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An Examination of Two Young Female Cohorts' Sexual Behaviors and HIV Status in a
Changing HIV Services Environment: Kisumu, Kenya 1997 and 2006

by

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DISSERTATION

Submitted in partial satisfaction of the requirements for the degree of

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of the

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Dedication and Acknowledgments

I dedicate this dissertation to my best friend and partner Ryan, who was always by my side as we travelled down the bumpy road toward completion of this project. Without your sincere support, this project would never have materialized.

Abstract

An Examination of Two Young Female Cohorts' Sexual Behaviors and HIV Status in a

Changing HIV Services Environment: Kisumu, Kenya 1997 and 2006

Coline E. McConnel

The primary purpose of this dissertation was to explain why HIV prevalence among

young Kenyan women declined from 30% in 1997 to 16% in 2006. This was the period

in which antiretroviral treatment (ART) and voluntary counseling and testing (VCT)

became available in Kisumu, Kenya; therefore, the primary research hypothesis was that

these services decreased HIV transmission among 2006 women.

Descriptive and quantitative analyses were performed. Service data and government

reports were used to describe ART and VCT roll-out in Kisumu, and literature on

globalization and state power were utilized as theoretical approaches. In 1997, 427 young

women aged 15 to 24 in Kisumu, Kenya answered demographic and sexual history

questions and were tested for HIV. In 2006, parallel data from 463 women were

collected. These data were used in multivariate regression models created using

Bronfenbrenner's Social Ecological model to examine changes in relationships between

ethnicity, education, sexual behaviors, VCT access and HIV status over time.

Comparing 1997 and 2006 women, there were few overall differences in sexual

behaviors. The primary finding was that in 2006, significantly more women had a

secondary education (41%) than in 1997 (16%), which was associated with less sexual

experience and decreased HIV risk. This was especially true among women with a secondary education who had never been married. The clearest services impact finding was that 2006 women who had ever been tested for HIV were significantly less likely than other women to be HIV-positive despite the fact that these women were more likely to have had two or more partners and to ever have been married. Future research should examine whether education policies in Kenya contributed to more 2006 women having a secondary education and how education and HIV testing protects young women from becoming HIV-positive.

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Chapter 1: Introduction

Between 1997 and 2006, great strides were made to prevent the spread of global

HIV/AIDS and to treat individuals who are HIV positive. Successful drug treatments

(antiretroviral treatment or ART) came to market, and with the advent of generic drugs

and lower prices, it became possible for more people around the world to have access to

these drugs. As part of this mobilization, worldwide awareness of HIV grew and

commitments to implementing HIV/AIDS prevention and treatment programs in regions

hard-hit by HIV blossomed.

Although this period of time is fascinating because of the incredible expansion of global

HIV awareness and the vast infusion of resources into HIV prevention and drug

treatment, the battle to respond to the global HIV epidemic is far from over. For example,

in 2005, only 55,000 of an estimated 273,000 (20%) Kenyans in need of ART were

receiving treatment (WHO, 2005). Additionally, it is unclear how the expansion of HIV

prevention services such as volunteer counseling and testing (VCT) may have been

effective in preventing new infections.

In Africa where over 90% of HIV-positive individuals have acquired HIV through

heterosexual contact, sexual behaviors largely determine initial HIV exposure. Cultural

norms relating to sexual behaviors and socioeconomic status may promote particular

sexual practices that are safer or higher risk for HIV infection for different social groups

within the same society. For example, Kenyan women aged 15-24 have been found to be

two (Joesoef, et al., 2003) to six times (Buve, et al., 2001a) as likely as same-aged men to

be HIV-positive. A couple possible reasons for the high HIV prevalence among this group include marriage at a young age to older spouses and receiving money or gifts for sex.

HIV prevention and treatment services may also have an impact on sexual behaviors. For example, there is mixed evidence that volunteer counseling and testing (VCT) is effective in lowering risky sexual behaviors. In 2000, the Voluntary HIV-1 Counseling and Testing Efficacy Study Group reported that, among Kenyan, Tanzanian and Trinidadian women, reports of unprotected sex with a primary partner decreased from 49% to 39% after women received VCT (2000). However, three recent studies indicate that VCT is more effective in decreasing risky sexual behaviors among HIV-positive individuals (Corbett et al., 2007; Matovu et al., 2007; Sherr et al., 2007).

These latter recent studies, all published in 2007, may include an ART effect. In the United States and Europe, ART availability has been associated with an increased likelihood to engage in unprotected sex (Crepaz, Hart, & Marks, 2004). The effect of ART on sexual behaviors in Africa is still largely unknown. While ART availability may promote demand for VCT and thus also promote increased awareness of how HIV is transmitted, ART availability may also decrease individuals' concern about becoming HIV positive.

While ART can transition HIV from a death sentence to a chronic disease, understanding why and how individuals engage in particular sexual behaviors remains an essential piece

in the puzzle of decreasing HIV transmission. Recent modeling data indicate that a comprehensive approach where treatment enhances prevention messages that are effective in decreasing risky sexual behaviors, as opposed to a prevention-only or treatment-only approach, would be the most effective in averting new infections and death (Salomon, et al., 2005).

Using data collected in 1997, Buve and colleagues (2001a) found a 30% HIV-prevalence rate among women aged 15 – 24. Parallel data from 2006 indicate a 16% HIV-prevalence rate among this population (Cohen, et al., 2009). This raises the question of whether this decline in HIV prevalence can be attributed to changes in sexual behavior and by extension to changes in prevention and treatment programs and/or other social changes that may have empowered these women, which have been cited repeatedly as a group at high-risk for HIV (e.g., Buve et al, 2001).

Aims

This study was designed to examine whether the influx of HIV services in Kisumu, Kenya between 1997 and 2006 contributed to changes in 2006 young women's sexual behaviors relative to 1997 young women's sexual behaviors, and whether any changes in sexual behaviors contributed to the reduced HIV prevalence in 2006. For this reason, my research describes changes in HIV services and focuses on changes in sexual behaviors over time. However, it was also my goal to take a social ecological perspective in conducting this research. For this reason, as much as possible, I have also explored other social factors more distal to HIV status that may have contributed to declining HIV

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prevalence in young women across the study period. Specifically, my three research aims are as follows.

RESEARCH AIMS:

AIM 1: Describe changes in access to antiretroviral treatment (ART) and volunteer counseling and testing (VCT) programs between 1997 and 2006.

AIM 2: Compare demographic, behavioral and physiological factors that predict HIV status among Kenyan women aged 15 – 24 in 1997 and 2006.

AIM 3: Examine how 2006 women's use of VCT services and knowledge and beliefs about HIV transmission and treatment predict HIV status in 2006

The data sources for sexual behavior and HIV status information were parallel survey datasets collected from Kisumu women aged 15 – 24 in 1997 (Buve, et al., 2001a) and 2006 (Cohen, et al., 2009). I used this information to create four multivariate logistic regression models to examine relationships between leverage points and HIV status in 1997 and 2006. These models are described fully in the methods section in chapter 3. Bronfenbrenner's Social Ecological Model (1989) was the conceptual framework for the multivariate logistic regression models (See Chapter 2). This model conceptualizes environmental and individual influences on health outcomes as nested spheres such that there are multiple, interrelated factors associated with an outcome. In this model, risk

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factors for HIV are referred to as "leverage points". For example, sexual behaviors are "individual/psychological leverage points".   The primary purpose was to examine factors that determined HIV status and how these factors may have changed over time.

Significance of the Research Problem

This project made three contributions to our understanding of how environments shape sexual behaviors and lead to variable health outcomes in terms of HIV status. First, young African women have been shown to be a group at high risk for becoming HIV-positive (Buve, et al., 2001b). This study focused on the HIV prevalence of young Kisumu women aged 15 – 24; therefore, it contributed to the HIV literature examining why young women are more likely to become HIV-positive compared to young men.

Second, this study used a social ecological approach to examine multiple interrelated factors in young Kisumu women's environments that may have impacted their sexual behaviors and ultimately, their HIV status. Taking an ecological approach is important to expanding our understanding of why young women in Africa have experienced an HIV prevalence two- to six-times greater (Buve, et al., 2001b; Joesoef, et al., 2003) than that of their male counterparts because it approaches the issue as a complex system. There were major changes in the availability of HIV prevention and treatment programs in Kisumu, Kenya between 1997 and 2006 – the period under investigation. Taking an ecological approach made it possible to examine how the increased availability of VCT and ART may have impacted young women's sexual behaviors without ignoring other

important factors such as education and gender norms, which also contributed to young women's life experiences and health outcomes.

Third, numerous studies have been published to examine relationships between increased availability to antiretroviral treatment (ART) and sexual behaviors in the United States (e.g., Crepaz, et al., 2004). However, since the roll-out of ART in Africa occurred more recently, less has been written about relationships between ART access and changes in sexual behavior there. This study added a data point to the discussion of whether access to ART in Africa has resulted in complacency and increased risky sexual behaviors as has been found in the United States. The few recently published studies from various countries in Africa have shown that so far, access to ART in Africa has not been strongly linked to increases in risky sexual behaviors, especially regarding women However, these studies have also stressed the importance of ART integrated with prevention services such as volunteer counseling and testing (VCT) to limit increases in risky sexual behaviors. This study was conducted in Kisumu, Kenya, where two-thirds of VCT programs for youth are integrated with ART . Therefore, information from this study can also be used to assess whether Salomon's conclusion that an integrated response is the most effective way to prevent new AIDS cases (2005).

Background

In this section, I describe what we know about HIV transmission – namely that HIV epidemics change over time and are due to associations between numerous transmission factors. Generally, transmission factors include sexual behaviors, which determine HIV

exposure and biological co-factors that determine HIV transmission risk. Social changes such as HIV prevention and treatment programs and more broadly, social factors that encourage female empowerment, can promote safer sex behaviors and help control some biological co-factors that increase the probability of HIV transmission.

Dynamic Epidemics

Twenty-five years after the HIV epidemic began, approximately 40 million people are living with HIV/AIDS worldwide. The African continent has been the hardest hit, with over half of the world's HIV-positive population – nearly 25 million people – residing in sub-Saharan Africa . HIV epidemics are dynamic, involving complex associations between social influences, sexual behaviors and biological co-factors. Sexual behaviors determine the probability of exposure, and then biological co-factors affect the probability of HIV transmission during sexual intercourse. Cultural norms and socioeconomic status as well as HIV prevention and treatment services may promote particular sexual practices that are safer or higher risk for HIV infection. These practices lead to regional variation in HIV prevalence, variable prevalence rates for different social groups within the same region, and change in prevalence rates over time. The latter type of variation is the focus of my research.

Sexual Behaviors

Sexual behaviors determine initial HIV exposure and are thus fundamental to the spread of HIV. In Kenya, sexual behaviors that have been found to increase risk of HIV infection include young age of first sexual intercourse for women, young age of first

marriage, large age difference between spouses (Buve, et al., 2001b), multiple partners (Cheluget, et al., 2004) and extramarital relationships (Glynn, Carael, Buve, Musonda, & Kahindo, 2003). Increased condom usage has been associated with declining HIV prevalence (Cheluget, et al., 2004; Yadav, et al., 2005).

HIV Prevention/Treatment Programs and Behavioral Change

Behaviors can be difficult to change; however, there is some evidence that changes in sexual behaviors have led to decreases in HIV prevalence in Kenya (Cheluget, et al., 2004; Hallett, et al., 2006). One possible reason for this change is the influx of HIV prevention and treatment programs in Kenya in the last 10 years. In 1996, the first effective HIV treatment, highly-active antiretroviral treatment (HAART), came on the market (Pujol, 2006). In 2001, the annual cost for HAART came down by a magnitude when generic drugs became available (World Health Organization, 2005a). Consequently, people in resource-poor regions began having more access to these drugs. At the same time, by 2005, only 55,000 of an estimated 273,000 (5%) Kenyans in need of ART were receiving treatment, indicating the recency of drug roll-out initiatives in this region (WHO, 2005).

During this period, the world became more aware of the spread of HIV in resource-poor regions, and more attention was paid to this issue both in terms of financing and rolling-out prevention and treatment programs. For example, in 2000, the United Nations Millenium Declaration led to the establishment of the Global Fund in 2001 (Global Fund, 2009). The Clinton Foundation created their HIV initiative in 2002 (Clinton Foundation,

2009). In 2003, UNAIDS and the WHO announced their "3 by 5" initiative, the goal of which was to treat 3 million people by 2005 (World Health Organization, 2007a). The same year, the Bush Administration announced PEPFAR, a 5-year, $15 billion initiative to fight HIV in 15 focus countries, of which Kenya was one (US Government). It is possible that some of these programs have shaped individuals' knowledge, beliefs and behaviors relating to HIV (Buve, et al., 2001a).

Over time, HIV prevalence trends could reflect programmatic impact at a societal level. It is important to understand why and how individuals engage in particular sexual behaviors in order to strengthen prevention and treatment programs. For example, numerous studies in the United States and Europe have found that individuals are less concerned about HIV and more likely to engage in unprotected sex when ART is available (Crepaz, et al., 2004). The effect of ART on sexual behaviors in Africa is largely unknown. An explanation for the upward trend in risky sex associated with treatment availability is that prevention messages were not integrated into clinical practice. Consequently, there has been more emphasis on integrating prevention and treatment as ART becomes available in Africa. A recent modeling study by Salomon and colleagues (2005) strengthens this point. Their work indicates that a comprehensive approach where treatment enhances prevention messages would be very effective in averting new infections and death.

There is some evidence to support the hypothesis that HIV prevention programs in Kenya have influenced knowledge, beliefs and behaviors relating to HIV transmission. For example, Agha (2003) found that branded mass media campaigns in Kenya contributed to

developing perceptions of HIV that promote condom use. Norman (2003), however, found that only 19% of 4293 adults from Kenya, Tanzania and Trinidad used condoms consistently with their most recent partner. One factor associated with condom usage was perceived difficulty in requesting a condom, indicating the importance of de-stigmatizing this topic. Similarly, Nzioka (2001) has argued for prevention programs that promote communication among adolescents because this group was hesitant to talk about safe sex practices with their partners even though they were aware of risky behaviors. As cited above, VCT has also been associated with reducing risky sexual behaviors; however, this effect may be more pronounced for HIV-positive individuals (Corbett et al., 2007; Matovu et al., 2007; Sherr et al., 2007).

Social Issues and Behavioral Change

In addition to a programmatic impact, broader social issues such as gender inequality and poverty also play an important role in determining sexual behaviors. For example, Kenyan women aged 15-24 have been found to be two (Joesoef, et al., 2003) to six times (Buve, et al., 2001a) as likely as same-aged men to be HIV-positive. Surprisingly, one mechanism for this finding is marriage. Clark (2004) found that early marriage increases women's risk of acquiring HIV because husbands are three times more likely to be HIV-positive than single girls' boyfriends, and marriage increases coital frequency and decreases condom use.

Another mechanism is commercial sex work, which is often motivated by poverty and a lack of alternative ways for women to support their families (Theobald, Tolhurst, &

Squire, 2006). For example, Morison and colleagues (2001) have found that widespread commercial sexual activity continues in Kenya. Fonck and colleagues (2005) have also found relationships between risky sexual behaviors, low education level, partner violence and increased risk of HIV in Kenyan women. Cultural norms around gender inequality and sexual behaviors likely contribute to these phenomena. For example, Maticka-Tyndale and colleagues (2005) interviewed primary school students in Kenya who described sexual encounters within discourses of force and exchanging gifts for sex. Women are also underrepresented in volunteer counseling and testing (VCT) programs in Kenya, and women who do use VCT are less likely to take condoms home (Taegtmeyer, Kilonzo, Mung'ala, Morgan, & Theobald, 2006). These findings underscore a need to empower women in order to reduce HIV prevalence.

Biological Factors

Biological co-factors impact the probability of HIV transmission during exposure and have also been associated with Kenya's relatively high HIV prevalence rate. These co-factors include herpes simplex virus type 2 (HSV-2) (Freeman, et al., 2007; McClelland, et al., 2005; Orroth, et al., 2007) and lack of male circumcision (Baeten, et al., 2005; Buve, et al., 2001b; Meier, Bukusi, Cohen, & Holmes, 2006; Moses, et al., 1994; Orroth, et al., 2007). The relationship between HSV-2 and HIV appears to change over time, with HSV-2 and HIV reinforcing each other as the proportion of people dually diagnosed increases (Buve, et al., 2001b; Freeman, et al., 2007). Additionally, Moses and colleagues (1994) reviewed 30 epidemiological studies and concluded that there is a large body of evidence supporting lack of male circumcision as a risk factor for acquiring HIV. More

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recently, Baeten and colleagues (2005) used modeling techniques to show that uncircumcised men in Kenya had more than a two-fold increased risk of acquiring HIV-1 per sex act. Meier and colleagues (2006) found a significant relationship between male hygiene and HIV infection, providing support for the hypothesis that hygiene is the mechanism for circumcision's effectiveness in preventing HIV. Additionally, Orroth and colleagues (2007) have found that the effect of circumcision on HIV spread may be mediated by its effect on decreasing risk for ulcerative STIs. Furthermore, young women may be particularly susceptible to HIV because of the immaturity of the genital tract (Royce, Sena, Cates, & Cohen, 1997) and/or due to increased risk of HIV transmission during a woman's first episode of sexual intercourse (Bouvet, De Vincenzi, Ancelle, & Vachon, 1989).

Conclusions

In Africa, unprotected sex has been fundamental to HIV transmission. Promoting safer sex practices through HIV prevention and treatment programs may be more important than ever in a context where ART has become increasingly available and where there may be a tendency to become complacent about HIV transmission. Since 2000, more prevention and treatment programs were funded and implemented in Africa than ever before in the history of HIV. Consequently, the period under investigation (1997 – 2006) was an important moment where the resources and technology (ART) became increasingly available to effectively prevent new infections and death.

What remains unclear is how HIV services may impact sexual behaviors. However, we do know that since 1997 and during the period when VCT and ART initially became available, HIV prevalence among young women in Kisumu, Kenya declined from 30% to 16%. Examining how HIV services relate to sexual behaviors and how sexual behaviors and biological co-factors (all leverage points) are associated with HIV prevalence contributes to our understanding of how HIV can be controlled in Kenya. Young Kisumu women are a particularly important group to study since they seem to have a greater susceptibility to HIV infection even after very few sexual episodes; therefore, it is imperative to understand how HIV services may affect young women's sexual behaviors and to provide access to effective HIV prevention services prior to sexual debut.

As will be described fully in chapters 3 and 4, through parallel surveys of young women in 1997 and 2006, it was possible to describe how sexual behaviors and HIV prevalence changed as HIV prevention services expanded and treatment services began between these two time points. I tied my analyses of behavioral change (individual/psychological leverage points) over time to changes in HIV services and in the social context in the area (physical environment leverage points) in three ways. First, I described changes in VCT and ART availability in Kisumu, Kenya during the last decade (aim 1). Second, I linked this information to 2006 women's reported use of VCT and knowledge and beliefs relating to HIV transmission and treatment (aim 3). Third, I looked for significant differences in background characteristics between the 1997 and 2006 samples, focusing on educational attainment, to explore changes in the social context of Kisumu that may also have had an impact on young women's sexual behaviors and HIV prevalence (aim

2). In this way, my research incorporated a multilevel analysis of how leverage points at international and local levels led to the current spectrum of available services and how VCT and ART programs and other factors in the environment of Kisumu impacted young women's sexual behaviors and HIV prevalence.

In chapter 2, I walk through the theoretical approaches used for this project – a review of global distribution of ART, literature on globalization and state power, and a presentation of Bronfenbrenner's Social Ecological Model, which served as the conceptual framework for my multilevel analysis. Methods for describing ART roll-out and VCT expansion in Kisumu, Kenya and creating multivariate logistic regression models to examine behavior change and HIV status in 1997 and 2006 are presented in chapter 3. Results of these analyses are presented in chapter 4, followed by a discussion of results and project conclusions in chapter 5.

Chapter 2: Theoretical Approaches

<u>Introduction</u>

The purpose of this chapter was to provide the historical context for landmark changes in HIV services in Kisumu, Kenya between 1997 and 2006 and to lay out a conceptual framework to approach the issue of how striking environmental changes in the availability of ART and VCT (physical environment leverage points) may have impacted individual behavior and ultimately HIV status in 2006. First, I describe milestones in making antiretroviral treatment (ART) available worldwide and provide reasons why ART roll-out happened as it did. Second, I look to sociological theories on globalization and state power as a context to understand the webs of power that facilitated ART access and the expansion of volunteer counseling and testing (VCT). Third, I present Bronfenbrenner's Social Ecological Model (1989) as a conceptual framework to connect these literature and guide the creation of multivariate logistic regression models to analyze risk factors or "leverage points" predicting HIV status among young Kenyan women. In other words, I used Bronfenbrenner's model as a way to connect socio-structural and physical environment leverage points, which I studied with the use of literature on globalization and state power, to individual behaviors (individual/psychological leverage points) and individuals' HIV status.

International Antiretroviral (ARV) Drug Distribution

By 2007, after developing nations like Kenya had been supplying antiretroviral (ARV) drugs or antiretroviral treatment (ART) for free or reduced cost for several years, Europe would not have immediately come to mind as a region lacking access to ART. So, it is notable that in the 1990s, European people living with HIV/AIDS (PLHAs) and physicians accused Abbott Laboratories, Merck, and the U.S. Food and Drug Administration (FDA) of concentrating on fully supplying the U.S. market without consideration to Europe's needs. At the time, the International Association of Physicians in AIDS Care (IAPAC) proposed implementing a global drug rationing agency to replace an expanded access model so that deciding who would gain access to medicines would be more on the basis of compassion rather than ability to pay (Alcorn, Nary, Pernet, Surchio, & Weiner, 1996).

Perhaps because of outcry such as this, in 1996, Abbott Laboratories began an expanded access program to make ritonavir available to 2,000 people worldwide via lottery (Baker, 1995). In addition, in 1997-1998, the Joint United Nations Programme on HIV/AIDS (UNAIDS), began piloting its Drug Access Initiative in Chile, Ivory Coast, Uganda, and Vietnam. Drug companies agreed to subsidize drug costs for this program (Cadman, 1998). A positive evaluation of this program in Uganda, which described decreased AIDS incidence and program costs and procurement strategies, was published in 1999 (Zuniga). Despite the pharmaceutical industry's involvement in these and other access programs, by the end of the 1990s, the majority of PLHAs in developing nations still did not have access to ART, and the industry was criticized by many, including activists, academics

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and policy makers, as an obstacle to equitable access in regions most affected by HIV and also least able to afford treatment (No authors listed, 2001).

By 1999 91-95% of people in the United States participating in the Centers for Disease Control (CDC) surveillance studies had been prescribed treatment at some point, 83-88% of this group reported having a current prescription, and 61-64% of people with current prescriptions had prescriptions for Highly Active Antiretroviral Treatment (HAART) (CDC, 2003). At the same time, in many other regions of the world, access to ART was minimal or non-existent. In most of Africa, Eastern Europe, and Asia, there was less than 10% access to these drugs at the end of 2003, while most nations of North America, South America, and Europe had 75%-100% access to these drugs (World Health Organization, 2004). (Table 1.)

In June 2005, Latin America and the Caribbean had 62% antiretroviral treatment (ART) coverage – a high among low- and middle-income countries – compared to 5% coverage in North Africa and the Middle East. "Ensuring access to ART for the most vulnerable and marginalized populations remains a huge challenge." (World Health Organiztion/UNAIDS, 2005). By 2006, access had improved slightly in these regions. Table 1 indicates ART roll-out between 2003 – 2006. While there were still ART coverage disparities in June 2006, many more people were receiving ART in 2006 compared to 2003. (Table 1.)

Table 1: Estimated number of people receiving antiretroviral therapy, people needing antiretroviral therapy, and percentage coverage in low- and middle-income countries according to region, December 2003-June 2006

Geographical Region	Estimated # of People Receiving ART June 2006 (low – high estimate)	Estimated # of People Needing ART (low – high estimate)	ART Coverage June 2006 (%)	Estimated # of People Receiving ART Dec. 2005 (low – high estimate)	Estimated # of People Receiving ART Dec. 2003 (low – high estimate)
Sub-Saharan Africa	1,040,000 (930,000 – 1,150,000)	4,600,000 (4,000,000 – 5,400,000)	23%	810,000 (730,000 – 890,000	100,000 (75,000 – 125,000)
Latin America & the Caribbean	345,000 (260,000 – 430,000)	460,000 (350,000 – 600,000)	75%	315,000 (295,000 – 335,000)	210,000 (160,000 – 260,000)
East, South & South-East Asia	235,000 (180,000 – 290,000)	1,440,000 (970,000 – 2,000,000)	16%	180,000 (150,000 – 210,000)	70,000 (52,000 – 80,000)
Europe and Central Asia	24,000 (23,000 – 25,000)	190,000 (130,000 – 260,000)	13%	21,000 (20,000 – 22,000)	15,000 (11,000 – 19,000)
North Africa & the Middle East	4,000 (3,000 – 5,000)	75,000 (43,000 – 120,000)	5%	4,000 (3,000 – 5,000)	1,000 (750 – 1,250)
Total	1,650,000 (1,400,000 – 1,900,000)	6,800,000 (5,800,000 – 8,000,000)	24%	1,330,000 (1,200,000 – 1,460,000)	400,000 (300,000 – 500,000)

(World Health Organization, 2006)

Figure 1 is a companion to Table 1 in that it depicts worldwide roll-out of ART between 2002 and 2005. As shown in Table 1, Figure 1 indicates rapid ART roll-out during this period and disparities between regions regarding ART access.

Figure 1: Number of people on antiretroviral therapy in low- and middle-income countries, 2002 to 2005
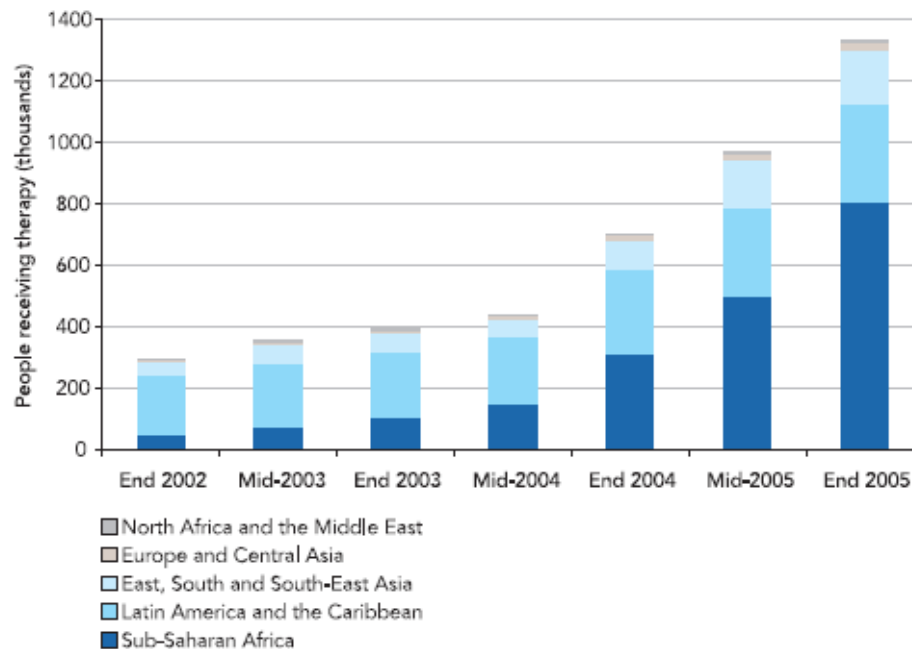
(UNAIDS, 2006)

Figure 1 indicates both that the largest number of people in need of ART were in Sub-Saharan Africa and that ART roll-out efforts seem to have focused on Sub-Saharan Africa. The number of people with ART access in this region grew substantially from year to year. In contrast, the number of people on ART in countries in Latin America and the Caribbean remained more stable because access was already relatively higher by the end of 2002, and the population in need of ART in that region was smaller.

Although my primary interest was the topic of equitable global distribution of antiretroviral drugs to treat HIV/AIDS, I began exploring issues around equitable global distribution and access to drugs in general with the purpose of developing a broader

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picture of how systems of international distribution to needed drugs work. I conducted two database searches in January 2007. First, I searched PubMed using the keywords "international drug distribution access". This search produced 178 articles dating back to 1983. I then searched PubMed using the keywords "international drug distribution" for the period 1960 – 1982 to find older articles as well. This search produced 50 references, of which few were relevant. Many papers were not written in English, indicating that the topic of international distribution was not a focus of research during this period prior to AIDS. However, the twelve relevant early papers did examine some of the same access issues being discussed today, and a key development during this period was the creation of the World Health Organization's (WHO) Essential Drug List in 1977.

Second, I searched SocAbstracts using the keywords "international" and "drug" and "distribution" or "access". This search produced 232 additional articles. I then used the recurring keywords "pharmaceutical industry" and "export-import trade" from my initial search to find an additional 87 articles.

To pare this list of articles down, I excluded articles that examined access within one country (e.g. anti-TB programs in Romania). I excluded non-English articles, and I did not include vaccine papers. I also excluded research on the topics of controlling illegal substances, internet prescription drug purchasing, and the impact of access to methadone/drug treatment as an HIV/AIDS prevention tool. Research looking at the ethics of conducting drug research in developing nations was also omitted. Furthermore, I

excluded articles examining importing drugs to the U.S. from Canada and papers looking at the problem of fake drugs and generic drug quality.

What was quickly striking about these searches was that the vast majority of the articles were on the issue of access to antiretroviral drugs to treat HIV/AIDS. Very few articles examined drugs to treat other illnesses. Consequently, I limited my literature review to articles examining the particular issue of global antiretroviral drug access. In addition, while there was substantial critical analysis of issues around access to ART, there were few empirical studies.

Drawing upon this literature, the discussion below was organized around historical milestones in processes of making ART available to all who need it, regardless of ability to pay (See Table 2). The few empirical studies were highlighted, but for the most part, critical analyses are incorporated in telling the story of providing access to ART worldwide. Reports from the World Health Organization (WHO) and Doctors Without Borders (MSF) were also used to document access to and cost of ART access over time.

Table 2: ARV Drug Distribution Timeline

Date	Development	Reference
1948	The World Health Organization is established as an agency of the United Nations.	(World Health Organization, 2007c)
	Universal Declaration of Human Rights by WHO member states.	(World Health Organization, 2007c)
1966	2 additional human rights declarations by WHO member states: the International Covenant on Civil and Political Rights (ICCPR) and the International Covenant on Economic, Social, and Cultural Rights (ICESCR)	(World Health Organization, 2007c)
1977	WHO publishes first essential drugs list.	(Laing, Waning, Gray, Ford, & t Hoen, 2003)
1978	WHO Alma Ata conference Declaration on Health for All	(World Health Organization)
1981	The New York Times reports the outbreak of a new cancer among gay men.	(New York Times, 1981)
1987	The first drug to treat AIDS, Zidovudine (AZT), becomes available.	(Pujol, 2006)
1991	PLWHA in Brazil gain initial access to ARVs.	(Chequer, Cuchi, Mazin, & Garcia Calleja, 2002)
1995	6 ARVs on the market.	(Pujol, 2006)
1996	HAART combination therapy comes on the market.	(Pujol, 2006)
	Brazilian presidential decree: universal free access to ARVs.	(Chequer, et al., 2002)
1999	95% of PLWHA in the U.S. have received a prescription for ARVs.	(CDC, 2003)
2000	Generic drugs compete with originator companies. Lowest annual cost per patient: O-$10,439, G-$2,767	(Medecins San Frontieres, 2005)
	Millenium Declaration, endorsed by 189 countries, sets out 8 goals to improve health and reduce poverty. Goal 6 is to halt and reverse the spread of HIV/AIDS by 2015.	(World Health Organization, 2007b)
2001	Large price reduction for ARVs. Lowest annual cost per patient: O-$727, G-$350	(Medecins San Frontieres, 2005)
	The Global Fund to fight AIDS, TB, and Malaria is established.	(The Global Fund)
2002	300K PLWHA in low- and middle-income countries receiving ARVs.	(UNAIDS, 2006)
	Lowest annual cost per patient: O-$~727, G-$209	(Medecins San Frontieres, 2005)
	The Clinton Foundation launches its HIV/AIDS Initiative.	(The Clinton Foundation, 2007)
2003	Lowest annual cost per patient: O-$~562, G-$201	(Medecins San Frontieres, 2005)
	3 x 5 Initiative launched by the WHO and UNAIDS.	(World Health Organization, 2007a)
	President Bush announces PEPFAR, a 5-year, $15 billion plan to fight AIDS, TB, and malaria in 15 countries.	(US Government)
2005	15% of PLWHA (1.3 million) in low- and middle-income countries receiving ARVs.	(World Health Organiztion/UNAIDS, 2005)

	28 ARVs available, and 112 new drugs in the pipeline.	(Pujol, 2006)
	Lowest annual cost per patient: O-$~562, G-$152	(Medecins San Frontieres, 2005)
2006	24% of PLWHA (1.65 million) in low- and middle-income countries receiving ARVs.	(UNAIDS, 2006)

International Coordination, Social Justice, and the Free Market

After World War II, the allied powers came together, just as countries had also gathered

after World War I "to promote international cooperation and to achieve peace and

security" (United Nations, 2007). These efforts resulted in the United Nations, a

milestone for international organization since it was created as a general coordinating

tool. This contrasted with previous efforts that focused on specific issues such as

international telephone communications.

When the United Nations was established in 1945, there was a strong desire for social

justice in the wake of World War II. For example, the WHO, which was established in

1948, is the UN's specialized agency for health. Its primary purpose is to promote "the

attainment by all peoples of the highest possible level of health" (World Health

Organization, 2007c).

However, there was also a strong desire to rebuild war-torn economies. For example, the

International Monetary Fund (IMF) and the World Bank were established in the 1940s

after the United Nations Monetary and Financial Conference in Bretton Woods, New

Hampshire in 1944 (the "Bretton Woods Accords"). The purpose of the IMF and the

World Bank are to "oversee stability in international monetary affairs and to facilitate the

expansion of world trade" (International Monetary Fund, 2007). The General Agreement

on Tariffs and Trade (GATT) was also developed at this conference and was the

backbone of international trade until the 1990s when the World Trade Organization

(WTO) was established to further formalize and harmonize international trade. Allied powers - the Soviet Union, United States, United Kingdom, China and France - became permanent members of the UN Security Council in 1945 and they continue to be the directors of the UN's efforts.

