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Different Disasters, Differential Impacts: The Effect of Droughts and Floods on Women's HIV Burden in Developing Nations

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by

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TABLE OF CONTENTS

LIST OF TABLES

ABSTRACT

Environmental change is an under-examined factor impacting women's health, globally. Climate-related disasters lack research in their connection to HIV, but nevertheless potentially have a tremendous impact on women's health in a variety of ways. Drawing on ecofeminist perspectives as a theoretical basis, I conduct analyses examining if the HIV burden among women is higher in nations that experience elevated rates of floods and droughts. In so doing, I examine whether different disasters impact women's health in different ways. Specifically, I posit that droughts, which are unpredictable, prolonged, and less understood, more negatively affect women's HIV burden than floods. I utilize two cross-national datasets and conduct ordinary least squares (OLS) regression to explore and interpret these relationships between climate-related disasters and women's HIV burden across developing nations. Overall, the results support the hypotheses, and also reveal important interaction effects between droughts and urban growth. Together, these findings suggest that suffering from disasters and moving to rapidly growing urban environments differentially impact women's health, as transactional sex likely becomes a coping mechanism in the face of such hardships.

Introduction

Despite overall improvements in global health over the last several decades, HIV/AIDS represents a serious public health threat in less-developed countries (UNAIDS 2011). Women are especially susceptible to HIV infection in comparison to men (amfAR 2015; WHO 2015) due to a combination of biological and social factors including access to education, healthcare, and their ascribed role as family caretaker (Austin and Noble 2014; Burroway 2010, 2012; Clark and Peck 2012; Heimer 2007; Masanjala 2007; McKinney and Austin 2015; Mojola 2011; Noble and Austin 2014; Oglethorpe and Gelman 2008; Quinn and Overbaugh 2005; Shircliff and Shandra 2011; Smith 2002). In fact, in Sub-Saharan Africa where the HIV pandemic is most acute, young women are eight times more likely to acquire HIV than men (WHO 2015).

The impact of climate-related disasters on women's HIV burden remains underexplored in current literature. Although HIV does not obviously appear to be a disease that has links to the natural environment, in contrast to infectious diseases like malaria, there are a number of potential underlying connections between HIV vulnerability and environmental conditions, especially for women. Ecofeminist perspectives offer that women are more closely tied to nature through their mutual oppression by patriarchal structures and ascribed statuses as providers (e.g., Gaard 2011; Howell 1997; Mies 1998; Mies and Shiva 1993, Rocheleau et al. 1996; Warren 1990). As gender roles dictate that women act as "environmental managers" in so far as they are responsible for growing food, gathering firewood, and fetching water, it follows that environmental change could have disproportionate impacts on women and women's health. Not as obvious is that this impact can also indirectly increase HIV susceptibility,

as the effects of climate-related disasters may change social relationships and behaviors, including risky sexual behaviors. Using ecofeminist perspectives as a theoretical basis, I predict that climate-related disasters have a significant impact on women's HIV burden across less-developed nations.

Between 2000 and 2009, there were three times as many disasters than there were between 1980 and 1989, and 80% of this increase was due to climate-related disasters (Leaning and Guha-Sapir 2013). Climate change has caused an increase in climate-related disasters, globally (UNDP 2016). Specifically, as a result of climate change, droughts have increased and storms have become more erratic, resulting in changing rainfall patterns (UNDP 2016). Less-developed nations lack resilience resources that allow them to cope with the impacts of climate-related disasters, and these nations are more likely to be affected by climate-related disasters (UNDP 2016). This increase in disasters affects populations at the household and individual levels as well. Disasters cause families to lose their homes and income, as individuals in less-developed nations largely live in rural areas, relying on subsistence farming for income and sustenance. Women bear the heaviest burdens resulting from climate change, as 80% of people displaced by climate change are women (UNDP 2015). Thus, due to their deep connection to the environment and the increase in disasters due to worsening climate change, women in less-developed nations are in an increasingly vulnerable position that compromises their health and well-being.

This research has the potential to uncover important relationships involving the environment and women's health. While most prior studies of women's HIV have focused on social, economic, and political predictors of HIV (e.g., Burroway 2010, 2012;

Clark and Peck 2012; Heimer 2007; McIntosh and Thomas 2004; Shen and Williamson 1997; Shircliff and Shandra 2011; Wickrama and Lorenz 2002), I attempt to illuminate the role that environmental conditions also have in shaping HIV trends for women in less-developed nations. As environmental change resulting from climate-related disasters is increasing in the poor regions that are endemic to HIV, examining the potential links between climate-related disasters and the HIV burden among women is especially important. Although the natural environment may not directly impact the HIV pathogen, environmental disasters are likely to alter social relationships and behaviors, including risky sexual behaviors, forced sex, and transactional sexual relationships, to make transmission more likely for poor women.

Women and HIV Vulnerability

In 1983, scientists discovered the human immunodeficiency virus (HIV), a retrovirus that infects immune system cells, compromising or eradicating their function and leaving individuals more vulnerable to new infections (WHO 2015). People contract and transmit HIV through sexual intercourse, contaminated blood transfusions, childbirth, breastfeeding, and sharing contaminated drug needles (WHO 2015). Years after contracting HIV, individuals develop acquired immunodeficiency syndrome or AIDS, the most advanced and deadliest stage of HIV infection (WHO 2015). Specifically, AIDS is a culmination of more than 20 opportunistic infections or HIV-related cancers (WHO 2015).

HIV predominantly affects people in less-developed countries. For example, over 95% of HIV cases are among people in developing nations. Sub-Saharan Africa, the

poorest region of the world-system, contains 70% of global HIV cases (WHO 2015). Thus, HIV is closely related to trends of poverty and international inequality. Indeed, many researchers (e.g. Fox 2010; Heimer 2007; Masanjala 2007; Smith 2002) recognize the relationship between poverty and HIV/AIDS, and poverty is considered to be a key determinant in shaping trends in the AIDS epidemic. Even the availability of antiretroviral therapies (ARTs), which prolong the lives of HIV-infected individuals, is greatly reduced in poorer nations. Moreover, healthcare workers from less-developed countries often relocate to other places offering better-paying jobs, limiting the availability of life-saving resources (Heimer 2007). In addition to HIV cases largely afflicting populations in less-developed countries, HIV is now acquired mostly by women.

In the 1980s and 1990s, more men had HIV/AIDS than women, as men made up over 65% of global HIV cases (UNAIDS 2011). Over the last two decades, however, this trend has nearly reversed, as women now constitute almost 60% of worldwide HIV cases. HIV/AIDS currently represents the leading cause of death for women of reproductive age (amFAR 2015; WHO 2015). The disproportionate increase in HIV/AIDS prevalence among women in less-developed countries is likely due to combination of social, biological, and as I argue here, environmental factors (Heimer 2007).

Women have a unique biological susceptibility to HIV contraction. Researchers cite hormonal changes, vaginal microbial ecology and physiology, and a higher prevalence of sexually transmitted infections (STIs) as biological ways in which women are especially susceptible to HIV (Quinn and Overbaugh 2005). For instance, ulcerative STIs are more common in women than in men, and these open lesions facilitate the

spread of HIV. Moreover, adolescent girls have a further heightened biological susceptibility to HIV infection and transmission, as they possess physiological properties of immature genital tracts such as "increased cervical ectopy or exposed columnar epithelium" (Quinn and Overbaugh 2005: 1583). Given the early age of marriage among women in less-developed countries, young women are especially vulnerable because there is an increased risk of contracting HIV in pregnancy and during the early postpartum period, as women have higher levels of progesterone during those times (Quinn and Overbaugh 2005). Researchers have found that higher progesterone levels are associated with an increased risk of HIV infection as well (Quinn and Overbaugh 2005).

In addition to biological forces, women in less-developed nations also face social or socio-economic vulnerabilities to HIV, as women are less empowered in comparison to men (Heimer 2007; Smith 2002). Individuals in less-developed nations are often ascribed unequal gender roles, reinforcing the idea that men are superior to women. Thus, women do not have access to the same opportunities as men. Moreover, these unequal gender roles lead to a lack of autonomy and decision-making power among women (Heimer 2007; Smith 2002). A lack of empowerment compromises women's access to contraceptives, education, and other resources which could prevent HIV transmission.

Many studies also emphasize the importance of women's participation in secondary schooling (Burroway 2010, 2012; Clark and Peck 2012; Shen and Williamson 1997; Shircliff and Shandra 2011). Education is a major contributor to women's health generally (e.g. Brady et al. 2007), as it equips women with resources, ideas, skills, attitudes, behaviors, and aspirations that positively impact their health (Burroway 2010; Wickrama and Lorenz 2002). Education particularly enhances women's empowerment

and improves gender equality by providing women with information on negotiating safe sex and delaying marriage by re-focusing young women's goals on future higher education or employment opportunities (e.g. Heimer 2007). Educated women are more able to make healthcare-related decisions that protect their reproductive and sexual health (Burroway 2010; Wickrama and Lorenz 2002). Young girls in less-developed countries are especially vulnerable to dropping out of school early to help with household or farm labor, increasing their likelihood of contracting HIV (Burroway 2010; Wickrama and Lorenz 2002).

In addition to health resources and education, other studies also consider the economic standing of women as a determinant of health. For example, Burroway (2012) finds that nations where women have legal access to land, loans, and property tend to have lower rates of HIV. Other researchers emphasize the importance of legitimate and formal employment activities for women in reducing their susceptibility to disease (e.g. Heimer 2007).

Women in less-developed nations have unequal access to healthcare, including less ability to "access and acquire health-enhancing resources and services," such as primary health care, family planning advice, contraceptives, and sex education (Austin and Noble 2014; Burroway 2010; Clark and Peck 2012; Heimer 2007; Wickrama and Lorenz 2002). Additionally, in some countries, women must attend doctors' appointments in the presence of a male family member, limiting their autonomy to make decisions about their reproductive health (Heimer 2007). As condoms and some other forms of family planning can directly prevent against HIV transmission, access to health services and use of barrier contraceptives are critical in explaining cross-national

variation in women's HIV rates (e.g. Austin and Noble 2014; Noble and Austin 2014; Shircliff and Shandra 2011).

