a voice and therefore power—directly reducing some of the components of poverty and meeting MDG 3.

Government spending on healthcare across Africa is also dismal. Each year African governments continually spend a smaller portion of their budget on healthcare expenditures than the rest of the world (WHO Africa, 2014). In 2008, only 21 countries in the African Region were spending the recommended US\$44 per capita on health (WHO Africa, 2012). Even though the African Union agreed in 2001 to raise their government health expenditure to 15%, only six out of 47 countries met this goal ten years later (WHO Africa, 2014). As mass drug administration and similar programs are largely planned, coordinated, and financed by the national governments, these sorts of programs cannot succeed without proper funding.

Out of pocket (OOP) payment for healthcare, the most common form of healthcare expenditure in the African Region, poses huge obstacles for low-income countries (WHO Africa, 2012). Both men and women may wait until their disease has progressed to a devastating stage before seeking treatment. Once again, women are particularly vulnerable. As women are typically financially dependent on men, research has shown that women and

children utilize healthcare services more when OOP is reduced (WHO Africa, 2012). This indicates that the desire to seek medical attention is prevalent, but the economic burden stands as a huge barrier for women's access to healthcare. Furthermore, by phasing out OOP payment, women have more money to invest in necessities for their household and family, such as sanitation facilities, nutrition, and education (WHO Africa, 2012).

Rwanda exemplifies the power of pro-poor, pro-women policies in government. Rwanda not only spends the highest percentage—at 23.8%—of its total government budget on healthcare compared to all other African countries, but its parliament contains more women than men—at 56% (WHO Africa, 2014). The Ministry of Health and the Ministry of Gender and Family Promotion are both under the direction of women ministers. As a woman and public servant, Dr. Agnes Binagwaho (2012), Rwanda's Minister of Health, specifically mentions gender and health policies in her mission statement as a mechanism for political strength and engagement. Rwanda has also largely eliminated their OOP fees in favor of community insurance schemes that share the burden of payment, which has allowed coverage for about 90% of the population (WHO Africa, 2012). These community-based insurance schemes have led to remarkable improvement in the health and lives of Rwandans. While not all countries may benefit from the same policies, the outcomes in Rwanda symbolize to the rest of Sub-Saharan Africa—and the entire world—the critical role that women can play in governance.

Economically

Economic solutions must address and financially respond to both neglected tropical diseases and poverty. First, research on NTDs is poorly resourced and underfunded. Only about 10% of global research funding is allocated to health concerns that affect 90% of the

world's population (Hunt, 2007). In effect, research and development (R&D) itself is in a state of impoverishment. Thus, incentives must be provided to help spur research in the areas of prevention, diagnostics, prognostics, treatment, and delivery. In addition to research on NTDs specifically, research is also needed in women's health and gender's role in medicine. Second, as NTDs are both a cause and consequence of economic oppression, economic empowerment of women is essential for NTD eradication.

According to Drugs for Neglected Diseases Initiative and *Médecins Sans Frontières* (2012), three fundamental problems exist in the development of medical innovation today. First, in today's market driven economy, commercial potential takes precedence over global need. Second, as innovative medicines are designed for resource-rich settings, developing countries become a mere afterthought. Finally, innovation remains expensive and is often priced too high for poor patients to reasonably access its products. In summary, current NTD treatments can be costly, unsafe, long-term, and complex (Mackey & Liang, 2012). Pharmaceutical companies have little incentive to create or to produce drugs for NTDs because their target population cannot afford costly treatment plans. Meanwhile, the target population is trapped in poverty because they are not being treated for the diseases that are crippling them.

As such, research on NTDs must be separated from the market-driven model and adopt a "health needs" model (MSF, 2012). Tax credits, subsidies, and grants could provide motivation to the private-sector to increase R&D for NTDs (Hunt, 2007). Tax credits could be given to companies that focus on the highest priority, global health needs, while reducing the tax credits already given to companies that focus on low priority lifestyle drugs, as market demands provide enough incentives for this latter class (Mackey & Liang, 2012).