The pharmaceuticals industry has been another international actor in the creation of international drug distribution systems. Like the UN, it is, for the most part, associated with industrialized nation states. However, unlike the UN, which has promoted social justice issues such as health for all as well as economic development, the pharmaceuticals industry's primary mission is to develop products that profit the industry. In 1948, the U.S. pharmaceutical industry reaped 17% after-tax profits on equity (Temin, 1979). This trend has been consistent since then, with Fortune Magazine reporting that the pharmaceuticals industry was easily the most profitable industry of 2002. That year, the industry as a whole earned 16% returns on revenue (Fortune Magazine, 2002).

The United Nations, which encompasses numerous specialized agencies such as the WHO and the WTO, as well as multinational corporations such as the pharmaceuticals industry compose a collection of organizations that have been vital to the creation of international systems of communication, collaboration, security and trade since the 1940s. Not only have these organizations formalized international coordination, they are also representative of regional power that has pushed these international organizations in particular directions. In other words, it is not just the UN and the pharmaceuticals

industry that have been leaders in global integration, but industrialized nation states' domestic interests that have shaped these efforts.

These organizations are important to explaining how antiretroviral drugs (ARVs) to treat HIV/AIDS have been developed and distributed internationally since the 1980s. In the paragraphs that follow, I describe how the UN, the pharmaceuticals industry, and nation states have participated in creating systems for developing and distributing ARVs. Along the way, I also highlight organized grassroots activism located both within nation states and in an international context, which has had an important impact on countering rising free trade priorities.

Essential Medicines and Highly Active Antiretroviral Therapy (HAART)

In 1977, the World Health Organization (WHO) published its first essential medicines list despite outcry from the pharmaceuticals industry that continues today. This list has been described as a "peaceful revolution in international public health" (Laing, et al., 2003) because it acknowledged that some medicines were more useful than others and also that these drugs were not available to many populations that could not afford to pay for them. Soon after, at the WHO's conference at Alma Ata in 1978, member states signed the Declaration on Health for All. These events built upon ideas of social justice that mobilized the creation of the WHO, and going back in history a bit further, had also made possible the Universal Declaration of Human Rights in 1948 following World War II (Hogerzeil, 2006).

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This historical context is important for a discussion of equitable drug distribution specifically, and an examination of health outcomes across different populations generally for a two reasons. First, these events highlight ongoing friction between two competing ideologies in providing health care: health as a human right and a matter of social justice vs. distribution based on conceptions of a free market and neoliberalism. As mentioned above, this important thread begins well before the advent of HIV/AIDS, and as I will argue in the coming pages, runs throughout most discussions of how to provide ARVs to those who need them.

Second, thinking about the WHO's essential medicines list sets up a timely framework for examining international ARV drug distribution both in terms of the players involved and systems that are in place now to facilitate or hinder equitable distribution of resources. Throughout the 1970s and 1980s - a context in which United States and United Kingdom policy increasingly promoted privatization and deregulation - efforts at the WHO to provide access to primary health care gained momentum, and concerns about an unregulated pharmaceuticals industry and access to drugs deepened. For example, in 1985, Streky criticized the pharmaceuticals industry's systems to provide medicines at reasonable prices and advocated for international harmonization of regulatory standards to promote health. A centerpiece of this argument was that drug development was based on market strength as opposed to need. At the time, 90% of the world's drugs were produced in industrialized nations, and these markets also consumed 80% of them (Streky, 1985). Another early article, also advocating the importance of the WHO's

essential medicines list in making drugs available to those who need them, warned of the drug industry's oligopolistic control of the drug market (Anonymous, 1986).

Discussions of equitable drug access were reinvigorated in the 1990s due to similar concerns: unequal access to available drugs to treat HIV despite available technology. Prior to 1987 when the first effective drug to treat HIV came on the market, a diagnosis of HIV was a death sentence because there were no drugs to successfully treat the virus. In 1987, Zidovudine or AZT became available; however, the first effective HIV treatment, a combination drug therapy known as highly active antiretroviral therapy (HAART), did not come on the market in the United States until 1996 (Pujol, 2006). At this time, disparities in treatment access became much more striking as those who had access to these new drugs could live with HIV as a chronic condition while those without access still faced a death sentence. Additionally, efforts to improve global drug access were fueled by international trade agreements being negotiated within the same period, such as the WTO's 2003 Trade-Related Aspects of Intellectual Property (TRIPS) agreement, which strengthened patent protections (M. K. Smith & Tickell, 2003).

Powerful Actors in International Drug Distribution

Numerous reasons have been given for disparities in access to HAART; however, the root of the problem is in a drug industry primarily located in industrialized nations that develops the majority of its drugs for people who live in these areas where there are strong economic markets. In such a system, drug access is limited when economic markets are weak.

Explaining disparities in global ARV drug access is much more complicated than this, though. The infrastructure of the pharmaceuticals industry can be linked to state policies in which it resides because these policies legalize ways of doing business (e.g., through regulatory agencies such as the Food and Drug Administration or FDA) and thus enable the pharmaceuticals system. Going yet further, the infrastructure of international organizations such as the UN and the WTO can be traced to specific industrialized nation states' efforts to coordinate international trade, to protect economies, and also to promote security. To complicate this picture, the pharmaceuticals industry and international organizations such as the WTO also directly impact state policy; therefore, while each organization possesses power to impact drug access, each has also been checked by the other. Furthermore, individuals can impact state policy through activism since nation states are also in the service of their populations. Sociological theory on these dynamics will be discussed in more length subsequently. In the following pages, using historical milestones and empirical research, I tell a story of global ARV drug access that highlights dynamics between these actors.

The Pharmaceuticals Industry

Originator and generic drug manufacturers can be divided into three categories. The brand-name drug producers tend to be older (e.g., GlaxoSmithKline has roots back to 1715, and Pfizer was founded in 1849), bigger (e.g, Pfizer is the world's largest pharmaceutical with over 122,000 employees worldwide), and based in either the United States (e.g., Abbott, Merck) or in Europe (e.g., Boehringer-Ingleheim, Hoffman-La

Roche). These companies develop and manufacture ARVs as a fraction of their overall business. Conversely, the generic drugs producers tend to be younger (e.g., Cipla, founded in 1937, is the oldest of the generics), smaller (e.g., Ranbaxy is the largest manufacturer with 9,000 employees) and majority-based in India (5 of 8 generic manufacturers). There are 2 exceptions – Gilead and Trimeris – that compose the third category of drug manufacturers. Both of these brand-name drug manufacturers are young and small, although based in the United States. Both were founded as a consequence of the HIV/AIDS epidemic and focus a majority of their work on HIV/AIDS treatments.

Although the United States and the United Kingdom are powerful, industrialized nations that have directed efforts at international coordination (e.g., UN, IMF, World Bank, etc.) and have developed most ARVs within their pharmaceutical industries, other regions of the world have also played powerful roles in making ARVs available with their generic drugs. Generic drugs, coming largely from Indian generic pharmaceutical companies, came on the market in 2000. Reports on procurement data from the WHO and Doctors Without Borders offer the clearest evidence that competition from generics stimulated huge decreases in drug prices (World Health Organization, 2005a). In 2001, the lowest price for an annual supply of ARVs from an originator company for one patient was $727 compared to $10,439 a year earlier. During the same period, prices for generic drugs were also drastically reduced from $2,767 in 2000 to $350 in 2001 (Medecins San Frontieres, 2005). (See Figure 2.)

Figure 2: The Effects of Generic Competition

May 2000-June 2005

Sample of ARV triple-combination: stavudine (d4T) + lamivudine (3TC) + nevirapine (NVP). Lowest world prices per patient per year. Generic competition has shown to be the most effective means of lowering drug prices. During the last four years, originator companies have often responded to generic competition.
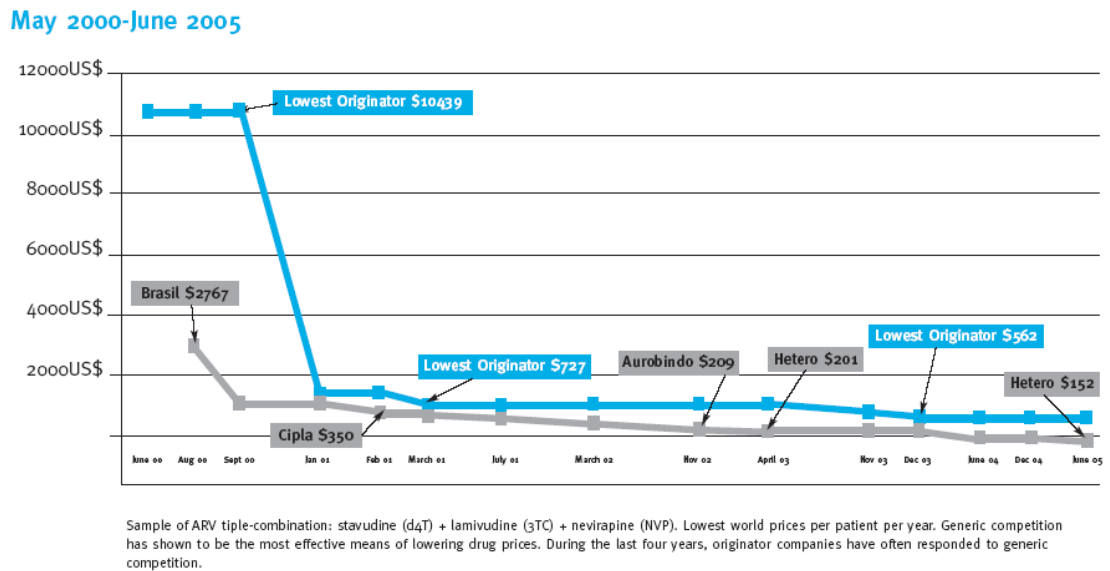
(Medecins San Frontieres, 2005)

Since the United States and the United Kingdom are primary sites for the oldest, biggest and most powerful drug companies, the success of these businesses impacts these nations' economies. Consequently, the pharmaceuticals industry is also a powerful stakeholder in these nation's policies and has impacted decision-making on trade rules both within each nation and internationally. As described above, the organization of the pharmaceuticals industry impacts drug pricing and availability. It also affects how program funds from nation states and other donors are spent for treatment globally. For example, in 2004, Dyer reported that non-governmental organizations (NGOs) such as Doctors Without Borders (MSF) had accused President Bush of blocking access to cheaper ARVs. Illustrating the close ties between the U.S. pharmaceuticals industry and federal government, Randall Tobias, a former CEO of Eli Lilly who at the time was the

U.S. global AIDS coordinator, claimed that the U.S. was hesitant to spend PEPFAR funds on generic drugs because of their questionable quality due to the WHO's drug prequalification project having fewer regulations than its U.S. counterpart, the FDA. However, data from several papers indicate equivalence (for example, (Kumarasamy, 2004); therefore, international organizations with a social justice mission like MSF countered with the explanation that the U.S. government was motivated for brand name drug manufacturers to receive money instead of foreign generic companies (Dyer, 2004). In line with the latter argument, an analysis of lobbying reports coming out of the Center for Public Integrity showed that the Pharmaceutical Research and Manufacturers of America, which represents 67 companies, had more contact with U.S. top international trade officials than with the FDA (Ismail, 2005).

Nation States, International Trade Agreements & Intellectual Property Protections
Discussion regarding the quality of generic drugs and politics around this issue foreshadow the issue around international drug distribution that has received the most attention in the recent literature: international trade agreements and intellectual property protections (IP). The availability of drugs to treat AIDS and the advent of competition between originator and generic sources for ARVs opened the door to motivation to formalize international trade laws. In an era of neoliberal globalization, it is not surprising that this topic has received considerable attention. It has been a hot-button issue because it involves clear debate over social justice and economic priorities.

Per FDA regulations, every new drug in the United States must go through an eight-step

process before consumers have access to the drug. First, preclinical testing is done to

assess the safety and efficacy of the drug in non-human animals. Second, the company

submits an Investigational New Drug (IND) application, which shows the results of the

testing. When the application is approved, the company can proceed with a Phase 1

clinical trial, which serves the purpose of determining a safe dosage among 20-80 healthy

volunteers. When this third step has been completed, the company can conduct a Phase 2

trial to assess the drug's effectiveness among 1000-3000 patients as a fourth step. Fifth, if

there are positive results from both phases of clinical trials, the company will submit

these data to the FDA as a New Drug Application (NDA). Sixth, an independent panel of

experts recommends whether or not the new drug should go to market, and the FDA

makes the final decision. Seventh, the company and the FDA collaborate on correct

labeling so that the drug is taken properly. Finally, the FDA clears the drug for marketing

and makes the drug available to physicians (Roche, 2009).

This process can take years – the industry average is eight to ten years (Roche, 2009);

however in some cases the process can be sped up in the U.S. to bring a drug to market

within a few years. The company developing the new drug usually acquires a patent on

the drug, which means that during the 20-year period beginning when the patent

application is filed, the company holding the patent controls the manufacture and sale of

the product in the country where the patent is held. The patent system was developed to

provide economic incentives for innovation; some argue that without intellectual property

rights, companies would not have the motivation to invest resources in the research and

development of new products. However, patents can also restrict who has access to the product and who does not since the company controls pricing and sales locations; therefore, there is also a need for emergency exceptions to achieve equitable access (Resnik, 2001; Werhane & Gorman, 2005).

University Role

Behind the economic interests of the U.S. drug industry, another piece to the puzzle of global equitable access to ARV drugs is drug research and development done at universities. Several authors have noted that the R & D for the vast majority of new drugs is done on university campuses and not within the pharmaceuticals industry. This means that, in the United States, public funds often support the development of drugs, which eventually are patented and then come to market from within the private drug industry that controls access to drugs based on economic interests.

Since universities are the primary patent holders of new drugs in some cases, they also have the power to impact global access to drugs. Universities can decide to make drugs available in regions where there is a small market by agreeing not to enforce their patent protections ('t Hoen, 2003; Correa, 2006a; Lieberwitz, 2005). For example, Kapczynski and colleagues provided a powerful example of how patents can restrict access and how universities can work with private industry to promote health priorities. They described how, in 2000, Doctors Without Borders encouraged Yale University and Bristol-Myers Squibb to make stavudine available in South Africa at 3% of the annual market price of $1600. Their story gives credit to Yale University, who made an unprecedented decision

to not enforce patent protections, even though at the time, the pharmaceuticals industry had not agreed to such actions. Yale's actions pushed the pharmaceuticals industry to open up markets in sub-Saharan Africa to generic drugs. At the same time, Yale most likely would not have done this without the urging of a humanitarian aid organization like Doctors Without Borders (Kapczynski, Chaifetz, Katz, & Benkler, 2005).

There were few articles dealing with the university role or the role of public-private partnerships (Widdus, 2001, 2003, 2005) in drug access. This appears to be an important area for more investigation because it sheds additional light on the complex political economy of patent protections and drug access and also on possible solutions.

National and International Systems of Intellectual Property Protection
Global distribution adds additional levels of complexity to making new drugs available. In addition to national and international agreements regarding intellectual property rights, international agencies like the Joint United Nations Programme on AIDS (UNAIDS), the World Health Organization (WHO), the World Bank, the United Nations Population Fund (UNFPA), and the United Nations Children's Fund (UNICEF) communicate pharmaceutical policy and give technical advice to partner countries wishing to gain access to ARVs. These agencies have formed the Interagency Pharmaceutical Coordination Group to coordinate global communication (World Health Organization, 2005b, 2009a). Additionally, as mentioned earlier, the WHO has had a prequalification project since 2001 that serves as an international drug regulatory agency. It works with the WHO, UNAIDS, UNICEF and UNFPA to promote efficient access to safe,

standardized ARVs (World Health Organization, 2009b). However, each country

maintains its own system for allowing drugs on the market. There may be a national drug

policy, regulations, and registration requirements. In addition, it may be possible to

obtain a within-country patent. For this reason, it is time-consuming to create global

access to individual drugs, and access requires commitment on the part of the patent

holder as well as national governments. With increased international trade during the

1990s, the World Trade Organization (WTO) replaced GATT in 1994 as a means to

simplify and harmonize international trade (Shaffer, Waitzkin, Brenner, & Jasso-Aguilar,

2005).

TRIPS and the Doha Declaration

WTO member countries are required to uphold the WTO's, trade agreements. One such

agreement is the Trade Related Aspects of Intellectual Property Rights (TRIPS)

agreement, which was developed during the Uruguay Round of talks (1986-1994). Under

this agreement, most member countries were required to increase patent protections by

2001. Prior to this agreement, countries were not required to patent medicines, and there

was diversity in approaches to patent protection. With TRIPS, all countries are now

required to provide minimum standards for patent protections (Shaffer, et al., 2005).

However, at the Doha Conference in 2001, a declaration was made to balance the

incentives of patents with social good considerations – to provide essential products like

lifesaving drugs at a reasonable cost and timeframe.

We agree that the TRIPS Agreement does not and should not prevent Members from taking measures to protect public health … we affirm that the Agreement can and should be interpreted and implemented in a manner supportive of WTO Members' right to protect public health and in particular, to promote access to medicines for all (Oh, 2005).

This declaration reiterated that TRIPS allows for compulsory licensing when an essential product under patent has not been brought to market. When there are "circumstances of extreme urgency" or when the product will have a "public non-commercial use", the compulsory license can be granted without first trying to obtain a voluntary license from the patent holder. Otherwise, a voluntary license will be sought first to provide the drug in either the private or public sector. Compulsory licensing gives governments the freedom to allow a domestic non-patent holder (a generic producer) to manufacture and distribute the patented product in the public sector. The Doha Declaration also extended exemptions on pharmaceutical patents in least developed countries until 2016. Finally, a waiver was added in 2003 to allow countries that are unable to manufacture pharmaceuticals domestically to import products made under compulsory licensing agreements in other countries (Amfar, 2006; World Trade Organization, 2009).

In response, several countries have issued compulsory licenses. For example, in 2002, Zimbabwe allowed for import and local production of ARVs. In 2003, Malaysia allowed the import of Indian ARVs to supply government hospitals. In 2004 Mozambique and Zambia issued compulsory licenses for local production of first-line ARV triple

combinations. Also in 2004, Indonesia issued a Presidential Decree, allowing for local production of nevirapine and lamivudine. Developing countries' decisions to obtain a patent, or to seek voluntary or compulsory licenses to import or locally produce generic versions depends on various factors including current prices, patent validity and length, intended use, and the availability of voluntary or compulsory licenses (Oh, 2005) Successful litigation may also play a part in gaining access (Hogerzeil, 2005)

High Prices and Patent Protections

Prior to 2000-2001, when generic drugs came on the market, and there were huge price reductions in ARVs, many voices argued that price restricted access to ARVs in developing nations (Piot & Coll Seck, 2001; Razum & Okoye, 2001; Shaffer, et al., 2005). There are various critical perspectives on price, patent protections and drug access; however, the following quote encapsulates the underlying message in these critiques:

> *One basic problem with the patent system is that it works only where markets are lucrative and profits are high. In a situation where the public health need is great but the market is small, patents do not work at all (Correa, 2006a).*

Patent protections in regard to ARVs have been hotly contested, with some arguing that patents do not pose a great barrier to access. For example, Attaran and Gillespie-White created a stir with their 2001 empirical article examining patent statuses of 15 ARV drugs in 53 African nations (A. G.-W. Attaran, Lee, 2001). Using a survey method, these

authors found that few drugs were under patent, and in addition, there was no significant correlation between geographic patent coverage and treatment access. A later paper showed similar trends in 65 low- and middle-income countries for 319 products on the WHO's Model List of Essential Medicines (A. Attaran, 2004). These authors concluded their argument by saying that poverty and lack of financing were greater obstacles to ARV drug access than patent protections.

However, the critical stance by authors who have argued that there are patents on some of the most appropriate drug combinations, paints a different picture. For example, zidovudine is patented in 33 of the 53 countries, and nevirapine is patented in 25 of the 53 countries. (A. Attaran & Gillespie-White, 2002). Other authors have supported the latter critical voice in their own analyses of how patent protections may limit drug access when markets are small (Havlir & Hammer, 2005; Palmedo, 2005). Oliveira and colleagues examined legislation in 11 Latin American and Caribbean countries to examine whether these governments were utilizing flexibilities in TRIPs to promote the health of their populations. Their conclusion was that,

> *The countries in this study did not incorporate all of the mechanisms allowed for by the Agreement and are not adequately using the provisions that enable World Trade Organization (WTO) members to obtain better health for the public, particularly in regard to gaining access to medicines. This situation may deteriorate in the future if other agreements establish more restrictive rules for intellectual property rights (Oliveira, Bermudez, Chaves, & Velasquez, 2004).*

In 2006, Correa indicated that there have been numerous bilateral agreement since TRIPS that have established more restrictive rules for intellectual property rights. For example, the U.S. has initiated 11 trade agreements with 23 nations since 2001. In a literature review, he finds little examination of why developing nations are willing to enter into bilateral free trade agreements. However, their perception that these agreements will lead to economic growth may, in fact, restrict generic competition and thus, drug access (Correa, 2006b).

Even though developing nations have entered into free trade agreements, these negotiations have not been without struggle. The above quote alludes to a recurring theme that rich and poor countries are divided on the issue of international patent harmonization (e.g., the WTO's TRIPs agreement, United Nations World Intellectual Property Organization's (WIPO) 2002 Patent Law Treaty) because poor countries – as a consequence of not having strong economic markets – may not only lose access to necessary drugs but also lose the ability to launch national protests to restricted drug access. Correa and Musungu have been quoted as arguing that harmonization of patent law will lead to a global imposition of U.S. patent law (New, 2006). Musungu has more recently argued that in a context of conflicting views on actors' contributions to meeting intellectual property challenges, benchmarks are necessary to gauge relationships between intellectual property rights, motivation to innovate, and public health outcomes (Musungu, 2006). Likewise, Vasan and colleagues conducted an observational study of the Global Fund's Purchase Price Report to determine how ARV drug pricing impacts

access in low- and middle-income countries. These authors found that price continued to inhibit access in lower middle-income countries even though low-income countries were able to purchase drugs at consistently lower cost. The authors concluded with the argument that more transaction data are necessary to provide a clear basis for pricing discussions (Vasan et al, 2006). In other words, relationships are unclear, and more work needs to be done to explicate these dynamics.

What is apparent is that decision-making in regard to the international distribution of resources is political, and agreements represent compromises that benefit powerful actors. For example, news reports reveal that the U.S., as a powerful player in guiding international organizations like the WTO, has been doing a balancing act to manage international decisions and domestic interests. In 2002, the U.S. was the primary critic of a proposal to allow developing nations that lack a domestic pharmaceuticals industry to import needed drugs made with a compulsory license in another country. This has been a contentious issue because even though the Doha Declaration allowed compulsory licenses when there is a public health emergency, these licenses were intended for domestic markets only and not for international export. The U.S. has also attempted to restrict the Doha Declaration to particular diseases (Hagmann, 2003). As mentioned earlier, similar politics have occurred over PEPFAR spending on brand name vs. generic ARV drugs (Dyer, 2004).

Brazil: An Example of the Power of Nation States to Promote Social Justice

Brazil stands out as an example of the power of a nation state to take social justice issues seriously with respect to providing ARVs to its population. ARVs were initially offered by the Brazilian government in 1991, and in 1996, the Brazilian president decreed that access to HAART was a right and initiated a free, universal program (Chequer, et al., 2002). In a review of ARV access in Latin American countries, Chequer and colleagues (2002) cite Brazil as an example of one of the first countries in the region to guarantee access.

Galvao (2002) has also done an historical analysis of ARV policy in Brazil and found that as much as possible, Brazil has used domestically-produced drugs to provide these drugs free of charge to all who need them. Drugs imported from abroad tend to be the most expensive and least available due to market pricing and intellectual property protections, and difficulty over pricing remains an issue for Brazil's long-term drug access.

Many groups such as non-governmental organizations (NGOs) and international bodies such as UNAIDS are now supportive of Brazil's drug access strategy although there was criticism of Brazil's actions early on. For example, in 1998, a Brazilian professor of medicine predicted that the government would not be able to sustain paying for treatment costs (No author, 1998). However, numerous other countries have followed Brazil's lead

and have also committed to providing ARVs free of charge to at least part of their HIV-positive populations. (e.g., Bennett & Chanfreau, 2005; Fang et al, 2004).

Teixeira and colleagues (Teixeira, Vitoria, & Barcarolo, 2004) report that the success of the Brazilian experience is due to an early governmental response, strong civil society participation, multisectoral collaboration, balancing treatment and prevention initiatives, and long-term promotion of social justice. The authors explain that the first AIDS program in Brazil started in 1984 when there were four known cases. They go on to provide a very positive evaluation of 20 years of efforts to prevent and treat HIV/AIDS, including reports of decreased mortality, improved health, and cost-effectiveness of interventions in the long-term. Homedes and Ugalde have made similar conclusions in examining Argentina's recent successful efforts to increase access to AIDS drugs (2006). In 2002, Elliott, referencing WHO statistics, noted that, of the 230,000 people who had access to these medicines, half were Brazilian residents (2002).

Activism Promotes Social Justice

Another important voice heard in discussions of how to distribute ARVs to all who need them was that of activist organizations. As mentioned previously, international humanitarian aid organizations - non-governmental organizations such as Doctors Without Borders - have been instrumental in promoting drug access programs. Many of the articles cited here are news articles that set the stage for what was going on during WTO international trade negotiations, although there is also critical scholarship of how AIDS activist groups have promoted improved drug access more generally. The take-

home point from the following descriptions is that grass-roots activism does seem to have been a key force pushing the world to increase their awareness of disparities in ARV drug access (H. D. Banta, 2001; R. A. Smith & Siplon, 2006) Activism has forced national and international policy-makers to weight social justice perspectives more heavily, and as a result, there have been more contributions to roll out ARVs to all who need them in recent years.

As mentioned above, early activism in Europe by PLHAs and physicians promoted drug access in Europe. These and other efforts may have been integral to the UN and drug companies' development of drug access programs. Prior to activism in Europe, PLHAs in the U.S. also created a social movement to gain access to ARVs in clinical trials. Through this movement, PLHAs became legitimate actors in drug development and distribution, and in this role, they were able to effectively question and impact empirical methods for ARV drug development (Epstein, 1996).

Smith and Siplon have chronicled the impact that activism has had on ARV drug access (2006). By 1999, this activism had gained a great deal of momentum and started receiving considerable media attention. For example, in March 1999, a new activist group – the Health Global Access Project (GAP) Coalition – sent members to the WTO's meeting on compulsory licensing of patents. At the time, they were also working to support the HOPE for Africa Act that would prevent the U.S. government from pressuring sub-Saharan African countries to adhere to stricter than necessary intellectual property protections (IP) under the General Agreement on Tariffs and Trade (GATT)

rules (No author, 1999). In July 1999, AIDS Treatment News reported that demonstrations were being held against Vice President Gore, who had a hand in developing patent protections (James, 1999) and subsequently interviewed Paul Boneberg with the Global AIDS Action Network, who proposed focusing activism on the U.S.'s lackluster response to AIDS (Boneberg, 1999). Eric Sawyer, co-founder of ACT UP/New York voiced a similar sentiment that trade policies should change to prioritize access to ARVs (Sawyer, 1999). In November 1999, a WTO pre-conference "Increasing Access to Essential Drugs in a Globalised Context" was hosted by Doctors Without Borders, Health Action International, and the Consumer Project on Technology. More than 350 people attended from 50 countries (D. Banta, 2000). The same year, all meetings of the WTO and the G8 were accompanied by demonstrations that pointed to the need for global fairness in free trade.

A Tipping Point

In 2000-2001, there was a tipping point in response to the problem of global ARV drug access disparities. Several of the authors referenced above have cited circumstances that resulted in increased awareness of the issue and also great increases in funding for programs to fight the HIV/AIDS epidemic through making ARVs available in developing nations. These include activism to promote social justice, competition from generic drugs, and university decisions to make drugs available.

In 2000, the United Nation's Millenium Declaration was endorsed by 189 member countries. This declaration contained eight goals, which were based on conference

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agreements throughout the 1990s. These involved efforts to reduce poverty and hunger, ill-health, and gender inequalities and to increase access to education, clean water, and environmental protections. The sixth goal specifically addressed halting and reversing the HIV/AIDS epidemic by 2015 (World Health Organization, 2007b).

In 2001, this declaration was followed-up by the establishment of the Global Fund to fight AIDS, Tuberculosis and Malaria. The Global Fund is a partnership between governments, civil society, the private sector, and affected communities to provide financing for international health projects. The Fund's 2001 goal was to provide ARVs to 1.8 million people within 5 years. As of December 1, 2005, the Global Fund reports that 384,000 people have now received ARVs as a result of their efforts (Global Fund, 2009).

Former President Bill Clinton, who had been influential in establishing the Global Fund, also established the Clinton Foundation HIV/AIDS Initiative (CHAI) in 2002. According to the Clinton Foundation, this initiative has now supplied ARVs to 415,000 people since its inception. This initiative has also been influential in reducing drug prices. Their efforts succeeded in putting together a procurement consortium that now has 58 partner countries, which facilitates the purchase of ARV drugs at reduced prices (The Clinton Foundation, 2007).

UNAIDS and the WHO launched another initiative in 2003, known as "3 x 5", the goal of which was to provide ARV drugs to 3 million people in low- and middle-income countries by 2005. By December 2003, they had reached 400,000 people, but by June

2005, they were far short of their goal, having supplied ARVs to 1 million people (World Health Organization, 2007a).

In 2003, the White House stepped up to the plate when President Bush announced the President's Emergency Plan for AIDS Relief (PEPFAR). This piece of foreign aid legislation involved spending $15 billion over 5 years to fight AIDS, tuberculosis and malaria in 15 focus countries. The goal of this effort was to provide ARVs for 2 million people. As of September 2006, 822,000 people now have access to ARVs (United States, 2008).

Although these initiatives have made big strides in providing ARV drug access, all initiatives have fallen short of their goals in providing treatment, and striking drug access disparities still exist (See Table 1 and Figure 1). In addition, these infusions of financing have changed the landscape of discussion around equitable drug access somewhat. While financing and patent protections remain an issue for drug access, debate on how to provide access is now focused more downstream. For example, health infrastructures (e.g., sufficient numbers of trained staff in health facilities, availability of laboratory equipment and supplies; efficient pharmaceutical supply and distribution services) in many countries are not prepared to deal with chronic illness. A major obstacle here is lack of human resources (Kober & Van Damme, 2004; Muula, 2004). Several authors have pointed to the need for international donors as well as within-country officials to develop more comprehensive strategies to create system-wide improvements over time as

opposed to approaching the problem of providing care for HIV without consideration to other health needs (e.g., (Kober & Van Damme, 2004).

Additional on-the-ground obstacles include lack of strong political will and government commitment to make drugs available, and inadequate demand forecasting and supply planning in countries, which results in erratic drug supplies (World Health Organization, 2005a). It is vital to have the commitment and financing of national governments so that each nation can build local infrastructure to procure drugs and make these drugs available to their populations (Chequer, et al., 2002; Teixeira, et al., 2004).

Another issue worthy of more attention is how treatment and prevention initiatives can work together to not only treat people who are HIV-positive, but also to prevent further transmission of the virus. Salomon and colleagues recently published an epidemiologic modeling paper showing that integrating prevention and treatment efforts is significantly more powerful in curbing the HIV/AIDS epidemic than prevention or treatment efforts in isolation (Salomon, et al., 2005). This is a key area to help inform current and future efforts in the context of recent efforts to roll-out ARVs. Examining the independent histories of HIV prevention and treatment efforts along with the sometimes antagonistic interactions between participants on both sides (e.g., (Marseille, Hofmann, & Kahn, 2002) may be useful to understanding current obstacles to combining treatment and prevention efforts and how to overcome these challenges.

Social Justice

Numerous recent articles have called for the importance of including and legitimizing an ethical or social justice voice in discussions of international trade and drug access. Faunce has made this argument in his analysis of Australian-U.S. trade and the UNESCO Universal Bioethics Declaration (Faunce, 2005a, 2005b; Newland, 2006) Elliott and colleagues have argued for three methods to increase drug access, which include promoting a right to health in international human rights law, implementing price controls and drug-financing mechanisms, and utilizing litigation to achieve results (Elliott, Parmar, Divan, & Berger, 2002). Slater has advocated for achieving social justice through litigation; the topic of her examination was India's drug industry's battles with multinational pharmaceutical companies (Slater & Harris, 2003).

Case studies have also been conducted examining the role of bioethics in the European Union's pharmaceutical drug market (Newland, 2006) and litigation in Venezuela using the human right to health (Torres, 2002). In 2001, a series of papers were also written examining the moral responsibility of multinational pharmaceutical companies to provide lifesaving drugs at reasonable cost (Brock, 2001; Daniels, 2001; Resnik, 2001). More recently, DeGeorge examined the impasse between the drug industry's economic and legal justifications and critical attack based on social justice reasoning (DeGeorge, 2005). Bond has also made an argument for an ethical voice in examining negative impacts of policies and programs advocated by the WHO, the World Bank, and the IMF, which are entrenched in a neoliberal paradigm (Bond & Dor, 2003). Werhane has conducted an

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historical examination of intellectual property (IP) rights and advocated for adjusting

discourse on IP to identify that innovation often involves a network of efforts and that

there is an obligation to share innovations that promote social goods (Werhane &

Gorman, 2005).

Conclusions

Two major themes woven throughout this history of international ART distribution are

efforts to promote free market ideology in the context of the social justice message that

life-saving drugs are a human right regardless of ability to pay. Several actions have been

highlighted here that seem to have increased access to ART in regions where PLHAs

were not able to pay for ART. These include: committed national and international

activism, committed governmental response, lowering drug prices through competition

with generics and increasing program financing, promoting human rights law, and

developing health infrastructures that are capable of managing a chronic disease like

HIV/AIDS.

Coming from a social justice perspective, the roll-out of ART and VCT can be taken as a

success story in terms of the sheer numbers of PLHAs worldwide who now have access

to ART regardless of their ability to pay. At the same time, access to ART in places like

Kenya was nearly a decade behind access in places like the United States due to

distribution systems based more on economic considerations than a social justice mission.