Religion may also affect women's susceptibility to HIV. Some studies have found an association between religion and HIV, where predominantly Muslim countries had lower HIV/AIDS rates than non-Muslim countries (World Bank 1997). Islam emphasizes female chastity, and some forms of Islam condemn homosexuality and prostitution (Antes 1989; Gallagher 1993; Smith 1994). With strict tenets regarding sexuality that are supported by families and communities in predominantly Muslim nations, it makes sense that nations with higher Muslim populations would have lower HIV prevalence (McIntosh and Thomas 2004). Although these social and economic factors are important in shaping HIV trends, environmental conditions likely also impact disease susceptibility, especially for women. I now turn to a discussion of ecofeminist theory to elaborate on these claims.

Ecofeminism

While differential access to healthcare resources, education, and economic autonomy are well-researched predictors of HIV/AIDS prevalence among women in less-developed countries, ecological impacts remain under-examined. At first glance, environmental conditions and HIV seem disconnected, as HIV is a sexually transmitted disease. However, there may be important relationships between global environmental change and HIV, due to women's unique relationship to the environment. Environmental, climate-related changes and events, including floods and droughts, could particularly impact the HIV burden among women in less-developed countries. Ecofeminism serves

as a theoretical background upon which to base this premise and informs the mechanisms that connect climate-change related events to HIV transmission among women, such as transactional sex, which I will expand upon later.

Ecofeminism involves the "historical, experiential, symbolic, theoretical" connections between the domination of women and the domination of nature (Warren 1990: 126). Women and nature both hold a feminized status that separates them from men who view them as inferior, and women and nature's supposed lack of rationality also justifies their subservience (Gaard 2011; Warren 1990). Through this "logic of domination," women and nature are subordinated under an elite, and sometimes violent, male-dominated order (Warren 1990: 28). A clear example of this lies within the image of nature as an untamable female who is violent and chaotic. This image prompts the perceived need for men to master and control nature and, through this image, women as well (Howell 1997).

This domination is carried out through practices such as the development of rural lands, including man-made deforestation, and through the practice of forbidding women from inheriting land (Frank and Unruh 2008; Mies and Shiva 1993; Roucheleau et al. 1996). For instance, in some less-developed countries, widows cannot inherit land; instead, a male relative of the deceased husband inherits the land, the widow, and her family. Sometimes, the widows will use their husband's suspected HIV status as a reason why the husband's male relative should not inherit the land; the widow portrays herself as a sickly burden to the husband's family, and agrees to cut herself off from them, so long as she is allowed to keep the land in order to provide for her family (Frank and Unruh 2008). This example of male family members (1) inheriting land and women, and (2)

readily abandoning said women and land due to suspected illness illustrates the ecofeminist theoretical perspective of women and nature being similarly dominated through patriarchal structures that frame both as expendable objects.

Just as nature provides life-sustaining materials, women in less-developed countries are also tasked with providing sustenance to their families (Rocheleau et al. 1996; Oglethorpe and Gelman 2008). Traditional gender roles in less-developed countries make women especially dependent on the environment, as women are primarily responsible for obtaining sustenance, food, water, firewood, and other resources from their natural surroundings for their household and families (Oglethorpe and Gelman 2008). This involves subsistence farming, wood gathering, and obtaining clean drinking water (Oglethorpe and Gelman 2008). This literal and figurative connection between women and nature means that the destruction or alteration of one compromises the stability of the other. Hence, women are more affected by and connected to the environment and environmental changes (McKinney and Austin 2015).

As previously discussed, women care for the environment more than men and are more likely to be stewards to the environment (Norgaard and York 2005; Shandra, Shandra, and London 2008). Cross-nationally, there exists a gender gap in concerns, values, and perception of risk regarding the environment. When women are less empowered and have less autonomy, the environment may subsequently suffer. Indeed, Norgaard and York (2005) found that societies with a greater representation of women in parliament are more likely to pass environmental legislation. That is, when women are placed in positions of power, they are more likely to use that power to protect the environment (Norgaard and York 2005). Additionally, other research shows that

women's non-governmental organizations (NGOs) have been instrumental in protecting forests and combatting deforestation, as women's NGOs are correlated with lower deforestation rates, cross-nationally (Shandra, Shandra, and London 2008). Thus, women's empowerment yields higher stewardship towards the environment and higher likelihood of environmental preservation.

Ecofeminist perspectives are under-utilized in research concerning the deeply-rooted connection between nature and women's health. Although underused, some researchers use ecofeminist theory as a basis upon which to examine direct and indirect effects of global environmental change on women's health, overall (Hunter, Reid-Hresko, and Dickinson 2011; McKinney and Austin 2015). For example, McKinney and Austin (2015) find that ecological losses compromise women's life expectancy through increased hunger and compromised access to healthcare resources. Additionally, researchers Hunter, Reid-Hresko, and Dickinson (2011) found that women living in less-forested areas in rural Haiti were less likely to use condoms and more likely to have an extramarital sexual partner. Thus, environmental scarcity was associated with risky sexual behavior among women (Hunter, Reid-Hresko, and Dickinson 2011). My work seeks to build on this emerging and timely branch of inquiry to consider how climate-related events of droughts and floods impact women's disproportionate vulnerability to HIV. I now turn to a discussion of the specific connections between disasters and women's HIV in less-developed nations.

Disasters and Women's HIV

Women's deep connection with nature also means they are potentially especially affected by climate-related disasters. As I explained above, women are ascribed roles as caretakers of the household and family in accordance with classic gender roles (Oglethorpe and Gelman 2008). As resources become compromised as a result of climate-related disasters, everyday domestic duties to find resources often turn into lengthy journeys. This makes women more exposed, overall, to disease. Some research identifies that women can become vulnerable to sexual assault when they have to walk to new areas or in unfamiliar districts for household duties, facilitating the spread of HIV through vaginal tears resulting from forced sex (Rocheleau et al. 1996; Stillwaggon 2006). These long journeys also negatively impact women's ability to participate in education, as long treks occupy women's time that would otherwise be spent on educational pursuits (McKinney and Austin 2015). Overall, women work harder in the wake of environmental change or devastation resulting from climate-related disasters, spending more time collecting and carrying resources home (Oglethorpe and Gelman 2008). Environmental alterations in the form of climate-related disasters make it harder for women to fulfill their household duties and responsibilities in less-developed nations, therefore disproportionately impacting women and women's health (Oglethorpe and Gelman 2008). So, although ascribed gender roles in less-developed countries negatively impact women's health (Heimer 2007; Smith 2002), environmental changes resulting from climate-related disasters may have even greater consequences for women's health.

Many studies describe that in times of scarcity, women are often forced to engage in prostitution to obtain food, commonly referred to as the "sex for food" trade. This

transactional sex refers to "non-marital, non-commercial sexual relationships where money and gifts are exchanged," primarily from men to women (Mojola 2011: 150). For instance, the "fish-for-sex" trade is a practice in less-developed nations, where women provide sex to traveling migrant workers in exchange for fish, which they then sell for money or use to feed their families (Fox 2010; Mojola 2011; Smith 2002). Women often turn to migrant workers for other monetary or material support as well, as these men seek extramarital sexual relations due to the influence of alcohol, boredom, or desire for entertainment (DeMotts 2008; Fox 2010; Mojola 2011; Mojola 2014). These economically stable men who are able to provide payment or gifts also tend to be much older than women in transactional sexual relationships. This age gap is paramount in explaining HIV susceptibility among women in transactional relationships, as older men often have multiple sexual partners and, thus, have much higher rates of HIV in comparison to young men (Mojola 2014).

Transactional sex is also not limited to extramarital relationships. In one study, researchers found that women in Soweto, South Africa, engaged in transactional sex with their primary partners in order to gain food, clothing, items for their children or families, transportation, and more (Dunkle et al. 2004). In long-term relationships underpinned by gifts, condoms are less likely to be used, facilitating the spread of HIV (Hunter 2015).

Transactional sex is linked to violence, as there is an increased risk of rape and physical violence from men (Dunkle et al. 2004). Moreover, in such relationships, there may not be sufficient access to condoms, and even if protection is available, women may refrain from requesting it for fear that the man will be deterred from having sex if he is told to use a condom (Mojola 2011). Even women who do not engage in transactional sex

are also vulnerable to HIV transmission from their migrant worker husbands when they return home (Mojola 2011). The pervasiveness of transactional sex among women of varying ages and marital statuses facilitates widespread HIV prevalence among women in less-developed nations due to increased likelihood of forced sex along with lack of protective contraceptives. Thus, there are a number of mechanisms by which climate-related disasters may increase women's risky sexual behavior, having a tremendous effect on increasing women's vulnerability to HIV.

Resource scarcity heightens and reinforces gender inequality-reproducing structures as well. Men seek to retain their dominant positions by preserving unequal access to depleted resources, enhancing women's vulnerability (Mies 1998; Dunaway and Macabuac 2007). Moreover, climate-related disasters impact other household members, including children and sick adults; when women have to take more time to fulfill their household duties because of climate-related disasters, there is less time to provide care to others. Women, therefore, carry the heaviest burden during times of resource scarcity resulting from climate-related disasters (de Waal and Whiteside 2003).

Climate-related disasters also negatively impact women's economic standing and independence (e.g., Burroway 2010; Enarson 2000; Wickrama and Lorenz 2002). Interruptions in education during and after a climate-related disaster can halt women's progress in advancing their economic standing and independence through education (e.g., Burroway 2010; Murray 2013; Wickrama and Lorenz 2002). Additionally, disasters cost self-employed women their workspace and supplies. Along with destruction of their valuable property due to storms and floods, women are the first to give up their personal assets to sell in order to care for their families. Due to their ascribed roles as family

caretaker, women are slower to return to paid work and are denied government relief due to the government's assumption that women are supported by their husbands (Enarson 2000). This loss in economic standing and independence leads to a higher risk of sexual assault and unsafe sex.

Despite the physical destruction of workspaces and the halting of their educational pursuits, women's workloads become even heavier in the wake of climate-related disasters. For instance, women are in charge of finding emergency relief assistance, are the first to assist the injured, are deeply invested in search and rescue activities, and are likely to physically their protect homes and businesses from climate-based disasters (Enarson 2000). Women also are proactive in mitigating hazardous conditions and preparing their households for disasters, involving themselves in community vulnerability assessment projects (Enarson 2000). Clearly, before, during, and after climate-related disasters, women work to ensure the needs of others before their own (Enarson 2000). Thus, women's health is compromised through negligence of their own health and increased risk of transactional sex in order to provide for their families and community members.