These incentive programs should encourage and reward pharmaceutical companies that market drugs at an affordable rate according to the national budget of countries where these diseases are endemic (Pérez-Casas et al., 2001). For example, prize schemes could also be created to reward researchers that produce a product under a certain price (MSF, 2012). This would create a competitive atmosphere that would allow for only the best ideas to flourish without creating products that are too expensive or too high-tech for developing countries.

From there, pharmaceutical companies could expand their donations to include expired drugs that would otherwise be destroyed or too expensive to donate. The expiration date on many drugs is arbitrary and does not reflect the actual amount of time it takes to lose their potency (Coffey, 2012). To be clear, this does not mean that developing countries should become a dumping ground for all expired medications. Rather, emphasis on prolonged potency testing of relevant drugs would ensure maximum use in resource-poor countries (Coffey, 2012). Aid should never be a burden upon the beneficiary, whether in cost or donation. As with many of these solutions, review processes would have to be developed and established to ensure unintended consequences are not hurting those that they are trying to help. Furthermore, the ethical ramifications of donating expired drugs would have to be explored.

Other economic incentives could be explored in relation to the method used in trading these medications. Tariffs on imported medicines and vaccines for NTD products, which currently range from 2% to 15% in about half of Sub-Saharan African countries, could be reduced or eliminated (Mackey & Liang, 2012). Trade and delivery become just as important as research and development because drugs are only good if they are accessible to the populations that desperately need them. Furthermore, by removing trade and delivery barriers

for NTDs, global partnerships (MDG 8) are formed, specifically through the sub-goals of increasing distribution of essential medications, providing access to scientific advancement from the private sector, and decreasing tariffs and barriers to trade. In an increasingly globalized world, isolation is truly a sign of poverty, so MDG 8 is crucial to removing social and economic oppression.

While research is needed on NTDs, research is also needed specifically on women's health. Dr. Luis Sambo, the Regional Director for Africa, stated in a "Report of the Commission on Women's Health in the Africa Region" that quality scientific research on women's health in the African Region is lacking (WHO Africa, 2012). In relation to NTDs, typical studies have focused on gender issues associated with schistosomiasis and onchocerciasis but have ignored other NTDs such as human helminthiasis (Gazzinelli et al., 2012). Furthermore, a need exists for applied research, translating gender-issues into health policies for gender-equality (Gazzinelli et al., 2012). With a greater understanding of women's health, NTDs can be better targeted and treated.

Though economic resources need to be directed to the research of NTDs and women's health, economic resources can also directly benefit women by means of microloans and credit access. Currently, women in Sub-Saharan Africa have limited access to credit, and as a result, they cannot effectively participate in the market place (WHO Africa, 2012). However, micro-credit allows for women and the poor to play an active role in poverty eradication by taking initiative in innovation and entrepreneurship (ACC, 1998). Dr. Agnes Binagwaho (2012) explains in her mission statement the way communities in Rwanda have found ways to invest in themselves. Members of the community pool their money in a cooperative, and then citizens are allowed to take out investment loans with the promise of

paying it back to the cooperative. It is this sort of innovative, community-based thinking that will allow for the economic development of communities and women. While methods that are effective in Rwanda may not be effective in the rest of Sub-Saharan Africa, community-led solutions offer the most promising approach.

Finally, women could stand to benefit economically through the granting of land rights. Though women in Sub-Saharan Africa complete about 70% of the labor on agriculture land, they only own 1% of that land (WHO Africa, 2012). The right to own land empowers women, fulfilling MDG 3, but also combats one of the components of poverty by granting women access to their own land to grow food to feed their family. Credit access and land ownership can also increase women's effective participation in society by raising their status within their home and community (WHO Africa, 2012). Women move from their subordinate position to positions of value and authority. Clearly, by investing in research and the economic empowerment of women, a nation moves one step closer to eradicating extreme poverty (MDG 1). Economic support results not only in economic freedom but also in social freedom.

Socially

Perhaps one of the most important resources available for the development of Africa is the human resource. As women make up roughly 50% of the population, it stands to reason that investment in the empowerment of women is a cost-effective measure, providing a positive feedback loop in health and economic development (WHO Africa, 2012). In fact, women are the "key agents of change" when it comes to community health and the control of NTDs, playing an important role in social influence, vector control, and community compliance with treatment plans (Hotez, 2009).