A primary message from this examination of global ART distribution over time is that

while it required much commitment from numerous actors, a more equitable distribution of ART was slowly reached.

Furthermore, while the extensive commentary and debate on international ART access was useful for creating a map of how ART was rolled out globally, there remains a lack of empirical data that examines relationships between how ART was rolled out on an international level and the increasing availability of ART on regional HIV epidemics and individual health outcomes. Several authors have argued that more information is needed in this area (e.g., Vasan, et al., 2006) There is a need for multilevel research that examines the workings of international processes like ART distribution in conjunction with health outcomes of individuals within particular regions. My dissertation project aimed to provide additional information in this area by using a social ecological model to link global efforts to roll-out ART (and VCT in parallel with ART) to individual behaviors and HIV status among two populations of young women in Kisumu, Kenya.

Furthermore, my models pointed to the importance of taking a more nuanced perspective on equitable global distribution of resources that also looks upstream accessing HIV services to broad basics such as education and poverty (socio-structural leverage points) to promote equitable health outcomes. My models examined the importance of changes in the availability of VCT and ART on sexual behaviors and HIV status, but also went further to look at additional socio-structural leverage points that contributed to young women's HIV status over time.

The lack of an empirical research focus linking international dynamics with individual health outcomes may be an historical artifact resulting from a focus on place that is now in the process of changing as the development and distribution of resources becomes increasingly international while the health outcomes of individuals remain more rooted within particular locales. In the next two sections, I review theories on globalization and state power as a way of developing a theoretical perspective on international and local contestations surrounding drug access described in this review of ART distribution milestones, which, in turn, sets the stage for understanding how VCT and ART became available to young women in Kisumu, Kenya between 1997 and 2006..

Globalization

> *Just as earlier sociologists faced the challenge of contributing to the establishment of national societies, so contemporary sociologists face the challenge of contributing to the understanding and the building of a global society. Finding a satisfying and indeed practical definition for a word that describes those processes should be at the heart of contemporary sociology (Van Der Bly, 2005).*

Definitions

"Globalization" is a difficult term to define because of its widespread and varied use by journalists and politicians, business theorists, and more recently, academics. Van Der Bly calls the use of the term "A Triumph of Ambiguity" (2005). She and others (Kiely, 2005;

Rosenberg, 2005) argue that while globalization is an important concept in the social sciences, the lack of clarity associated with its usage hinders empirical research in the social sciences on the topic.

To simplify – and perhaps over-simplify – the situation, Scholte (2000) has collapsed a variety of definitions into five, broad descriptions. First, globalization is internationalization. As countries communicate and trade with each other, their international relationships become "globalized". In other words, globalization is the process of national economies and identities ultimately becoming subordinate to a transcendent global network of transactions and regulations. There has been considerable debate on this possible trajectory of globalization, which will be explored more below.

Some theorists use terms like "internationalization", "multinational", "transnational", and "globalization" interchangeably. However, others like Hirst and Thompson (1999) and Hatzichronoglou (1999) distinguish among these terms. To them, "international" and "multinational" refer to organizations that maintain a national identity while communicating and trading with organizations in other nations. "Transnational" refers to an entity that no longer has a national identity, management, or regulations based within a particular nation. Discussions of globalization as internationalization tend to focus on business transactions, financial markets and politics (e.g. global governance); however, this definition applies to the internationalization of cultures as well.

Second, globalization is universalization. It is the spread of products, knowledge, and technology to all people in the world. A few examples of globalization as a universalizing process could include the distribution of brand-name products like Coca-Cola, perhaps health care workers' knowledge of how to prevent and treat HIV/AIDS, and internet access. This definition associates globalization with increased uniformity and homogenization among people that will ultimately lead to a global society; thus, this definition has an obvious overlap with the definition of globalization as transnationalization (definition 1). Globalization as a process of universalization implies increased economic as well as cultural and political interrelatedness and conformity.

Third, globalization can be viewed as a process of westernization[1] in which western products such as capitalism, rationalism, and industrialism are distributed throughout the world, replacing local economic, political, and cultural structures. Globalization as westernization pegs globalization as a top-down, deterministic process that nations, communities, and individuals have no power to resist. While many theorists would agree that current globalization processes are dominated by western powers, several also point out that both historically and at present, globalization is much more than just an expansion of western power (Giddens, 1999; Sen, 2002).

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[1] The term "westernization" is problematic in that it is an over-simplification, creating an extremely rough division between the "west" and the rest. The term itself is an indication of the acceptance of "western" global dominance both in terms of colonialism and now in the spread of neoliberalism.

Fourth, globalization is the spread of supraterritoriality. In other words, globalization is the increased disconnect between social space and geographic space. Appadurai (1996) describes such disjunctures between economy, culture, and politics as "-scapes" (e.g., ethnoscapes, mediascapes, etc.) "to point to the fluid, irregular shapes of these landscapes" (p. 33), implying complex intermingling of histories and perspectives and physical spaces. Consequently, even though products or media may be known globally, there can be incredible variation in how these items are perceived, used, and integrated with existing cultural norms to the extent that unique "-scapes" are created.

Estes and Phillipson (2002) also describe globalization as a complex process involving contestation between social and geographic space, this time between states and international pressures. Political, economic, and cultural contestation within and between nation states and international organizations raises questions regarding conceptions that tie individuals to a geographic place such as the conception of "citizens" and their expected social rights.

While Giddens, an advocate of this definition, tends to focus on economic globalization, he also stresses that it is "a basic mistake to treat globalisation as solely or even primarily economic. The economic marketplace is certainly one of the driving agencies of intensifying globalisation, but globalisation is not primarily economic in and of itself. Globalisation refers to a set of changes, not a single dimensional change. Many of these changes are social, cultural and political, rather than purely economic, and one of the

main drivers in addition to the global marketplace is something partly separable from it, which is the communications revolution" (1999).

Fifth, globalization is a liberalizing process to the extent that it is viewed as being synonymous with the removal of restrictions on trade and capital. In other words, globalization can be described as an economic neoliberal ideology – an orientation toward free trade policies that promote the opening up of economies to international trade, investment and finance. For the most part, economists agree on this definition of globalization to explore how globalization leads to poverty reduction and economic stimulation (Khor, 2001; Van Der Bly, 2005; World Bank, 2001).

While some argue that neoliberalism has promoted economic growth and has decreased poverty, others vehemently disagree and can provide data to indicate that neoliberalism has increased disparities between rich and poor. Globalization as neoliberalism will be explored more below as some perspectives on globalization such as those of radicals and neo-Marxists have developed as criticisms of neoliberalism and see global governance as a convenient way for the United States to exert its dominance to promote global, corporate capitalism (Gowan, 2001; D. Held & McGrew, 2002).

These five, general categories of globalization definitions illustrate the breadth with which the term is used. Each category is not mutually exclusive. Rather, the categorizations are useful in outlining various facets of globalization that each contribute to a more complete and complex representation of globalization (Scholte, 2000). Taken

together, these definitions of globalization all point to processes of opposing tendencies –

a tug-of-war between economic, political, and cultural interests both across and within

regions. While top-down globalization in the form of westernization or neoliberalism

appears deterministic, a bottom-up approach reveals local agency to resist pressures to

homogenize or to eliminate social welfare systems (e.g., through implementation of state

policies). While the communications revolution opens the door to the possibility of a

global society wherein people in all corners of the world participate in the same economy

and readily share information with each other – perhaps even in the same language – it

also sets the stage for increasing regional heterogeneity as a local response to conformity

pressures. Further, these definitions bring up political questions such as who are the

participants in globalization, however defined, and who is excluded, both from

participating in creating global processes and benefiting from its outcomes. Through the

neo-Marxist literature here and in the next chapter, I will argue that examining these

contestations as class antagonism is important to understanding what is going on.

Globalization refers broadly to dynamics of societal change as people from around the

world communicate with each other. However, this statement also sets up a fundamental

debate among globalization researchers. Some argue that globalization is nothing new;

the exchange of resources and knowledge occurring today is a continuation of world-

wide exchanges that occurred thousands of years ago (Hirst & Thompson, 1999; Sen,

2002). Thus, globalization in this sense distracts from the actual forces shaping society

today. Others stress that globalization is a unique process currently because of its scale

and that it will ultimately transform basic social institutions like the state (D. Held & McGrew, 2002; D. Held, McGrew, A.G., Goldblatt, D. & Perraton, J., 1999).

From Globalists to Skeptics

> *As economic, social and political activities increasingly transcend regions and national frontiers, a direct challenge is mounted to the territorial principle which underpins the modern state (D. Held & McGrew, 2002).*

David Held and his collaborators have labeled two globalization perspectives that form two exteme poles of thinking on globalization (D. Held, McGrew, A.G., Goldblatt, D. & Perraton, J., 1999). At one end of the spectrum are the "globalists". Held and Giddens (Giddens, 1999) site the Japanese business writer Kenichi Ohmae as a pure example of a globalist. Ohmae argues that the era of the nation state is being subsumed by the rise of the global economy, and the state does not have the power to resist globalization. Giddens has also been cited as "the main sociological advocate of 'globalization theory'" (Kiely, 2005). He writes that, "The dominant feature of our time is the intensified economic interdependence and intensified competition that all economies must now enter into on a global level" (Giddens, 1999). From this perspective, globalization constitutes a significant transformation, and as these processes mature, they will result in basic institutions that are a striking departure from the institutions we know today.

Globalists take an historical approach to examine distinctive organizational forms over long periods of time. New modes of social organization are currently developing as

space/time constraints diminish due to technological advances. These transformations

involve changes in socio-economic organization, territorial principle, and power. Central

to this perspective is a concern with power – "its instrumentalities, configuration,

distribution, and impacts. Globalization is taken to express the expanding scale on which

power is organized and exercised" (D. Held & McGrew, 2002).

In contrast, the "skeptics" are those who perceive globalization to be much more about

ideology than reality. According to the skeptics, globalization is a myth. While they

would agree with the globalists that the world is becoming more interrelated, skeptics

argue that the exchanges occurring between people around the globe today are no

different from those occurring in the past.

From this perspective, globalization is generally defined as a politically-motivated

movement to remove social welfare policies and restrictions on trade under the rubric of

facilitating competition in a global economy (Estes & Phillipson, 2002).

Skeptics argue that, in reality, globalization does not have the power to change the role of

nation states; therefore, globalization itself does not lead causally to a reduction of the

welfare state or to increasing disparities between people who are engaged in the global

economy and those who are not. Rather, it is nation states' political responses to a belief

in the legitimacy of neoliberalism that leads to decreases in the safety net for citizens in

individual nations (Estes & Phillipson, 2002; Navarro, 1999).

The power of globalization as a neoliberal ideology is that it brings the promise of

increased resources, knowledge, and power for all citizens in nations that successfully

compete in the global marketplace. This ideology has gained momentum as more people

have jumped on this bandwagon. Harvey (2005), in his history of neoliberalism, has

argued that this ideology became dominant in the late 1970s and early 1980s because it

appealed to our valuation of and desire for human dignity and individual freedom.

Kiely (2005), reiterating Rosenberg's (2005) distinction between "Globalization Theory"

and a "theory of globalization", explains that giving globalization causality is erroneous.

Discourses of globalization as "Globalization Theory" are complicit with neoliberal

agendas. As such, globalization is nothing more than a neoliberal version of

modernization theory, which hypothesizes that nation states are on similar trajectories of

development, and less developed nations can become more developed by emulating and

having contact with more developed countries. In a similar vein, Van Der Bly (2005) has

argued that sociologists need to define globalization more clearly so that agency can be

brought back into the equation and so that sociologists can create maps of current

globalization processes in contrast to focusing on what she terms "futurology".

Instead of improving global access to basic resources, critical analyses of neoliberalism

have uncovered a different trend. Governments' decisions to reduce trade restrictions has

led to increasing disparity between individuals who have directly benefited from free

exchange and those who have lost income and health benefits as a result of these same

policy changes. While the elite few have gained from this type of globalization, the

majority seems to have suffered (Motchane, 2003; Navarro, 1999, 2004; Ollila &
Koivusalo, 2002).

Again, in pointing to older development theories, Kiely (2005) has identified
underdevelopment theory as a more realistic way to understand globalization today.
According to this theory, the development of the West was premised on the exploitation
of the rest of the world. Consequently, international contact did not aid development
(Amin, 1990; Caldwell, 1977; Frank, 1974). Rather, the world can be divided into core
and periphery, and Kiely (2005) explains that "this has enormous implications for
understanding contemporary globalization" (903). The problem with globalization is that
it maintains and expands historically elite groups' access to resources while substantial
portions of the world are excluded from globalization's benefits. In this regard,
globalization is nothing new. It is an extension, on a massive scale, of historical
inequities.

Sen (2002) has described current globalization processes as a continuation of more than a
millennium of east-west exchanges. He has focused on distribution problems of
globalization, indicating that the state maintains its role to regulate the distribution of
globalization benefits. According to Sen, globalization as neoliberalism and as
transcendent of any local government is not based in reality.

> *The market economy does not work by itself in global relations – indeed, it cannot*
> *operate alone even within a given country. It is not only the case that a market-*

inclusive system can generate very distinct results depending on various enabling

conditions (such as how physical resources are distributed, how human resources

are developed, what rules of business relations prevail, what social-security

arrangements are in place and so on). These enabling conditions themselves

depend critically on economic, social, and political institutions that operate

nationally and globally (4).

Likewise, Hirst and Thompson (1999) have argued against the idea that there is a

genuinely global economy in the making. (They define "global economy" as a situation

where national economies have become subsumed into a higher-order network of

international regulations and exchange.) Their analysis indicates an alternate model in

which national economies and policies drive performance of the international economy as

opposed to the other way around. Carr (1981), Estes & Phillipson (2002), Hoogvelt

(1997, 2001), Navarro (1999), and Weiss (1998) have also made similar skeptical/critical

arguments.

Although a broad distinction between globalists and skeptics may be helpful as a starting

point from the political science literature, few theorists can be placed at either pole and

other theorists have examined issues in globalization with a more nuanced voice. For

example, Sassen (2000) describes "a new geography of centers and margins" (82).

Regions and cities are global power centers to the extent that non-mobile processes of

globalization (e.g. telecommunications facilities) are tied to these cities and export

processing zones. These cities amass a "disproportionate share of corporate power" (91)

as well as disadvantaged people, many of whom have immigrated to find work. Consequently, personal identities as citizens of nation-states loosen. In addition, disparities grow between people who work in valued sectors in global cities and low-wage workers who also play an important, although primarily invisible role in globalization processes. Unlike Ohmae, however, the more moderate conclusion in Sassen's work is that the roles of marginalized people in globalization processes require more visibility; state policies could counter-act trends toward increasing stratification despite increasing power focused in global cities.

The majority of globalization researchers make arguments that are on a globalist/skeptic continuum, arguing that the world is becoming more interrelated. While technological advances allow for more rapid communication across geographic space, institutions such as the state have not lost their agency to participate in these changes. "The dispute between globalists and skeptics was not about the reality of change; it [was] about the nature and significance of the changes underway as well as the driving forces behind them" (Weiss, 1998).

Outcomes of Neoliberalism

Even though there is a general consensus that the absolute income gap between the world's richest and poorest nation states is at an historically high point, neoliberal globalists have made the argument that the global economy is improving. They back up

this point with data that indicates that the relative income gap[2] is narrowing (UNDP, 2001; Wade & Wolf, 2002; World Bank, 2001) and absolute poverty is declining (Wolf, 2002).

In contrast, critical globalists argue that this perspective is distorted. Poverty and inequality are becoming worse because the resources attributed to neoliberalism are spread unevenly both across and within nation states (D. Held & McGrew, 2002). As a result, the world is now organized, not on formerly geographic divisions, but as winners and losers of globalization (Castells, 1998; Hoogvelt, 2001).

Navarro (1999, 2004) has argued that globalization as a neoliberal ideology has worked to lift trade restrictions and to reduce welfare in states because of international alliances between dominant classes. Policies advocated for and implemented by agencies such as the International Monetary Fund (IMF), the World Bank and the World Health Organization (WHO), which represent these dominant classes, have led to increasing disparities between class groups.

Weisbrot and colleagues (2002) provide empirical evidence to support this trend. They examined trends in economies, health, education, and literacy during two periods: 1960 – 1980 and 1980 – 2000. The latter period was operationalized as a period of globalization

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[2] "The difference between the income of the typical individual and world average income, calculated as a percentage of the latter" (Held & McGrew, 2002: 79).

in that trade restrictions were lifted during this period. Weisbrot's data broadly indicate

that globalization has led to policy changes that have not benefited developing countries,

and they argue that policymakers should consider alternate development strategies. As

two examples, the average yearly change in life expectancy at birth (in years) and in the

literacy rate (in percentage points) was greater during the earlier time period.

Political Perspectives on Promoting Equitable Resource Distribution

Globalists and skeptics disagree regarding what should be done within the current

neoliberal political context to promote equitable distribution of globalization's resources.

Held and McGrew (2002) outline seven political perspectives that span the

globalist/skeptic continuum. On one end, of course, are neoliberals who argue for

weakening nation-state organizations and deregulating markets under the guiding

principle of individual liberty. On the other end are radicals who, prioritizing a common

good, argue for bottom-up social movements to create social change in local communities

and subnational regions. Between these two poles are liberal internationalists,

institutional reformers, global transformers, and statists/protectionists. These perspectives

propose various reforms including transparent international governance, widening

political participation, strengthening global governance, and strengthening nation-state

governance (See Table 8.1 in Held & McGrew, 2002: 116-117).

Numerous globalists and skeptics alike are critical of the removal of agency from

conceptions of globalization as an unstoppable neoliberal force. These perspectives argue

for agency and the importance of place in shaping the outcomes of globalization

processes. Like Sassen (2000), Navarro has described globalization as a "specific form of internationalization that responds to specific financial and economic interests that are articulated in the class relations of each society" (Navarro, 1999, p. 220), but "politics still matters" (Navarro, Schmitt, & Astudillo, 2004). He argues that the impact of neoliberalism on different countries' welfare states depends on the politics within each country. It is not the case that globalization necessarily forces states to reduce support for their citizens' welfare. Estes and Phillipson (2002) make a similar argument.

Navarro and colleagues (2004) used typologies to classify countries and then examined trends in four types of countries' welfare states between the 1970s and 1990s. Their analysis indicates that, for the most part, countries maintained the social welfare characteristics across the period. This result provides evidence for the power of within-country politics, despite pressures to adopt neoliberal strategies to compete in a global economy. (Navarro, 2000; Navarro, et al., 2004).

Additionally, Navarro (1998) provides evidence that regionalization and not globalization of economies is occurring. In other words, the bulk of multinational corporations' production and sales occur in their home countries. At most, 20% of multinational corporations' sales occur outside their home region. Likewise, Busfield (2003) questions whether "globalization" is an appropriate term in describing the direction the pharmaceutical industry is taking. Her research indicates that the industry is dominated by a few multinational corporations based in either the United States or Europe that also focus their distribution in industrialized nations. As a consequence of mergers in the

1990s, this dominance has become even more pronounced, with fewer companies controlling a larger share of the industry. In this way, Busfield seems to agree with Navarro that, first, "globalization" is somewhat of a misnomer. She suggests using other terms such as "internationalization", "multinationalization" or "westernization" to describe trends in the pharmaceutical industry. "Regionalism" could definitely be added to this list.

Second, Busfield's description of the trajectory the industry is taking mirrors Navarro's class-based perspective on globalization. Companies are less likely to focus distribution in developing countries because prospective profits are higher in industrialized nations, and international alliances are alliances among the elite in each country. Thus, elite classes control business decisions, which lead to unequal distribution of the benefits of medicines.

Knoke and colleagues' (2002) network analysis of alliances in the global information sector adds weight to Navarro and Busfield's arguments that in reality, globalization may be a process much more about regional alliances than about a theorized global communication and trade network. Knoke's data indicate that between 1991 and 2000, networks became more differentiated and more regionally-focused. Thus, data refute his own globalization hypothesis that over time, organizations from different nations would create a stable network of alliances that composed the core of the global information sector.

Held and McGrew (2002) attempt to consider many of these arguments by proposing "cosmopolitan social democracy" (118), which involves applying values of social democracy - "the rule of law, political equality, democratic politics, social justice, social solidarity, and economic effectiveness" (118)– to the increasingly global organization of economics and politics. Even though Rosenberg (2005) claims that globalization as a zeitgeist is already dead, these authors argue that more can be said about globalization than has been so far.

Conclusions

There are strengths and weaknesses in the variety of perspectives presented here. While the perspectives provide useful frameworks for analyzing processes of globalization as complex and dynamic interactions, a primary weakness is an absence of agency and a need to develop this empirically in perspectives on global power contestation. "The locus of effective political power can no longer be assumed to be simply national governments – effective power is shared and bartered by diverse forces and agencies at national, regional and international levels. All parties agree on this" (Held & McGrew, 2002: 123). In other words, theorists point to a transformation of power that will not eliminate the power of the nation-state, but is reorganizing it on a global level such that the state power is both expanding and contracting. "Globalization, in this account, is associated with a transformation or an 'unbundling' of the relationship between sovereignty, territoriality and political power" (Ruggie, 1993; Sassen, 1996). Current global organization is "highly complex, interconnected and contested" (Held & McGrew, 2002: 130). In this order, nation-states are one layer in a multilayered system of regional and global governance

among other states and non-governmental organizations, which are involved in complex contestations of power.

One method to describe global power contestations is to examine a particular issue like international ART distribution. A case study approach may help develop a map of the actors involved in decision-making as well as historical contexts that have created and enabled particular systems and outcomes. It also allows for tests of various perspectives on globalization.

Diverse forces have been involved in developing and distributing drugs to treat HIV/AIDS. On an international level, there are organizations like the UN, the WTO and the World Bank. On the other hand, there have also been grassroots efforts to increase ARV drug access. None of the actors in this environment, however, exist in a simple dualistic environment of international or local. The international organizations have ties to particular regions and nation states, with nations such as the United States and the United Kingdom being centrally involved with the creation of organizations like the UN, the WTO, and the World Bank. These powerful nation states are also the sites of most of the pharmaceuticals industry producing ART and compose the majority of the drug market. Effective local actions to increase drug access have also become international movements as is evident from the 1999 WTO protests as one example.

What is clear from this review of ART distribution is that globalization is both top-down and bottom-up. It is complex, and as mediators of international movements like

neoliberalism, nation states can be powerful players in making ART available to their populations. Brazil is an access success story made possible by strong national commitment to providing ART through making decisions rooted in social justice considerations. On the other hand, it is also clear that even though it enacted a $15 billion foreign aid package (PEPFAR), the U.S. also used its power to shape drug access policy to benefit its domestic drug industry. While there are arguments within the globalization literature on the power of the state in a global context, the case of ART distribution lends credibility to a perspective that the nation state is both powerful and dynamic since it contributes to globalization but is also shaped by it.

Similarly, place matters. Globalization occurs in local contexts. Nation states, defined traditionally with geographic borders, have global roles. The U.S. and the U.K., because they are the sites of most of the world's drug development, have been powerful actors along with the pharmaceuticals industry in regulating nationally and internationally how drugs are both developed and distributed. The importance of place is especially evident in the brand-name/generics debate with generic producers primarily in India – and outside the expected industry region – coming on the scene as a new force helping set the terms of distribution. This led to contestation not only on the basis of drug price negotiation, but due to a new region entering the drug development and distribution arena.

Place also matters in the case of brand-name ART distribution. These drugs have been more available in areas with strong economic markets since they come out of an industry that invested in developing the drugs with the purpose of earning a profit. Likewise,

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debate over intellectual property protections and international trade agreements also reflected place since they tended to favor economically the suppliers of resources like ART even though need was and continues to be global.

An examination of the history of ART distribution also provides evidence that class analyses are an important way to examine agency in processes of globalization like resource distribution. Access has spread from industrialized nations to non-industrialized nations with a major factor in access being ability to pay. In this context, it is quite straightforward to apply the idea of a new type of social stratification as a winner or loser of globalization. Not only has there been a clear diffusion of ART first to people who can pay market prices and then much later to people who can't afford to pay, the winners of globalization – the elite class of people from each country – are also the people actively involved in policy-making within organizations such as the U.S. government, the WTO and the UN. From this perspective, it is unsurprising that the distribution of ART looks the way it does today with substantially more drug access in regions where there are strong markets.

Finally, defining globalization as neoliberalism is a useful means of framing global negotiations over making ART available to all who need them. It speaks to global policy-making done by international organizations such as the World Trade Association (WTO) and the WHO that intrudes upon domestic policy. It also speaks to international domination by a few powerful states such as the United States that steer these internationational organizations to create global policy. For example, several authors

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have criticized the World Health Organization (WHO) directly for the slowdown of progress in developing countries. Ollila and Koivusalo (2002) argue that the World Health Report 2000's recommendations were less based on empirical evidence than on ideology. They, like Motchane (2003), show that the World Health Organization is caught up in a movement to transmit privatization and market dominance from developed to developing countries. Motchane (2003) highlights how the WHO, through faith in a neoliberal ideology, has sided with pharmaceutical companies to the detriment of developing nations' citizens, even though funding from the private sector composes only a small proportion of the WHO's overall budget.

These authors make an important point. Globalization players like the WHO, the World Bank, and the International Monetary Fund are promoters of neoliberal policies around the globe, in some cases for their own benefit and the benefit of their funders. These analyses provide support for Sen's (2002) concern about benefit distribution inequities and Navarro's (2000) argument that globalization is about class struggles. The strong voices are the ones who stand to benefit most from the types of globalization processes that they implement.

At the same time, these actors have been held in check by grassroots movements and NGOs like Doctors Without Borders that have successfully countered neoliberal ideals with social justice perspectives. As an effective political force, these movements have raised awareness of inequities in ART access and have motivated the pharmaceutical industry to lower their costs and create flexibilities in intellectual property protections,

the generic drug industry to put low-cost drugs on the market, and governments and international organizations to increase financing for drug treatment programs worldwide.

Murphy (2000) argues that the primary stage where "struggles over wealth, power, and knowledge are taking place" is the current system of global governance (D. Held & McGrew, 2002). Since globalization as neoliberalism is tied directly to developing and marketing resources, I have found this definition to be the most relevant to my work examining distribution patterns of ART. In the following section, I focus on this definition and work that critically responds to a neoliberal agenda in exploring the context for continued inequities in who has access to these drugs, and furthermore, health outcomes among those with increasing access to both ART and HIV prevention programs.

State Power

In the following section, I argue, as other researchers also have (e.g., Aronowitz & Bratsis, 2002) that a closer examination of state power is important to shed light on complex contestations for power in a global context. As is evident in the previous chapter, globalization research is an attempt to go beyond the traditional borders of the nation-state to explain social organization. At the same time, these researchers have taken contradictory viewpoints on nation-states' power and roles as borders have become increasingly permeated, and some state theorists have argued that a weakness of this literature is that the state has not been adequately theorized.

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Here, I first describe several reasons why a look at state theory may be important in a context of examining global ART distribution. Then, I focus on neo-Marxist perspectives on state power as particularly relevant. Finally, I explore some current and future directions for research in this area and point to a few limitations.

The Importance of State Theory in a Global Context

There are several reasons why it is useful to draw upon theories of state power in conjunction with theories of globalization when examining an issue such as global access to antiretroviral drugs and ultimately health outcomes of populations. First, several researchers have pointed out that the state continues to be "a mainstay of global relations" (Aronowitz & Bratsis, 2002 xxi) and "[q]uantitatively, the growth of the state, from the size of its budget to the scope of its jurisdiction, is one of the few really uncontested facts of the last century" (D. Held & McGrew, 2002, p. 9). At the same time, the idea of the modern state, which relied on a correspondence between a bounded territory and legitimacy to sovereign power over the area, is relatively new, dating back to the eighteenth and nineteenth centuries in Western Europe and its colonies (D. Held, 1995; Skinner, 1978).

The expansion of the modern state continued through the 1990s as a result of decolonization and the development of systems of international coordination based upon economic interests in addition to collective cultural and social identities. The nation state's relationship to international coordination can be traced back to the Peace of

Westphalia of 1648. However, it was not until the early nineteenth century that this order resulted in norms in international law rooted in "territorial sovereignty, the formal equality of states, non-intervention in the internal affairs of other recognized states, and state consent as the foundation stone of international legal agreement" (Crawford & Marks, 1998; D. Held & McGrew, 2002, p. 11). The state appears to have risen to power over time as the result of expansions of similar systems of organization that recognized each other and could communicate internationally to govern discrete territories.

Second, as is evident in the previous chapter, theories of globalization speak directly to views on state power. Some theorists argue that globalization processes are transforming state power as territorial boundaries become less clear, while others propose that globalization is indicative of historical power struggles, and the nation-state maintains a vital function to control international pressures. Others, such as Brenner (1999), have pushed the dichotomy of a strong state vs. a weak state further by pointing to a need to go beyond such dualism to broaden conceptions of the state and to examine relationships between states and global economies. Understanding dynamic roles of states in a global context may aid in understanding what "globalization" means and also how social justice can be promoted in this context.

Third, the review of the literature on ART distribution and access indicates that while there are numerous players in the international arena and on the ground, the politics and policies of nation-state governments have and continue to play a clear role in making these drugs available. As I explained in more detail earlier, the governments of Brazil and

Uganda have succeeded in making these drugs available to their populations through long-term dedicated efforts. The U.S. has also shown its power in dictating policy that in some cases, has served to protect the interests of the pharmaceutical industry based within its borders.

Fourth, all varieties of state theory attempt to explain "the social foundations and dominating effects of political power" (Aronowitz & Bratsis, 2002, p. xiii), which is also the primary purpose of this examination of disparities in access to ARVs. As Aronowitz and Bratsis have argued, state theory is more important than ever in a context where neoliberalism is accepted and where political debates are presented as increasingly technical and dissociated from social agency and class antagonisms. State theory can give voice to real contestations for power in current systems that may not be so visible otherwise.

Neo-Marxist perspectives on state power may be especially useful because these perspectives point to capitalist production and accumulation and class conflict as keys to explaining these institutions and the practices that constitute them. The importance of production and economic interests is clear in the review of ARV distribution where access to these drugs was strikingly better in locations where there were strong economic markets for these drugs. In addition, it is also apparent that class conflict in the shape of winners vs. losers of neoliberalism has shaped outcomes of ARV distribution. Perhaps this is clearest through the 1999 WTO demonstrations in Seattle, which have also been cited elsewhere as an example of class agency to struggle against capital as well as an

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example of how nation-state mediation maintains power in such international movements (Aronowitz & Bratsis, 2002, p. xxi).

In this section, I start by describing several neo-Marxist conceptions of the state. Then, I conclude by beginning to explore how this literature, combined with globalization research can be used to understand the landscape of international ART distribution and ultimately, variable health outcomes of different populations.

Neo-Marxist State Theories

Aronowitz and Bratsis (2002) explain in their introduction that in the 1970s, state theory received substantial amounts of attention, but the popularity for such investigations had waned by the late 1980s. These authors argue that the quick rise and fall of state theory was due to its connection to political strategy. State theory was given substantial attention by political movements such as Eurocommunism in the 1970s, and as attention to state theory waned, political discourse also became more distanced from social agency. "The popularity and decline of state theory are directly related to the vicissitudes of class struggles and political conditions" (p. xiv). At the same time, though, Block, Therborn, Offe, Wolfe, O'Connor and others continued this debate throughout the 1980s, and Skocpol and other neo-realists who presented a Weberian conception of the state as an autonomous social actor challenged Marxist perspectives (Block, 1987; O'Connor, 1973; Offe, 1984; Skocpol, 1979; Therborn, 1987; Wolfe, 1977). By the late 1980s, the focus had turned to explaining "differential national development outcomes in the world economy" (Robinson, 2001 p. 190).

Current Marxist perspectives on the states have their roots in debates between Miliband and Poulantzas in the 1970s and 1980s. Miliband (1969) presented an instrumentalist Marxist perspective in which he viewed the state as an institution in service of the capitalist class due to their powerful political organization. Alternatively, Poulantzas presented a functional/structuralist viewpoint, claiming that the state does not serve the interests of any one class, but acts to protect capitalist modes of production and fragments working class movements (1978). Both researchers' perspectives focused on political power in contrast to a pluralist perspective or an approach that treats the state as independent of society (Aronowitz & Bratsis, 2002).

In line with Poulantzas' arguments, Habermas and Offe have pointed to crisis tendencies of capitalist systems. Habermas conceptualizes the state in advanced capitalism as an entity that not only allows capitalism to proceed, but "makes the accumulation of capital the substance of political planning" (1975, p. 46). Accordingly, Offe argues that the state in late capitalism (in which the state intervenes and is implicated in processes of production as opposed to a liberal-capitalist state in which the state does not interfere) is prone to crisis as it attempts to balance a capitalist economy against resultant processes of socialization (Offe, 1984).

The success of the state to avert crisis depends upon how three state subsystems are related or insulated from each other: the economic system, the political/administrative system, and the normative (legitimation) system. The state is prone to political crisis

because it is involved with cleaning up dysfunctional consequences of private production to maintain legitimacy while at the same time trying not to infringe on private production (Offe, 1984).

Habermas adds that the state pays attention to dysfunctional consequences that have elicited "politically effective reactions on the part of individual capital grouping, organized labor, or other organized groups" (1975, p. 54). Economic crisis tendencies tend to be output and not input crises involving the distribution of burdens and rewards in line with the values of the system, or in line with what is perceived as fair under a legitimate state system (Habermas, 1975, p. 45). When disparities become too large, economic crisis can lead to a socio-cultural crisis or withdrawal of legitimation from a state system that does not adequately regulate such inequities.

Habermas also points to what he terms class compromise, a situation in which class consciousness has become fragmented as the consequences of capitalism have been spread across new groups (e.g., consumers) or natural groups lacking organization. This structure "makes (almost) everyone at the same time both a participant and a victim. Of course, with the clearly (and increasingly) unequal distribution of wealth and power, it is important to distinguish between those belonging more to one than the other category" (Habermas, 1975, p. 39). As the state intervenes to maintain legitimacy, crisis tendencies shift into the administrative system since the economic system is no longer mediated only by market forces. Thus, class domination depends increasingly on "factual constellations

of power" (Habermas, 1975, p. 68) that direct how to distribute surplus in the public sector, and by extension, constitute the terms of class compromise.