In having their economic standing compromised and workloads increased, it follows that women recover from economic loss resulting from climate-related disasters more slowly than men. Women's less empowered status in less-developed countries means that men's recovery takes priority, and men lead decision-making efforts in the home. Women's medical and economic recovery takes a back seat to men's concerns. Left with few options to economically recover, women instead adapt to their economically disempowered positions and ascribed role as family caretaker (Enarson

2000). Thus, climate-related disasters increase women's economic insecurity and unpaid workloads, subsequently negatively impacting their health.

As I explained above, climate-related disasters, such as floods and droughts, result in food shortages, hunger, displacement, injury or medical costs, and halting education (de Waal and Whiteside 2003; Dunaway and Macabuac 2007; McKinney and Austin 2015; Mies 1998). Climate-related disasters may also lead to the concentration of people in Internally Displaced Persons (IDP) camps (e.g., Austin et al. 2008; Horton 2012; Murray 2013; Neumayer and Plümper 2007). Displacement and concentration in IDP camps can result in sexual abuse of women in over-crowded areas under male, military control, also leading to the spread of HIV (e.g., Austin et al. 2008; Horton 2012). Specifically, a 2010 report from Doctors without Borders stated that, over the course of five months following a major Haitian earthquake, 212 patients were treated for sexual violence (Murray 2013). After climate-related disasters occur, violence against women in IDP camps increases due to stress, alcohol use, and general breakdown of law and order (Neumayer and Plümper 2007). Moreover, police and troops' failure to provide adequate security heightens women's susceptibility to rape and domestic violence (Horton 2012). Injury and lack of access to basic medical and sanitary supplies due to climate-related disasters may again lead women to adopt risky sexual behaviors in order to get proper medical care to treat immediate injury (Horton 2012; Neumayer and Plümper 2007). Sexual abuse and risky sexual behaviors in IDP camps in the wake of climate-related disasters exacerbate women's vulnerability to contracting HIV. For many women, displacement after climate-related disasters often involves migrating to urban areas.

Another common form of displacement is relocation to an urban area, especially for rural families who are most dependent on the natural environment and are, therefore, most affected by creeping, gradual, and prolonged climate-related disasters such as droughts (Henry et al. 2004; Hunter et al. 2011). Droughts impede access to water sources for long periods of time, thereby suppressing rural communities' ability to use water for household consumption, food production, fishing, and hunting. In this manner, droughts affect individuals' formal employment opportunities in agriculture, forestry, and tourism, and negatively impacts families at the household level that depend on subsistence living (Hunter et al. 2011; Martin 2013). Thus, when access to water becomes compromised through drought, rural individuals and families in less-developed countries migrate to urban areas in search of employment and resources. In this way, droughts and changes in rainfall contribute to urban growth rates (e.g., Gaetano and Jacka 2004; Henry et al. 2004; Nawrotzki, Riosmena, and Hunter 2013; Rain et al. 2011; Shandra et al. 2003).

Upon arrival in urban areas, "environmental migrants" often take up informal work, as formal job opportunities are scarce (Tacoli 2009). With no money, few resources, scarce housing options, and informal employment, environmental migrants often become part of urban slum populations (e.g., McMichael 2012; Obeng-Odoom 2012). This means that the urban growth resulting from environmental change ends up taking place in urban slums.

Indeed, in less-developed countries, globally, urban growth is often urban *slum* growth (Davis 2006; Joshi, Fawcett, and Mannan 2011; Satterthwaite 2011). Despite the common idea that urbanization leads to economic growth, several studies have found a

relationship between urbanization and economic *decline* in less-developed countries (e.g., Davis 2006; Kentor 1981; Timberlake and Kentor 1983; Turok and McGranahan 2013). This supports the notion that "push factors" such as climate-related disasters drive people from rural communities to migrate to urban areas, regardless of whether formal employment or adequate housing are available (Obeng-Odoom 2011; Turok and McGranahan 2013). Internationally, there is a well-established link between urban slums and poor health (e.g., Antai and Moradi 2010; Jorgenson and Rice 2010; Rice and Rice 2009). Urban slums are overcrowded, lack proper sanitation and clean water, and have poor housing options.

Moreover, as mentioned previously, individuals living in urban slums engage in informal labor, including street peddling, domestic work, and prostitution (McMichael 2012). With lack of sanitation and the increased likelihood of engaging in risky sexual behavior, along with women's ascribed role of family caretaker, it follows that environmental migrant women in urban slums are at an increased risk of contracting HIV. Therefore, not only are disasters and urban slum growth closely related, but both compound and worsen women's susceptibility to HIV infection.

Many researchers have empirically examined the connection between global environmental change and health in developing countries without directly incorporating ecofeminism as a theoretical framework (e.g., De Souza et al. 2008; DeMotts 2008; deWaal and Whiteside 2003; Frank and Unruh 2008; Hunter, De Souza, and Twine 2008; Kaschula 2008; Mojola 2011). Some emerging studies illuminate the relationship between some environmental factors and HIV/AIDS; for instance, Kaschula (2008) finds that poor households rely heavily on wild foods, and that poor households afflicted by

AIDS may not be able to use or gather wild food due to labor shortages and stigma associated with having AIDS. Also, Hunter and colleagues (2011) find that in areas of natural capital decline, condom use is lower, leading to an increase in HIV transmission. However, prior research has not yet focused on the potential impact of climate-related disasters on women's HIV/AIDS burden in less-developed countries.

My research thus attempts to fill this gap by examining the relationship between climate-related disasters and women's HIV/AIDS. Moreover, I employ ecofeminist theoretical frameworks to explore the deeply-rooted relationship between environmental change and women's health, specifically examining HIV/AIDS among women. Although studies of the "sex for fish" trade and related themes begin to establish a link between degradation or environmental change and risky or dangerous sexual behaviors, this study will illuminate how climate-related disasters impact women's distinct vulnerability to HIV in developing nations, and how two different types of disasters, floods and droughts, may impact women's share of HIV to different extents.

Floods and Droughts: Different Disasters, Different Impacts?

Less-developed nations enduring changing rainfall and rising drought prevalence caused by climate change are the nations that are least responsible for causing climate change (Parks and Roberts 2006). Moreover, these nations have the fewest resources available to cope with the impacts of these escalating disasters (Parks and Roberts 2006; UNDP 2015; UNDP 2016). As shown above, previous research establishes that women's health is disproportionately impacted by climate-related disasters (Enarson 2000). In addition, different disasters may impact women's health in various ways and to different

extents. Taking all of these factors into account, women in less-developed nations, where disasters are on the rise and the impacts of climate change are most powerful, are most vulnerable and bear the heaviest health burdens in the wake of climate-related disasters.

Developed nations are the most responsible for climate change due to high global emissions, yet they are the least vulnerable to the negative effects of climate change (Parks and Roberts 2006). Indeed, the United States, which holds 4% of the world's population, produces over 20% of global emissions, while 136 less-developed nations are responsible for a mere 24% of global emissions (Parks and Roberts 2006). Despite their lack of responsibility for climate change, less-developed nations are most negatively affected by climate change. Due to their current positions in the world economy, colonial history, and fewer resources to cope with the impacts of disasters, less-developed countries are more devastatingly affected by climate change (Parks and Roberts 2006). A clear example of this inequality concerns Hurricane Mitch, which struck Honduras in 1998. An increase in air and water temperatures culminated in the perfect environment for the "deadliest regional hurricane in recorded history" (Parks and Roberts 2006: 342). Honduras' history of colonialism, man-made deforestation, and land allocation resulted in a shaky economy and wide-spread migration to urban slum environments. So, the devastating effects of receiving six feet – or two years' worth – of rain in two days were worsened by landslides resulting from deforestation, and the high urban population density made escaping the torrential flooding nearly impossible (Parks and Roberts 2006). This example clearly demonstrates how less-developed nations are more vulnerable to and negatively impacted by climate-related disasters resulting from climate change.

When examining the impacts of climate-related disasters in less-developed countries, it is important to consider the potentially differing effects of disasters. In 2011, of the 64 climate-related disasters in Africa recorded in the International Disaster Database (EM-DAT), 69% were floods, 17% were droughts, and storms constituted 14% of climate-related disasters that year (Guha-Sapir 2012). Clearly, floods are among the most frequent climate-related disasters. While less frequent, however, droughts were more powerful, affecting 21 million people in Africa in 2011 (Guha-Sapir 2012). I specifically compare floods and droughts in my analysis because floods are frequent and widespread, and droughts have powerful impacts on populations. Specifically, I seek to examine the possible varying effects of floods and droughts on women's health in less-developed countries.

Floods occur when water covers land where it is normally not present (Pedroso 2014). They can be triggered by thunderstorms, tornadoes, tropical cyclones, monsoons, melting ice and snow, and dam breaks, among other events (Pedroso 2014). Thus, floods' causes can be easily visible, as even the layperson can see water rising in a river, can feel winds increase when hurricanes approach, and can observe dark storm clouds gathering (National Drought Mitigation Center 2016). Sophisticated meteorological technology also has the potential to accurately predict the potential damage these hydrological events may wreak (National Drought Mitigation Center 2016). The events that cause floods are also fairly ephemeral, making floods relatively short-lived climate-related disasters. So, the causes of floods are often clear and relatively predictable, with floods' beginning and ending points rather easily established. Certainly, floods do sometimes occur suddenly, or by causes that were not perceived to be vulnerabilities, such as a dam being damaged in

an earthquake. However, in comparison to other types of disasters, floods tend to be more predictable.

Contrastingly, droughts remain more enigmatic. Droughts, simply defined as an extended period of time without rain, are present in various areas of the world (Wilhite 2016). They cannot often be predicted, and there are no drought watches or warnings that are similar to warnings issued for thunderstorms or tornados (National Drought Mitigation Center 2016). Droughts begin slowly and gradually taper off, and their effects could remain invisible for years, making droughts an insidious and "creeping" natural disaster (National Drought Mitigation Center 2016).

Compared to floods, droughts are gradual, prolonged disasters, covering larger areas of land (Guha-Sapir 2012). This leads to a lack of data reporting, and, sometimes, data are misreported, with losses and number of people affected being grossly underestimated (Guha-Sapir 2012). As it stands, there appears to be far fewer droughts than floods, globally. Despite being less frequent in occurrence, droughts affect far more people than floods. For instance, floods comprised 67% of all climate-related disasters in Africa over a decade, while droughts made up a mere 13% of all African climate-related disasters over the same decade (Guha-Sapir 2012). However, 80% of individuals in Africa who were affected by climate-related disasters during that decade were affected by *drought*. Only 16% of those affected by climate-related disasters were affected by floods, as shown below (Guha-Sapir 2012).