Therefore, successful interventions in the control and eradication of NTDs will include a comprehensive plan to empower women. All the solutions presented above contribute to the social development of women. In some way, whether directly or indirectly, they empower women to be more independent and vocal about the issues that affect them. Water access empowers (Fisher, 2006). Gender policies empower (Binagwaho, 2012). Micro-credit empowers (ACC, 1998).

Education stands as perhaps the most significant component of empowerment and ultimately leads to the improvement of health and socioeconomic status. In fact, the ACC (1998) specifically pointed out that education and women's empowerment are critical to the eradication of poverty. It has even been suggested that education and women's empowerment are *invaluable* to the overall health of a country (Fongwa, 2002). Ultimately, as women increase their social status, they become assets to their community, and their vulnerability—both for poverty and NTDs—drastically decreases. Access to schools and increased education directly fulfills MDG 2.

Empowering women allows them to break out of traditional gender roles and participate more fully in their community, country, and culture. Traditionally, women make up the majority of the health sector, but they largely fill subordinate and supporting roles, such as nurses and midwives (WHO Africa, 2012). Despite this, nurses play a vital role in rural health centers, where NTDs are prevalent and nurses are the only available health resource (Fongwa, 2002). In order to increase the number of women physicians, education must become as much of a priority for girls as it is for boys in primary and secondary schools. Though this requires a long-term investment, the returns are invaluable, as women may be more willing to seek medical attention within the community from a female

physician than from a male physician (WHO Africa, 2012).

While research and development for the biological elements of NTDs are essential, the social causes cannot be underestimated because the conditions of poverty allow these diseases to develop. Even though the US is geographically not tropical, economically developed, and medically advanced, NTDs are still found amongst the poorest populations in America. Empowered female physicians and women in general could therefore provide better insight into the specific factors that trap their community in poverty and that place the populace at risk for disease.

As previously stated, health in Sub-Saharan Africa is best understood from the community perspective. Up to 80% of individuals in SSA seek treatment from traditional healers before western medicine, due to not only the lack of access to hospitals but also due to increased spiritual and familial support (Kaschula, 2013). From an anthropological perspective, this is important knowledge, as cultural competence contributes to NTD and poverty reduction.

Traditionally, physicians and health professionals do not target, diagnose, or treat the larger pathology of structural violence or similar social interventions (Farmer et al., 2006). However, as a symptom of structural violence, a prescription for clean water, credit access, or education may be the best medicine for NTDs. This emphasizes the need for physicians working with poor populations to understand the social structure of their society in order to increase empathy with their patients. Women in the community have a natural instinct for this. The social empowerment of women brings cultural competence and a much needed voice to the strategies used to provide healthcare to a community.

In summary, solutions for eradicating poverty and NTDs rely on comprehensive

actions taken medically, politically, economically, and socially. Table 3 provides a summary of the proposed solutions and the Millennium Development Goals that they fulfill. Women stand at the center of the cycle of neglect and therefore at the center of the solution.

TABLE 3: Breaking the Cycle of Neglect

This table provides a list of proposals as presented in the text and their relation to the Millennium Development Goals

Medically	MDG 6: Combat "other diseases"	Restructuring of MDA Telemedicine
	MDG 4: Reduce child mortality	Vector-control
	MDG 5: Improve maternal health	Water, sanitation and hygiene programs
	MDG 7: Ensure environment sustainability	Solar-powered satellites
Politically	MDG 3: Promote gender equality	Policies for gender equity Policies for treatment and/or prevention Women in parliament Replace OOP payments
Economically	MDG 1: Eradicate poverty	Credit access Grant land rights
	MDG 8: Global partnerships	Encourage trade and donations by reducing tariffs Incentivize private-sector for R&D
Socially	MDG 3: Empower women	Education Medical, political, economic empowerment
	MDG 2: Education	Access to schools Increase female physicians Cultural competence of doctors

CHAPTER V

CONCLUSIONS

Poverty, human rights, and neglected tropical diseases are intricately intertwined. Thus, eradication of NTDs and global poverty are complex problems that will not be solved with any one approach. Poverty is more than just not earning a certain amount of money. It is more a state of constant social and economic oppression, where lack of adequate food, water, healthcare, and education prevents people from self-actualizing and reaching their full potential. It is a symptom of a larger pathology, namely structural violence. A comprehensive policy is not about making everyone the same but rather working together for a world in which every person can achieve a level of life that is right for them.