Alford and Friedland (1985) examined three different perspectives on the state: the pluralist, the managerial/organizational, and class/Marxist perspective. These authors analyzed literature from each of these perspectives and argued that each leads to a useful level of analysis. They emphasize this point by linking each perspective to one of Lukes' dimensions of power. A one-dimensional view of power focuses on individual decision-making, while a two-dimensional view incorporates who has control over the agenda of politics. The third dimension of power broadens to consider power relationships in the absence of political conflict or power as hegemony or historical condition. In other words, this dimension takes into account social arrangements or interests of populations that have not been shaped by political participation. In pointing to these three levels, Alford and Friedland argue that each is involved in every political situation to a greater or lesser degree and should be considered in turn to completely understand the situation.

In Aronowitz and Bratsis's book, Paradigm Lost (2002), numerous authors have both expanded upon this earlier work and examined ways in which more work should be done. Echoing Alford and Friedland's sentiment, Panitch has argued that we should go beyond the Miliband vs. Poulantzas debate because we not only need to understand relationships between classes and state institutions, but we need to increase our awareness of how state structures impact state actions in order to develop projects that promote egalitarianism. Kalyvas and Aronowitz point to the rule of law as one organizing feature of the modern

capitalist state that deserves more attention and is increasingly important not only within a state structure but in an international context, as is evident from the previous discussion of international trade agreements. Jessop has extended Poulantzas' perspective by examining how relationships between states have changed since the 1970s due to a wider range of participants and more levels of territorial organization. These changes have caused a switch from government to international governance, although nation-states maintain their role of promoting social cohesion within geographic boundaries. Finally, Tsoukalas points to the state's pressing ideological crisis to legitimize increasing power asymmetries between capital and labor in a globalized context.

It seems that the major consensus in recent analyses of state power is that first, the state is not disappearing. Rather, it is being transformed and distanced from particular geographic spaces. Second, the ways in which states are being reconfigured relate to processes of globalization, and these should not be approached dualistically.

Brenner begins his analysis of the state in a globalized context by pointing to the proliferation of globalization research that points to the importance of new geographic spaces, and at the same time, the tradition of bounding social analysis within conceptions of a territorialized nation-state. "[S]pace no longer appears as a static platform of social relations, but rather as one of their constitutive dimensions, itself historically produced, reconfigured, and transformed" (Brenner, 1999, p. 40) . He attempts to go beyond "state-centric epistemologies" as a unifying theme in globalization research, and he advises

researchers to consider the state as simultaneously "a site, medium, and agent of globalization" (p. 41).

In arguing for a reconceptualization of state territorialism and political space, he stresses the importance of thinking dialectically – to consider territory as both static and as historically changeable. He explains that social scientists should look beyond conceiving of state transformation either as a movement toward global territorialization or as deterritorialization in which flows are borderless. Rather, theorization on globalization and the state should be approached as "a multi-scalar restructuring of capitalist territorial organization" (p. 68).

MacLeod (2001) agrees with Held and McGrew (2002) that the nation state was taken-for-granted as the natural organization of social and economic regulation until recently. Now, however, the state is facing challenges to its power due to globalization and regionalism as a means of economic governance. Consequently, political economic spaces are increasingly being contested and re-territorialized (Brenner, 1999; Cameron & Palan, 1999; N. Smith, 1992; Swyngedouw, 1997). Citing Boyer and Hollingsworth, MacLeod describes what is going on today as "'a complex intertwining of institutions at all levels of the world, from the global arena to the regional level', with no single hegemonic authority and with causality running in virtually all directions and among all levels of society" (Boyer & Hollingsworth, 1997, p. 470). Jessop (1994, 1999) has explained that the state is being "hollowed out", but no level in the complex has yet stepped up to take on a role of metagovernance.

However even though roles of the state are changing with globalization processes, MacLeod argues that the state has not lost its importance or power as it is being reshaped. Rather, it still serves a vital role as mediator: to regulate and thus to aid in capital accumulation (Cameron & Palan, 1999, p. 280). And city centers and regions have become strategic sites for these activities, not as exclusive levels of organization, but "as densely superimposed, interdependent forms of territorial organization" (Brenner, 1999, p. 433).

Burnham (2001) points to class antagonism relating to modes of production as vital to making sense of state power in a globalized context. He argues that class antagonisms make capitalism a fragile process, and more importantly, a concept like "state" is not static. He conceptualizes the state as being a dynamic form that results from social relations, which the state, in turn, regulates.

In a globalized context, it is necessary to switch the focus from a capitalist state form to thinking about nation states as political nodes in global flows of capital. In other words, flows of capital and modes of production on a global scale give roles to regions, which then lead to particular relationships of exploitation and thus varying forms of state structures that attempt to make production and accumulation as efficient as possible. This conception of the state is similar to Poulantzas' in that he viewed states as power relations between classes and not necessarily tied to a particular territory (Tabak, 1999).

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Robinson (2001) also points to the importance of history, both in examining the limitations of social theory to go beyond the nation state and to underscore the historic relativity of the form of the nation state. He argues that the nation state and the state can be different concepts; in fact, we need to distinguish between these terms that are often used interchangeably. It's not the case that discussions of globalization and the state need to be approached in a dualistic way by either looking at the state as central to mediating clashing interests (the strong state) or by approaching the state as no longer important in a global context (the weak state). A stumbling block within the globalization literature to moving beyond such dualism has been using a Weberian conception of the state in which economic and political spheres, or markets and states are separate, externally related, and have their own independent logics. Additionally, Poulantzas seems to have argued a similar point in that he explained that capitalist governments do not need to be destroyed to make way for proletarian policy-making. Rather, political struggle would be more successful than economic struggle, and this could be achieved in the context of the state (Thomas, 1999).

In contrast, within an historical materialist approach, transnational states are premised on ideas of transnational class formation. Within such an approach, it is possible to think about how spaces relate to "uneven development denoted primarily by social group rather than territorial differentiation" (Robinson, 2001, p. 160). While nation-states have increasingly less power to mediate impacts of capital accumulation, transnational capital is increasingly involved in creating policy, reflecting relationships between the two and the rise of transnational capitalist classes. In the future, theorizing on globalization and

the state should look beyond describing an historically static conception of the nation-state to examine transformations of capital and states in a global context. Shaw (1997)has done similar work, using Mann's (1988) conception of state to argue for a global western state that is an agglomeration of power in North America, Western Europe, Japan and Australia. In doing so, however, he also points to continuing difficulty in determining how a global state includes and constitutes multiple levels of state power.

More recently, Barrow (2005), whose arguments seem to be in line with Navarro's (described above), has offered a counter-reply to this line of thinking to argue that nation-states remain the primary actors in globalization, providing the political and material conditions necessary for global accumulation. By extension, globalization is currently a form of American imperialism.

Conclusions

The reviewed literatures on globalization and state theory underscore the importance of examining contestation and specifically, class conflict in understanding any political debate. These literatures argue that global elites from various nation-states have created policies that have led to ongoing disparities in who has access to ART and who does not despite the feasibility of making these drugs more available. This is one of many possible examples of how resource distribution has become more unequal as global capital has gained power.

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The majority of researchers have made the argument that the nation-state is not going away. Rather, it is in a state of transformation, both losing power to mediate as a result of globalization while also powerfully guiding globalization processes. Others have pointed to ambiguity in how to bring systems such as ARV distribution in line with social justice reasoning as issues such as this cross nation-state boundaries and involve a wide array of actors on multiple levels. These systems can appear to be unchecked as transnational corporations have gained economic and political power in the absence of centralized global governance.

However, there is also reason for optimism that individuals and groups have the agency to promote egalitarian ideals. Brazil's ability to quickly and efficiently provide ART to all HIV-positive citizens is a prime example of both nation-state power to mediate neoliberal ideology and the power of an active civil society. Recent efforts to decrease drug prices through activism, increased financing, and generic drug competition are additional examples of actions that have pushed back against transnational corporations and policies that solely promote financial gain for the individuals involved.

At the same time, there is a great deal of ambiguity in the review of ART distribution, and literatures on globalization and the state. For example, while there is considerable commentary on ART distribution, there is little empirical research that delineates links between policies (e.g., international trade policy, intellectual property protections) and health outcomes. In the latter two literatures, researchers are still debating definitions of core concepts.

A general message that can be taken from this literature is that the issue of inequitable distribution patterns is a political endeavor. We are currently faced with a changing political landscape, which involves transformations of spaces, such that normative definitions of nation-states are contested, and these transformations have and are leading to increasingly complex power relations involving actors on multiple levels and across multiple organizations.

While these spaces are becoming more complex, it is important to find agency in how these systems are currently working and trace these maneuverings to outcomes. A number of researchers have looked to examinations of class conflict to find agency, and this is an important point in understanding motivations behind actions even though concepts of class have become fuzzy and fractured. While it is the case that concepts of class have changed and now involve more-or-less winners and losers of global capital, it is still quite clear in a history of ART distribution to see how these drugs have diffused from rich to poor and white to black, with the latter groups yet struggling with higher HIV prevalence and access to ART more than 10 years after HAART came on the market in the U.S.. Examinations of class are important not only in regard to outcomes, but such examinations point to power hegemony and conversely the absence of certain voices in policy decision-making.

Arguments in the globalization and state literatures point to the importance of examining specific complexes of power relations (e.g., Habermas' "factual constellations of power")

on multiple levels over a long enough time span to find links between actions and variable outcomes. Such case studies should also paint a broad enough picture to trace power relations to historical conditions. Alford and Friedland (1985) were right to argue for integration of multiple theoretical perspectives, which examine multiple levels of power structures.

Such an analysis could place more focus on peripheral regions, which have been somewhat overlooked in both the globalization and state literatures. More work could be done to spell out more clearly how cities, regions or nation-states that are not leaders in a global economy have an impact, or can become stronger participants in these systems. Specifically, our view of globalization processes should expand to incorporate how these regions are involved with current trajectories and how their involvement may push for increased social justice in relation to distribution equity or even what some researchers have termed an American imperialism.

Bronfenbrenner's Social Ecological Model

In the next section of this chapter, I describe Bronfenbrenner's Social Ecological Model (Bronfenbrenner, 1989) as a framework to connect multiple levels of power structures that may have impacted young Kenyan women's sexual behaviors and HIV status between 1997 and 2006. My primary research focus was to look at sexual behaviors and HIV status among Kisumu women aged 15 – 24 in 1997 and again after ART roll-out and VCT expansion in 2006. I also described city-wide changes in VCT services and ART

availability in this ten-year period as one explanation of variability in sexual behaviors and HIV status from 1997 to 2006. Since many HIV services originated or expanded during the period as a consequence of the development of HAART and new sources of international funding such as the Global Fund and PEPFAR, describing changes in HIV services and the impact of these services on individual health was a multilevel endeavor. Politics and decision-making on international, national, local and individual levels made an impact on the timing, type and number of services offered in Kisumu today and on the effectiveness of these services in preventing the transmission of HIV.

In conducting multilevel research that has the aim of linking individual behaviors to one's environment, I have drawn upon two theoretical approaches. First, as described in more detail previously, I have used the theoretical literature on globalization and state power as a means to discuss contestation among numerous actors relating to rolling-out HIV prevention and treatment programs. Second, as described next, I have selected Bronfenbrenner's Ecological Systems Theory (1989) to help explain and predict which young Kenyan women are more or less likely to engage in unprotected sex, and to become HIV-positive in a changing social context that included ART roll-out, the expansion of VCT services, and also changes in female empowerment.

Central to many arguments regarding globalization are perspectives on the extent to which nation states have the staying power to control interactions that transcend national boundaries, such as providing HIV prevention services and ART to people living with HIV/AIDS, and to promote social justice in terms of equitable distribution of

globalization's resources among its citizens. Between 1997 and 2006, ART became increasingly available and HIV prevention programs expanded in places like Kenya as an outcome of large international sources of funding such as PEPFAR and the Global Fund. Evaluations of the impact of these policies have just begun; it is important to understand local outcomes on HIV prevalence and mortality in a complex global context where there are both commitments to fight HIV and extensive contestation among decision-makers on multiple levels (e.g., pharmaceutical companies, international organizations, national governments) in how to do so.

Social ecological models or perspectives are ways of connecting individual behaviors with environments. With such perspectives, it is possible to discuss multiple effects and interrelatedness on multiple levels across individual beliefs and behaviors and environmental factors that may lead to particular health outcomes – in this case whether one becomes HIV positive. Using an ecological model is a way to take a joint and equal focus on the individual and the environment in understanding a health outcome such as becoming HIV positive. The starting point assumption for research such as this is that "multidisciplinary and multilevel interventions are most effective for facilitating lasting improvements in health" (Grzywacz & Fuqua, 2000).

Bronfenbrenner's Ecological Systems Theory is a useful perspective to integrate the numerous influences on multiple levels that globalization processes (e.g. international funding and organization sources for HIV prevention and treatment) have had on individuals in specific regions (e.g., individual sexual behaviors and ultimately, HIV

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status). This perspective lays out four interrelated levels ranging from broad cultural ideology down to individual experiences that are conceptualized as nested Russian dolls such that the broadest environmental level – the macro-level – encompasses each of the narrower levels of influence.

Bronfenbrenner's four levels include the macro-level, which encompasses broad social influences such as cultural ideologies, belief systems and social policies. In terms of the current project, this level includes neoliberal ideologies relating to globalization processes, e.g. what Robert Reich has recently termed Supercapitalism (Reich, 2007) and decision-making on the level of international organizations, e.g., the WHO, the World Bank, multinational organizations. The next level, the exo-level, is comprised of many organizations and interpersonal relationships that create a community. The individual is not necessarily actively involved in this community, but is affected by it. Relevant examples of this level include nation-level commitments to HIV prevention and treatment and the availability of HIV services. The meso-level is composed of groups the individual is actively involved with, such as work, school, and family environments. The last level, then, is the micro-level, which is interpersonal or individual behavior. See Figure 3.

Figure 3: Bronfenbrenner's Ecological Systems Theory

Change in Relationships over Time ⟶
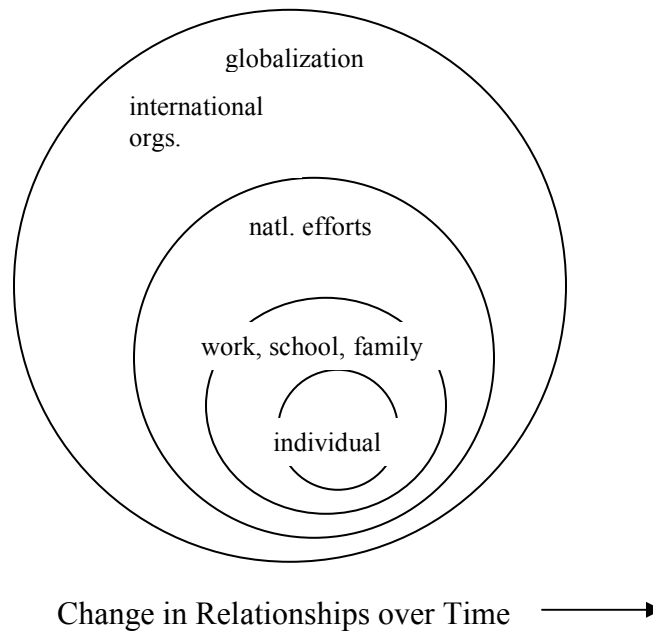
This model is recursive such that individual behavior can have an impact on

communities, nations, and international decision-making, for example through activism.

Likewise, one's environment has an impact on one's knowledge and beliefs about HIV

and ultimately may play a part in sexual behavior decision-making. Finally,

Bronfenbrenner developed Ecological Systems Theory as a means of examining

person/environment interactions over time, and thus to examine change in human

behavior over time. In this project, changes in sexual behavior and HIV prevalence

between 1997 and 2006 were explored in a context where HIV prevention messages and

other social factors such as educational attainment also changed in the interim.

I used Bronfenbrenner's social ecological model, building on Grzywacz and Fuqua's

(2000) application of this model to health. These researchers have highlighted three

"leverage points" that have been found repeatedly to impact health outcomes. These include socio-structural factors such as race/ethnicity and education, psychosocial and physical environmental factors such as access to HIV services, and individual/psychological factors such as sexual behaviors. Figure 4 is an adaptation of Grzywacz and Fuqua's model (p. 104) that incorporates the variables I included in my project to predict HIV status as a health outcome. (See the data sources section below for complete variable information.) Figure 4 is also similar to the conceptual framework that Akwara and colleagues recently used to examine relationships between Kenyans' perceptions of HIV risk and sexual behavior (Akwara, Madise, & Hinde, 2003). While Akwara and colleagues did not cite a specific ecological model such as Bronfenbrenner's Ecological Systems Theory, they have set a precedent for work in this area. (Figure 4.)

Figure 4: An HIV-focused Adaptation of Bronfenbrenner's Ecological Systems Theory
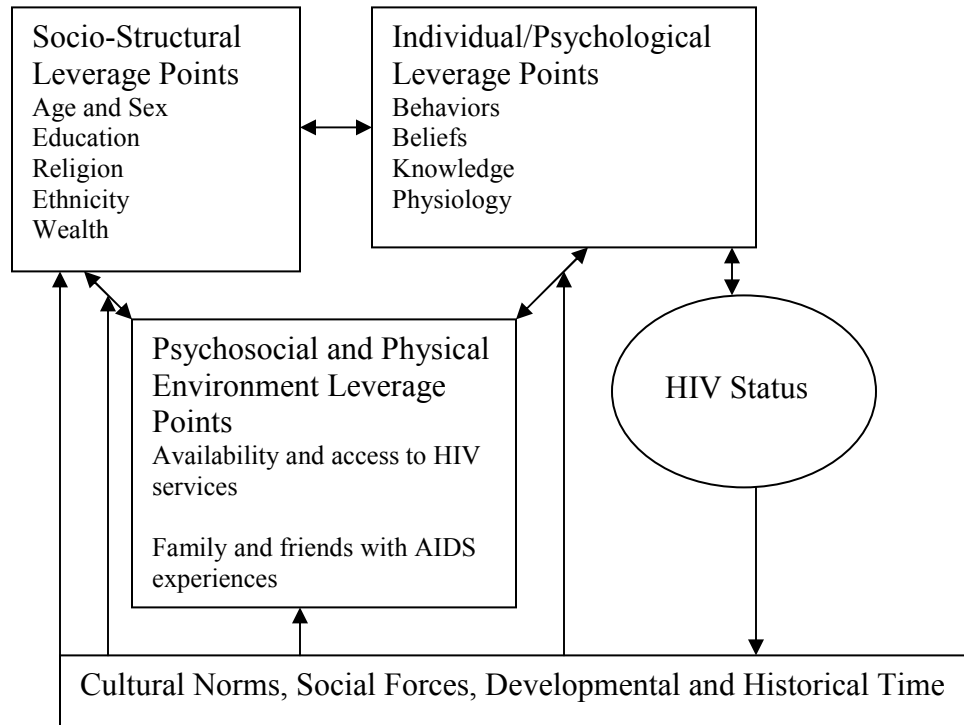
(Adapted from Grzywacz & Fuqua, 2000)

Like Figure 3 depicting Bronfenbrenner's Social Ecological Model as a series of nested and interrelated spheres, Figure 4 indicates three leverage points that can affect a health outcome such as HIV. The socio-structural leverage points incorporate macro- and exo-level influences on behavior, and the physical environment leverage points include exo- and meso-level influences. Finally, the individual/psychological leverage points map to the micro-level sphere in Figure 3. Two-directional arrows are used to portray the interrelatedness of each leverage point and the health outcome. Furthermore, change

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occurs over time as cultural norms and social forces change. Figure 4 is not exhaustive. Rather, it depicts the leverage points that were the focus of this research project, which is further specified in chapters 3 and 4.

Conclusions

I connected the sociological literature on globalization and state power to Bronfenbrenner's Ecological Systems theory as a means to examine the hypothesis that changes in young women's HIV prevalence in Kisumu, Kenya in the last ten years were related to changes in sexual behaviors and biological co-factors, which reflected dynamic influences within the social context during the period. The socio-structural leverage points represent the most entrenched influence on psychological leverage points. These leverage points could change over time but tend to be more stable than the changes seen in the psychosocial/physical environment leverage points between 1997 and 2006. The psychosocial/physical environment leverage points cover changes in HIV services in Kisumu during the period of investigation. These leverage points represent the outcome in one locale of international efforts and contestation among numerous actors to make ARVs available to those who need them and not just to those who can pay for them. In this sense, the psychosocial/physical environment leverage points compose both the broadest level of influence and a local influence on young women's sexual behaviors and HIV status. In Figure 4 above, many arrows are drawn in both directions to indicate that individuals (psychological leverage points) are not just affected by their environments; individuals' actions also contribute to environmental change over time.

While I was not able to comprehensively apply Bronfenbrenner's model to my empirical

investigation due to data limitations, this model was helpful in guiding the creation of the

multivariate regression models discussed in chapters 3 and 4. It allowed me to examine

whether influences more proximal (e.g. psychological leverage points) or more distal

(e.g., socio-structural leverage points) to HIV status carried more influence. Furthermore,

it pointed out areas where data are currently lacking that should be investigated to create

a more complete picture of environment-individual influence over time. As will be

described in chapter 3, my multivariate regression models focused on socio-structural and

psychological leverage points. These models were accompanied by descriptions of

psychosocial/physical environment leverage point changes – ART roll-out and VCT

expansion. Within each leverage point, there are many more areas that could be

investigated that I was not able to capture here. However, my research is an initial effort

to understand how international contestation over ART distribution and the specific way

in which ART and VCT were rolled out in Kisumu may have influenced young Kenyan

women's knowledge and beliefs about HIV transmission, use of HIV services, and

ultimately HIV status.

The literature on globalization and state power underscored what was already apparent in

the story of international ARV drug distribution: globalization involves contestation

among many actors and spheres of influence. Local outcomes of contestations can be

mediated by the state, by localities, and by grassroots efforts. Bronfenbrenner's Social

Ecological model is a means to conceptualize these numerous sources of influence on an

ultimate outcome, in this case young women's sexual behaviors and HIV status.

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Chapter 3: Methods

The overall purpose of my dissertation was to examine the issue of why HIV prevalence among young women aged 15 to 24 in Kisumu, Kenya declined from 30% in 1997 to 16% in 2006. This is an important period to investigate because between these years, antiretroviral treatment (ART) became available in the public sector for the first time and HIV prevention services such as voluntary counseling and testing (VCT) expanded. It may be the case that changes in HIV services impacted young women's knowledge of HIV transmission, sexual behaviors, and ultimately their HIV status. However, it could also be the case that other social factors impacted HIV status through various mechanisms. Methods for this research project were developed to examine multiple factors or "leverage points" (to use Bronfenbrenner's social ecological model terminology) that may be related to HIV status.

This dissertation had three specific aims. My first aim was to describe how HIV services changed in Kisumu between 1997 and 2006 by documenting how many facilities offered VCT and ART and how many people received these services by year. Aim two involved constructing multivariate regression models to examine leverage points that predicted HIV status among young Kenyan women in 1997 and 2006. My third aim was to explore how young women's use of HIV services, educational attainment, and knowledge and beliefs about HIV in 2006 further explained these women's HIV status.

Aim 1: HIV Services Change Between 1997 and 2006

This aim was designed to examine changes in access to volunteer counseling and testing and to antiretroviral drugs. I tracked changes in volunteer counseling and testing (VCT) services and antiretroviral treatment (ART) availability in Kisumu, Kenya between 1997 and 2006. I chose to investigate changes in VCT as opposed to other types of prevention programs (e.g., condom distribution) for three reasons. First, VCT was virtually nonexistent in Kisumu in 1997; therefore by focusing on changes in VCT services, I was able to approximate a pre-test/post-test design in examining changes in sexual behaviors and HIV status in survey data coupled with descriptions of how VCT services and ART availability changed in the interim. Second, VCT is both a prevention strategy and the gateway to ART. The two services have expanded together, and ART has increased demand for VCT. Previous research, as mentioned earlier, has found connections between VCT and ART and behavior change, which is aim 2 of my study. Third, because of the nature of VCT, I was able to collect more complete information on VCT services change over time than other prevention programs.

My description of HIV services change in Kisumu is derived from two general sources. First, I obtained published information online from primary international funders of Kisumu's HIV services. These included the United States' President's Emergency Plan for AIDS Relief (PEPFAR), the World Health Organization (WHO), and the Clinton Foundation. Second, through working with Craig Cohen at UCSF, who is a primary investigator on the ARTIS project that collected survey data in 2006, and other

colleagues in the United States, Belgium, and Kenya, I generated a list of contacts who

could give me information about HIV services scale-up in Kisumu. Barbara Marston at

the Centers for Disease Control was a primary source. She was instrumental in initial

drug roll-out efforts in Kisumu and was able to pass along some of her documentation of

program expansion. With the help of Kenyan colleagues, while I was in Nairobi and

Kisumu for one month in fall 2008, I was able to meet with many of my Kenyan contacts

to gather published and internal documents regarding program scale-up. These reports are

from Kenyan national and Kisumu district government offices as well as from HIV

program offices.

My primary goal was to document VCT expansion and ART roll-out in terms of number

of program sites, number of people served, and gender, age and HIV status of people

served by month or by year from inception through 2006. As much as possible, I also

attempted to find out who funded the programs and to gather information on the

programs' history, philosophy, mission and connections with other programs.

Aim 2: Factors Predicting HIV Status in 1997 and 2006

Aim 2 was to compare demographic, behavioral and physiological factors ("socio-

structural, and individual/psychological leverage points") that predicted HIV status

among Kenyan women aged 15 – 24 in 1997 and 2006. I used two parallel data sets to

analyze relationships between leverage points and HIV prevalence among young women

in Kisumu, Kenya at two time points. In 1997, Buve and colleagues collected data from

23 sentinel clusters representative of the city population and from 17 additional census areas that were selected systematically to represent all areas of the city of Kisumu (Multicentre data). Using this sampling method, they identified 1,014 eligible men and 1,191 eligible women between the ages of 15 and 49. Of the eligible men, 829 (82%) participated in interviews and 626 (62%) had blood taken for HIV/STI testing. Of the eligible women, 1,060 (89%) participated in interviews and 893 (75%) had blood taken for HIV/STI testing(Cohen, et al., 2009). Nearly half, 521 (49%) of the 1,060 women, who participated in interviews were under the age of 30 (Buve, et al., 2001a).

In 2006, Cohen and colleagues collected parallel data in Kisumu to compare to the Multicentre data as well as to investigate the impact of antiretroviral therapy on sexual behaviors (The ART Impact Study or ARTIS). They had a 68% response rate and enrolled 1,677 individuals. 749 were male and 906 were female. 507 (56%) of the 906 women who participated in interviews were under the age of 25 (Cohen, et al., 2009).

In 1997 and again in 2006, respondents were asked demographic questions (e.g., age, ethnicity, education) and questions about their sexual history including sex with spouses and non-spousal partners. Participants were also tested for HIV, HSV-2 and trichomoniasis. In 2006, respondents were also asked questions about their perceptions of HIV risk and their knowledge and beliefs about ART and HIV.

Parallel questions and cases from each dataset were combined into one larger dataset. In the 1997 and 2006 datasets, and also in the combined dataset, respondents were indicated

by a study code only. While each dataset contains demographic information such as age, sex, education level and employment status, I did not possess any personal information such as name or address that would have allowed me to identify respondents.

Sample

Datasets were analyzed for comparability. Among the women age 15 – 24 sub-sample, 2006 women were slightly older, more educated, and had higher rates of unemployment. Marital status was comparable. I also compared the 1997 and 2006 datasets to the 2003 Kenya Demographic and Health Survey (KDHS) on these characteristics, which is a repeating, national survey. Although comparable, the sample of women surveyed for the KDHS in Kisumu District is much smaller than the 1997 and 2006 surveys since this was a nation-wide sample that did not focus on Kisumu (Republic of Kenya, 2003). These KDHS data are included here as a reference because they they provide another source to examine changes in leverage points and HIV status among young Kisumu women over time. See Table 1.

Table 1: 1997 Multicentre and 2006 ARTIS Sample Characteristics

	1997 Multicentre	2003 KDHS*	2006 ARTIS
Sample Size			
N, women age 15 – 24	521	55	507
% of all women surveyed	49%	49%	56%
Age			
Mean age	19.2	20.1	20.1
Age 15 – 19 % (N)	54 (281)	38 (21)	42 (213)
Age 20 – 24 % (N)	46 (240)	62 (34)	58 (294)
Education			
None % (N)	2 (12)	0	1 (5)
Primary % (N)	80 (418)	66 (36)	58 (289)
Secondary % (N)	17 (86)	26 (14)	36 (179)
Marital Status			
Never married % (N)	50 (263)	60 (33)	45 (232)
Ever married % (N)	50 (258)	40 (22)	55 (275)
Currently married % (N)	47 (245)	36 (20)	47 (240)

*Kenya Demographic and Health Survey (KDHS). Numbers provided are for the sub-sample of women surveyed in Kisumu District. Ever/currently married status includes women who are/have lived with a man but who weren't necessary legally married or married by custom (Republic of Kenya, 2003)

Data were collected from the same 22 sentinel site clusters in 1997 and 2006. Table 2 indicates the 1997 and 2006 sample sizes for each of these 22 sentinel clusters. In 1997 and 2006, 17 additional census enumeration areas were selected to supplement the 22 sentinel clusters. These areas differ between the 1997 and 2006 samples. Controlling for clusters did not impact results. This is discussed in chapter 4.

Table 2: 1997 Multicentre and 2006 ARTIS Sentinel Site Clusters

#	sentinel site number (CBS number)	Total Sample				Women Age 15 - 24			
		Multicentre		ARTIS		Multicentre		ARTIS	
		N	%	N	%	N	%	N	%
1	513	48	4%	43	5%	11	3%	14	5%
2	514	50	4%	51	5%	9	3%	14	5%
3	515	64	6%	76	8%	16	5%	28	9%
4	516	53	5%	51	5%	18	6%	15	5%
5	517	29	3%	29	3%	4	1%	10	3%
6	1282	59	5%	30	3%	16	5%	6	2%
7	1283	38	3%	37	4%	7	2%	11	4%
8	1284	54	5%	31	3%	14	4%	9	3%
9	1286	71	6%	40	4%	17	5%	13	4%
10	1287	74	6%	27	3%	28	9%	10	3%
11	1288	56	5%	47	5%	22	7%	12	4%
12	1289	52	5%	37	4%	20	6%	13	4%
13	1290	74	6%	42	4%	20	6%	17	6%
14	1291	63	5%	40	4%	14	4%	13	4%
15	1292	38	3%	65	7%	10	3%	20	7%
16	1293	41	4%	38	4%	10	3%	16	5%
17	1294	48	4%	39	4%	9	3%	12	4%
18	1295	66	6%	49	5%	20	6%	11	4%
19	1296	29	3%	45	5%	9	3%	15	5%
20	1297	34	3%	44	5%	11	3%	13	4%
21	1298	56	5%	46	5%	12	4%	15	5%
22	1299	56	5%	42	4%	19	6%	13	4%

Total from Sentinel Clusters	1153	949	316	300
Total Sample Size	1889	1655	521	507
% of Total from Sentinel Clusters	61%	57%	61%	59%

Survey Response Rate Comparisons

There were marked differences in survey response rates for the 1997 and 2006 samples.

In 1997, 87% (n = 261) of women aged 15 – 19 who were contacted, participated in the

survey, and 70% (n = 226) had blood taken. Likewise, 91% (n = 427) of women aged 20

– 29 who were contacted, participated in the survey. Of these, 78% (n = 368) had blood

drawn. In contrast, in 2006, only 49% (n = 213) of women aged 15 – 19 who were

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contacted, participated in the study, and 43% (n = 192) had blood drawn. Likewise, 54% (n = 445) of women aged 20 – 29 who were contacted, completed the survey, and of these women, 49% (n = 406) also had blood drawn. These sampling differences may be due to differences in data collection strategies in 1997 and 2006. One possibility is that more data collection was done during the day instead of in the evening in 2006. However, it does not appear that these sampling differences have significantly affected survey results. As shown in the findings section, the two samples were comparable across numerous risk factors for HIV.

Variables

Table 3 lists all variables that were present in both the 1997 and 2006 datasets and used in multivariate models to examine leverage points that predict HIV status among Kenyan women aged 15 – 24 in 1997 and 2006, and then to analyze changes in how these factors predict HIV from time 1 to time 2.

In 2006, HIV serology and counseling was carried out according to local standards of practice in Kenya, using two parallel rapid assays, with a third ELISA assay for resolving discrepancies between the first assays. With this algorithm, two negative rapid HIV-1 assays at enrollment defined negative HIV serology. Two positive rapid assays defined positive HIV serology. Discordant or indeterminate rapid assay results were resolved by an ELISA assay. In 1997, samples were initially tested with an ELISA assay, and HIV status was confirmed with one of three rapid tests. Samples giving discrepant results were tested with an HIV 2.2 blot or using an algorithm using Vironostika HIV Uniform II Plus

O followed by Enzignost Anti-HIV ½ Plus and INNO-LIA HIV Confirmation as

necessary (Buve, et al., 2001a).