Chart 1: Occurrence of Climate-Related Disasters in Africa by Disaster type

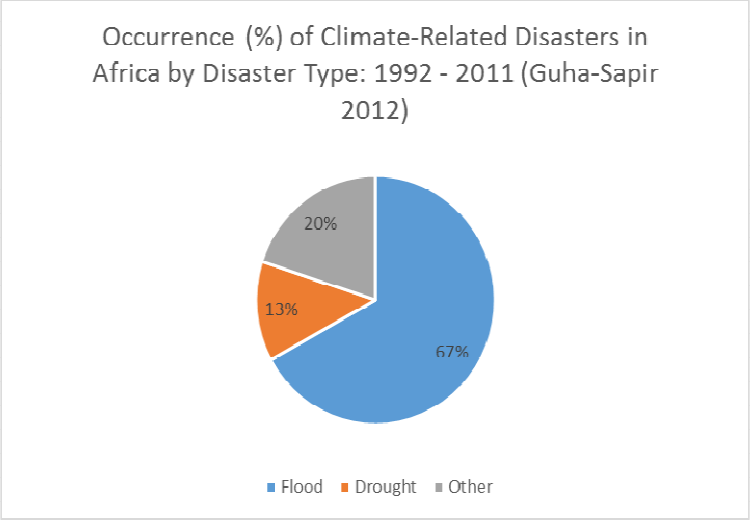
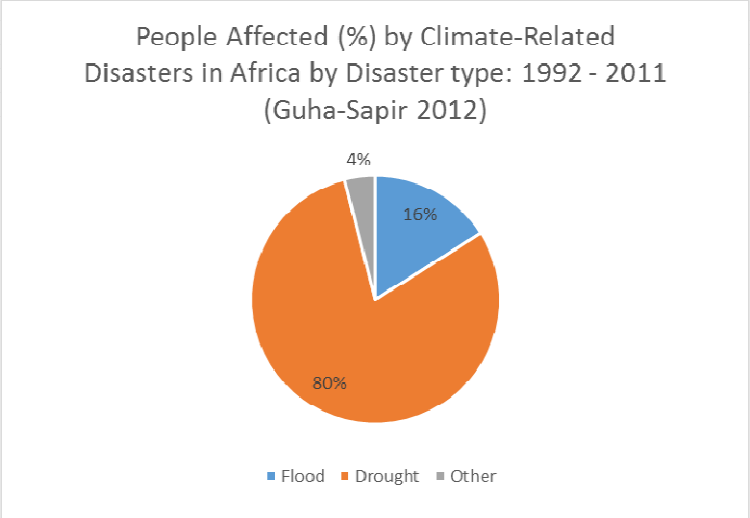


Chart 2: People Affected by Climate-Related Disasters in Africa by Disaster Type



Droughts also cause considerably more financial damage than floods. For instance, a drought in Morocco in 1999 caused $1.2 billion in damage, while a 2002 Moroccan flood yielded only $0.3 billion in damage (Guha-Sapir 2012). Thus, when droughts occur, they are likely to cause substantially more damage than floods.

Taking into account the physical differences in droughts and floods, along with our differing understanding of each, floods and droughts likely have varying impacts on

women's health. With the prolonged, delayed onset of droughts, women may be more likely to be more adversely affected by droughts than they would be by floods. Theoretically, women affected by longer-term disasters suffer more deeply from resource depletion and lack of formal employment, increasing their susceptibility to forced sex. With the economic impacts noted above, it is also likely that drought affects household economies over longer periods of time, increasing the likelihood of women turning to risky sexual behaviors and transactional sexual relationships. This increased likelihood of forced sex and transactional sexual relationships heighten women's likelihood of contracting HIV. With floods having a relatively ephemeral effect, they may have a lesser impact on women's health than droughts.

Hypotheses

Taking the above body of literature into consideration, I predict that climate-related disasters have a statistically significant impact on women's HIV burden across less-developed countries, even when controlling for other relevant variables. That is, I predict that nations with a higher percentage of the population affected by floods and droughts will have a higher HIV burden among women relative to men, in comparison to nations with a lower percentage of the population affected by these climate-related disasters, net of other factors.

I also predict that droughts have a stronger impact than floods on women's HIV burden across less-developed countries. That is, I predict that nations with a higher percentage of individuals affected by drought will have a higher share of HIV among women, compared to men, despite other factors. In accordance to previous literature and

statistics (Guha-Sapir 2012), droughts are less frequent yet more powerful than floods, in that they adversely affect larger populations. The resource depletion resulting from droughts, along with droughts' prolonged nature, may increase women's susceptibility to contracting HIV.

In the wake of devastating resource depletion caused by droughts, many individuals from rural regions migrate to urban areas to seek out employment, housing, and resources (Austin 2015, McMichael 2012). However, environmental migrants often end up living in urban slum environments where they find employment in informal labor markets. Thus, I predict that there is a potential interaction effect between droughts and floods and urban growth, respectively, and this interaction term will have a statistically significant impact on women's HIV burden in less-developed countries that have experienced drought in the last 15 years, net of other factors.

Methods

Sample:

I utilize two different samples across the two sets of analyses for droughts and floods, respectively, in order to maximize the samples for each set of analyses. My samples include all nations that experienced a drought or flood, respectively, and that had data for all variables used in the analysis, including the women's HIV measure.[1] I exclude nations that did not experience any flood or drought from 1998 to 2012; as some nations are not included in regions where droughts or floods may be possible or impactful, it

[1] The exception to this is that three nations in the drought analyses, and four nations in the flood analyses, did not have data on the indicator, "Number of Physicians per 1,000 People." Rather than exclude these missing cases from my analyses, I allowed the sample size to float across the models that include Physicians per 1,000 People and those that do not, in order to keep as many cases in the sample as possible.

makes sense to limit my sampling frame in this way. Fundamentally, some countries will not experience drought, or the chances of a drought are so slim that these nations do not have a place in this analysis. Contrastingly, floods are more common and occur in many more geographical areas than droughts (Guha-Sapir 2012). Because of this difference in flood and drought occurrence, it is necessary to use two different samples. For analogous reasons, I only include nations that have measurable levels of HIV in my analyses.

I include only less-developed countries in my samples because the predictors of HIV vary significantly among developed and less-developed nations, and traditional ascribed gender roles are also more relevant in less-developed countries. Also, poor nations bear the brunt of climate related disasters, including droughts and floods in particular (Guha-Sapir 2012; UNDP 2015; UNDP 2016). In my analyses, I use the World Bank's definition of less-developed countries, which include nations with GNI per capita of $12,735 or less (World Bank 2015).

Table 1: Nations Included in the Flood Analysis (N= 74)

Afghanistan	Côte d'Ivoire	Lao PDR	Philippines
Algeria	Dominican Republic	Lesotho	Rwanda
Angola	Ecuador	Liberia	Senegal
Armenia	Egypt, Arab Rep.	Macedonia, FYR	Serbia
Bangladesh	El Salvador	Madagascar	Sierra Leone
Belize	Ethiopia	Malawi	South Africa
Benin	Fiji	Mali	Sri Lanka
Bhutan	Gambia, The	Mauritania	Sudan
Bolivia	Georgia	Moldova	Swaziland
Burkina Faso	Ghana	Morocco	Tajikistan
Burundi	Guatemala	Mozambique	Tanzania
Cambodia	Guinea	Nepal	Thailand
Cameroon	Guyana	Nicaragua	Togo
Central African Rep	Honduras	Niger	Tunisia
Chad	India	Nigeria	Uganda
Colombia	Indonesia	Pakistan	Uzbekistan
Congo, Dem. Rep.	Jamaica	Papua New Guinea	Yemen, Rep.
Congo, Rep.	Kenya	Paraguay	
Costa Rica	Kyrgyz Republic	Peru	

Table 2: Nations Included in the Drought Analysis (N = 48)

Afghanistan	Ethiopia	Madagascar	Peru
Angola	Fiji	Malawi	Rwanda
Armenia	Gambia, The	Mali	Senegal
Bolivia	Georgia	Mauritania	South Africa
Burkina Faso	Guatemala	Moldova	Sri Lanka
Burundi	Honduras	Morocco	Sudan
Cabo Verde	India	Mozambique	Swaziland
Cambodia	Indonesia	Nepal	Tajikistan
Chad	Kenya	Nicaragua	Tanzania
Colombia	Kyrgyz Republic	Niger	Thailand
Ecuador	Lao PDR	Pakistan	Uganda
El Salvador	Lesotho	Paraguay	Uzbekistan

Analytic Strategy:

In order to test my hypotheses, I utilize ordinary least squares (OLS) regression. OLS regression allows researchers to statistically examine the relationship between multiple independent variables and one dependent variable (Allison 1999). One use of OLS regression is to investigate associations between variables, while controlling for other known factors (Allison 1999). That is, OLS regression helps to examine whether particular variables impact the dependent variable, and to what extent.

OLS regression enables me to examine the effect of droughts and floods on women's HIV burden while controlling for other known factors such as women's empowerment, healthcare access, development, Muslim population, and geographical location. This way, I can demonstrate whether there is a relationship between droughts, floods, and women's health that remains robust, even when accounting for other known

indicators that impact the disproportionate burden of HIV among women in less-developed countries. Also, OLS regression represents an important foundational technique that is a good starting point for this line of research, as examining the relationship between disasters and women's HIV burden represents a new course of inquiry.

Although there are many benefits, OLS regression also has methodological drawbacks. One of the most important concerns in OLS regression, especially when using relatively small sample sizes of country-level data, is multicollinearity. Multicollinearity occurs when independent variables highly correlate with each other, rather than with the dependent variable. Multicollinearity subsequently yields biased regression coefficients (Allison 1999). For instance, in my analyses, Female Secondary Education, Contraceptive Use Rate, and Fertility Rate would highly correlate with each other in OLS regression models, as these variables tend to go together in measuring women's status. The inter-relationship may inflate standard error estimates, compromising statistical significance in my models. To remedy this problem, I diagnose multicollinearity across all models by determining the variance inflation factors (VIFs) within each regression model. VIF values of more than 2.50 indicate that one or more independent variables are notably correlated with one another. However, statisticians identify that multicollinearity is only problematic in an analysis when it involves the key independent variables (Allison 1999). For example, when only the control variables show signs of multicollinearity, it is still possible to assert that an important relationship exists between the key independent and dependent variable of interest. I pay careful attention to issues of multicollinearity as I construct my models, including carefully scrutinizing the VIFs and adding variables in a

stepwise fashion. Moreover, I note the average VIF in each model, which remains fairly low across all models.