If income distribution is viewed as a standard bell curve, albeit skewed, then someone is always going to fall above and below the average. It is not about trying to defy the laws of mathematics and redefine the meaning of average. Someone will always be poorer than someone else, but the goal is to eliminate the symptoms of poverty, such as the lack of social capital, education, or healthcare. Progress towards the elimination of NTDs acts as a “powerful equalizer,” bridging gaps in social and economic disparity (WHO NTD, 2013). By viewing neglected tropical diseases through the lens of human rights, the movement is advanced towards equal dignity and respect for every person—rich or poor.

In regards to a comprehensive policy or strategy that addresses NTDs and women’s rights from a medical, political, economic, and social standpoint, opponents may question the cost-effectiveness. However, healthcare and empowerment are not commodities, they are rights. If concerns of cost-effectiveness prevent a person from receiving essential medicines,

then society is guilty of normalizing the death of that person. Furthermore, in this light, when the rights of an individual are violated, as is the case when women or the poor bear an uneven burden of disease, then the rights of everyone are violated.

Humans are not just connected by their rights and their dignity; they are also connected by their biology. Dr. Nathan Wolfe, an epidemiologist, said in a public lecture at Angelo State University that airplane flight patterns are a mixing vessel of microbes on the planet: bacteria in the Amazon can be transported to Southeast Asia and viruses in Africa are not so far from North America anymore. Pathogens do not respect national boundaries. In a globalized world, society is only as healthy as its vulnerable populations. Furthermore, if improper use of pesticides or medications causes mutations in any of these pathogens, then NTDs may not be solely a problem of the poor.

Humanitarianism has a long history of trying to help but really causing more disruption. The sociologist Robert Merton proposed the theory that directive action often has unintended consequences, whether predictable or unforeseen, good or bad (Kleinman, 2010). Medical aid is especially at risk because the concept of health, the understanding of illness, and the rationale of taking medications differ substantially across cultures. As with any humanitarian mission, the obstacle remains of ensuring that aid is delivered to the people who are in need of them and not to the hands of corrupt governments or insurgents.

While this thesis is largely built upon generalities pertaining to Sub-Saharan Africa, it is important to note that success and sustainability ultimately depend upon on-the-ground partnerships (Allen & Parker, 2011). Community partnerships prevent blanket approaches to solving issues like public health and poverty by encouraging individuality and specificity to meet the needs of a village, region, or country. Partnerships serve as a protective force

against disruptive humanitarianism. Each community will be unique and may require slightly different solutions for the same problem. Grassroots efforts cannot be underestimated. Whereas large international agencies can miss the nuances of a community, grassroots organizations are deeply aware of the specific concerns of a community. After all, the countries where these diseases are endemic will be in the best position to solve their own problems, not an outside agency (Farmer, 2004).

As Her Excellency Mrs. Ellen Johnson Sirleaf, the President of the Republic of Liberia, stated so eloquently, “a nation thrives when mothers survive; we must strive to keep them alive” (WHO Africa, 2012). Feminism may be thought to be mainly a Western idea; however, developing countries are playing key roles in international politics by promoting gender-sensitive policies for the health of men and women (Vlassoff & Moreno, 2002). In fact, all 46 countries in the African Region are signatories to the United Nations Convention on the Elimination of All Forms of Discrimination Against Women, which includes provisions for women’s health (WHO Africa, 2012).

The next step is to move this political will to political commitment and action. Women stand at the center of it all, acting as a valuable yet untapped resource in Sub-Saharan Africa. In essence, the cycle of neglect can be shattered from the inside out through the empowerment of women.

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