Table 3: Independent Variables in the 1997 Multicentre and 2006 ARTIS Data Sets

Variable	Definition
Date of Data Collection	0 = 1997 1 = 2006
Socio-Structural Leverage Points	
Age	0 = 15 – 19 1 = 20 - 24
Ethnicity	0 = Luo 1 = Other
Education	0 = primary, primary not completed or never attended 1 = post-primary/vocational, secondary, or higher
Student Status	1 = Student 0 = Other
Birthplace	1 = Kisumu or other urban area 2 = Rural area

Individual/Psychological Leverage Points - Behaviors	
Alcohol Consumption (in the last 4 weeks)	1 = Yes 0 = No
Ever been married	1 = Yes 0 = No
Ever had sex	1 = Yes 0 = No
Current Marital Status	1 = Married 0 = Unmarried (single, separated, divorced or widowed)
Age of Sexual Debut	1 = < age 9 – 15 0 = > age 15
Lifetime Number of Sex Partners	0 = 0 – 1 1 = 2 or more
Non-spousal Partner in Last Year	1 = Yes 0 = No
Individual/Psychological Leverage Points - Physiology	
HSV-2 Infection	1 = Positive 0 = Negative
Health Outcome	
HIV Status	1 = Positive 0 = Negative

In summary, there were fourteen variables that were available to compare data in 1997

and 2006. These included five socio-structural leverage points - age, ethnicity,

respondents' level of education, whether the respondent was currently a student, and

birthplace. Additionally, there were eight individual/psychological leverage points

focusing on sexual behaviors. These included alcohol consumption, whether the

respondent had ever had sex, ever been married and current marital status. Additionally,

information was compared regarding age of sexual debut, total number of sexual partners

and whether respondents had had sex with a partner who was not a spouse in the last

year. In 1997 and again in 2006, women were also tested for HSV-2 infection, which has

consistently been found to be a risk factor for HIV and indicative of sexual behaviors

(e.g., Freeman, et al., 2007). Finally, the primary outcome measure – HIV status – was

collected in 1997 and 2006.

Aim 2 of my dissertation was to compare demographic, behavioral and physiological

factors that predicted HIV status among Kisumu women aged 15 to 24 in 1997 and 2006.

I met this aim by creating multiple logistic regression models using information collected

across these fourteen variables in 1997 and again in 2006. The purpose of this was to

provide an answer to the question of why HIV prevalence had declined from 30% in

1997 to 16% in 2006 among this group.

Aim 3: Impact of Other Factors on HIV Status in 2006

Aim 3 was to examine how 2006 women's educational attainment, use of VCT services,

and knowledge and beliefs about HIV transmission and treatment predicted HIV status in

2006. The 2006 survey data included additional variables that allowed for an initial

exploration of how additional leverage points, which included household wealth, use of

HIV services, and knowledge and beliefs about HIV, further explained these women's

HIV status. This was my third aim because it allowed me to connect environmental

changes in HIV services to individual behaviors and health outcomes.

Table 4 lists all additional variables that were present in the 2006 dataset and were used

in conjunction with the descriptive HIV services information (aim 1) – to analyze how

2006 women's additional leverage points predicted HIV status in 2006.

Table 4: Other Variables from the 2006 ARTIS Dataset

Variable	Definition
Socio-structural Leverage Points	
Household Wealth: Do you have electricity in your house? Do you have a working TV in your house? Do you have a working radio?	1 = Yes 2 = No
Psychosocial and Physical Environment Leverage Points	
Use of VCT and Health Services	
Have you ever been tested for HIV?	1 = Yes 2 = No 3 = Not sure
Have you been to a health care provider in the last year?	1 = Yes 2 = No
Have you ever been treated for an STD?	1 = Yes 2 = No 3 = Not sure
Has your partner ever been treated for an STD?	1 = Yes 2 = No 3 = Not sure
Individual/Psychological Leverage Points - Beliefs	
HIV Transmission Knowledge	
People can reduce their chances of getting HIV by using a condom every time they have sex.	1 = Agree 2 = Disagree 3 = DK
If someone is tested for HIV, a "positive blood test" means that the person is infected with HIV for life.	1 = Agree 2 = Disagree 3 = DK
Are circumcised men less likely to be HIV-positive?	1 = Agree 2 = Disagree 3 = DK
Do you prefer a man who is circumcised?	1 = Agree 2 = Disagree 3 = DK

ART Knowledge	
Have you heard of ART?	1 = Agree 2 = Disagree 3 = DK
Individual/Psychological Leverage Points - Behaviors	
Have you ever used a condom?	1 = Yes 2 = No 3 = Not sure
Have you ever been forced to have sex?	1 = Yes 2 = No 3 = Not sure
Have you ever exchanged sex for money or other resources?	1 = Yes 2 = No 3 = Not sure
Individual/Psychological Leverage Points - Physiology	
Do you currently have genital ulcers?	1 = Yes 2 = No 3 = Not sure

Additional 2006 ARTIS variables that were not collected in the 1997 Multicentre Study were added to the 2006 multivariate model developed in aim 2 as a means to begin exploring how changes in HIV services may have impacted 2006 women's sexual behaviors and HIV status. See Table 4 above for a list of these variables. As in aim 2, I used backward stepwise logistic regression including all additional variables that were predictive of HIV status in univariate analyses at $p <= .10$ to create a final 2006 model. Additional interactions were not analyzed.

To summarize, for aim 3, I explored sixteen additional variables collected in 2006 that were not collected in 1997. Three of these variables were socio-structural leverage points indicating household wealth. Four variables were psychosocial/physical environment leverage points related to respondents' use of VCT services and general health services.

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In addition, there were nine individual/psychological-level variables. Eight of these related to respondents' beliefs about HIV transmission and knowledge of ART availability and high-risk sexual behaviors. Finally, respondents were asked whether they had genital ulcers at the time of being surveyed. In addition to HSV-2, this was an intermediate physiological outcome of sexual behaviors that could increase risk for HIV. See Table 4.

These variables were included in the final multivariate regression model created for aim 2 to establish a more-direct link between respondents' knowledge and use of VCT and ART and changes in sexual behaviors and HIV outcomes. This was important since I had hypothesized that young women's sexual behaviors and resultant HIV status might change as a result of exposure to VCT and ART.

Data Management

Initial descriptive analyses involved computing means, medians, and standard deviations for numeric variables. For categorical variables, I examined the response frequency for categories within each variable and then collapsed categories as necessary when particular categories had few responses and when collapsing categories made conceptual sense and/or when I could collapse categories without losing information. For example, in the 1997 dataset, only 3 of 427 respondents said that their current employment status was "retired or disabled". Therefore, this category was rolled into the "unemployed" category. Additionally, I explored whether some variables such as respondent age should

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be treated as continuous or categorical variables. See Appendix A for more detail regarding the creation of variables used in univariate analyses and multivariate models.

All records missing an HIV test result (94, 18% of the initial 521 records in the 1997 data and 44, 7% of the initial 507 records in the 2006 data) were eliminated, resulting in 427 records for 1997 and 463 records for 2006. I looked into whether there was any selection bias in doing this by conducting crosstabs analyses to compare whether there were significant demographic differences among women with and without an HIV test result, separately for 1997 and 2006 data.

In both the 1997 and 2006 datasets, there were no significant ethnic, religious or education differences. However, there was a significant bias related to sexual history in the 1997 dataset. 21.5% of 1997 women who had never been married vs. 14.6% of ever married women were missing an HIV test result (p<.05). Likewise, 32.3% of women reporting never to have had sex vs. 15.2% of sexually active women were missing a test result (p<.05).

The same trend held in 2006 even though it was not statistically significant. In 2006, 9.3% of never married women vs. 6.5% of ever married women were missing a test result (p>.05). 11.9% of women who had never had sex vs. 8.4% of sexually active women were missing an HIV test result.

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This finding also means that younger women were more likely to be missing a test result, with 15 – 17 yr olds having higher rates of missing tests for both 1997 and 2006 data. For the most part, respondents missing an HIV test were also missing an HSV-2 test – 76% in 1997 and 94% in 2006.

This bias could have various explanations. First, tests may not have been done for younger respondents because they may have needed parental permission to have an HIV test. Second, if respondents were telling the truth and had never been married or had sex, they may not have seen the purpose in having an HIV test done. If this is the case, then HIV prevalence is overreported, especially in the 1997 dataset. Alternatively, however, it could be the case that women without test results lied about being sexually active. If this scenario is true, these women were most stigmatized for being sexually active and possibly HIV positive and would hypothethically have higher rates of HIV. In this case, rates of HIV in the 1997 sample are conservative. Finally, the rate of missing tests is higher in 1997 than 2006, indicating some change in obtaining HIV test results across the 10-year period – whether decreased HIV-related stigma or more open policies in allowing minors to have an HIV test without parental consent. It is not possible to determine which way HIV prevalence may be biased as a result of missing test results.

Data Imputation

I imputed missing data for independent variables as much as possible using information from other variables. For example, only women who said they had never been married

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were asked the question, "Have you ever had sex?" resulting in many missing records for this question. However, because of this skip pattern, I was able to fill in the answer "yes" to the latter question for all women who said they had been married.

For some missing records, however, this method was not possible. Consequently, I used a couple other techniques to impute data. First, the "impute" command in Stata was used to impute missing values, using all other variables in the dataset for all variables except for age of sexual debut. This was done separately for 1997 and 2006 datasets. The percentage of missing data imputed by variable for each dataset is listed in Tables 5 and 6. 15% of records were missing for the age of sexual debut variable since this proportion of women had not had sex yet. In all of these cases, respondents' age of sexual debut was categorized as "older", occurring sometime between age 16 and 24 as opposed to a younger sexual debut occurring at age 15 or younger. This was also true of additional records in the 2006 dataset relating to sexual behaviors. Consequently, the answer "no" was imputed for all of the following six variables: ever used a condom, ever exchanged sex for resources, ever forced to have sex, ever treated for an STD, partner treated for an STD in the last year, have genital ulcers now. As described below, multivariate models using imputed data were compared with models using listwise deletion to explore any impact imputation may have had on final model results. Data imputation did not significantly affect results.

Table 5: Percentage of Imputed Data in Parallel 1997 Multicentre and 2006 ARTIS Variables Used in Multivariate Models

Variable	Multicentre N (%)	ARTIS N (%)
Education	0	8 (2)
Employment	6 (1)	0
Birthplace	0	12 (3)
HSV-2 status	30 (7)	3 (1)
Alcohol consumption	0	1 (.2)
Ever married	0	1 (.2)
Age sexual debut	65 (15)	69 (15)
# sexual partners	0	15 (3)
Sex with a non-spouse?	0	11 (2)
# of non-spouse partners	0	7 (2)

Sample N after eliminating all cases with missing HIV test result:	427	463

As stated above, 15% of data were missing for the "age of sexual debut" variable because respondents skipped this question after answering that they had never had sex. All of these women's sexual debut was imputed as "older" – age 16 or older – as opposed to "younger".

Table 6: Percentage of Imputed Data in Additional 2006 Survey Variables

Variable	N (%)
Ever used condom	70 (15)
Ever exchanged sex for resources	72 (15)
Ever forced to have sex	68 (15)
Ever treated for STD	70 (15)
Partner treated for STD in last year	70 (15)
Have genital ulcers now	78 (17)
Likelihood of circumcised vs. non-circumcised men to have HIV	18 (4)
Prefer partner to be circumcised or uncircumcised	36 (8)
Chances of getting HIV reduced by using condoms	24 (5)
Positive blood test means HIV infection	33 (7)
Ever heard of ART	11 (2)
Have electricity	1 (<1)
Have TV in house	1 (<1)
Have a working radio	1 (<1)
Seen a health care provider in the last year	1 (<1)
Ever had an HIV test	18 (4)
HIV risk perception	20 (4)

As stated above, a "no" response was imputed for the first 6 variables since respondents skipped these questions after answering that they had never had sex. All other variables had relatively smaller numbers of missing data points. Categories for some variables were collapsed based on small numbers in particular categories and also based on statistical procedures. This is discussed in detail in chapter 4.

Univariate Analyses

I conducted univariate logistic regression analyses between each independent variable and the dependent variable HIV status as part of developing multivariate models to

examine associations between each predictor and HIV status (separately for 1997 and 2006 data). I used the "logistic command in Stata 10.1 for these analyses.

AIM 2: Multivariate Regression Models

Multivariate logistic regression models were fitted separately for the 1997 and 2006 data to explore hierarchical relationships between independent variables and HIV status at each of these time points. These models drew upon Bronfenbrenner's Ecological Systems Theory as a conceptual framework (see figures 1 and 2 above). I have also used Fuchs et al's paper (1996) as a guide to taking a hierarchical approach in using conceptual frameworks in epidemiological analysis. Specifically, I used backward stepwise logistic regression beginning with covariates that were predictive of HIV status in univariate analyses at $p <= .10$.

Two-way interactions in line with my adaptation of Bronfenbrenner's conceptual framework (See Figure 2) were also explored individually as a means to determine which interactions to include in the multivariate model. These included interactions between socio-structural leverage points and sexual behaviors since the more distal demographic variables are thought to be proxies of socioeconomic status and cultural background and therefore predictive of sexual behaviors that directly relate to health outcomes. Likewise, since HSV-2 status is directly related to sexual behaviors, interactions between sexual behavior variables and HSV-2 status were also explored to examine whether engaging in risky sex and also being positive for HSV-2 may further exacerbate risk for HIV.

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Interactions that were possible to examine considering sample size and that were significant (p<=.10) were added to the multivariate model. Covariates were then excluded stepwise based both on the significance of the covariate and the conceptual understanding of how the covariate should influence the model. For example, in the 1997 model, age was excluded in the first step because it is largely a proxy for sexual experience, and there was no significant relationship with HIV status, controlling for sexual behaviors.

Models were compared using the "lrtest" procedure in Stata 10.0. A residuals analysis on the final model was conducted using the "predict" command with the "dbeta" option in Stata 10.0 to examine whether excluding highly influential records influenced the model. Additionally, crude overall goodness of fit for the final model was examined using the "lfit" command in Stata 10.0 to produce Pearson's chi2 goodness of fit statistics. Final models including and excluding cluster controls were also examined using the "xtlogit" procedure in Stata 10.0 to determine whether controlling for clusters significantly changed model results.

To further understand changes in relationships over time, a combined multivariate logistic regression model using integrated data from 1997 and 2006 was also performed. The initial model included all covariates in the final 1997 and 2006 models as well as a study date variable (0 = 1997, 1 = 2006) and all possible interactions. A final model was obtained using backward stepwise elimination of non-significant risk factors and interaction terms (p > 0.10).

Limitations

The quantitative aims 2 and 3 focus on comparing two parallel datasets collected

approximately 10 years apart. While the survey methods used in 2006 were designed to

copy those from 1997, there were differences in data collection, which raise some

questions about the comparability of the datasets. First, the 17 census enumeration areas

differed in the 1997 and 2006 samples; it is unclear how these areas differ from each

other in terms of residents' socioeconomic status and survey response rates. It could be

the case that the populations surveyed in 1997 and 2006 were less comparable than

expected due to differences in data collection.

Additionally, there has been considerable movement of Kisumu's population between

1997 and 2006 as well as AIDS-related mortality prior to the roll-out of ART in 2003,

which could have resulted in a 2006 sample of young women that was less comparable to

1997 women than expected. In other words, differences in methods between the 1997 and

2006 samples could have selected for somewhat different populations. In addition, the

assumption that collecting data from a population residing in the same location at two

time points resulted in a comparable population may be problematic in some ways unless

changes in the physical environment across time have been fully taken into account.

Mortality and population movement have not been adequately explored and could be

examined with future research.

Male circumcision has been cited as another reason for regional variation in HIV prevalence (e.g. Buve, et al., 2001b). I was unable to examine whether women's HIV status corresponded with their partners' circumcision status. Changes in rates of male circumcision could have impacted changes in HIV prevalence over time. This issue could be examined with future research. However, if this was the case, HSV-2 prevalence would have also been expected to decline, and it did not.

A focus of this project was to examine how sexual behaviors may have changed in line with HIV prevention messages received from recently established VCT sites based on the hypothesis that engaging in less risky sexual behaviors may have partially accounted for the decline in young women's HIV prevalence between 1997 and 2006. Assuming that young Kisumu women have personal control over their sexuality – which is not always the case due to poverty and unempowered female gender roles – knowledge and beliefs about HIV transmission and ART should impact sexual behaviors. However, since there were no questions asked about perceptions of HIV risk and knowledge/beliefs about ART and HIV in 1997, I was unable to compare changes in health beliefs over time.

Furthermore, since the young women surveyed came from the general Kisumu population and not from a VCT clinic, I was unable to temporally link use of HIV services with changes in knowledge and beliefs about HIV and ultimately with changes in sexual behaviors. A pre-test post-test longitudinal design using survey data from VCT clinic clients could explore the issue of when sexual behaviors tend to change, either as a result of hearing an HIV prevention message, receiving a positive HIV test result or due to

other circumstances such as experiencing the loss of a friend or family member to AIDS. Finally, changes in HIV prevalence may occur years after related changes in sexual behaviors and biological co-factors like HSV-2, making analyses of how social factors influence sexual behavior and how sexual behaviors impact HIV prevalence more complex than represented here even though my models examine change over time.

Summary

The purpose of my dissertation was to analyze why HIV prevalence among young women aged 15 to 24 in Kisumu, Kenya declined from 30% in 1997 to 16% in 2006. I approached this question using descriptive and quantitative methods. Since I had hypothesized that this decline could be attributed, in part, to changes in the availability of VCT and ART, my first aim was to describe the roll-out of VCT and ART services in Kisumu during the period under investigation. Therefore, my primary goal in this endeavor was to collect VCT and ART services data to understand the timeline of roll-out of these services, and, as much as possible, to find out how these services may have been received by young women.

Additionally, I explored, in broad brush strokes, what life was like for young women living in Kisumu between 1997 and 2006. For example, I researched changes in women's enrollment in secondary school, and I learned about basic living conditions. The purpose of this was to investigate other factors in women's environments that may have impacted 2006 women's sexual behaviors and HIV status relative to their 1997 counterparts. This

was in keeping with my social ecological perspective. I focused on changes in education since in 2006 many more women had achieved a secondary education (40%) compared to 1997 women (16%). My primary sources for this descriptive work were government documents and program managers' records.

I used multivariate logistic regression models in aims 2 and 3 to compare relationships beween socio-structural and individual/psychological leverage points and young women's HIV prevalence in 1997 and again in 2006. Models focused on broader social influences such as Luo ethnicity and educational attainment as well as individual sexual behaviors to explain HIV status. In aim 2, I created three models using variables that were available in 1997 and 2006. In aim 3, I created an expanded 2006 model that included additional variables only collected in 2006 to establish a stronger connection between knowledge and use of VCT and ART and changes in sexual behaviors and HIV prevalence. This design allowed me to provide a multilevel answer to the question of why HIV prevalence may have declined among this group during this period.

Chapter 4: Results

The purpose of this dissertation was to explore the question of why an HIV prevalence of 30% in young Kisumu women aged 15 – 24 in 1997 had declined to 16% in 2006. In providing an answer to this question, I developed three specific aims. The first was to describe changes in access to HIV services between 1997 and 2006 by describing the roll-out of antiretroviral treatment (ART) and volunteer counseling and treatment (VCT). The second aim was to create multivariate logistic regression models to compare 1997 and 2006 survey data that included socio-structural, physical environment, and individual/psychological leverage points and young women's HIV status. The third aim was to explore the impact of additional factors from the 2006 ARTIS study including women's knowledge of HIV transmission and use of HIV services. In this chapter, I present the results of my analyses for each of these aims.

Aim 1: Changes in Access to HIV Services Between 1997 and 2006

Aim 1 was designed to examine changes in access to volunteer counseling and testing and to antiretroviral drugs. I described ART roll-out and the expansion of VCT in Kisumu, Kenya between 1997 and 2006 in order to explore the impact of changes in these HIV services on young women's sexual behaviors and HIV status in 2006 compared to 1997 women's sexual behaviors and HIV status. To contextualize this information, the following paragraphs also provide a description of population

projections, poverty, gender equity and educational attainment of individuals living in Kisumu.

This information is important because, as described in my theoretical approaches chapter (p. 52), Bronfenbrenner's Social Ecological Model, which I have used as a framework for this research, assumes that there are multiple environmental influences on individual behavior and health outcomes. The following descriptions of population projections, poverty, gender equity norms, and education are macro- or exo-level socio-structural leverage points. After these descriptions, I provide information on how HIV services were rolled out in the region. Finally, I present specific numbers regarding the roll-out of VCT and expansion of VCT in Kisumu. According to Bronfenbrenner's model, changes in HIV services represent more proximal or meso-level influences or psychosocial/physical environment leverage points on sexual behaviors and HIV status, which are interrelated with broader social realities such as poverty and educational attainment, and all of these can change over time. I begin with a description of HIV prevalence for the region and for young women since this is the primary health outcome of interest.

Health Outcome: HIV Prevalence

In 1999, HIV prevalence in Kisumu District was approximately 30%, and in 2001, the rate was estimated at 28% (Republic of Kenya, 2001 p. 21). 2000 data indicated that 35% of this population was positive (Republic of Kenya, 2002 p. 10, 19). In 2003, 7% of females in Nyanza Province aged 15 – 19 (n = 267), were positive, and 25.5% of females

aged 20 – 24 (n = 164) were HIV positive (Republic of Kenya, 2003). Similarly, Kenya's

Economic Recovery Strategy report for 2004-2005 obtained an HIV prevalence rate of

9.2% among pregnant women aged 15 – 24 who attended an antenatal clinic (Republic of

Kenya, 2006a p. xix). According to this source, 17% of women aged 15 – 49 tested

positive, compared to 10.6% of men (Republic of Kenya, 2004b p. 14) (No table shown

for data in this paragraph).

Overall prevalence has declined substantially in Kisumu District in the last few years, and

it is unclear why reported prevalence had such a steep drop from 26% in 2003 to 11% in

2004 among women tested at sentinel surveillance sites (NASCOP, 2007). See Table 1.

Table 1: HIV Prevalence in Kisumu District: Pregnant Women at Sentinel Surveillance
Sites

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
HIV Prev.	32%	27%	25%	33%	29%	26%	26%	11%	15%	18%

Source: (NASCOP, 2007)

Comparable to data shown in Table 1, in 2006, HIV prevalence was 12% among young

women aged 15 – 19. However, among 20-24 year-olds, prevalence was higher at 32%

(table not shown for these data) (NASCOP, 2006). As sited by Buve and colleagues

(Buve, et al., 2001b), this finding may indicate the importance of HIV prevention

programs that target young women prior to becoming sexually active.

Socio-structural Leverage Points: Population Projections

Kisumu District is in western Kenya along the shores of Lake Victoria. It is one of twelve

districts making up Nyanza Province, and it is the provincial headquarters (Republic of

Kenya, 2004a p. 4; 2004b). The city of Kisumu is the only urban area in the district with

over 2,000 people in residence. In 2001, approximately 42% of the population of Kisumu

District was under 15 years old, and 73% of the population was under 30 (Republic of

Kenya, 2001 p. 19). Life expectancy was 50.7 years for women and 47.2 years for men

(Republic of Kenya, 2001 p. 21).

Table 2 lists population projections for Kisumu District from the Kenya 1999 Population

and Housing Census. The 2003 projected female population in Kisumu District was

281,064. Of this number, 48,793 were estimated to be between the ages of 15 and 24

(Republic of Kenya, 1999c p. 6).

Table 2: Kisumu District Population Projections

	1999	2000	2001	2002	2003	2004	2005	2006
total	504,359	526,948	533,383	539,563	545,476	551,110	556,457	561,025
females					281,064			
females, 15 - 24					48,793			

- Empty cells indicate that no sex or age breakdown was provided.

Sources:

Republic of Kenya (1999a). *Kenya 1999 Population and Housing Census. Counting our people for development. Vol I: Population distribution by administrative areas and urban centres.*

Republic of Kenya (1999c). *Kenya 1999 Population and Housing Census. Counting our people for development. Vol. VII: Analytical report on population projections.*

Republic of Kenya (2001). *Kisumu District Development Plan 2002 - 2008: Effective management for sustainable economic growth and poverty reduction.*

The total population of the city of Kisumu was 322,734 in 1999. Of this total, 160,380 were female and 162,354 were male (Republic of Kenya, 1999a, 1999b). In Nyanza province, there were 3,564,203 people total, of which 1,880,383 were female and 1,683,820 were male. Among the women, 49% were reportedly economically inactive, meaning that respondents classified themselves as students, homemakers, retired or incapacitated. Of the remaining women, 36% worked on the family farm, and 8% worked in a family business. Additionally, 5% of women formally worked for pay, and 2% said they were unemployed (Republic of Kenya, 1999b p. xi) (no table shown for city and province population statistics).

Socio-structural Leverage Points: Poverty

In 2001, 53% of Kisumu District's population was considered to be living under the poverty line, and earlier reports indicated an increase in poverty in the region across the 1990s (Republic of Kenya, 1997; 2001 p. 20-22). This trend appears to have continued into the 2000s as district monitoring and evaluation reports list 63% of the district population living below the poverty line in 2004 – 2006 (Republic of Kenya, 2006d p. 6; 2007 p. 2). In Nyanza Province, 65% of people are poor – the poorest province in Kenya (Republic of Kenya, 2006a). In this latter report, poverty was defined as "an inability to acquire basic needs such as food, shelter, clothing, health services, education, legal services" (p. 6).

Estimates from 2001 indicated that the average annual income of Kisumu District residents was approximately 7,200 Kenyan Shillings, which, in today's exchange rate translates to approximately $110 per year. The majority - 85% - of households use firewood or charcoal as their primary energy source, 30% have piped water, and approximately 14% of households have electricity (Republic of Kenya, 2004b p. 8). In 2001, the district identified four factors relating to such high levels of poverty – drought and flooding, which impact agriculture and health; a weak agricultural market and infrastructure including poor roads; HIV/AIDS; and gender inequalities (Republic of Kenya, 2001 p. 20-22). In 2004-2006, several additional factors were cited: "collapse of the co-operative movement", hostility and "political interference towards foreign investors", low rates of literacy, and a high dependency ratio". Additionally, these reports describe numerous negative consequences of poverty, which include dropping out of

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school, prostitution, child labor, homelessness, lack of facilities and infrastructure,

HIV/AIDS-related mortality and morbidity due to lack of access to healthcare,

malnutrition, crime, and high fertility rates (p. 7, p. 3). The overall national poverty rate

for Kenya is 52% (Republic of Kenya, 2006d p. 7; 2007 p. 3-4).

In Kisumu District, women have been most affected by poverty. More than half - 66% of

Kisumu District women - are subsistence farmers. Approximately 75% of households

rely on agriculture for their income (Republic of Kenya, 2001 p. 8-10). Women bear a

disproportionately large share of the burden of farm labor in addition to domestic work.

At the same time, women face inhibitive cultural norms such as lack of access to

property, restrictions on family inheritance, and wife inheritance (Republic of Kenya,

2001 p. 21-22).

Socio-structural Leverage Points: Gender Equity

District-level reports cite cultural practices and poverty as reasons for the spread of

HIV/AIDS and consequently, a priority to change (eg. Republic of Kenya, 2006d p. 54).

Although not fully described, some of these cultural practices and poverty issues likely

include polygamy, prostitution and exchanging sex for resources, widow cleansing and

inheritance, domestic violence [For example, 56.2% of women in Nyanza province

reported having experienced physical or sexual violence. (Republic of Kenya, 2003;

2004b p. 14)], women's lack of access to property and education, unemployment, and

early marriage (For example, the Kenya 1999 Population and Housing Census reported

that 14.5% of births in Kisumu were to women age 15 – 19 (Republic of Kenya, 2004b p. 8).

In 2004, the Women's Bureau was elevated to the Department of Gender in the Ministry of Gender, Sports, Culture and Social Services, and a National Gender Commission was established to promote equitable participation in development. According to this Ministry, low levels of education for women coupled with cultural practices such as those listed above have resulted in low representation of women in decision-making and lack of access to many economic opportunities. The 2003 National Policy on Gender and Development is currently being implemented to reduce these inequalities. In addition, the 2005 Sessional Paper Gender Equality and Development was enacted in 2006. In 2005/2006, the Commission's goals were to establish gender divisions in all ministries relating to education, health, agriculture, and employment, to implement capacity-building projects, and to prioritize methods of monitoring and evaluating progress in promoting gender equity (Republic of Kenya, 2006a p. 75).

There is some evidence of recent increases in gender equity in Kenya as a result of these initiatives although there remains substantial gender disparity in education at higher levels, employment and health. As one example, there are now many more women involved in national decision-making compared to a decade ago. In 1997, there were 9 Members of Parliament; in 2006, 22 of 222 Members of Parliament were women (Republic of Kenya, 2006a p. 78).

Socio-structural Leverage Points: Education

Using Kenyan government reports and available records from the Kisumu District

Education Office, I have assembled some information about female enrollment in

secondary schools in Kisumu District and in Kenya as a whole in the last ten years.

However, these sources sometimes conflicted with each other, and there was also a

problem of lack of data. For these reasons, the numbers presented here should be taken as

a rough guide only. Much more research needs to be done to fully understand changes in

female enrollment patterns in both primary and secondary schools over time.

In 2006, total primary school enrollment for Kisumu District was 60,702 students, with

approximately even numbers of boys and girls. The teacher:student ratio was 1:40. There

were 18,919 students enrolled in secondary school with boys (10,785) outnumbering girls

(8,134) (Republic of Kenya, 2007 p. 27-8).

Figure 1 shows trends in female secondary school enrollment in Kisumu district between

2000 and 2007:

Figure 1: Female Enrollment in Secondary School, Kisumu District: 2000 – 2007
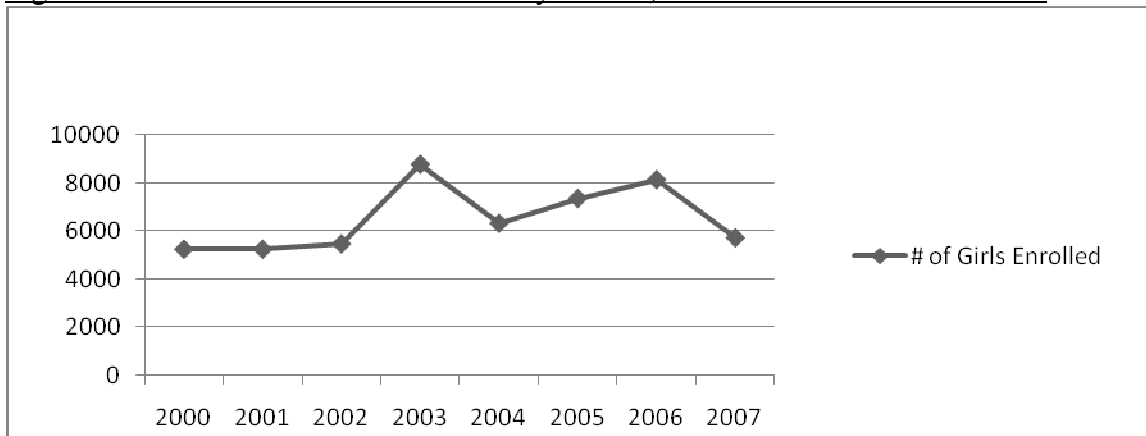
Source: Gichana, E. (2007). Trends in female secondary school enrollment. In C.
   McConnel (Ed.) (Compilation of Kisumu District Education Records ed.).
   Kisumu: Kisumu District Information Center, District Commissioner's Office.

It may be the case that private school enrollment was included in these data for 2003 –

2006, which explains the spike in enrollment. It is unclear from reporting whether this is

truly the case. If so, enrollment patterns are quite flat – but have risen slightly in public

schools when one compares 2000 – 2002 enrollment with 2007 enrollment. See Figure 1

(Gichana, 2007).

In 1999, nation-wide, 2,841,431 girls reported being in primary school compared with

2,965,672 boys. However, only 403,064 girls compared with 458,136 boys reported

attending secondary school. These data indicate male/female parity for primary school,

but significant disparity at the secondary school level and also much lower rates of

secondary school enrollment for both girls and boys (Republic of Kenya, 1999b p. ix) (no

table shown for these data).

The numbers from Kisumu District tell a similar story. In 1999 there was male/female parity for school attendance among boys and girls for primary school. However, by age 15, disparity in school attendance emerged such that more males than females were still attending (Republic of Kenya, 1999b p. 1-41). See Table 3.

Table 3: Secondary School Attendance: Kisumu District, 1999

Age	At School	Left School	Never Attended	Not Stated	Total
Females Age 15 - 19	14,214	17,751	575	290	32,830
	43.3%	54.1%	1.8%	0.9%	
Males Age 15 – 19	17,517	12,008	520	274	30,319
	57.7%	39.6%	01.7%	00.9%	
Females Age 20 - 24	1,730	25,392	546	227	27,895
	6.2%	91.0%	2.0%	0.8%	
Males Age 20 - 24	2,845	21,384	366	231	24,826
	11.5%	86.1%	1.5%	0.9%	

Source: Republic of Kenya (1999b). *Kenya 1999 Population and Housing Census. Counting our people for development. Vol II: Socioeconomic profile of the population*.

In 1999, there were considerably more males aged 15 – 19 than women aged 15 – 19 who were still in school. Likewise, more females than males in this age bracket had already left school. See Table 3.

Table 4 provides more detail regarding the highest level of school completed. In 1999, over half of females and males age 15 – 19 were in or had completed standard level 5 – 8 – primary school. Slightly more females were in attendance compared to males. This is also true among the 20 – 24 year age group; however, it appears that males were somewhat more likely to continue on to secondary school, with 42% of males compared

to 36.2% of females having completed form 1 – 4 – high school (Republic of Kenya,

1999b p. 2-41).

Table 4: Highest School Level Completed, Kisumu District

Age	None	Pre-primary	Primary		Secondary	College		Not Stated	Total
			1 - 4	5 - 8	1 - 4	5 - 6	University		
Females 15 - 19	597	143	3,439	19,629	6,948	23	27	2,024	32,830
	1.8%	0.4%	10.5%	59.8%	21.2%	0.1%	0.1%	6.2%	
Males 15 - 19	535	183	4,528	16,484	6,301	17	12	2,259	30,319
	1.8%	0.6%	14.9%	54.4%	20.8%	0.1%	<0.1%	7.5%	
Females 20 - 24	565	56	1,318	14,864	10,101	63	214	714	27,895
	2.0%	0.2%	4.7%	53.3%	36.2%	0.2%	0.8%	2.6%	
Males 20 - 24	374	71	1,405	11,573	10,422	65	212	704	24,826
	1.5%	0.3%	5.7%	46.6%	42.0%	0.3%	0.9%	2.8%	

Source: Republic of Kenya (1999b). *Kenya 1999 Population and Housing Census.*
    Counting our people for development. Vol II: Socioeconomic profile of the
    population.

Corresponding with the male/female equity in secondary school attendance seen in Table

4, in 2001, girls completed an average of 7 years of primary education and boys

completed 8 years. While secondary school attendance was much lower for girls (41% v.