Another potential pitfall of OLS regression is reverse causation, where the dependent variable actually affects the independent variables in the regression models (Allison 1999). The potential of reverse causation can be lessened through appropriately time ordering the dependent and independent variables. Also, because it typically takes several years to detect HIV, especially in poorer societies, there are substantive reasons to measure the independent variables in time before the HIV outcome variable. For analogous reasons, this strategy has been used in similar cross-national research on HIV (e.g., Austin and McKinney 2012; Burroway 2010, 2012; McKinney and Austin 2015; Shircliff and Shandra 2011). Specifically, I use data on women's share of HIV from 2014[2], while the independent variables are measured circa 2010[3], with the exception of the key disaster variables, which I explain further below.

I obtained most data from the World Bank's "World Development Indicators" database. The data for my key independent variables are from EM-DAT, the International Disaster Database. I downloaded the World Bank data into a CSV file, coded the EM-DAT data into a CSV file by hand, and then converted the CSV files into a STATA files to compose my data sets.

[2] It is important to note that, while this measure does not specify when women were diagnosed with HIV, the key independent variables span 15 years, capturing a substantial amount of time. So, using the 2014 measure of women's share of HIV in conjunction with key independent variables spanning 15 years was the best method, considering there is no available cross-national data on women's HIV incidence, or number of new cases per year.

[3] For some independent variables used in my analyses (e.g., female contraceptive use, number of physicians, female secondary schooling, fertility rate), missing data for the year 2010 were estimated using neighboring years of 2005 – 2009 and 2011 – 2013.

Key Dependent Variable:

Women's HIV Burden (Women's Share of HIV). My dependent variable is women's share of the adult population (ages 15+) living with HIV. Women's HIV Burden measures the female percentage of the total adult population who are living with HIV (WHO 2013). That is, this variable shows the ratio of women living with HIV, compared to men.

I employ this ratio, rather than a prevalence measure, because it appropriately captures the gender inequalities in the burden of HIV. Past studies have shown that total HIV prevalence and women's HIV prevalence are highly correlated at over .97 (Austin and Noble 2014). So, if overall HIV rates are high, women's rates will also be elevated. Thus, predictors of total HIV prevalence and female HIV prevalence are nearly identical (e.g., Burroway 2012; Shircliff and Shandra 2011) and examining female HIV prevalence, therefore, does not capture the inequality in the level of the HIV burden among women in relation to men in poor nations. Since my work seeks to explore the disproportionate HIV burden among women in comparison to men, I appropriately examine women's HIV burden through the Women's Share of HIV variable provided by the World Bank (2015).

Key Independent Variables:

Percent affected by Droughts, Percent affected by Floods (average, 1998 – 2012): To measure the percentage of the population affected by climate-related disasters, I examine the number of people affected by floods or droughts. These data are from the EM-DAT Database, which defines "affected by" as "people requiring immediate assistance during a period of emergency, i.e. requiring basic survival needs such as food,

water, shelter, sanitation and immediate medical assistance" (EM-DAT 2013). I limit myself to examining only these two disasters as a starting point because floods and droughts are closely associated with climate change dynamics, and they are also common and severe, globally.

Because the frequency and magnitude of climate-related disasters vary from year to year, I calculate an average percentage of the population affected by floods or droughts from the years 1998 to 2012. Utilizing an average measure helps to account for certain years where floods and droughts were more present or non-existent. As long as at least one flood or drought event happened at least once during this time period, they were included in this measure. To reach this average, I first divide the number of people affected by floods and the number of people affected by droughts in each country by that country's population for every year spanning from 1998 to 2012, obtaining population data from the World Bank. Then, I average the affected rate, separately, to yield two variables: average percentage of the population affected by floods from 1998 to 2012, and average percentage of the population affected by droughts from 1998 to 2012. To correct for high skewness, I log transform the Average Percentage of the Population affected by Floods variable.

Additional Independent Variables:

As shown above, women's health and susceptibility to HIV are greatly influenced by accessibility to healthcare resources. To measure this concept, I include *Physicians per 1,000 people* to measure the number of physicians present per 1,000 people, including general care physicians and specialist medical practitioners (World Bank

2015).[4] This variable is log-transformed to correct for high skewness. This measure of physician availability reflects overall accessibility to professional healthcare in a given area.

Women's empowerment is a well-researched indicator of women's health and vulnerability to HIV infection. I include three commonly used indicators to estimate the effects of women's empowerment: female contraceptive prevalence, female secondary educational enrollment, and fertility rate. Numerous studies indicate that these are among the strongest predictors of female health outcomes (e.g., Brady et al. 2007, Shen and Williamson 1997; Wickrama and Lorenz 2002). I first incorporate *Female Contraceptive Prevalence,* a rate measuring the percentage of women who practice, or whose sexual partners are practicing, contraception in any of its forms. This variable usually only includes married women ages 15 to 49. I include this variable because using any form of contraception, regardless of its ability to prevent HIV transmission, is associated with an increase in women's empowerment and ability to make decisions about one's sexual health (Heimer 2007; Smith 2002). I also include *Female Secondary Educational Enrollment* to measure primary and secondary school enrollment for women. In order to get a more accurate measure of enrollment, I utilize the gross enrollment ratio which refers to the ratio of educational enrollment regardless of age, to the population of the age group corresponding to the level of education shown. For example, female secondary educational enrollment is measured as a ratio of all girls enrolled in secondary school to all girls in a population considered to be "secondary school-age." As shown above, women's participation in education is a well-researched indicator of women's improved

[4] In my samples, I have four fewer cases for Physicians per 1,000 people than all other indicators in my analysis.

health, globally, increasing their likelihood of employment, empowerment, and access to healthcare (e.g. Burroway 2010, 2012). Finally, I incorporate *Fertility Rate,* which is defined as the number of children that a woman would be expected to have if she were to live to the end of her childbearing years. Lower fertility rates among women are potentially associated with an increase in women's empowerment, and so this variable is important to include in my analysis. Many HIV studies use the aforementioned indicators to measure or assess women's empowerment (Brady et al. 2007; Shen and Williamson 1997; Wickrama and Lorenz 2002), and some authors turn these three indicators into a composite indicator measuring women's empowerment in Structure Equation Modeling (SEM) (e.g., Noble and Austin 2014).

Measures of economic development are important control variables in my analysis, as they are often thought to be important cross-national predictors of health. The first development measure I employ in my analysis is *GDP per capita.* I use GDP per capita, as it is the most common way of measuring the economic standing of a country in comparative analyses. GDP per capita measures a country's total economic output by taking the gross domestic product (GDP) and dividing it by the number of people in the country. Using a standardized international dollar (purchasing power parity) measurement allows for more accurate cross-national comparison as well.

I also include *External Debt Stocks,* which refers to total external debt stocks to gross national income (World Bank 2015). Total external debt is measured as the "sum of public, publicly guaranteed, and private nonguaranteed long-term debt, use of IMF credit, and short-term debt" (World Bank 2015). Incorporating external debt stocks into my analysis paints a picture of a country's financial independence and economic autonomy,

where less debt may be correlated with lower HIV burden among women in less-developed nations.

Additionally, I incorporate *Democracy* into my analyses by utilizing Freedom House's Democracy Index from the year 2010. Freedom House operationalizes each nation's democracy through an ordinal scale ranging from 1 (most free) to 7 (least free). Previous research (e.g., Austin and Noble 2014; Burroway 2012; Shircliff and Shandra 2011) includes similar measures of Democracy in their analyses. Following previous researchers who posit that higher levels of democracy may be correlated with better health outcomes (Austin and Noble 2014; Burroway 2012; Shircliff and Shandra 2011), I expect that more democratic nations have a lower HIV burden among women.

Finally, I include *Urban Population,* which measures the percentage of people living in urban areas, where urban areas are defined by national statistical offices (World Bank 2015), and *Urban Population Growth,* measuring increases in urban communities of a given country (World Bank 2015). Urban Population reflects nations' development levels, where the poorest nations tend to be the least urbanized overall. However, it is important to note the Urban Population Growth variable will capture the extremely high levels of urbanization that characterizes developing nations, which may not be indicative of improved well-being or development, but rather, urban slum growth.

To understand further dimensions to women's health, I include *Percent Muslim* and *Sub-Saharan Africa* in my analysis. Percent Muslim refers to the percentage of the national population that identifies Islam as their religious affiliation. This measure was obtained from the Pew Research Center's World Muslim Population by Region and Country (2009). In previous studies (McIntosh and Thomas 2004), nations with large

Muslim populations were found to have lower HIV prevalence. This relationship between higher Muslim populations and lower HIV prevalence may have resulted from strict religious tenets dictating sexual abstinence before marriage. Thus, Muslim population is an important indicator to include in my analysis. Sub-Saharan Africa measures whether a country is located in the Sub-Saharan region of Africa. A value of "1" indicates that the country is located in Sub-Saharan Africa, while a "0" reflects non-Sub-Saharan African status. As stated above, there is a concentration of HIV-positive women in Sub-Saharan Africa (UNAIDS 2012), so I expect nations located in this region to have a higher HIV burden among women.

Interaction Term:

As explained above, resource strain stemming from droughts or floods potentially forces rural communities to migrate to urban locations, though there are reasons to think this may be especially salient for droughts, as they tend to be prolonged events that incite a different coping strategy (Austin 2015; McMichael 2012). These urban sites are key locations for informal markets and transactional sex. Therefore, I include an interaction term involving each disaster variable, respectively, and urban growth. This interaction term was created by multiplying the Average Percentage of the Population affected by Droughts or the Average Percentage of the Population affected by Floods variable by the Urban Growth Rate indicator. When used in the OLS Regression models, the Urban-Drought or Urban-Flood interaction variable is used in conjunction with only one of the main effect variables (Urban Growth) due to the low sample size and issues with multicollinearity. Using only one of the main effect variables reduces multicollinearity stemming from limited degrees of freedom. Excluding one of the main effect variables is

a strategy that constitutes an emerging method when working with small sample sizes (e.g., see Austin 2010; Burns et al. 2003; York and Gossard 2004).

Results

First, I examine the correlation matrices, explaining the predominant relationships between my independent variables and dependent variable, and among independent variables. Then, I will move onto my key regression results, where I examine the impact of droughts on women's HIV burden followed by floods on women's HIV burden in less-developed nations.

Table 3: Correlation Matrix and Univariate Statistics (Drought Sample)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) Women's HIV Burden	1.00												
(2) GDP per Capita	-.66	1.00											
(3) Average % Affected by Droughts	.52	-.27	1.00										
(4) Contraceptive Use Rate	-.55	.75	-.21	1.00									
(5) Female Secondary School Enrollment	-.71	.73	-.30	.71	1.00								
(6) Fertility Rate	.75	-.77	.39	-.79	-.84	1.00							
(7) Physicians per 1,000 people (ln)	-.81	.60	-.35	.58	.79	-.81	1.00						
(8) Percent Muslim Pop.	.16	-.37	.06	-.59	-.32	.41	-.18	1.00					
(9) Democracy Index	-.30	.29	-.23	.32	.23	-.18	.03	-.27	1.00				
(10) External Debt Stocks	-.32	.07	-.19	.06	.26	-.34	.42	-.03	-.01	1.00			
(11) Percent Urban Pop.	-.67	.65	-.52	.45	.59	-.55	.52	-.15	.42	.32	1.00		
(12) Urban Growth	.71	-.60	.16	-.52	-.76	.77	-.77	.26	-.15	-.37	-.50	1.00	
(13) Sub-Saharan Africa	.73	-.62	.42	-.62	-.68	.77	-.81	.17	-.05	-.25	-.44	.63	1.00
Mean	44.82	4344.22	1.87	44.69	57.38	3.86	-1.25	31.19	3.75	38.22	39.62	3.13	.46
SD	13.03	3098.46	2.14	22.89	28.85	1.62	1.61	40.03	1.35	21.02	17.99	1.69	.50
Minimum	18.22	710.63	.00	4.8	11.12	1.44	-4.83	.1	1	15.15	10.64	-.42	0
Maximum	61.99	12452.43	8.43	80.4	104.09	7.58	1.56	99.7	7	91.65	76.92	6.76	1
Skewness	-.22	.86	1.75	-.13	.04	.48	-.27	.83	-.04	1.17	.28	.20	.17

Table 4: Correlation Matrix and Univariate Statistics (Flood Sample)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) Women's HIV Burden	1.00												
(2) GDP per Capita	-.61	1.00											
(3) Average % Affected by Floods	.16	-.05	1.00										
(4) Contraceptive Use Rate	-.62	.73	-.04	1.00									
(5) Female Secondary School Enrollment	-.64	.77	-.11	.75	1.00								
(6) Fertility Rate	.71	-.75	.05	-.79	-.84	1.00							
(7) Physicians per 1,000 people (ln)	-.64	.47	-.38	.41	.63	-.61	1.00						
(8) Percent Muslim Pop.	-.04	-.18	-.24	-.41	-.22	.29	-.03	1.00					
(9) Democracy Index	-.14	.28	.28	.29	.28	-.25	.03	-.37	1.00				
(10) External Debt Stocks	-.18	.11	-.03	.11	.27	-.36	.34	-.17	.14	1.00			
(11) Percent Urban Pop.	-.48	.65	-.16	.42	.55	-.48	.38	-.11	.30	.13	1.00		
(12) Urban Growth	.57	-.58	.02	-.48	-.72	.75	-.63	.23	-.21	-.45	-.40	1.00	
(13) Sub-Saharan Africa	.78	-.66	.04	-.71	-.75	.83	-.55	.09	-.18	-.29	-.34	.63	1.00
Mean	46.29	4735.73	-1.72	42.60	57.66	3.82	-1.35	31.96	3.83	39.43	41.82	3.02	.45
SD	13.19	3523.99	2.09	22.80	28.34	1.55	1.61	39.08	1.43	23.59	16.92	1.63	.50
Minimum	11.70	671.01	-8.08	4.8	10.07	1.40	-4.83	.10	1	2.06	10.64	-.42	0
Maximum	61.99	12562.43	1.55	82.1	106.42	7.58	1.56	99.7	7	110.70	76.92	6.76	1
Skewness	-.53	.75	-.98	1.74	.11	.34	-.14	39.08	.06	1.11	.13	-.01	.22

The correlation coefficient for Average Percentage of Droughts and Women's HIV burden displayed in Table 3 suggests that there is a moderately strong relationship between droughts and women's share of the HIV burden. Contrastingly, results in Table 4 suggest that there is no relationship between floods and women's share of the HIV burden. The correlation coefficient for Women's HIV Burden and the Average Percentage of the Population Affected by Floods is .16, indicating a very weak relationship.

The results in Tables 3 and 4 also demonstrate strong inter-relationships among Contraceptive Use Rate, Female Secondary School Rate, and the Fertility Rate. With correlation coefficients at or above 0.7 among all three indicators, multicollinearity will be a problem in my analysis. These indicators are nevertheless important controls to include in my models assessing women's share of HIV, so I cannot simply exclude them from my analyses. Instead, to address this issue, I create a composite indicator with these three measures.

After establishing the three indicators had strong relationships with one another, with coefficients at or above +/-0.70, I ran a Principal Component Analysis, a precursor to Factor Analysis (described below). The major value to take into account during Principal Component Analysis is the Eigenvalue associated with Component 1. If this Eigenvalue is above one, Factor Analysis is appropriate. The Eigenvalue for Component 1 in my Principal Component Analysis is 2.56, far above the desired value of one.

After taking the correlation and Principal Component Analysis into account, I employ Factor Analysis. Factor Analysis takes many variables and reduces them to a smaller number of dimensions (Allison 1999). So, in my Factor Analysis, I include the

three aforementioned indicators, Contraceptive Use Rate, Female Secondary Educational Enrollment, and Fertility Rate. Factor Analysis provides a standardized measure in Z-Scores of each variable.

Upon making a scale combining Contraceptive Use Rate, Female Secondary Educational Enrollment, and Fertility rate, Chronbach's alpha reveals that the reliability coefficient for this scale is .92. This supports the idea that these variables in this scale capture the same underlying concept of women's empowerment. I call this scale "Women's Empowerment" in the OLS Regression models.

The average Female HIV Burden is 44.82%. This means that, across my Drought sample of 48 less-developed nations, women make up nearly half of the population living with HIV. In a larger sample of less-developed countries, this percentage would be higher. For instance, in my Flood sample, the average Female HIV Burden is slightly higher, at 46.29%. So, across my Flood sample of 74 less-developed nations, women compose about half of the populations living with HIV.

Overall, across the two samples, women's HIV burden ranges from 11.22% to 61.99%, reflecting both low and high HIV burden among women across nations in my sample. With a standard deviation much lower than the mean, and a skewness of only -.22 and -.53 in the drought and flood samples, respectively, there was no need to log-transform this variable.

In my sample of 48 less-developed nations, an average of about 2% of populations were affected by droughts. The average percentage of populations affected by droughts ranged from less than one percent to 8.43%. It is important to note that this measure is an average of 15 years of droughts, so a nation could have experienced a

drought affecting 25% of their population one year, with no droughts affecting the same population for the remaining 14 years. The skewness of this indicator is somewhat high, at 1.75. Therefore, as a robustness check, I generated a correlation matrix with a log-transformed version of this variable, and the correlation results were not substantially different.

Because the Average Percentage of the Population affected by Floods variable is log-transformed due to presence of extreme cases, it is difficult to interpret the univariate statistics. However, since this variable is log-transformed, the skewness is low, at -.98. Before log-transformation, the average percentage of the population affected by floods was 0.67%. This means that less than 1% of populations were affected by floods over the span of 15 years. The average percentage of the population affected by floods ranged from .0003% to 4.72%. The highest percentage of a population affected by floods over the span of 15 years was only slightly higher than the mean percentage of the population affected by droughts. This clearly reflects Guha-Sapir's (2012) report emphasizing that floods, although far more frequent, affect much smaller percentages of populations than droughts. Simply put, droughts have a much stronger impact than floods, despite their relative infrequency.

I now turn my attention to the Ordinary Least Square (OLS) Regression results. I run two separate regressions, one examining the impact of droughts on women's HIV burden, and the other focusing on floods' effect on women's HIV burden, each presented in Tables 5 and 6, respectively.

Table 5: OLS Regression Results of Droughts Predicting Women's HIV Burden

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Drought Average	.255** (1.55) *.600* [1.15]	.348*** (2.12) *.602* [1.12]	.344** (2.09) *.623* [1.14]	.360*** (2.19) *.626* [1.42]	.243** (1.48) *.582* [1.26]			.261** (1.59) *.592* [1.28]
GDP per Capita	-.006 (-.000) *.000* [2.41]	.014 (.000) *.000* [2.22]	-.021 (-.000) *.001* [2.40]	.070 (.000) *.000* [2.92]	-.034 (-.000) *.001* [2.25]	.013 (.000) *.001* [2.23]	-.045 (-.000) *.001* [2.27]	-.065 (-.000) *.000* [2.48]
Women's Empowerment	-.184 (-2.52) *2.53* [4.04]	-.676*** (-9.45) *2.06* [2.47]	-.533*** (-7.46) *2.16* [2.58]	-.238 (-3.33) *2.38* [3.90]	-.265* (-3.70) *2.22* [3.47]	-.286^{+} (-4.00) *2.59* [3.81]	-.033 (-.467) *2.51* [4.53]	-.002 (-.033) *2.85* [5.85]
Physicians per 1k (ln)	-.342*** (-4.30) *1.21* [2.70]							-.218 (-1.75) *1.43* [4.32]
Percent Muslim		-.186* (-0.61) *.034* [1.25]						-.063 (-.020) *.033* [1.45]
Democracy Index			-.013 (-.127) *.998* [1.16]					
External Debt Stocks			-.013 (-.082) *.065* [1.17]					
Percent Urban				-.111 (-.080) *.100* [2.54]				
Urban Growth				-.431** (3.32) *1.08* [2.63]		.337* (2.60) *.478* [2.46]	.267* (2.05) *1.03* [2.51]	.295* (2.24) *1.13* [3.01]
Sub-Saharan Africa					.462*** (11.95) *3.34* [2.30]		.453*** (11.72) *3.31* [2.30]	.270* (6.94) *3.80* [2.98]
Urban Growth*Drought						.312** (.478) *.170* [1.37]	.200* (.310) *.159* [1.51]	
Mean VIF	2.58	1.76	1.69	2.68	2.32	2.47	2.63	3.05
N	44	48	48	48	48	48	48	44
R^2	.67	.63	.61	.69	.69	.61	.70	.73

Notes: *** p< .001, ** p < .01, * p < .05, $^{+}$< *.10* (one-tailed tests); standardized regression coefficients are flagged for statistical significance; the unstandardized regression coefficient are labeled in parentheses; standard errors are reported in italics; and the VIFs are labeled in brackets.