59%), the girls who did attend secondary school tended to complete all 4 years (no table

shown for these data). Approximately 75% of adult females and 98% of adult males are

literate (Republic of Kenya, 2001 p. 10)

In the education sector, a key policy priority in the early 2000s was to "increase access to

quality and affordable basic education . . . to achieve a 100% primary school enrollment

rate and reduce the disparity in access and quality in education" (Republic of Kenya,

2006c p. 53). This countered the 1988 policy that required cost-sharing for education,

which has been linked to a decline in primary school enrollment throughout the 1990s as

poverty increased. In 1990 enrollment was at 95% in Kisumu compared to 85% enrollment in 2002 (Republic of Kenya, 2006d p. 31). In 2003, Free Primary Education (FPE) was introduced, and in 2005, enrollment was still comparable to 2002 levels at 83.2% (p. 53). However, according to the Mid-term Review of the Economic Recovery Strategy for Wealth and Employment Creation 2003 – 2006, the enrollment rate in primary school rose to this level from 79.8% in 2002, indicating a slight upward trend (Republic of Kenya, 2006c).

Nationwide, FPE led to a huge upsurge in primary school enrollment between 2002 and 2004, with one million new students attending school during that period. In Nyanza province, primary school net enrollment rates for females increased from 95.4% to 96.2% across the 2003/4 – 2004/5 school years (Republic of Kenya, 2006a p. 54). Continuing trends toward increased enrollment in both primary and secondary schools are expected, especially after free secondary education is implemented in the next couple years (Republic of Kenya, 2006c).

Nation-wide enrollment as a result of FPE seems to have already impacted secondary school enrollment. Enrollment in secondary schools increased from 19.2% (778,601) in 2002 to 22.9% (928,149) in 2005. The transition of students from primary to secondary school increased from 47% in 2002 to 57% in 2006. Likewise, university enrollment went up during the period from 71,349 to 89,979; however, the percentage of women enrolled in universities was relatively stable – 38.7% and 36.3% respectively (Republic of Kenya, 2006c).

The government of Kenya cites universal primary education as a priority in line with the World Health Organization's Millenium Development Goals (World Health Organization, 2007b), which involves the elimination of gender disparities at all levels of education (Republic of Kenya, 2006a). Additionally, the Kenya Education Sector Support Programme (KESSP), which was launched in 2005, is expected to enhance enrollment and quality of education (Republic of Kenya, 2006a).

Physical Environment Leverage Points: HIV Services Coordination

There are many examples of efforts based locally in Kisumu, nationally in Kenya, or internationally to fight HIV directly or indirectly. In my own efforts to understand the webs of programs underway with a specific focus on volunteer counseling and testing (VCT) programs and antiretroviral drug treatment (ART) rollout, I have reached three conclusions that will be substantiated by the information provided on the following pages. First, there has been an explosion of efforts to both prevent new cases of HIV and treat existing cases of HIV in the last ten years, spurred along by successful, new and cheaper ART. Second, however, there has also been an unfortunate lack of communication and coordination among local, national, international, governmental and private HIV prevention and treatment efforts. Consequently, conflict has resulted from competing interests and general lack of trust. Or, alternatively, past histories of lack of trust, cooperation and understanding led to the current tangled mass of semi-isolated and overlapping HIV initiatives. Third, efforts to prevent and treat HIV in Kisumu and

nationally in Kenya have been far less monitored, evaluated and presumably efficient than theoretically possible as a result.

There are recent Kisumu district reports that lay out strategy and provide monitoring and evaluation of grassroot and district-level demographics and development programs. In addition to being used at the district-level, these reports have been motivated by national initiatives and have also reached a national level in that each district provides a report that composes a piece of national ministry reports. These reports have been carried out as part of Kenya's national policy of decentralization. For example, the 2004-2005 Monitoring and Evaluation Report for Kisumu District (Republic of Kenya, 2006d) was motivated by the Republic of Kenya's Economic Recovery Strategy for Employment and Wealth Creation (Republic of Kenya, 2006a). The Investment Programme of this master plan laid out a plan for an integrated national system of monitoring and evaluation, of which the Kisumu District report was a piece.

Kisumu District has a District Development Officer (DDO) and a District Monitoring and Evaluation Committee (DMEC) who assemble the District Annual Monitoring and Evaluation Reports (DAMERs) (Republic of Kenya, 2006d p. 12). However, Kisumu District faces fundamental obstacles to providing an annual DAMER, which include "non-documentation of most of the vital information in some departments" as well as difficulties obtaining information from some departments due to suspicion or unwillingness to participate, and inadequate funding (p. 10, 12). The government of Kenya concurs, reporting that district-level monitoring and evaluation reports have been

limited by the lack of an M & E culture and technical expertise (Republic of Kenya, 2006a).

District-level monitoring and evaluation has been further hampered by individual departments' and NGOs' existing M&E systems that do not link with broader government M&E initiatives (Republic of Kenya, 2006d, 2007). An exception is Kenya's National AIDS Control Council (NACC), which has developed a system to monitor organizations such as Community Based Organizations (CBOs), Constituency AIDS Control Committees (CACCs), and District Technical Committees (DTCs) within Kenya that implement HIV/AIDS activities, but this is also disconnected to the DAMER (Republic of Kenya, 2006d p. 13).

From 2004-2006, CACCs and DTCs met irregularly due to unpredictable funding from NACC (Republic of Kenya, 2006d p. 16; 2007). Total HIV/AIDS funding from NACC during this period was 32,517,000 Ksh (~$420,000 US)(Republic of Kenya, 2006d p. 17). These numbers were not updated in the 2005-2006 M & E Report. In addition, the development of district-level HIV/AIDS strategies was still in early stages during this period since developing "district HIV/AIDS control strategies . . . [and implementing] HIV/AIDS/STI management package at all levels" (Republic of Kenya, 2006d p. 55) was listed as a priority.

Reports' descriptions of CBOs and NGOs indicate numerous international initiatives that have targeted Kisumu district. While these initiatives have helped curb the HIV/AIDS

epidemic in Kisumu, as discussed above, monitoring and evaluation of initiatives by local government has been complicated and unsuccessful since these initiatives often do not report back to government offices (Republic of Kenya, 2007 p. 46).

There has been a pronounced presence of foreign donors in Kisumu. In 2006, the number of NGOs in Kisumu District increased to 68, and noted major achievements included helping disadvantaged children gain access to education, providing healthcare to mothers and children, and providing HIV/AIDS services (Republic of Kenya, 2007 p. 30, 33).

Unsurprisingly, there has been conflict around coordinating local and international aid initiatives. For example, in describing Kisumu District's poverty, the 2004-2005 and 2005-2006 Monitoring and Evaluation Reports state that the public perceives poverty as "a scourge that perpetuates dependence on donors, government, NGOs and relatives" (p. 6, p. 2) Additionally, as referenced above, there has been hostility and political interference targeting foreign investors.

In line with the perception of dependence on donors, resources allocated to HIV/AIDS increased by over 885% between 2000 and 2005, and resources external to the government of Kenya composed 99% of these funds (Republic of Kenya, 2006a p. 67). An estimated 95% - 98% of funding for Kenya's HIV prevention and treatment programs has come from external donors. The government of Kenya did not set aside any funding for HIV/AIDS in their 2008 budget (Kamigwi, et al., 2006; PlusNews, 2008). Table 5

shows HIV funding by source in Kenyan Shillings and U.S. Dollars by year for 2000 –

2005.

Table 5: HIV/AIDS Resources by Source of Funding 2000 – 2005 (KShs millions; ~$US
millions)

	2000/01	**2001/02**	**2002/03**	**2003/04**	**2004/05**	**2005/06**	**% Change***
GoK	70; _.9_	10; _.13_	120; _1.5_	40; _.5_	156; _2_	_3.5_	variable
Donors budgetary	302; _3.8_	1,165; _14.8_	1,796; _22.8_	2,685; _34.1_	6,794; _86.4_		2,274%
Donors non-budgetary	1,760; _22.4_	3,539; _45_	4,136; _52.6_	5,487; 69.8	11,961; _152.08_		679%
# NGOs	10	26	19	22	52	68	680%
Total	2,142; _27.2_	4,744; _60.3_	6,071; _77.2_	8,234; _104.69_	18,963; _241.11_		886%
% Increase over Prior Year		221%	128%	136%	230%		

*2000/01 – 2004/05 for resources figures, 2000/01 – 2005/06 for number of NGOs

Sources: Republic of Kenya (2006a). _Economic recovery strategy: Annual progress
        report 2004 - 2005_.
Republic of Kenya (2007). _Monitoring and Evaluation Report Kisumu District: 2005 -
        2006_

The annual increase in funding from the Kenyan government's budgetary and non-

budgetary sources or NGOs increased substantially between 2000/01 – 2004/05. In terms

of dollar amounts, however, funding for HIV from the government of Kenya was

dwarfed by external contributions.

The biggest new external source of HIV funding during this period was funding from the

U.S. President's Emergency Plan for HIV/AIDS Research (PEPFAR). Table 6 indicates

contributions to Kenya in U.S. dollars beginning in 2004.

Table 6: PEPFAR Funding for HIV Prevention and Treatment Programs in Kenya ($US millions)

Fiscal Year	2004	2005	2006	2007	2008	% Change 2004-2008
Funding	92.5	142.9	208.3	368.1	534.8	578%

Source: United States (2008). The United States President's Emergency Plan for AIDS
   Relief 2008 country profile: Kenya Retrieved January 11, 2009, 2009, from
   http://www.pepfar.gov/press/81596.htm

In 2004, Kenya received 92.5 million U.S. dollars, which increased by year such that by

2006, funding had doubled to 208 million U.S. dollars. Kenya is still receiving support

for HIV services through this policy, and funding has recently been extended. (Table 6)

Kisumu's services have been transformed by PEPFAR. Although I was not able to

provide more specific information about programs funded by PEPFAR in Kisumu, one of

my Kisumu colleagues estimated that 80% of services in Kisumu have been funded by

PEPFAR in recent years (Reson Marima, personal communication 10/23/07). This

estimate was substantiated by the number of plaques on the doors of program offices

acknowledging PEPFAR and the Atlanta-based Centers for Disease Control for support.

Another key external donor of support for HIV services in Kisumu, Kenya during the

period was the Global Fund. See Table 7.

Table 7: Global Fund Disbursements for HIV Prevention and Treatment Programs in Kenya ($US millions)

Fiscal Year	2003	2004	2005	2006	2007	2008	% Change 2003-2008
Funding	8.3	28.1	21.1	55.7	28.2	39.8	480%

Source: The Global Fund (2008b). Global Fund disbursements by region, country and grant agreement (in USD equivalents) Retrieved January 11, 2009, from http://www.theglobalfund.org/documents/disbursementdetails.pdf

Beginning in 2003, Kenya received $8 million U.S. dollars in funding for HIV services from the Global Fund. By 2006, annual funding had increased to nearly 56 million U.S. dollars. Kenya continues to receive support for HIV services from this source (Table 7).

The period between 2000 and 2005 was one of great change in HIV services in Kenya. As the government of Kenya reported in 2005, "Awareness and sensitization campaigns, enhanced national coordination efforts and increasing international support and resources have all created an unprecedented opportunity to prevent new infections and reduce the impact of HIV/AIDS in Kenya (Republic of Kenya, 2006a p. 68). Motivated by increased donor support, the government of Kenya made a commitment to "comprehensively implement the Kenya National HIV/AIDS Strategic Plan, 2002-2005. This involved restructuring the National AIDS Control Council (NACC), which had been established in 1999 (Republic of Kenya), developing a plan to rollout HIV resources, in line with WHO goals, and making ART available to 95,000 people by the end of 2005 (Republic of Kenya, 2006a p. 65-6). Although behind schedule, this goal has been met. As of

December 1 2008, there are 91,366 Kenyans on ART provided by the Global Fund (the Global Fund, 2008).

2003/2004 was an especially successful HIV/AIDS control implementation year. During this year, an HIV/AIDS cabinet committee was established and chaired by the Kenyan President Kibaki. HIV/AIDS control units were set up in all ministries. Additionally, committees were established at district and constituency levels. An account was also set up to provide financing to community initiatives, and the cost of ART declined ten-fold from $500 USD to $50 USD per month. Consequently, the number of people on ART doubled from 10,000 to 20,000. Voluntary counseling and testing (VCT) centers were also established in all district hospitals.

In 2004/2005 the Kenyan government intensified these efforts and built multi-sector partnerships such that a national infrastructure to fight HIV/AIDS was considered to be in place by this time. During the period under review, the national infrastructure included grassroots organizations like the constituency AIDS control committees (CACCs) in 210 constituencies and district technical committees (DTCs) in 71 districts. Additionally, CBOs, NGOs, and FBOs implemented over 5,000 new projects in Kenya. Monitoring and evaluation also improved in 2004/2005 with the government of Kenya rolling out a two-tier national/district-level monitoring and evaluation system as part of the second year of Kenya's Investment Programme for the Economic Recovery Strategy (Republic of Kenya, 2006a p. xxi). Additionally, improvements were made in integrating ART into the

health care system, and guidelines were developed to manage and control opportunistic infections (Republic of Kenya, 2006a p. 66-7).

Nonetheless, numerous challenges have also been cited. The rate of new infections was still high in 2005, and some populations such as young girls remained at high risk of becoming positive. Furthermore, the availability of ART was still far short of country needs. The Kenya National AIDS Strategic Plan 2005-2010 is expected to set up a framework that will allow all stakeholders to more effectively harmonize their efforts to avoid misallocation of resources and duplication of efforts (Republic of Kenya, 2006a p. 68-9).

Physical Environment Leverage Points: Volunteer Counseling & Testing (VCT)
The Kenyan Ministry of Health included the introduction of volunteer counseling and testing (VCT) as part of its response to the HIV epidemic in its 1999 – 2004 National Strategic Plan. The Kenyan government published national guidelines through the National AIDS and STD Control Programme (NASCOP) and the National AIDS Control Council (NACC) in 2001. These guidelines were based on VCT protocols originally developed by the Centers for Disease Control (CDC) and the USAID Impact Project.

VCT is always voluntary. This means that informed consent and confidentiality are always maintained, and anonymous services can be provided. Currently, individuals who are under the age of 18 who are not "mature minors" - individuals who are married,

pregnant, parents or involved in risky sexual behavior – require parental or guardian consent.

VCT also involves both pre- and post-test counseling, which emphasizes behavior change to prevent HIV transmission. Counseling is also used to recommend couples counseling and as a means to provide referrals to appropriate services such as ART in the event of a positive test result.

The testing component of VCT utilizes an initial rapid test so that clients can receive their test result the same day or even within one hour. Ideally, each client is initially tested using two types of rapid tests to prevent against incorrect test results. In the event of a positive test, a confirmatory test is also done. Laboratory technicians are encouraged to conduct tests; however, trained and supervised counselors may also carry out simple rapid tests. All VCT staff are required to complete training in counseling and testing.

VCT expanded significantly in Kenya in recent years. At the end of 2004, there were 367 sites in Kenya, and by the end of 2005, there were 680 sites (Marum, Taegtmeyer, & Chebet, 2006; World Health Organization, 2006). Likewise, in Kisumu District, there was a strong push for VCT scale-up beginning in 2003. That year, there were approximately 9 sites offering VCT; by the end of 2004, there were 13 sites, and in 2005, 18 sites were offering VCT. In 2006 and 2007, the number of sites providing VCT jumped to 23 and 25, respectively. See Table 8.

Table 8: VCT Scale-Up in Kisumu District as Reported by DASCO

	2002	2003	2004	2005	2005 – women aged 15 - 24	2006	2006 – women aged 15 - 24	2007	2007 – women aged 15 - 24
# Facilities	3 or fewer	9 or fewer	13	18		23		25	
# Counseled			9,215	19,050	7,840	21,401	11,591	19,178	
# Tested			8,779	18,509	7,697	20,181	10,156	17,978	8,425
% of Cnseled Tested			95	97	98	94	88	94	
# HIV+			3,097	6,770	1,902	6,336	2,286	5,526	1,770
% HIV+			35	37	25	31	23	31	21
Total Female Population	275,177	278,193	281,066	283,793	132,993	286,123	134,085	288,415	135,159
% of Total Female Population Tested			3%	7%	6%	7%	8%	5%	5%

Source: DASCO (2007). Kisumu District AIDS and STDs Control Office Excel Files.

Even though there were a few sites providing VCT by 2002, district-level services reporting did not begin until 2004. That year, 8,779 women were tested for HIV; no age breakdowns were recorded. In 2005, 18,509 women were tested, of which 42% were women aged 15 – 24. VCT roll-out in Kisumu was the most rapid during this 2004 – 2005 period with the number of women tested more than doubling. In 2006, 20,181 women were tested of which 50% were young women, and similarly, in 2007, 17,978 women were tested, of which 47% were women aged 15 – 24. See Table 8.

Between 2004 and 2007, over 30% of all women tested for HIV were found positive; over 20% of young women were HIV-positive. These percentages are substantially higher than estimates obtained in 1997, 2003, and 2006, indicating, respectively, 30%, 15%, and 16% HIV-prevalence among women aged 15 to 24 in Kisumu (Buve, et al., 2001a; Cohen, et al., 2009; Republic of Kenya, 2003). See Table 8.

The percentage of the total female population tested for HIV jumped from 3% to 7% in

2003-2004 (estimated assuming no repeat testing); however, since 2004, the percentage

of women in Kisumu District participating in VCT has remained relatively flat at 5% -

8% (Table 8). As reported by the Joint HIV and AIDS Programme Review (JAPR) in late

2005, more men than women were accessing VCT, and young women aged 12 – 15 were

attending VCT in extremely small numbers. At this time, only one youth-friendly VCT

center existed even though youth were described as one of the most HIV-vulnerable

populations since HIV-related stigma was high, and consequently, youth tended not to

visit VCT sites (Republic of Kenya, 2006b). By 2007, there were two youth-centered

sites providing VCT services and two others in start-up phase that had not yet started

providing VCT. These data are included in the Kisumu District AIDS and STDs Control

Office (DASCO) data sited above in Table 8. Tuungane broke down their services data

by sex and age. Between October 2004 and September 2007, this site provided VCT to

approximately 15% to 30% of Kisumu's young female population. See Table 9.

Table 9: VCT Scale-Up at Tuungane Youth VCT Center in Kisumu – Women Aged 15 –
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	Oct. 2004 – Dec. 2005	Jan. – Mar. 2006	Apr. 2006 – Mar. 2007	Apr. – Sep. 2007
# Counseled	1,174	925	4,275	1,335
# Tested	1,038	865	4,047	1,279
% of Counseled Tested	88%	94%	95%	96%
# HIV+	178	182	669	192
% HIV+	17%	21%	17%	15%

Source: Tuungane Youth VCT Center (2007). Excel Files.

It is difficult to compare the data in Table 9 across columns since different periods of
time were used for data collection. However, it is still possible to see that over time,
Tuungane provided services to increasingly more young women.

Using Kisumu District AIDS and STDs Control Office (DASCO) records, 12 of the 16
ART sites active in 2007 were also providing VCT, indicating that by 2007, 69% of ART
sites had integrated services. Both youth-centered VCT sites were integrated VCT/ART
sites (no table shown).

Kisumu District reports described numerous barriers to providing VCT associated with
recent and rapid scale-up. Barriers included erratic availability of test kits, staff shortages,
staff incompetencies including non-adherence to national VCT guidelines, and staff
burnout (Republic of Kenya, 2006b).

At the 2007 HIV/AIDS Implementers' Meeting, additional prevention gaps were highlighted (personal communication with Reson Marima, 10/23/07). These included inadequate funding; poor targeting of efforts such that individuals who most needed VCT were not receiving it; ongoing HIV-related stigma and discrimination, which reduces VCT uptake; service fragmentation, which leads to missed opportunities to disrupt HIV transmission; and capacity issues.

Physical Environment Leverage Points: Antiretroviral Treatment (ART)

HIV treatment was not available outside the private sector in Kenya before 2001. Prior to that year, there was some symptom management being provided, and antiretroviral treatment (ART) was available at high cost in the private sector. Five pilot sites began providing ART in the public sector in Kenya in 2001. By 2003, the Kenyan government was providing ART to about 1,000 people, and approximately 10,000 additional people were on ART in the private sector by this time. As of June 2004, the government of Kenya was providing ART to approximately 3,500 people at 30 sites nationwide. ART roll-out was rapid in 2004, and by December, 100 sites were offering ART. By June 2005, approximately 30,000 people were receiving ART in the public sector, and as of November 2005, 55,000 people were on ART through 250 sites in public, private and mission facilities (WHO, 2005) (no table shown).

Likewise, in Nyanza Province, there were 26,943 people on ART by the end of 2005. Quarterly reports indicate rapid scale-up in the region for that year with 12,488 on ART

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in Q1, 14,628 by the end of Q2, 18,848 by Q3, and 26,943 on ART by Q4. (WHO, 2005) (no table shown).

Data from Kisumu District within Nyanza Province indicate a similar story. Two private sites began providing ART in the late 1990s; however, there was essentially no public access until 2003-2004. At the end of 2003, 2 pilot sites were providing ART, and 236 people were on ART. This represented approximately 1% of the population in need of ART at that time. By the end of 2004, 5 sites were offering treatment, and 481 had received ART. In striking contrast, by September 2005, 3,851 people were on ART through 11 sites. In 2006, the number of sites offering ART had grown to 14, and 8,928 people were receiving treatment. By June 2007, 13,489 people were receiving ART from 16 sites, an estimated 71% to 100% of HIV-positive people in Kisumu District in need of ART (Marston, 2007). See Table 10.

Table 10: ART Roll-out in Kisumu District: 2003 - 2006

	2003	2004	2005	2006
# of facilities providing ART	2	5	11	14
# of people on ART	236	481	3,851*	8,928
Total population	545,476	551,110	556,457	561,025
HIV prevalence	26%**	11%	15%	18%
Total HIV-positive population	145,642	61,724	62,323	62,835
% of HIV-positive population in need of ART (conservative: 15%)	21,846	9,259	9,348	9,425
% of HIV-positive population in need of ART (liberal: 30%)	43,693	18,517	18,697	18,850
*% ART coverage (15-30% estimation)	1% - 1%	3% - 5%	21% - 41%	47% - 95%

*This is probably a low estimate based on September 2005 data from the CDC. Kisumu JAPR 2006 indicated that 8,213 PLWHA in Kisumu District were using ART by the end of 2005. 60% of this population was female, and 23,000 people had enrolled in a treatment program.
**KDHS data indicated that HIV prevalence among women aged 15 – 24 in 2003 was 14.9%.
Sources:
DASCO (2007). District AIDS and STDs Control Office Excel Files.
Marston, B. (2007). Excel files. Centers for Disease Control.
NASCOP (2007). National HIV Prevalence in Kenya Retrieved March 21, 2009, from
    www.vydo.or.ke/Assets/NatEst2006.doc
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Summary

ART roll-out was swift in Kisumu, expanding from availability to approximately 1% of

HIV-positive people to over half of HIV-positive individuals in four years. The majority

of funding for ART roll-out came from sources external to the Kenyan government, and

PEPFAR stood out as the primary contributor of ART and VCT services in Kenya. VCT

services also expanded as a gateway to ART.

While the expansion of HIV services in Kisumu between 1997 and 2006 can be taken as a success story, barriers to providing services remain. One such barrier is ensuring that high-risk populations such as young women receive services. In 2006, there were still only two VCT centers that targeted youth, although both of these provided integrated VCT and ART. Tuungane was the only site in Kisumu that had available services data. It may be the case that because services were rolled out so quickly and recently, some high-risk populations like young women are still not fully utilizing VCT as a prevention tool prior to becoming HIV-positive and in need of ART. Nonetheless, the roll-out of ART and VCT in Kisumu, Kenya transformed services availability there.

In the next section, I present multivariate regression models to compare 1997 and 2006 young women's HIV status and leverage points or risk factors that predict HIV status at each time point – one prior to HIV services roll-out and one post-services roll-out.

Aim 2: Factors Predicting HIV Status in 1997 and 2006

The overall purpose of Aim 2 was to compare demographic, behavioral and physiological factors that predict HIV status among Kenyan women aged 15 – 24 in 1997 and 2006. Specifically, the study explored how associations between these leverage points and HIV status may have changed over a period of time that was striking for change in regard to HIV services. As explained in the previous section, the bulk of HIV prevention programs were introduced and ART was initially offered between 1997 and 2006.

In this section, I present results from population surveys collected in 1997 (Multicentre) and 2006 (ARTIS). First, using descriptive statistics, the surveys were compared across all leverage points. Second, I examined all univariate relationships between leverage points or risk factors and HIV status separately for the 1997 and 2006 surveys. Third, separate multivariate models for 1997 and 2006 were conducted. Finally, a combined preliminary 1997-2006 multivariate model is presented to begin exploring time interactions.

Descriptive Statistics Comparing the 1997and the 2006 Samples

Table 11 shows the descriptive statistics for the 1997 and the 2006 samples. The table shows the significant differences in the two samples.

Table 11: Descriptive Statistics for the 2006 ARTIS and the1997 Multicentre Surveys

Descriptors	1997 N(%)	2006 N(%)	OR (95% CI)
Socio-Structural Leverage Points			
Age			**1.59 (1.22 – 2.07)***
15 - 19	226 (52.93)	192 (41.47)	
20 - 24	201 (47.07)	271 (58.53)	
Mean	19.26	20.11	
Ethnicity			0.85 (0.61 – 1.17)
Luo	343 (80.33)	359 (77.54)	
Other	84 (19.67)	104 (22.46)	
Religion			**4.28 (2.63 – 6.95)****
Protestant or Catholic	349 (81.73)	440 (95.03)	
Other	78 (18.27)	23 (4.97)	
Birthplace			**2.07 (1.58 – 2.71)****
Kisumu or other urban area	198 (46.37)	297 (64.15)	
Rural area	229 (53.63)	166 (35.85)	
Education			**3.68 (2.64 – 5.11)****
Primary or lower	358 (83.84)	271 (58.53)	
Secondary or higher	69 (16.16)	192 (41.47)	
Current Student			1.37 (0.98 – 1.92)
Yes	73 (17.10)	102 (22.03)	
No	354 (82.90)	361(77.97)	
Individual/Psychological Leverage Points - Behaviors			
Alcohol Consumption in the Last Month			**3.06 (1.76 – 5.34)****
Yes	18 (4.22)	55 (11.88)	
No	409 (95.78)	408 (88.12)	
Ever Married			1.16 (0.89 – 1.51)
Ever Married	222 (51.99)	258 (55.72)	
Never Married	205 (48.01)	205 (44.28)	
Ever had Sex			1.42 (0.96 – 2.10)
Ever had Sex	362 (84.78)	411 (88.77)	
Never had Sex	65 (15.22)	52 (11.23)	
Currently Married			1.00 (0.77 – 1.31)
Married	209 (48.95)	227 (49.03)	
Unmarried	218 (51.05)	206 (44.99)	
Age of Sexual Debut			0.78 (0.60 – 1.01)
Age 9 - 15	214 (50.12)	261 (56.37)	
Age 16 - 22	213 (49.88)	202 (43.63)	
Mean	15.58	15.98	
Number of Sexual Partners			1.15 (0.87 – 1.52)
0-1 Partners	153 (35.83)	151 (32.61)	
2 or More Partners	274 (64.17)	312 (67.39)	
Mean	2.05	2.39	
1 or More Non-spousal Partners in the Last Year v. None			**0.66 (0.48 – 0.91)***
Non-spousal Partner(s)	113 (26.46)	89 (19.22)	
No non-spousal Partners	314 (73.54)	374 (80.78)	

Individual/Psychological Leverage Points - Physiology			
HSV-2-positive v. HSV-2-negative			0.96 (0.74 – 1.25)
Positive	224 (52.46)	238 (51.40)	
Negative	203 (47.54)	225 (48.60)	
Health Outcome			
HIV-positive v. HIV-negative			**0.43 (0.31 – 0.60)******
Positive	129 (30.21)	73 (15.77)	
Negative	298 (69.79)	390 (84.23)	

Comparison: age 15 – 19, other ethnicities, other religions, rural area birthplace, primary education, not a current student, did not consume alcohol in the last week

*p < .05 **p < .01 ***p < .001 ****p < .0001

Socio-Structural Leverage Points. In 1997, the mean age of respondents was 19.2; 2006 women were significantly older with an average age of 20.1 (See Table 11). However, because there was incomplete information on date of birth, age was measured in years only; there was no partial-year precision. This finding may be due to rounding error, which should be explored with additional research. There was no significant difference in ethnicity between the two samples. At both time points, approximately 80% of women surveyed were from the Luo tribe. Women surveyed in 2006 had significantly higher levels of education. 41% of 2006 women compared to 16% of 1997 women had attended secondary school or a higher level of education. Additionally, more 2006 women reported currently being students (22%) compared to 1997 women (17%); this difference approached significance. I had not hypothesized any population differences between the 1997 and 2006 samples. (Table 11).

Individual/Psychological Leverage Points. Compared to 1997 women, 2006 women consumed significantly more alcohol. There were no significant differences in the proportion of women who had ever been married. In 1997, 52% of women reported ever

having been married compared to 56% of 2006 women. 2006 women were slightly more likely than their 1997 counterparts to report ever having sex (89% vs. 85% respectively), and were also somewhat more likely to have had sex by age 15 (56% vs. 50%). Both trends approached significance. 1997 and 2006 women had similar numbers of sexual partners; however, 2006 women were significantly less likely to have had sex with a non-spousal partner in the prior year compared to 1997 women (19% vs. 26%, respectively). There was no significant difference between 1997 and 2006 women in terms of herpes simplex virus-2 (HSV-2) status. At both times, over 50% of the sample tested positive (52% in 1997 and 51% in 2006). (Table 11.)

Health Outcome - HIV Status. Women surveyed in 1997 had twice the odds of 2006 women to be HIV-positive. In 2006, 16% of women tested were positive compared with 30% in 1997. See Table 11.

Univariate Relationships

Table 12 shows the univariate relationships in the independent variables in 1997 and in 2006. These are discussed below.

Table 12: Univariate Relationships between Leverage Points and HIV Status

	1997 OR (95% CI)	2006 OR (95% CI)
Socio-Structural Leverage Points		
Age 20 – 24	**2.08 (1.36 – 3.16)***	**2.27 (1.29 – 3.96)**
Luo ethnicity	**2.79 (1.48 – 5.25)**	1.76 (.89 – 3.49)
Protestant or Catholic	1.04 (.61 – 1.79)	.88 (.29 – 2.68)
Secondary education	1.10 (0.63 - 1.91)	**0 .44 (0.25 - 0.77)**
Current Student	**0.27 (0.13 – 0.58)***	**0.17 (0.06 – 0.49)***
Individual/Psychological Leverage Points		
Consumed alcohol in last month	0.45 (0.13 - 1.59)	1.80 (0.91 – 3.54)
Ever married	**2.27 (1.48 – 3.49)***	**2.21 (1.28 – 3.81)**
Ever had sex	**4.21 (1.87 – 9.51)***	**10.83 (1.47 – 79.67)**
Currently married	**1.95 (1.27 – 2.99) ***	1.32 (0.80 – 2.18)
Sexual debut age 15 or younger	**1.72 (1.13 – 2.61)***	**1.82 (1.10 – 3.01)***
2 or more sexual partners	**3.13 (1.91 – 5.13)****	**4.70 (2.19 – 10.09)****
HSV-2 status	**8.67 (4.83 – 15.59)****	**6.86 (3.39 – 13.84)****

Comparison: age 15 – 19, other ethnicities, other religions, primary education, no longer a student, no alcohol in the last month, never married, never had sex, currently single, sexual debut age 16 or older, 0 – 1 sex partners
*$p < .05$ **$p < .01$ ***$p < .001$ ****$p < .0001$

Socio-Structural Leverage Points and HIV. In 1997 and 2006, women aged 20 – 24

years had twice the odds of women aged 15 – 19 to be HIV positive. Additionally, in

1997, Luo women had nearly 3 times the odds of being HIV-positive compared to non-

Luo women. This trend held for 2006 women although it was not statistically significant.

There was no significant relationship between education and HIV status in 1997;

however, 2006 women who had achieved a secondary education or higher had only 44%

the odds of being HIV-positive compared to women with lower levels of education.

Additionally, 1997 and 2006 women who were currently students were significantly less

likely than women who were no longer students to be HIV-positive. This result was

confounded with respondent age. See Table 12.

Individual/Psychological Leverage Points and HIV. There was no significant

relationship between alcohol consumption and HIV status in 1997. Although not

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significant, in 2006, women who reported drinking alcohol in the last month were more likely to be HIV-positive (p = .09).

Focusing on sexual behaviors, unsurprisingly, ever having sex and ever being married were significantly associated with increased HIV-risk at both time points. Similarly, in 1997, women who were currently married were significantly more likely to be HIV-positive compared to single women. However, in 2006, this relationship became non-significant. In 1997 and 2006, women who had sex for the first time at age 15 or younger had nearly 2 times the odds of other women to test positive. Finally, in both 1997 and 2006, there was a strong relationship between number of sexual partners and HIV risk. Women with 2 or more partners had three times the odds of testing positive for HIV in 1997 and nearly 5 times the odds of testing positive for HIV in 2006. All of these findings were as expected in that women who had more sexual experience were more likely to be HIV-positive. Furthermore, as a consequence to sexual behaviors, 1997 women who were HSV-2 positive had over eight times the odds of being HIV positive as HSV-2 negative women. Similarly, 2006 women who were HSV-2 positive had seven times the odds of testing HIV positive. See Table 12.

Multivariate Regression Model in 1997

The initial 1997 regression model included all factors associated with increased HIV risk (p < .10) in univariate analyses. These were: respondent age, ethnicity, current student status, age of sexual debut, ever been married, number of sexual partners across one's

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lifetime, and HSV-2 status. Additionally, a significant interaction between ethnicity and whether the respondent had ever been married was included.

Respondent age, current student status, and age of sexual debut were eliminated in three steps without significantly altering the model. Two models were then created including or excluding number of sexual partners. This covariate remained in the final model because the likelihood ratio test performed indicated that a model excluding number of partners was close to significantly different from the inclusive model (chi2[1] = 2.81, p = .09).