Table 6: OLS Regression Results of Floods Predicting Women's HIV Burden

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Flood Average	.029 (.171) *.474* [1.03]	-.036 (-.224) *.544* [1.06]	-.005 (-.034) *.583* [1.09]	.016 (.099) *.552* [1.03]	.063 (.400) *.462* [1.01]			.038 (.224) *.446* [1.15]
GDP per Capita	.094 (.000) *.000* [2.75]	.057 (.000) *.000* [2.50]	.009 (.000) *.001* [2.57]	.105 (.000) *.001* [3.24]	-.027 (-.000) *.000* [2.48]	.012 (.000) *.001* [2.47]	-.028 (-.000) *.000* [2.48]	.016 (.000) *.000* [2.87]
Women's Empowerment	-.314** (-4.19) *1.98* [3.51]	-.802*** (-11.32) *1.93* [2.69]	-.726*** (-10.25) *2.08* [2.81]	-.546** (-7.71) *2.33* [3.67]	-.117 (-1.65) *2.15* [4.39]	-.546** (-7.71) *2.34* [3.67]	-.054 (-.759) *2.36* [5.25]	-.077 (-1.03) *2.42* [6.60]
Physicians per 1k (ln)	-.580*** (-4.51) *.979* [2.55]							-.362** (-2.82) *1.01* [3.44]
Percent Muslim		-.253** (-.089) *.031* [1.18]						-.106 (-2.82) *.027* [1.44]
Democracy Index			.100 (.919) *.909* [1.26]					
External Debt Stocks			.011 (.006) *.052* [1.11]					
Percent Urban				-.144 (-.112) *1.03* [1.85]				
Urban Growth				.191⁺ (1.55) *1.03* [2.18]			.117 (.946) *.973* [2.71]	-.001 (-.005) *.835* [2.34]
Sub-Saharan Africa					.683*** (18.01) *3.15* [2.71]		.652*** (17.18) *3.19* [2.76]	.475*** (11.90) *3.27* [3.42]
Urban Growth*Floods						-.582 (-.110) *.194* [1.42]	-.014 (-.027) *.164* [1.43]	
Mean VIF	2.46	1.86	1.77	2.39	2.65	2.56	2.92	3.04
N	68	74	74	74	74	74	74	68
R^2	.61	.52	.47	.50	.64	.49	.64	.70

Notes: *** p< .001, ** p < .01, * p < .05, ⁺ < *.10* (one-tailed tests); standardized regression coefficients are flagged for statistical significance; the unstandardized regression coefficient are labeled in parentheses; standard errors are reported in italics; and the VIFs are labeled in brackets.

In the OLS Regression results involving my Drought sample in Table 5, my hypotheses are corroborated. Across models, there is a statistically significant relationship between droughts and women's share of the HIV burden. In other words, even when controlling for economic, geographical, healthcare-related, and women's empowerment indicators, the impact of droughts on the proportion of HIV cases among women remains robust. The opposite holds true in my OLS Regression models involving the Percentage of Populations affected by Floods, as indicated in Table 6. Across all models, there is no statistically relationship between floods and women's HIV burden. Therefore, I spend the rest of this section elaborating upon findings illustrated in Table 5.

The average VIF consistently remains around 2.50 in Table 5, except for in Model 8, where it is high at 3.05. However, as I noted previously, high VIFs are only an issue when the key independent variable is involved (Allison 1999), and the VIF for my key independent variable remains lower than 1.5 across all models. The R^2 coefficient in Model 1 is high, at .67, which means that 67% of variation in women's HIV burden can be explained by the population affected by drought, GDP per capita, women's empowerment, and number of physicians per 1,000 people. In Model 8, the most saturated model, 73% of the variation in women's HIV burden can be explained by the variables in Model 1, plus the size of the Muslim population, urban growth, and Sub-Saharan African location.

In Model 1, when controlling for GDP, women's empowerment, and number of physicians per 1,000 people, I find that a one percent increase in droughts is associated with a 1.55% increase in women's share of the HIV burden. It is also noteworthy that women's empowerment is associated with a decline in women's share of the HIV burden,

while GDP per capita has no effect. I keep these indicators in future models because they are key controls when examining gendered dimensions of health issues.

I incorporated the size of the Muslim population into Model 2, which has a statistically significant relationship with women's share of the HIV burden as well. However, this relationship loses statistical significance in Model 8, where I control for the highest number of variables. These findings are congruent with other studies finding that, while Muslim population appears to have a relationship with HIV prevalence, this statistically significant effect is often erased when controlling for other indicators (Heimer 2007; McIntosh and Thomas 2004).

Model 3 includes democracy and external debt stocks, neither of which bear a statistically significant impact on women's HIV burden. Much like the wavering impact of Muslim population on women's HIV, these results reflect current literature that finds inconsistent results for the salience of democracy and external debt when examining dimensions of women's health in less-developed countries (Heimer 2007; McIntosh and Thomas 2004).

However, in Model 4, there is a strong, significantly significant relationship between urban growth and women's HIV burden. This relationship also remains robust in Models 6 through 8. The lack of a statistically significant relationship between urban population and women's HIV burden is also noteworthy; it suggests that high levels of urban growth in particular have adverse effects on women's health. This result likely reflects the pattern of urban slum growth in less-developed countries (Austin 2015; McMichael 2012), where women living in urban slums have a higher risk of contracting HIV in comparison to men.

Controlling for location in Sub-Saharan Africa revealed a significantly significant relationship to women's share of the HIV burden. That is, Sub-Saharan African nations tend to have a disproportionate HIV burden among women in relation to men, net of droughts, women's empowerment, GDP per capita, urban growth, number of physicians, and Muslim population. Indeed, Sub-Saharan African location proves to be an important indicator in previous studies examining women's health (Austin, Choi, and Handley [forthcoming]; Austin and Noble 2014). However, it is important to note that Sub-Saharan Africa is not driving these findings; even when controlling for Sub-Saharan African location in Models 5, 7, and 8, the relationship between droughts and women's HIV burden remains robust.

I introduce the Urban Growth-Drought interaction term in Models 6 and 7, and my hypothesis regarding a statistically significant impact of this interaction term on women's HIV burden is supported. As shown by the statistical significance and coefficients of the interaction term in Models 6 and 7, the slopes of the drought indicator on women's HIV burden differ significantly in areas of higher urban growth, relative to nations with less urban growth. That is, the effect of droughts depends on urban growth in a given nation. Specifically, the impact of droughts on women's HIV burden is worsened in nations with higher urban growth, as indicated by the positive interaction term coefficients of .312 and .200 in Models 6 and 7, respectively. This interaction effect demonstrates that the impact of droughts on women's HIV burden is stronger in areas experiencing urban growth, even when controlling for women's empowerment, healthcare access, economic factors, geographic location, urbanity, and ethnicity.

In Model 8, the final and most saturated model, I find that the relationship between droughts and women's HIV burden remains strong. In this model, when controlling for six independent variables covering the areas of healthcare access, economic factors, women's health, geographic location, urbanity, and ethnicity, a 1% increase in droughts would yield a 1.59% increase in women's HIV burden. This is important because, as mentioned previously, when droughts strike, they affect large percentages over a long period of time. Droughts that last several years can thus greatly increase the already substantial HIV burden among women.

Finally, although there was no statistically significant impact of floods on women's HIV burden, the basic patterns found in Table 5 hold true in Table 4. For instance, women's empowerment consistently predicts women's share of HIV in my flood sample as well. Across most models, women's empowerment has a statistically significant impact on women's HIV burden, where higher women's empowerment yields lower HIV burden in less-developed nations. Moreover, urban growth largely has a positive relationship with women's share of HIV among the 74 nations in my flood sample as well. This demonstrates that nations with higher urban growth have a higher HIV burden among women in my flood sample. These findings in Table 4 bring support to my findings in Table 5, showing that the same relationships in my sample of 48 nations generally hold true in a larger sample of 74 nations.

Conclusion

Climate-related disasters are an under-examined force impacting women's HIV burden in less-developed countries. Climate-related disasters continue to increase in

number and intensity as a result of climate change, and poor nations are in the weakest position to be able to manage the catastrophic impacts of these events (Guha-Sapir 2012; UNDP 2015; UNDP 2016). As the HIV burden grows larger among women in less-developed countries, it is necessary to take a holistic approach, to examine all possible contributing factors.

Generally utilized as a theoretical base in non-quantitative research, ecofeminism represents a new contribution to critical theory. Highlighting the shared oppression between women and nature, ecofeminist perspectives posit that women and nature are closely connected, and the destruction or alteration of one compromises the stability of the other. The environmental change and resource scarcity resulting from climate-related disasters, therefore, yields alarming impacts on women's health. Currently, ecofeminism is mainly explored and discussed in qualitative, exploratory research within the humanities (e.g., Gaard 2011; Howell 1997; Mies 1998; Mies and Shiva 1993, Rocheleau et al. 1996; Warren 1990). My research uses ecofeminist perspectives to inform macro-level, cross-national, quantitative research, thereby providing a new lens through which to examine women's health. This close, unquestionable link between women and the environment must be considered when examining dimensions of women's health.

In my statistical analyses, I found a robust, statistically significant relationship between droughts and women's HIV burden. Contrastingly, there was no relationship between floods and women's HIV burden. My research thus illuminates the idea that not all climate-related disasters affect women's health in the same way; creeping, gradual, and prolonged disasters such as droughts worsen women's HIV burden compared to shorter-lived disasters like floods. The analyses also reveal a statistically significant

interaction between droughts and urban growth. These findings suggest coping with disasters by moving to a rapidly growing urban environment will not benefit women's health, as transactional sex likely becomes a coping mechanism in the face of urban poverty.

However, given the lack of cross-national data on women's risky sexual behaviors and transactional sex, I cannot actually test these mechanisms. My research has taken the first step by illuminating the relationship between droughts and women's HIV burden. Moving forward, I suggest combining these quantitative findings with qualitative research to determine whether transactional sex and risky sexual behaviors are mechanisms through which drought worsens women's HIV burden. This "on-the-ground" investigation could further elucidate the complex relationship between climate-related disasters and women's health.