The 1997 multivariate model was run again after controlling for data collection clusters using the xtlogit command in Stata 10.1 as follows: xi: xtlogit HIV i.HSV2 i.NUMpartners i.student i.education*marriage, i(Cluster) pa vce(robust) or. Estimates were similar so data have been presented without controlling for clusters. Likewise, the 1997 multivariate model was run using imputed data and using listwise deletion. Estimates were similar, so the model using imputed data was presented here.

The final multivariate model indicated the importance of a combination of socio-structural and individual/psychological leverage points in predicting HIV status. Luo women were more likely to be HIV positive than non-Luo women. Regarding individual/psychological leverage points, women who reported having 2 or more sexual partners were not at higher risk for HIV after controlling for the other leverage points in the model. However, women who tested positive for HSV-2 had 7 times the odds of other women to be HIV positive. Since becoming HSV-2 positive is downstream from choices

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in sexual behaviors, this variable is likely a proxy for a combination of number of

partners, use of condoms with partners and selection of partners who may be more or less

likely to be HSV-2 positive. See Table 13. This was substantiated by the finding that

when HSV-2 status, which was consistently the strongest predictor of HIV status, was

excluded from the final model, the relationship between number of sexual partners and

HIV status increased substantially (OR = 2.36, 95% CI = 1.36 – 4.11, p < .01) (no table

shown).

Table 13: 1997 Logistic Regression Model of Risk Factors for HIV

| Covariate	OR	95% CI
Socio-Structural Leverage Points		
Luo Ethnicity	.98	.40 - 2.44
Individual/Psychological Leverage Points		
Ever Married	.26	.07 – 1.01
2 or More Sexual Partners	1.51	0.83 – 2.77
HSV2-positive	**7.11**	**4.01 – 12.64***
Interactions		
Luo Ethnicity x Ever Married	**4.81**	**1.13 – 20.40***

Comparison: other ethnicities, ever married, non-Luo ethnicity x ever married, 0 – 1
partners, HSV2 – negative
*p<.05, **p<.01, ***p<.001

There was also an interaction between Luo v. non-Luo ethnicity and whether the respondent had ever been married (See Table 13). After controlling for number of sexual partners and HSV-2 status, ever-married Luo women had over 4 times the odds of ever-married women of other ethnicities to test positive for HIV. (AOR = 4.72, CI = 1.54 – 14.48). Marriage appears to be a risk factor for HIV among Luo women more than for women of other ethnicities.

Figure 2 below illustrates the significant interaction between Luo ethnicity and marriage history. It shows the proportion of ever-married Luo and non-Luo women who were HIV-positive.

Figure 2: HIV Prevalence Among Luo and Non-Luo Women Who have Never or Ever Been Married
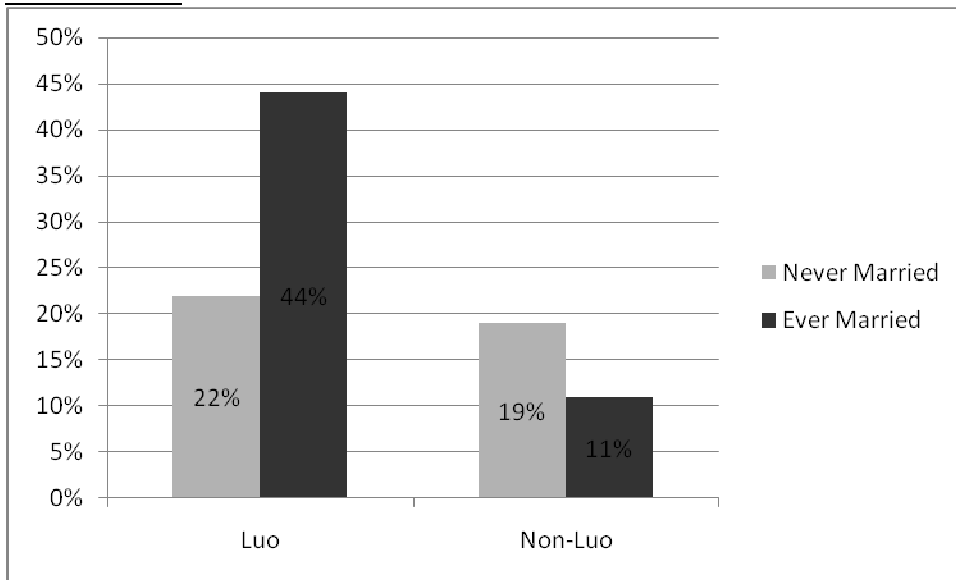
Approximately 44% of ever-married Luo women (81 of 185 women) were HIV-positive comapared to 11% (4 of 37) of ever-married non-Luo women. Luo women who had ever

been married had over four times the odds of non-Luo women who had ever been married to be HIV-positive. More work needs to be done to explore mechanisms for the finding that ever-married Luo women were at increased risk of becoming HIV-positive relative to women of other ethnicities. Two possibilities are different infidelity norms for the Luo tribe compared to other tribes and differences in socioeconomic status between tribes.

The importance of currently being a student was initially factored into the 1997 multivariate model. While this variable approached significance, it fell out due to small numbers. For example, 73 (17%) of 427 women included in analyses reported currently being a student. Among all students, 9 (12%) were HIV-positive.

Multivariate Regression Model in 2006

The initial model included all factors significantly associated with increased HIV risk in univariate analyses (p<.10). These included Luo v. non-Luo ethnicity, age, current student status, secondary education or higher v. primary education or lower, alcohol consumption, ever v. never been married, age of sexual debut, number of sexual partners in one's lifetime and HSV-2 status. A significant interaction between education and marriage history was also included.

Respondent age, Luo v. non-Luo ethnicity, alcohol consumption, and age of sexual debut dropped out in four steps without significantly altering the model. As in the 1997 model,

the relationship between number of sexual partners and HIV status grew stronger when

the model was run without HSV-2, which continued to be a strong HIV-status predictor.

Like the 1997 multivariate model, the 2006 multivariate model was run again after

controlling for data collection clusters using the xtlogit command in Stata 10.1. Estimates

were similar so data have been presented without controlling for clusters. Likewise,

estimates using imputed data or listwise deletion were similar, so the 2006 model using

imputed data was presented here. Table 14 shows the results of the final logistic

regression model for 2006.

Table 14: 2006 Logistic Regression Model of Risk Factors for HIV

Covariate	OR	95% CI
Socio-Structural Leverage Points		
Secondary Education or Higher	**0.20**	**0.07 - .62****
Current Student	.39	.12 – 1.25
Individual/Psychological Leverage Points		
Ever Married	**.37**	**.16 - .82***
2 or More Sexual Partners	**2.74**	**1.12 – 6.71***
HSV2-positive	**4.82**	**2.33 – 9.98*****
Interactions		
Secondary Education x Ever Married	**4.52**	**1.20 – 17.01***

Comparison: primary education or lower, not a student, ever married, primary education
x ever married, 0 – 1 partners, HSV2-negative
*p<.05, **p<.01, ***p<.001

The final model indicated that, similar to the 1997 model, women reporting 2 or more

sexual partners in their lifetime had nearly three times the odds of women who had had 0

or 1 partners to be HIV-positive (See Table 14). There was also a strong relationship

between HSV-2 and HIV status. Women who tested positive for HSV-2 had almost five

times the odds of HSV-2-negative women to also be HIV-positive. A significant interaction among level of education (secondary education or higher v. primary education or lower) and marital history (ever v. never been married) remained in the full model. The following Figures 3 and 4 illustrate the significant interaction between education and marriage history in the 2006 multivariate model. Never-married women who had a secondary education or higher were significantly less likely than never-married women with lower levels of education to be HIV-positive (AOR = 0.20, 95% CI = 0.07 - 0.62). See Figure 3.

Figure 3: HIV Prevalence Among Women with a Primary or Secondary Education Who have Never or Ever Been Married
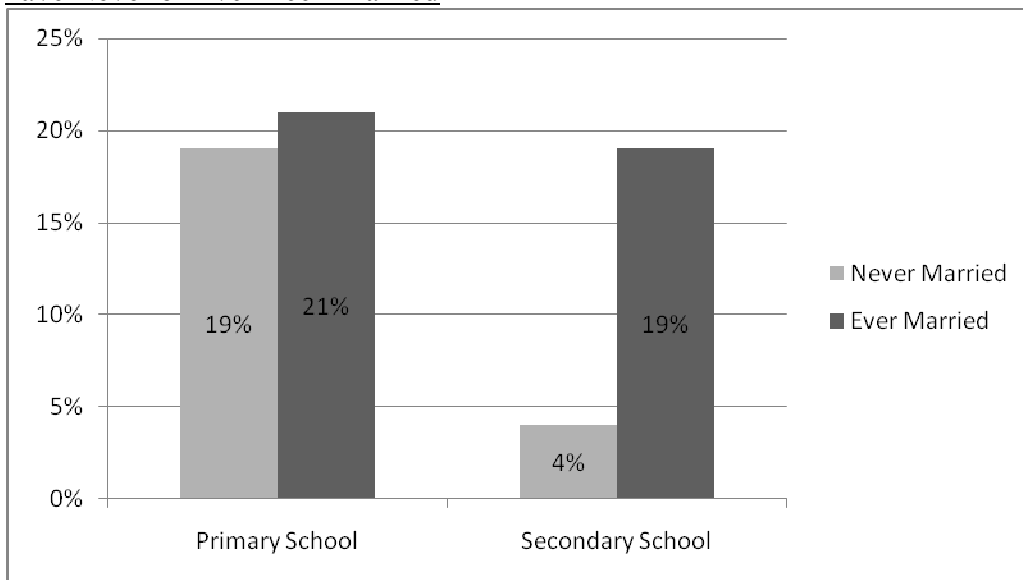
Among never-married women with a secondary education or higher, 96% (114 of 119 women) were HIV-negative and only 4% were HIV-positive (5 of 119 women). Comparatively, 19% of never-married women with a primary school education or lower

were HIV-positive (16 of 86 women), while 81% were HIV-negative (70 of 86 women). Never-married women with higher levels of education had just a 20% chance of being HIV-positive compared with never-married women with lower levels of education (Figure 3). Likewise, among women with a secondary education, never married women were significantly less likely to test HIV-positive than ever married women (AOR = 0.18, 95% CI = 0.06 – 0.54).

Level of education did not significantly alter HIV risk among ever-married women (Figure 3). Overall, never-married women with a secondary education or higher had a significantly reduced chance of being HIV-positive compared to ever-married women with a primary education or lower (Figure 3). To summarize, the importance of this interaction appears to be that staying in school was protective of HIV because it tended to decrease sexual experience.

This conclusion was substantiated by the finding that women with a secondary education were less likely than women with a primary education to ever have been married (OR = .29, 95% CI = .19 - .42, p < .001). Of women with a secondary education, 62% had never been married and 38% had been married. Comparatively, 32% of women with a primary school education had never been married and 68% had been married. There was also a trend toward women who reported currently being a student to be at decreased risk for HIV compared to women who were no longer students (p = 0.11). A likelihood ratio test indicated that eliminating this covariate from the overall model significantly changed the model, so it was maintained even though it is confounded with respondent age. Women

with a secondary education or higher were also significantly less likely to have had 2 or more sexual partners (OR = .56, 95% CI = .38 - .83, p<.01), or to have been HSV2-positive (OR = .50, 95% CI = .34 - .73, p<.001).
See Table 14.

1997/2006 Combined Multivariate Model

The initial model incorporated factors included in the final 1997 and 2006 models. These were: ethnicity (Luo vs. non-Luo), level of education (secondary or higher vs. primary or lower), current student status (no vs. yes), number of sexual partners in one's lifetime (2 or more vs. 0-1), and HSV-2 status (positive vs. negative). The Luo v. non-Luo ethnicity by ever vs. never been married interaction from the 1997 model, and the secondary education or higher vs. primary education or lower by ever vs. never been married interaction from the 2006 model were also included. An interaction with the year of data collection (1997 or 2006) was added for each of these factors to examine change in relationships between risk factors and HIV status over this time period. Two-way interactions between year of data collection and current student status, HSV-2, and number of sexual partners were dropped in 3 steps without significantly altering the model.

The final combined model included the following variables: Luo vs. non-Luo ethnicity, secondary education or higher vs. primary education or lower, current student status, ever vs. never been married, number of sexual partners (2 or more vs. $0 - 1$ sexual partners), and HSV-2 status. See Table 15.

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Table 15: 1997 and 2006 Combined Logistic Regresion Model of Risk Factors for HIV

Covariate	OR	95% CI
Socio-Structural Leverage Points		
2006 Study Date	.20	.02 – 1.81
Luo Ethnicity	1.15	.45 – 2.90
Secondary Education	1.57	.63 – 3.95
Student Status	**.48**	**.24 - .96***
Individual/Psychological Leverage Points		
Ever Married	.25	.06 – 1.02#
2 or More Sexual Partners	1.61	.98 – 2.66
HSV-2 Positive	**6.06**	**3.84 – 9.54*****
Interactions		
Luo Ethnicity x Ever Married	4.26	.99 – 18.22#
Luo Ethnicity x Study Date	5.54	.56 – 55.19
Ever Married x Study Date	9.09	.69 – 120.15
Luo Ethnicity x Ever Married x Study Date	**.03**	**.002 - .49***
Education x Marriage	.95	.26 – 3.45
Education x Study Date	**.12**	**.03 - .53****
Education x Marriage x Study Date	5.00	.78 – 31.89

Comparison: 1997 study date, other ethnicities, primary education or lower, not currently a student, never married, 0 – 1 partners, HSV2 negative
#p=.05, *p<.05, **p<.01

Controlling for these factors, currently being a student was associated with less HIV risk.

This variable was confounded with respondent age. Additionally, as in previous models,

HSV-2 status was a strong predictor of HIV status. Women who were HSV-2-positive

had six times the odds of women who were HSV-2-negative to be HIV-positive.

Ethnicity x Marriage Interaction Over Time.

There was a significant change in HIV risk over time for ever-married Luo women such

that in 2006, the HIV risk for this group was 33% that of risk in 1997 (AOR = .33, 95%

CI = .20 - .56, p < 001). In other words, even though Luo women who had ever been

married were at increased risk of being HIV positive compared to never-married Luo

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women and to non-Luo women, the level of risk went down substantially for this group

between 1997 and 2006. See Figure 4.

Figure 4: HIV Prevalence Among Ever-Married Luo and Non-Luo Women in 1997 and
2006
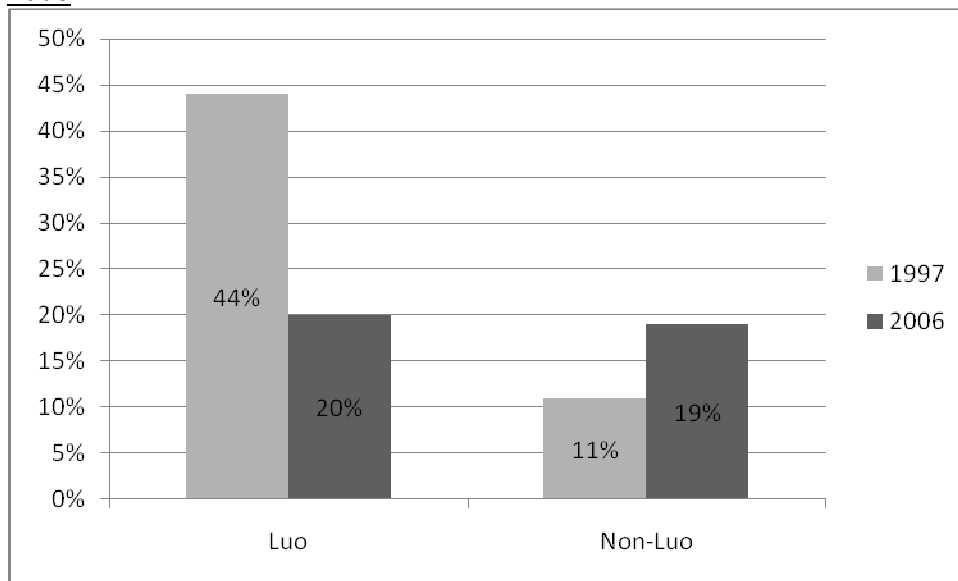
In 1997, 44% (81 of 185) ever-married Luo women were HIV-positive. However, in

2006, while still a high prevalence rate, only 20% (42 of 205) of ever-married Luo

women were HIV-positive. See Figure 4.

Education x Marriage Interaction Over Time.

There was also a significant change in HIV risk among never married women with a

secondary education such that never married women with a secondary education in 2006

were significantly less likely to be HIV-positive compared with their 1997 counterparts

of which there were few in 1997 (AOR = .02, 95% CI = .002 - .28, p < .01). See Figure 5.

Figure 5: HIV Prevalence Among Never-Married Women with a Primary or Secondary
School Education in 1997 and 2006
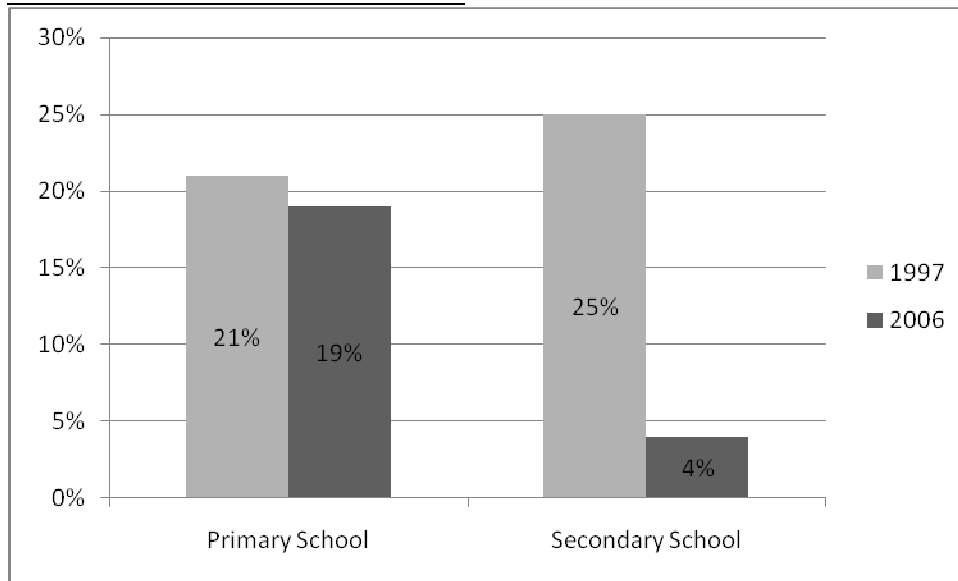
In 1997, 25% of women (10 of 30) who had never been married and who had a secondary

education or higher were HIV positive. In 2006, HIV prevalence was substantially lower

among this group. In 2006, only 4% of women (5 of 119) who had never been married

and who had at least a secondary education were HIV-positive. See Figure 5.

In summary, the results from the 1997 and 2006 combined model repeated the results

found in the separate 1997 and 2006 models. Namely, HIV prevalence declined among

young women between 1997 and 2006. Being Luo and ever married were important

leverage points predicting HIV-positive status in 1997 and 2006; however, HIV

prevalence among ever-married Luo women declined substantially between 1997 and

2006. Additionally, more 2006 women – especially Luo women - had a secondary

education compared with 1997 women, which resulted in education becoming an important leverage point predicting HIV status in 2006. Among women who had never been married and who had a secondary education or higher, HIV prevalence was a low 4% compared to 16% overall for young women aged 15 – 24. As in the separate 1997 and 2006 models, HSV-2 status was the strongest predictor of HIV status and likely served as a proxy of numerous socio-structural, physical environment, and individual/psychological leverage points upstream from becoming HSV-2-positive.

Aim 3: Impact of Other Factors on HIV Status in 2006

Aim 3 was to examine how 2006 women's educational attainment, use of VCT services, and knowledge and beliefs about HIV transmission and treatment predicted HIV status in 2006. Specifically, additional variables collected in the 2006 ARTIS survey that were not available in the 1997 data were examined. These included: women's socioeconomic status (socio-structural leverage points), knowledge of HIV transmission and use of HIV services (combination of physical environment and individual/psychological leverage points). The hypothesis was that the decline in HIV prevalence among young women between 1997 and 2006 could be attributed in part to the influx of VCT and ART during the interim. If this hypothesis was correct, then accurate knowledge about HIV and use of HIV services should be related to safer sex practices and a decline in HIV and STD prevalence.

Univariate Relationships

Table 16 shows the univariate relationships between women's socioeconomic status, the

use of HIV services, and knowledge of HIV transmission and HIV status.

Table 16 : Univariate Relationships Between Additional 2006 Leverage Points and HIV

	OR (95% CI)
Socio-Structural Leverage Points	
Have electricity	.77 (.44 – 1.37)
Have a TV	.54 (.28 – 1.06)
Have a radio	**.48 (.26 - .94)***
Read a newspaper once a week	.61 (.36 – 1.04)
Individual/Psychological Leverage Points	
Went to health care provider in the last year	.87 (.53 – 1.43)
Ever tested for HIV	**.49 (.33 - .94)***
Never treated for STD	**.32 (.15 - .70)****
Partner treated for an STD in the last year	.60 (.19 – 1.89)
Unsure whether partner had been treated for STD	**1.93 (1.12 - 3.32)***
A positive blood test indicates HIV	.66 (.31 – 1.40)
Circumcision lowers men's risk of having HIV	1.66 (.99 – 2.76)
Prefer a circumcised partner	.79 (.45 – 1.40)
Ever heard of ART	.68 (.41 – 1.14)
Don't currently have genital ulcers	**.32 (.14 - .76)****

Comparison: don't have electricity, don't have a working TV, don't have a radio, don't
read a newspaper, did not go to a health care provider in the last year, never tested for
HIV, ever treated for STD, partner not treated for an STD in the last year, knew whether
partner had been treated for STD, positive blood test does not indicate HIV, circumcision
doesn't lower men's risk of HIV, do not prefer a circumcised partner, have not heard of
ART, have genital ulcers
*p < .05 **p < .01 ***p < .001

Socio-Structural Leverage Points and HIV. In 2006, 29% of women interviewed had

electricity in their houses compared with the 2001 estimates provided in aim 1 indicating

that approximately 14% of people in Kisumu had electricity (See Table 16). Additionally,

37% had a working television. Most women - 87% - had a working radio, and 44% said

they read a newspaper one or more times each week. 2006 women who had a radio had

half the odds of other women to be HIV positive. Similarly, women who reported reading

the newspaper at least once each week were somewhat less likely than other women to be

HIV-positive. There were no significant relationships between HIV and having household electricity and a working TV.

Individual/Psychological Leverage Points and HIV. Nearly half (48%) of 2006 women had been to a health care provider in the last year (See Table 16). There was no significant relationship between having visited a health care provider in the last year and HIV status. Similarly, about half of the 2006 women surveyed reported having been tested for HIV at some point in their lives, and those who had ever been tested for HIV were significantly less likely than other women to be HIV-positive. Additionally, 7% of women surveyed said they had ever been treated for an STD. The remaining women who had never been treated for an STD were significantly less likely to be HIV-positive. In terms of sexual partners, 4% of women's partners had been treated for an STD in the last 12 months. A substantial minority - 23% - of women were unsure of whether their partners had been treated for STDs or not. Women who said that they were unsure of whether their partner had been treated for an STD had almost two times the odds of other women to be HIV-positive.

Looking at beliefs about HIV transmission, the majority – 90% - of 2006 women agreed that a positive blood test indicates HIV infection, and 89% said that using condoms decrease the risk of HIV transmission. However, only 48% thought that circumcised men are less likely to become infected with HIV compared to uncircumcised men, although 59% of women said that they preferred that their partner to be circumcised. 2006 women who correctly answered that circumcision lowers men's risk of having HIV were

significantly more likely to be HIV-positive. Perhaps due to the recent roll-out of ART, 68% of women had heard of ART. There were no significant relationships between HIV status and knowing that using condoms reduce the risk of HIV transmission, agreeing that a positive blood test indicates HIV infection, or having knowledge of ART. See Table 16.

As for sexual behaviors, 64% of 2006 women said that they had used a condom, 17% of women had exchanged sex for money or other resources, and 12% had been forced to have sex at some point in their lives (See Table 16). There were no significant relationships between HIV status and ever having used a condom, ever exchanging sex for money or other resources or ever being forced to have sex. As a consequence to their sexual experiences, 6% of 2006 women reported having genital ulcers when they were surveyed. Women who did not have genital ulcers at the time of being surveyed were significantly less likely to be HIV-positive.

Regression Model for the Impact of Other Factors on HIV Status in 2006
To examine the impact of other factors on HIV status in 2006, all terms used in the final 2006 model in Aim 2 (See Table 4) as well as the leverage points identified in Table 6 above were included in the final model. The only addition was the inclusion of the individual/psychological leverage point "ever tested for HIV", which indicated respondents' uptake of newly available VCT services.

I eliminated terms using a backward stepwise strategy, comparing reduced models with the Stata command "lrtest". I eliminated "have a radio", "read a newspaper", "don't

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currently have genital ulcers", "unsure of whether partner has been treated for STD", and "circumcision lowers men's risk of having HIV" in five steps without significantly altering the model. The variable "ever tested for HIV" was maintained in the final model since it added predictive power to the overall multivariate model. See Table 17 for the final 2006 model.

Table 17: Regression Model for the Impact of Other Factors on HIV Status in 2006

Covariate	OR	95% CI
Socio-Structural Leverage Points		
Secondary Education or Higher	.24	.08 - .75*
Current Student	.37	.11 – 1.19
Individual/Psychological Leverage Points		
Ever tested for HIV	.39	.22 - .69**
Ever Married	.37	.16 - .85*
2 or More Sexual Partners	3.01	1.20 – 7.58*
HSV2-positive	5.43	2.58 – 11.47***
Interactions		
Secondary Education x Ever Married	4.67	1.22 – 17.87**

Comparison: primary education or lower, not currently a student, never tested for HIV, never married, 0 – 1 partners, HSV2-negative, primary education x never married

The findings in this multivariate model were very similar to the 2006 model presented in Aim 2. Controlling for other leverage points in the model, women with more partners were more likely to be HIV-positive as were women who were HSV2-positive. The interaction between level of education and marriage also remained such that women with a secondary education who had never been married were significantly less likely to be HIV-positive than ever-married women with a secondary education or never-married women with less education. Additionally, however, women who had been tested for HIV were significantly less likely than other women to be HIV-positive after controlling for these factors. (See Table 17.)   This finding provides some evidence that new VCT services in Kisumu may have been effective in preventing new HIV cases. The

mechanisms for this conclusion are unclear, however. Women who had ever been tested for HIV had twice the odds of other women to have had two or more partners (OR = 1.96, 95% CI = 1.31 – 2.92, p = .001) and to have ever been married (OR = 2.07, 95% CI = 1.42 – 3.01, p < .001). It could be the case that women sought VCT services after a sexual experience where the woman thought she had been exposed to HIV; at the same time, women who were motivated to get an HIV test may have also been motivated to protect themselves from becoming HIV-positive in some way even though they did not abstain from sex. Another alternative is that this variable had a socioeconomic status component.

In summary, the results for Aim 3 showed that there were five leverage points in the model that were important in predicting whether women were HIV-positive or negative. As in the 2006 multivariate regression model in Aim 2, level of education and marriage history were important such that women with a secondary education or higher and who had never been married were at significantly decreased risk for HIV. Unsurprisingly, women's number of sexual partners and whether respondents were HSV2-positive were also strong predictors of HIV status as in the previous models.

This model differs from the 2006 multivariate model in Aim 2 in that, controlling for the other leverage points, whether respondents had ever been tested for HIV was associated with a decreased risk of HIV. Therefore, this model supports the hypothesis that the availability of new VCT programs in Kisumu would be associated with a decline in HIV prevalence.

Summary

In summary, the purpose of my dissertation was to provide an answer to the question of why HIV prevalence among young women declined from 30% in 1997 to 16% in 2006. I took a social ecological perspective to approach this issue as a complex model with numerous environmental influences on individual behaviors and health outcomes. In Aim 1, I used descriptive methods to document VCT and ART roll-out. I discovered that many new programs were implemented such that in 2003, approximately 1% of the population had access to ART, but only four years later in 2006, more than half of HIV-positive individuals in need of ART had access to these services, and VCT was rolled-out in parallel as a prevention tool and as a gateway to ART. While there are still only two VCT programs that target youth, both of these programs provide services integrated with ART, and two-thirds of all available VCT programs in the area provide services integrated with ART. The majority of these services were the result of foreign aid, specifically through PEPFAR.

It appears that these services may have aided in the decline in HIV prevalence among young women. In Aims 2 and 3, I created multivariate logistic regression models using data collected from young women in 1997 and 2006 to examine multiple factors associated with HIV status. In Aim 3, which was the aim in which I created a multivariate model for 2006 with socio-structural variables indicating respondents' use of VCT services, I found that women who had ever been tested for HIV were significantly less

likely to be HIV-positive after controlling for all other factors in the model. This finding was in line with my research hypothesis that new HIV services in Kisumu would have an impact on sexual behaviors that would ultimately result in a decline in HIV prevalence. It remains unclear, however, how women who had ever gotten an HIV test protected themselves from becoming HIV-positive since these women were also more likely to ever have been married and to have had two or more sexual partners.

In Aims 2 and 3, I also found that education – a more distal influence on sexual behaviors and HIV status – was important in lowering HIV risk in 2006 but not in 1997. In 2006, women who had a secondary education or higher and had never been married were at significantly less risk for HIV. Women with a secondary education were also less likely to ever have been married, to have had two or more sexual partners, or to have been HSV2-positive than women with lower levels of education, providing an indication that secondary education may be protective of HIV because it is associated with less sexual experience.

The importance of education in the 2006 models was surprising. In 2006, 40% of women had a secondary education or higher compared to only 16% in 1997. Furthermore, in 1997, Luo women had only half the odds of other women to have gotten a secondary education, but in 2006, Luo women were equally as likely as other women to have had a secondary education. This accounts for the change from a significant interaction between Luo ethnicity and ever being married that predicted higher rates of HIV in the 1997 multivariate model (Aim 2) to a significant interaction between having a secondary

education and never having been married that predicted lower HIV prevalence in the 2006 model. The importance of Luo ethnicity fell out of the 2006 model (also Aim 2).

My results can not specify why there were significantly more educational opportunities for women in 2006 compared to 1997, especially for Luo women. During the period under investigation, Kenya had promoted national policies to encourage girls to stay in school. It could have been these efforts or perhaps changes in socioeconomic status between the 1997 and 2006 samples that allowed more Luo women to attain higher levels of education and postpone marriage. More research should be done in the area of how educational opportunities impact sexual behaviors as a means to develop effective policies that promote women's education and health.

Finally, my multivariate regression models in Aims 2 and 3 also indicated the importance of physiology in becoming HIV-positive. In the 1997 and 2006 multivariate models, being HSV2-positive was the strongest predictor of HIV status after controlling for all other model factors. HSV-2 is indicative of sexual behaviors, which did not change substantially from 1997 to 2006 while HIV declined substantially. It may be the case that while women altered their sexual behaviors to prevent themselves from becoming HIV-positive, they continued to expose themselves to HSV-2. A couple of possibilities for this scenario include sero-sorting and having sex with HIV-positive partners who were on ART.

Chapter 5: Discussion and Conclusions

Introduction

This dissertation used an adaptation of Bronfenbrenner's Social Ecological Model (1989;

Grzywacz & Fuqua, 2000) to explore several explanations of why HIV prevalence

declined among young women in Kisumu, Kenya between 1997 and 2006. One possible

explanation, focusing on meso-level changes in young women's physical environments,

is that there was an influx of HIV programs beginning around 2003 that made

antiretroviral treatment (ART) available and expanded access to volunteer counseling and

testing (VCT). Prior to that year, young women in Kisumu had very limited access to

these services. Therefore, I hypothesized that the decline in HIV prevalence from 30% to

16% among young women during this period could be attributed, in part, to changes in

young women's physical environments through the roll-out of these HIV services.

Aim 1 was, therefore, to describe antiretroviral treatment (ART) program and volunteer

counseling and testing (VCT) expansion in Kisumu, Kenya between 1997 and 2006. I

met this aim through archival research and speaking with individuals who had been

directly involved with making ART and VCT available in Kisumu.

Aim 2 was to compare demographic, behavioral and physiological factors that predict

HIV status among Kenyan women aged 15 – 24 in 1997 and 2006. Finally Aim 3 was to

examine how 2006 women's use of VCT services and knowledge and beliefs about HIV

transmission and treatment predict HIV status in 2006. For Aims 2 and 3, I used

Bronfenbrenner's Social Ecological Model as a framework for the creation of multivariate logistic regression models exploring multiple influences on young women's HIV status. These influences included socio-structural leverage points – ethnicity, religion and education – and individual/psychological leverage points - sexual behaviors and HSV- 2 status. Data for these regression models came from comparable population surveys collected in 1997 and again in 2006. Since ART and VCT became available in the interim, this design allowed me to explore the impact of HIV services change ("meso-level" or "psychosocial/physical environment leverage points") on young women's sexual behaviors ("micro-level" or "psychological/individual leverage points") and HIV status in 2006 compared to 1997 survey data without excluding other socio-structural leverage points that were thought to be interrelated and also important to women's behaviors and HIV status.

I created three of these multivariate models for aim 2, which included separate models for 1997 and 2006 data and a 1997/2006 combined model. For aim 3, I created an exploratory expanded 2006 model that incorporated several measures of socioeconomic status and variables indicating the extent to which the 2006 women had accessed VCT. Through these three aims, I was able to describe how ART and VCT were rolled out in Kisumu and to provide multilevel explanations for why HIV prevalence in young women aged 15 – 24 declined from 30% in 1997 to 16% in 2006.

Methods

For Aim 1, I described the roll-out of VCT and ART in Kisumu, Kenya, and what life was like for young women living in Kisumu between 1997 and 2006. My primary sources for VCT and ART services information were national- and Kisumu district-level government reports and VCT and ART services records from the Kisumu District HIV/AIDS and STDs Control Office (DASCO), Tuungane Youth VCT Center in Kisumu, and Barbara Marston at the U.S. Centers for Disease Control who helped direct services roll-out in Kisumu during the period under investigation. My primary sources to understand female school enrollment were government reports and enrollment statistics from the Kisumu district Department of Education obtained with Evans Gichana's assistance from the Kisumu district Information Center. I also incorporated basic information about poverty, female gender roles, population characteristics and employment obtained from government reports.