My study has several limitations, however. My sample of drought-affected countries was especially small (N = 48). Overall, there were less data available on droughts, and also less overlap in data for my other independent variables, leading to the exclusion of cases due to the use of listwise deletion strategies. However, I attempted to address this limitation by examining my data carefully to identify any patterns in missingness, of which I did not identify any. Hopefully as monitoring on climate related disasters as well as other factors considered here as independent variables improves, future investigations will be able to broaden the number of countries examined.

A second limitation of my research strategy was multicollinearity, where there were high correlations among predictor variables. This can lead to unreliable and unstable estimates of regression coefficients. In particular, multicollinearity sometimes

increases the variance of coefficient estimates and creates sensitivity to minor changes in the model, potentially weakening the analysis' statistical power statistical power (Allison 1999; Frost 2013). To address this, I carefully inspected the variance inflation factors in my regression models and added variables in a step-wise fashion. However, this limited the number of variables I could include in the models, and in the most saturated models, many notable controls were non-significant, though they had been important in prior models, including women's empowerment, number of physicians, and Muslim population percentage. I reduced additional sources of multicollinearity by creating a composite indicator for women's empowerment, consisting of Contraceptive Use Rate, Female Secondary School Enrollment, and Fertility Rate, as all three of these individual indicators were highly correlated.

The interaction effect between urban growth and the percentage of people affected by droughts begins to reveal some of the specific mechanisms by which droughts increase women's distinct vulnerability to HIV. Therefore, one potential area of future research could be Structural Equation Modeling (SEM), which allows researchers to investigate direct and indirect relationships among predictors (e.g., Noble and Austin 2014). In this case, SEMs would allow researchers to more thoroughly understand the mediating effect of urban growth on the relationship between climate-related disasters and women's share of the HIV burden. SEMs would also allow researchers to construct latent and composite concepts using multiple variables, helping to reduce multicollinearity issues (e.g., Noble and Austin 2014).

Currently, there are efforts being made to address and mitigate the increasing frequency and severity of disasters in less-developed countries. The United Nations

Development Programme (UNDP) is currently conducting efforts to build resilience in the wake of climate change and increased disaster risk (2016). The UNDP has invested $1.7 billion in disaster risk reduction and recovery in less-developed nations (UNDP 2016). This organization also incorporates gender equality into their disaster mitigation and resilience efforts (UNDP 2016). Through this program, women are involved in key disaster risk reduction initiatives, such as contingency planning and long-term recovery. The UNDP also cites women's access to land, water, forests, housing, and other assets as critical to their efforts (UNDP 2016). That being said, climate-related disasters are still increasing, and women remain most vulnerable to the effects of these disasters. Because women in less-developed nations generally hold the ascribed role of family caretaker, other policy recommendations must be focused on gender inequality within formal and informal employment.

In the wake of climate-related disasters that deplete the natural resources that supply sustenance and employment, women turn to informal labor markets to provide for themselves and their families. This informal labor often takes the form of transactional sex, street peddling, or domestic work (McMichael 2012). Even if women do not engage in transactional sex, their work often takes place in informal markets. The unsettling implications of women's participation in informal labor markets is reflected in current research, where employment, itself, has no statistically significant relationship with the HIV burden among young women in less-developed countries (Austin, Choi, and Handley [forthcoming]). This lack of a relationship is a crucial finding in itself, demonstrating that employment is not the "silver bullet" that remedies the HIV burden among women in less-developed countries. Women do not need merely any jobs; they

need the *right* jobs. Efforts must be made to provide well-paying employment opportunities for women, along with access to education for women to develop the skills needed to obtain employment in skilled sectors, especially in the wake of climate-related disasters.

Additionally, targeted interventions concerning the logic of partner choice for women may be useful (Austin, Choi, and Handley [forthcoming]). As mentioned previously, women often engage in risky sexual behavior in order to provide for themselves and their families. Older, more affluent men often provide gifts, money, and other resources to women in transactional sexual relationships, and HIV prevalence is higher among these older men. Demonstrating to women how their likelihood for contracting HIV increases with the age of their sexual partners may be more effective than traditional messages such as the traditional "ABC" messages common in current public health outreach concerning HIV/AIDS. Demonstrating the importance of more careful choices may be more relevant in areas where transactional sex is less avoidable.

As mentioned previously, condoms are less likely to be used in transactional sexual relationships (Hunter 2015; Mojola 2011, 2014). Potential programming involving the participation of the clients of sex workers may help to change this pattern. That is, if clients of sex workers or men in transactional sexual relationships are shown that they are at a higher risk of contracting or transmitting HIV, they may be more inclined to engage in safer transactional sex through condom use.

From 2001 to 2010, floods constituted over half of all climate-related disasters in Africa, while droughts only composed 13% of African climate-related disasters during this decade (Guha-Sapir 2012). However, 80% of those affected by climate-related

disasters overall were affected by droughts, demonstrating that, although more infrequent, droughts affect larger populations than floods, and usually for longer periods of time. Although this is only one example, many developing nations share similar stories of droughts having a stronger effect than floods on populations. Young women in countries affected by environmental change are the fastest-growing population becoming infected with HIV (WHO 2015); thus, there is an obvious need to explore the crucial link between the environment, disaster, and women's health. Environmental and disaster-related dimensions to women's health are overlooked in research and denied altogether in everyday discourse (Steingraber 2002). It is my hope that this work paves the way for future studies examining the link between global environmental degradation, disaster, and women's health, especially women's HIV burden in less-developed countries. At this time, we lack the diverse analyses needed to understand the myriad causes of the HIV pandemic; utilizing ecofeminist theory to examine the environmental dimensions of women's HIV burden will help to illuminate the ways that environmental conditions impact women's health.

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August 2016 – May 2020 (Expected)

M.A. – Sociology, Lehigh University (4.0 GPA)
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Thesis: *Different Disasters, Differential Impacts: The Effect of Droughts and Floods on Women's HIV Burden in Developing Nations*

B.A. – Sociology & Philosophy, Millersville University of Pennsylvania (3.97 GPA)
January 2012 – December 2013
Thesis: *Life, Money, and Liberty: Religious Frames and the Contraceptive Clause of the Affordable Care Act*
Departmental Honors

A.A. – Social Sciences, Harrisburg Area Community College (3.87 GPA)
September 2008 – December 2011
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EMPLOYMENT:

August 2014 – May 2016	Teaching Assistant, Department of Sociology and Anthropology, Lehigh University
May 2015 – May 2016	Research Assistant, Department of Sociology and Anthropology, Lehigh University
September 2013 – December 2013	Student Worker, Department of Sociology and Anthropology, Millersville University of Pennsylvania
January 2012 – December 2013	Note-Taker, Learning Services, Millersville University of Pennsylvania

March 2010 – January 2012 Student Worker, Business Department, Harrisburg Area Community College

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Austin, Kelly F., Michelle Choi, and Virginia Handley. "Trading Sex for Security: Unemployment and the Unequal HIV Burden Among Young Women in Developing Nations" (Under review at *International Sociology*)

Handley, Virginia and Kelly F. Austin. "Disasters Worsen Women's Health: Environmental Change and Women's HIV Burden in Developing Nations." (In preparation for submission to *International Journal of Comparative Sociology*)

Handley, Virginia and Kelly F. Austin. "Fallen Trees and Failing Health: Deforestation and Women's HIV Burden in Developing Nations." (In preparation for submission to *Population and Environment*)

Austin, Kelly F. and Virginia Handley. "New Vulnerabilities, Old Inequalities: Gender Inequality, Environmental Change, and Women's Health" invited submission to "Gender Equality and Inequality: Global Perspectives, Cultural Influences and Social Issues." New York: Nova Science Publishers.

HONORS AND AWARDS:

Graduate Life Leadership Award: Honorable Mention – Honorable Mention from Lehigh University (2016) for exemplary commitment, leadership, and service to the Lehigh graduate student community

Department of Sociology and Anthropology Travel Grant – $200 awarded by the Department of Sociology and Anthropology at Lehigh University (2016) to present research findings at the Eastern Sociological Society (ESS) annual meeting

Health, Medicine, and Society Travel Grant – $200 awarded by the Health, Medicine, and Society program at Lehigh University (2016) to present research findings at the Eastern Sociological Society (ESS) annual meeting

Graduate Student Senate Travel Grant – $150 awarded by the Graduate Student Senate at Lehigh University (2016) to present research findings at the Eastern Sociological Society (ESS) annual meeting

Summer Research Fellowship Award: Dale S. Strohl Summer Research Fellowship Award – $5,000 awarded by the College of Arts and Sciences at Lehigh University (2015) to conduct research on women's health in a comparative perspective

Outstanding Student Award: Millersville University Sociology and Anthropology Department's Outstanding Senior Award – awarded by the Department of Sociology and Anthropology at Millersville University (2013)

Travel Award: Guy and Helen Swope Travel Award – $1,000 awarded by Harrisburg Area Community College to study International Business in London, UK (2011)

Member of Alpha Kappa Delta – International Sociology Honors Society (2013)

Member of Phi Theta Kappa – International Honors Society (2011)

CONFERENCE PRESENTATIONS:

2016 – "Trading Sex for Security: Unemployment and the Unequal HIV Burden Among Young Women in Developing Nations." Eastern Sociological Society Annual Conference, Boston.

2014 – "Life, Money, and Liberty: Religious Frames and the Contraceptive Clause of the Affordable Care Act" Eastern Sociology Society Annual Conference, Baltimore.

2014 – "Life, Money, and Liberty: Religious Frames and the Contraceptive Clause of the Affordable Care Act" Sociologists for Women in Society Winter Conference, Nashville.

PROFESSIONAL MEMBERSHIPS:

Eastern Sociological Society (member since 2014)
American Sociological Association (member since 2014)
Sociologists for Women in Society (member since 2014)

TEACHING ASSISTANT APPOINTMENTS:

SOC 001: Introduction to Sociology, Lehigh University; Fall 2014, Spring 2015, Spring 2016

- Led weekly 50 minute recitations involving lecture, discussion, and small group activities.
- Administered and graded student exams.
- Graded and provided feedback on student papers, exercises, and projects.

SOAN 111: Research Methods and Data Analysis, Lehigh University; Fall 2015

- Graded student exercises, labs, reading responses, and major papers.
- Assisted students with using Stata.
- Met with students by appointment to answer questions and discuss assignments.

- Scanned and duplicated class reading materials.

SOC/POLS 104: Political Sociology, Lehigh University; Fall 2015

- Graded student exercises and lab exercises.
- Met with students by appointment to answer questions and discuss assignments.
- Scanned and duplicated class reading materials.