This information was framed by literature reviews of global ART distribution, perspectives on globalization, and neo-Marxist theories of state power as a context in which to understand the timing and nature of VCT and ART roll-out in Kisumu, Kenya and a means to consider how international movements such as global ART distribution may ultimately impact particular individuals in particular places.

Samples

For Aims 2 and 3, I utilized data from two parallel population surveys collected in 1997 (Buve, et al., 2001a) and 2006 (Cohen, et al., 2009). At both time points, men and women

aged 15 to 49 answered demographic questions and questions about sexual history and had blood drawn to be tested for HSV-2, Trichomoniasis, and HIV. In 1997, 1,519 men and women were surveyed compared to 1,655 in 2006. In 1997, 521 (31%) were young women under the age of 25. In 2006, 507 (34%) were young women under the age of 25. I used young women's data from these surveys to create multivariate logistic regression models that examined socio-structural and individual/psychological leverage points associated with young women's HIV status in 1997 and in 2006.

Aim 1 Findings

VCT and ART were rolled out rapidly between 2003 and 2006. In 2003, these services were virtually nonexistent, but by 2006, 47% – 95% of individuals in need of ART had received it and over 10,000 women aged 15 – 24 had participated in VCT. This translated to approximately 5% - 8% of this population getting tested annually (DASCO, 2007; Marston, 2007).

While the speed with which ART was introduced was a success story, barriers remained to providing high-quality services. These included erratic availability of test kits, staff shortages, staff incompetencies, and lack of targeting of high-risk groups such as young women (Republic of Kenya, 2006b). Furthermore, since VCT and ART were rolled out by many different foreign donors, there was also a lack of coordination and monitoring and evaluation of services between donors and the government of Kenya (Republic of Kenya, 2006d), which may have reduced the effectiveness of VCT and ART programs in Kisumu.

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The roll-out of VCT and ART services in Kisumu was rapid because effective drug

treatments for HIV had been available in the U.S. and other industrialized nations for

nearly a decade (Pujol, 2006). The availability of these drugs in Kisumu, Kenya, was

delayed because of inability of the government of Kenya's and most residents' to pay the

high price for these drugs and services and the lack of alternate methods of obtaining

these drugs (such as in Brazil) (Chequer, et al., 2002). By the early 2000s, however, new

flexibilities in international trade agreements and generic drug competition occurred,

which made ART available off-patent, drastically reduced drug prices (World Health

Organization, 2005a). Concurrently, the momentum behind efforts to make ART

available to everyone in need as opposed to only those with an ability to pay for it

reached a tipping point so that international organizations made the drugs available.

While there was the contestation among actors involved with developing and distributing

ART, international organizations such as the World Trade Organization (WTO) promoted

an international free trade ideal.   The coordination of international efforts was advanced

by other organizations like the World Health Organization (WHO) promoted both free

trade ideals and a social justice mission to provide equitable access to health care.

Interrelationships across nations deepened through international trade agreements and

international patent laws that tended to promote the economic interests of dominant

actors such as multinational pharmaceuticals corporations and industrialized nations (M.

K. Smith & Tickell, 2003).

At the same time, more and more international and national actors began envisioning the possibility of successfully rolling out ART outside industrialized nations where there were strong markets and existing health infrastructure to handle managing HIV as a chronic disease. For example, new organizations like the Global Fund (Global Fund, 2009) were formed, and the U.S. government introduced a foreign aid package called the President's Emergency Plan for HIV/AIDS Relief (PEPFAR) (US Government) that dwarfed most other initiatives to roll-out ART to many regions of the world that had, until that point, been denied access to ART. The result was an international outpouring of support to make VCT and ART available in many regions of the world, and specifically in Kisumu, Kenya beginning around 2003.

The way in which ART was distributed first to strong markets and then to weak markets corresponded with a skeptical perspective on globalization that identified nation states as mediators of international influences (Estes & Phillipson, 2002; Navarro, 1999). For example, ART became available first to regional alliances of industrialized nations that housed multinational pharmaceutical corporations holding patents on these drugs, created rules of international trade, and provided strong markets for these drugs. Some nations outside these alliances, of which Brazil was a an exception, counteracted this neoliberal global trend by making long-term commitments to guaranteeing ART access to all its citizens and pursing generic drug options, which resulted in earlier access to ART compared to other countries that did not make such commitments (Chequer, et al., 2002; Galvao, 2002).

Furthermore, from this perspective, globalization involved contestation among numerous actors including transnational and international organizations and nation states such that the state has been not only a mediator of globalization but also an essential site, medium and agent of globalization in conjunction with other actors such as other states and international organizations. The state has not disappeared in a globalized environment. In fact, skeptical perspectives argue that national policies drive the international economy (Hirst & Thompson, 1999).

A prime example of this dynamic in regard to ART distribution was the U.S. PEPFAR legislation passed in 2003 that provided $15 billion U.S. dollars across 5 years to support HIV prevention and treatment programs (US Government). The Bush administration passed this legislation, citing health disparities as a security concern in the context of beginning an unpopular war in Iraq post-9/11. The legislation was politically beneficial in that it unified Republicans, Democrats, and conservative religious organizations like Catholic charities at a time when there was much political disagreement among these groups. Additionally, it was economically beneficial to charitable organizations working in AIDS. When PEPFAR passed, it became the largest foreign aid package the U.S. had implemented in several decades, and it arguably transformed HIV/AIDS prevention and treatment programs in places like Kisumu (United States, 2008).

This skeptical perspective on global ART distribution corresponds with a neo-Marxist perspective on state power, which argues that states represent power relations among classes and, more specifically, that economic interests are articulated in the class relations

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of any society. The state tends toward crisis when it is unable to balance its support of capitalist production with social outcomes that are perceived by citizens to be reasonable. When disparities between classes become too great, the state is forced to step in to solve the distribution problem or it will risk losing its legitimacy. Furthermore, the state is particularly motivated to intervene when organized groups representing capital, labor or other interests have already made politically effective responses to an inequitable distribution problem (Habermas, 1975; Offe, 1984). Going beyond the borders of a single state, globalization becomes alliances of dominant classes writ large (Navarro, 1998, 1999).

This theory was illustrated by what happened in global ART distribution. The WHO, the Global Fund and the Clinton Foundation were among the first to organize and fund ART roll-out to weak markets across the turn of the century (The Clinton Foundation, 2007; The Global Fund; World Health Organization, 2007a, 2007b) as generic drugs were allowed to come on the market at only a fraction of the cost of branded drugs (Medecins San Frontieres, 2005). As a result of these and other organizations' efforts, the world became more aware of ART as an effective treatment for HIV. The Bush administration's unilateral response with PEPFAR then built on the momentum of these organizations' lead, and at the same time, dwarfed these efforts. The passage of PEPFAR resulted in the majority of VCT and ART programs opened in Kisumu in 2003 or later.

Most VCT and ART programs in Kisumu were the result of support from donors external to Kenya. While the Government of Kenya spent $1-2 million U.S. dollars annually on

HIV between 2000 and 2005, external sources of funding increased from $22 million U.S. dollars to $152 million U.S. dollars across the same period. Likewise, in 2000, there were 10 non-governmental organizations (NGOs) in Kisumu in 2000, but by 2006, there were 68 (Republic of Kenya, 2006a, 2007). As described previously, the largest new funder was PEPFAR, which contributed $93 million U.S. dollars to Kenya in 2004, $143 million U.S. dollars in 2005, and $208 million U.S. dollars in 2006 (United States, 2008). The Global Fund began assisting HIV efforts in Kisumu in 2003 as well, providing $8 million U.S. dollars to Kenya that year, ramping up to spending $56 million U.S. dollars in 2006 (The Global Fund). All in all, HIV/AIDS resources in Kenya increased by over 885% between 2000 and 2005, and an estimated 95% - 98% of that funding came from external donors (Kamigwi, et al., 2006). Considering that PEPFAR's budget dwarfed all other contributions, it was not surprising that the presence of PEPFAR was especially strong in Kisumu in late 2007.

A relative gap in this story is the government of Kenya's role in promoting ART access before and after 2003. The Government of Kenya established The National AIDS Control Council (NACC) in 1999 and made a commitment to comprehensively implement their national HIV/AIDS Strategic Plan 2002 – 2005, which involved rolling out HIV resources in line with the World Health Organization's WHO's goals (Republic of Kenya, 2006a). However, most of their reports focused on foreign aid. The particularities of Kenya's actions in managing foreign donations should be explored in future research. Furthermore, in my research, there were few indications of local responses to the influx

of foreign aid. For example, in one Kisumu district report, poverty was cited as a "scourge" that has led to donor dependence (Republic of Kenya, 2007).

Underdevelopment theory argues that the West exploited the rest of the world and that international contact did not facilitate, but hindered development (Amin, 1990; Caldwell, 1977; Frank, 1974). The story of ART distribution specifically, and trajectories of globalization more broadly, parallel the long history of inequities between African countries and the West (Kiely, 2005). For example, the scourge of poverty in Kenya allowed powerful nations such as the U.S. to implement foreign aid legislation like PEPFAR. Multinational organizations based in powerful countries like the U.S. were encouraged to both innovate and direct the distribution of ART rather than supporting the local government in these activities.

Conceptualizing globalization as international alliances of dominant classes leads to categorizing regions and individuals as core or periphery (Kiely, 2005), as centers or margins (Sassen, 2000), or as winners or losers of globalization (Castells, 1998; Hoogvelt, 2001). This means that in order to understand patterns of differential access to ART over time, it is necessary to also look at a long history of inequities across regions. African regions were hardest hit by HIV and they lacked the capabilities to innovate ART and to gain access to ART.

To summarize, ART and VCT were rolled out quickly across four years in Kisumu, Kenya, but this movement did not occur until almost ten years after effective ART

became available in the United States. New HIV services in Kisumu were primarily the result of foreign aid and specifically the PEPFAR legislation from the U.S. These details support the perspective that international movements like the global roll-out of ART are the result of international alliances of dominant classes exerting their economic and political interests alongside normative standards of social justice. Furthermore, the way in which ART became available worldwide shows the long history of the inequitable distribution of resources.

Aim 1 examined multiple influences that resulted in a particular spectrum of ART and VCT services becoming available in Kisumu, Kenya in the early 2000s. This was a revolution in health since it transformed HIV from a death sentence to a chronic disease. More research is required to understand the government of Kenya's role in improving access to ART and VCT in Kisumu and ultimately, the impact of these services on young Kenyan women's health. A study comparing variable state responses to ART access linked to differential histories of ART and VCT access and citizens' health outcomes could make states' mediation roles more apparent.

Aim 2 Findings

In Aim 2, I explored multiple influences on health outcomes on a lower level. Aim 2 focused on how a decline in HIV prevalence among young women may have been influenced by the roll-out of ART and VCT in Kisumu in addition to broader social influences on sexual behavior such as ethnicity and education.

Declining HIV Prevalence, Stable HSV-2 Prevalence

Even though HIV prevalence declined from 30% in 1997 (Buve, et al., 2001a) to 16% in

2006 (Cohen, et al., 2009), there was no significant change over time in herpes simplex

virus 2 (HSV-2) prevalence. Over 50% of women surveyed were positive for HSV-2 in

1997 and again in 2006. This was a surprising finding because previous researchers have

argued that HIV and HSV-2 epidemics fuel each other because being positive for HSV-2

increases risk for becoming HIV-positive and also makes an individual who is HIV-

positive more infectious (Freeman, et al., 2007). In contrast, my results showed that rates

of HSV-2 remained high while HIV prevalence declined considerably.

There are potential explanations for the finding in this study. First, this could be an effect

of ART availability in Kisumu. ART is usually considered a treatment for HIV as

opposed to a prevention strategy, but it may also be an effective prevention tool because

ART lowers viral loads and thus decreases the chance of HIV-positive people

transmitting HIV to their partners (Rotheram-Borus, Swendeman, & Chovnick, 2009). It

could be that while 1997 and 2006 women had comparable sexual behaviors (as

discussed below), 2006 women were more likely to have had unprotected sex with HIV-

positive men who were using ART. If this was the case, then women may have been less

likely to have become HIV-positive after being exposed to an HIV-positive partner with a

decreased viral load. At the same time, these women could have become HSV-2 positive.

Second, this finding could be the outcome of sero-sorting based on young women hearing HIV prevention messages at VCT clinics, through media campaigns, or at school. Thus, young women who were HIV-negative may had associated with men who were also HIV negative. At the same time, women's HIV-negative partners may have been positive and unsymptomatic for HSV-2, and as much as women were having sex without using condoms, 2006 women could still have become positive for HSV-2 despite protecting themselves from becoming HIV-positive. To summarize, this finding seems to indicate that 2006 women were not consistently using condoms with their partners, but were protecting themselves from becoming HIV-positive through having sex with HIV-positive partners on ART or through sero-sorting. This could explain why HIV services played a role in declining HIV prevalence among young Kenyan women. Future research is warranted to determine whether either of these explanations is correct because they would identify how access to ART and VCT may have prevented new HIV cases.

Few Significant Changes in Sexual Behaviors Over Time

In line with the finding of no decrease in HSV-2 prevalence, there was also no significant change in most of 2006 young women's risky sexual behaviors compared to 1997 women's behaviors (Buve, et al., 2001b; Cheluget, et al., 2004; Glynn, et al., 2003). Consequently, there did not appear to be significant overall changes toward safer sex due to VCT availability as has been found in other studies (Voluntary HIV-1 Counseling and Testing Efficacy Study Group, 2000), as I had hypothesized.

At the same time, the finding showed that there were no overall increases in risky sexual behaviors relating to ART availability, as has been found in other studies in the U.S. (e.g., Crepaz, et al., 2004) This finding corresponds with research in Africa indicating no significant increase in risky sexual behaviors associated with ART access (Eisele, et al., 2008; Luchters, et al., 2008; Moatti, 2003), especially among women (Cohen, et al., 2009). Since ART is offered at a majority of VCT clinics in Kisumu, this finding supports the previous research that integrated services are effective in addressing the HIV epidemic (Salomon, et al., 2005).

One significant sexual behavior difference between the two samples was that 2006 women were significantly less likely to have had sex outside of marriage in the previous year (19% compared to 26% in 1997), which has been found to be a risk factor for HIV (Buve, et al., 2001b). This finding was consistent with the hypothesis that women would practice safer sex after accessing VCT to the extent that they learned about the increased HIV risk associated with extramarital or concurrent relationships and/or with having more sexual partners.

Young Women in 2006 had Higher Levels of Education
There were two significant unexpected differences between the two samples. The 2006 sample was slightly older, with a mean age of 20.1 compared to a mean age of 19.3 in 1997. While this difference was significant, it is unclear whether this difference impacts the comparability of the two samples. This finding may be due to differences in how

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respondents reported age in 1997 (age on birthday) and 2006 (birthdate) and thus may be attributed to rounding error. This issue should be explored with additional research.

The other striking difference was that 2006 women were significantly better educated than 1997 women. Only 16% of 1997 women had a secondary education. In contrast, 41% of 2006 women had a secondary education. At both time points, approximately 80% of the women were from the Luo tribe. In 1997, Luo women had half the odds of non-Luo women to have attended secondary school (OR = .53); in 2006, Luo women were equally likely as other women to have attended secondary school.

Regression Model in 1997

The final 1997 multivariate model indicated that Luo ethnicity, whether the respondent had ever been married, number of sexual partners and HSV-2 status were significant risk factors for HIV. Additionally, there was a significant interaction between Luo ethnicity and whether respondents had ever been married. Luo women who had ever been married had nearly five times the odds of non-Luo, ever-married women to test positive for HIV after controlling for other factors in the model (AOR = 4.72). It could be that Luo women were in a lower socioeconomic status group than non-Luo women. If this was the case, these women may have been at greater risk for HIV than other women for a variety of reasons. Another possibility is that Luo women were more likely to marry older spouses who could provide for them. Glynn and colleagues (2003) found that women who married older men were at greater risk of becoming HIV-positive. Additionally,

perhaps there are different infidelity norms among Luo couples, which resulted in more Luo women marrying HIV-positive men.

HSV-2 was the strongest predictor of HIV status in the 1997 model and overshadowed the importance of women's number of sexual partners upstream from becoming HSV-2 positive. Women who had HSV-2 had over seven times the odds of other women to also have HIV (OR = 7.11) This result is not new; previous research has also indicated that HSV-2 increases HIV risk (e.g. Buve, et al., 2001b). This suggests that education and prevention efforts should focus on HSV-2 to a greater extent in order to reduce HIV.

My research underscored the importance of physiological factors impacting the risk of becoming HIV-positive after exposure to HIV. This study confirmed that being positive for herpes is related to a significant increase in HIV risk. Despite a significant decline in HIV prevalence between 1997 and 2006 while rates of HSV-2 remained stable, at each time, women who were HSV-2 positive were also significantly more likely to be HIV-positive. Additionally, while not directly studied here, previous research has found that young women may be at particular risk of becoming HIV-positive after being exposed to HIV because of the immaturity of their genital tracts (Reid, 1992). Thus, young women may be much more likely to become HIV-positive after few sexual experiences. Furthermore, as a whole, the 1997 model provided evidence that a multilevel response to the HIV epidemic among young Kisumu women that incorporated pro-Luo and pro-female education, HIV prevention programs and treatment for STDs would be the most effective in preventing new HIV cases.

Regression Model in 2006

The 2006 multivariate model was similar to the 1997 model with Luo ethnicity, whether the respondent had ever been married, number of sexual partners and HSV-2 status included as significant risk factors for HIV. HSV-2 was again the strongest predictor of HIV status and also indicative of higher risk sexual behaviors such as having more sexual partners and ever having been married. 2006 women with HSV-2 had nearly five times the odds of HSV-2 negative women to test positive for HIV.

As in 1997, women's number of sexual partners was important. Women with two or more partners had nearly three times the odds of women with fewer partners to be HIV-positive. This is consistent with previous research showing that risk for HIV increases with more sexual partners (Cheluget, et al., 2004). The Luo ethnicity interaction with marriage disappeared in this model and was replaced by a significant interaction between education and marriage. Women who had a secondary education or higher and who had never been married were significantly less likely than both ever married women with a secondary education or never married women with lower levels of education to have HIV. It appears that this interaction became important because of the large increase in the percentage of Luo women who had attended secondary school in 2006 relative to 1997 Luo women (41% and 16% respectively). This finding corresponds with previous research that found relationships between low levels of education, partner violence and risky sexual behaviors (Fonck, et al., 2005). Early age of first marriage has also been

cited as a risk factor for acquiring HIV because spouses are likely to be older and HIV-positive, and married women engage in more sex than single women (Clark, 2004).

My findings agree with previous research indicating that staying in school was associated with limiting sexual experience (physorg.com, 2009). Women with a secondary education were less likely to ever have been married and also less likely to have had two or more sexual partners. It is possible that this result was due to women receiving HIV-prevention messages at school, so that women with higher levels of education knew more about HIV transmission. A second related possibility is that women may have learned communication skills and gained confidence in school that allowed them to communicate more openly with their partners about using condoms. Finally, women who achieved a secondary education may have come from a higher socioeconomic status group, and therefore, may have been less likely to have had sexual experiences that related to economic needs. The changes in young Kisumu women's socioeconomic status between 1997 and 2006 was possible due to AIDS mortality in the region. These issues should be the focus of future research since this project was not able to investigate the mechanisms behind the finding that education was protective for HIV among young women.

1997/2006 Combined Multivariate Model

The 1997-2006 combined model, which included all significant factors in the 1997 and 2006 models, indicated similar results. HSV-2 remained the strongest predictor after controlling for other factors in the model. Women positive for HSV-2 had six times the odds of other women to also test positive for HIV. HSV-2 tended to overshadow the

importance of women's number of sexual partners, but after controlling for HSV-2 status, women who had two or more partners were still significantly more likely to be HIV-positive.

Over time (1997 to 2006), there was no significant change in HIV risk based on Luo ethnicity or ever being married. Overall, ever-married Luo women had nearly five times the odds to be HIV-positive compared to ever-married women of other ethnicities (OR = 4.89). Even so, the HIV risk for this group was significantly lower in 2006 than in 1997 (AOR = .33). As discussed above, more research needs to be done in this area to understand whether ever married Luo women were at increased risk of becoming HIV-positive because of different infidelity norms for the Luo tribe and/or whether there was a socioeconomic status (SES) component to this finding that remained unchanged between 1997 and 2006.

Likewise, 2006 women with a secondary education or higher were significantly less likely to be HIV-positive than their 1997 counterparts (OR = .13). This was especially true of 2006 never married women with a secondary education compared with 1997 never married women with a secondary education (AOR = .02). Only 4% of never married women with a secondary education were HIV-positive, providing evidence for the conclusion that education lowered young women's chances of becoming HIV-positive because young women who stayed in school delayed marriage.

To summarize, my primary findings were that 2006 women's sexual behaviors were comparable to 1997 women's sexual behaviors despite the influx of VCT and ART in the interim. There was no significant increase in risky sexual behaviors, as has been found with other research examining the behavioral impact of ART (Crepaz, et al., 2004). Likewise, overall, there was no significant increase in safer sex behaviors as young Kisumu women gained more access to HIV prevention messages through VCT. The one exception was that 2006 women were less likely than 1997 women to have had a sexual partner who was not a spouse. This provides an indication that 2006 women may have had fewer concurrent partners even though they had the same number of total sexual partners as 1997 women. If so, this finding would be in line with previous research results indicating that VCT can be effective in preventing young women from becoming HIV-positive (e.g., Salomon, et al., 2005).

Despite few significant changes in sexual behaviors, HIV prevalence declined from 30% to 16% among young women while rates of HSV-2 were stable and remained the strongest predictor of HIV status in 1997 and 2006. This result points to importance of sexual behaviors in determining whether a young woman becomes HSV2-positive and ultimately HIV-positive. As a whole, the regression models all supported the importance of multilevel approaches to preventing new HIV cases that go beyond focusing on sexual behaviors and treatment for STDs like HSV-2.

The importance for young women to have educational opportunities and to have basic needs met was supported, suggesting that education empowered women to control their

sexuality and ultimately their HIV status. Achieving higher levels of education and delaying marriage were associated with significantly lower HIV risk. This finding seems to partially account for the 1997 regression model finding that ever-married Luo women were at increased risk of becoming HIV-positive relative to other women in 1997 while 2006 ever-married Luo women were not. Since in 2006, Luo women were equally as likely as women from other tribes to have achieved a secondary education, it appears that promoting educational opportunities among young Luo women may be an effective way of preventing HIV and also promoting social opportunities for these women that allow them to control their sexuality.

Aim 3 Findings

The purpose of Aim 3 was to examine how women's use of VCT services and knowledge and beliefs about HIV transmission and treatment predicted HIV status in 2006.. I created one more 2006 logistic regression model, which included additional 2006 covariates from the ARTIS study. By using a backward stepwise approach to create this model, I found that the only additional variable was important. Having ever been tested for HIV was associated with a significantly reduced risk of becoming HIV-positive. This was the clearest finding that supported the hypothesis that VCT can be an effective prevention tool among individuals not yet HIV-positive, which has also been found in other published studies.

Women who had ever had an HIV test had twice the odds of other women to have ever been married or to have had two or more sexual partners. This finding indicates that

women may have been motivated to get an HIV test after a sexual experience they felt had exposed them to HIV. This scenario corresponds with the finding that 68% of women sampled in 2006 were aware of ART and had some knowledge of HIV transmission. Multiple explanations are possible for the association with getting tested for HIV and decreased HIV risk. Women who had used VCT services may have been more inclined than other women to sero-sort, to use condoms, and to communicate about HIV status and safe sex practices with their partners after hearing HIV prevention messages. Alternatively, there may also have been a socioeconomic status component to this variable such that these women's HIV-positive partners may have been more likely to have been on ART. This factor could have lowered transmission rates despite marriage increasing exposure to HIV. Likewise, women who had gotten an HIV test may have been more likely to have partners who were HIV-negative.

Conclusions

Sen (2002) has argued that to achieve social justice in a globalized world, more equitable distribution systems are necessary to promote access to all resources by all. Since HAART came on the market in 1996, there has been considerable international attention to the issue of making ART available to all who need it regardless of ability to pay. This attention was well-focused since for many, HAART transitioned HIV from a death sentence to a chronic disease. VCT, which has been found to be effective in preventing HIV was also rolled out as a gateway to ART, and ART itself may be effective in preventing HIV since it lowers viral load.

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Between 1997 and 2006, when VCT and ART became available in Kisumu, Kenya, HIV prevalence among young women aged 15 to 24 in the area declined from 30% to 16%. There is some indication that these services had an impact on HIV status even though the only significant difference in measured sexual behaviors was that 2006 women were less likely to have had a sexual partner outside marriage than 1997 women. The clearest connection I found between use of new HIV services in Kisumu and young women's HIV status was that controlling for other socio-structural and individual/psychological leverage points, women who had ever been tested for HIV were significantly less likely to be HIV-positive.

My primary finding was that 41% of 2006 women compared to 16% of 1997 women had achieved a secondary education, and higher levels of education were associated with significantly lower rates of HIV especially among women who had never been married. Education appears to protect young women from becoming HIV-positive because it is associated with delaying marriage and having fewer sexual partners. Future research should explore whether Kenya's educational policies were successful in increasing female enrollment and whether there are additional relationships between education, sexual behaviors, and HIV outcomes. For example, there may be a socioeconomic status component such that women with more means were more able to stay in school.

Importance of Study Findings

This project points to the importance of taking a multilevel approach in understanding factors that impact individual sexual behaviors and HIV status and also the importance of

developing comprehensive HIV policies that take into account socioeconomic status, gender norms, and educational opportunities in addition to developing HIV prevention initiatives focused on sexual behaviors and treatment for STDs. The literature on globalization and neo-Marxist state power, the descriptions of ART and VCT availability in Kisumu provided, and the results from regression models all support this conclusion in different ways.

While ART and VCT were important in declining HIV prevalence among young women, socio-structural leverage points such as ethnicity and education (which relate to socioeconomic status in various ways) were also vital to HIV outcomes and represented basic features of environments that condition the effectiveness of HIV services. These areas should also be included in HIV prevention investigations, and more broadly, in examinations of equitable distribution of globalization's resources, even though they reflect long histories of inequalities and may therefore be more difficult to approach and change. While the innovation of ART was a revolution in healthcare, it mattered less for individuals living in extreme poverty. Education as an HIV-prevention tool among young women may be a particularly productive area to research since it overlaps with more macro-level issues such as culture and socioeconomic status, yet it provides a clear direction in which to focus health policy research.

Limitations

The current study focused on how new HIV services in Kisumu may have impacted young women's sexual behaviors and HIV prevalence. However, due to the project

design, I was unable to clearly link use of HIV services with HIV outcomes.

Furthermore, this project focused on general trends, and thus had a broad focus that was

not amenable to examining particular mechanisms responsible for relationships found

between environmental influences and individual sexual behaviors and health outcomes.

Finally, this project did not examine the impact of AIDS-related mortality on young

women's HIV prevalence in 2006. Changes in HIV prevalence between 1997 and 2006

could also be attributed to mortality during this period.

Implications for Future Research

This project pointed to several practical issues that could be the focus of future HIV

prevention research. First, future HIV prevention research should focus on education as

an important factor in HIV prevalence among young women. In this area, future research

should examine whether Kenya's recent pro-female education policies were effective in

helping young women attain secondary educations. Furthermore, additional research is

necessary to fully understand how education protects young Kenyan women from

becoming HIV positive.

Since AIDS-related mortality was not taken into account in explaining the decline in HIV

prevalence among young women between 1997 and 2006, future research should be

conducted. Likewise, it would be useful to conduct additional research that directly

connects the use of HIV services with changes in sexual behaviors, HSV-2 status, and

HIV status to more fully understand the impact of HIV prevention and treatment services

on individual behavioral and health outcomes. Finally, this project provided evidence that

research that approaches HIV epidemics as complex systems is useful in understanding

patterns of HIV prevalence and also developing comprehensive health policies.

Appendix

Creation of Variables for 1997 and 2006 Multivariate Models

Categories for two socio-structural leverage point variables – birthplace and employment – were collapsed based on non-significant results from nested likelihood ratio tests using the "lrtest" command in Stata. Consequently, the final birthplace variable used in models had two codes: born in either Kisumu or another urban area vs. born in a rural area. The final employment variable also had two codes: student or other (which includes three categories of employment, unemployed, homemaker, retired/disabled, other). For this reason, this variable was renamed "student status".

In setting up variables, I also explored whether relationships between HIV status and the continuous variables age, age of sexual debut, and number of sex partners across one's lifetime were linear using three techniques. First, I conducted locally weighted regression using the "lowess" command in Stata to create a smoothed scatterplot illustrating the relationship between a numeric independent variable and the binary outcome variable HIV status.

Second, I created squared versions of each continuous variable and subtracted the mean of the non-squared variable to reduce the correlation between the squared and non-squared variables ([var-mean][var-mean]). I then entered the new squared variable into a logistic regression with the non-squared variable, using HIV status as the dependent variable. In this way, I was able to examine whether there was a significant relationship

between the parabolic coefficient and HIV status in addition to or instead of the linear term.

Third, I conducted logistic regression models with data pooled across the 1997 and 2006 datasets to examine whether 1997 and 2006 slopes differed. These models included the dependent variable HIV status; two independent variables – the numeric variable and time of data collection (1997 or 2006); and the interaction term numeric variable*time of data collection. A significant interaction term would indicate significantly different slopes and thus different relationships between the numeric variable and HIV status from time 1 to time 2.

Both the squared and non-squared relationships between age and HIV status were significant in 1997 (age coefficient: OR = 1.2, p<.001; age squared coefficient: OR = .95, p<.01). The lowess graph indicated increasing levels of HIV up to age 21. At this point, the slope leveled and began decreasing at age 23. In 2006, only the linear relationship was significant, with level of HIV increasing from age 15 to 24 (OR = 1.18, P<.01). In the pooled data logistic regression, both main effects were significant, indicating that the likelihood of being HIV positive increases with age and that the likelihood of being HIV positive was higher in 1997. However, the interaction term was not significant. I also examined relationships between age as a categorical variable and HIV status. I found that 1997 and 2006 women aged 20 – 24 had over two times the odds to be positive compared to women aged 15 – 19 (OR = 2.08, z = 3.41, p = .001). For these reasons, I opted to use

a categorical age variable (age 15 – 19 vs. 20 – 24) in univariate and multivariate regression analyses.

Neither the squared nor non-squared relationships between age of sexual debut and HIV status were significant in 1997 or 2006. In 1997, the lowess graph indicated that there was lower risk of HIV with delayed sexual debut. In 2006, women who had sex for the first time at 13 or 14 had the highest levels of HIV risk. In the pooled data logistic regression, both main effects were significant, indicating that the likelihood of being HIV positive was higher with earlier sexual debut and that the likelihood of being HIV positive was higher in 1997. However, the interaction term was not significant. I also examined relationships between age of sexual debut as a categorical variable and HIV status. I tried a three-category variable indicating early/average/late debut (age 9 – 14, 15 – 17, 18 – 24). I also tried three varieties of two-category variables based on a precedent in the literature to define early debut at age 15 or younger and also based on lowess graphs and average/median sexual debut in the 1997 and 2006 datasets: (age 9 – 14, 15 – 24; age 9 – 15, 16 – 24; age 9 – 16, 17 – 24). There was just one significant coefficient using the age 9 – 15 vs. 16 – 24 distinction in sexual debut; in 2006, women who had sex for the first time at age 15 or younger had nearly two times the odds of older women to be HIV positive (OR = 1.8, z = 2.33, p < .05). For this reason, the age 9 – 15 vs. 16 – 24 categorical sexual debut variable was used in univariate and multivariate regression analyses.

Both the squared and non-squared relationships between number of partners across one's

lifetime and HIV status were significant in 1997 (num partners coefficient: OR = 1.6,

p<.001; num. partners squared coefficient: OR = .92, p<.05) and 2006 (num partners

coefficient: OR = 1.6, p<.001; num. partners squared coefficient: OR = .82, p<.001). The

lowess graph for 1997 indicated increasing levels of HIV with more partners, although

the curve began flattening at 4 partners. In 2006, a similar curve was found; however, the

curve flattened at 3 partners and HIV risk went down slightly with more than 3 partners.

HIV risk was higher in 1997 relative to 2006. In the pooled data logistic regression, both

main effects were significant, indicating that the likelihood of being HIV positive

increases with more sexual partners and that the likelihood of being HIV positive was

higher in 1997. The interaction term approached significance, as did a likelihood ratio

test comparing regression models with and without the interaction term. For this reason, a

weak interaction effect was assumed.

I also examined relationships between several categorical versions of this variable and

HIV status based upon the lowess graphs and response frequency (0 – 6 or more partners,

few/some/many partners – 0-1 vs. 2-4 vs. 5 or more, 0-3 vs. 4 or more partners, 0-2 vs. 3

or more partners, 0-1 vs. 2 or more partners). In conducting likelihood ratio tests, I did

not find a significant difference between using 7 codes (0 – 6 or more partners) and using

the most extreme 2 codes (0 – 1 vs. 2 or more partners), although there were significant

differences between models when comparing the 7-code variable to the other 2-code

variables (0 – 2 vs. 3 or more partners and 0 – 3 vs. 4 or more partners). Additionally, I

found that 1997 and 2006 women who had had 2 or more partners had 3 - 5 times the

odds to be positive compared to women who had had 0 or 1 partners (1997: OR = 3.13, z = 4.54, p<.001; 2006: OR = 4.7, z = 3.98, p<.01). I have used this latter 2-categorical variable for univariate and multivariate regression analyses.

Neither the linear or squared version of "length of stay in Kisumu" was significantly related to HIV status in either 1997 or 2006. Additionally, an examination with pooled data indicated that there was no main effect of length of stay in Kisumu on HIV status; the interaction term with time of data collection also was non-significant. This variable was dropped from analyses. The variable "religion" was also excluded from models since no significant relationships were found between respondents' religion and HIV status in either 1997 or 2006.

Relationships between independent variables were also explored separately for 1997 and 2006 data using the "tabodds" procedure in Stata 10.1.

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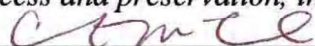
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