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FACTORS ASSOCIATED WITH SUBSEQUENT PREGNANCY IN HIV-INFECTED WOMEN AND HIV-NEGATIVE WOMEN: EXPERIENCE FROM URBAN ZIMBABWE

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FACTORS ASSOCIATED WITH SUBSEQUENT PREGANCY IN HIV-INFECTED WOMEN AND HIV-NEGATIVE WOMEN: EXPERIENCE FROM URBAN ZIMBABWE

by

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DISSERTATION

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FACTORS ASSOCIATED WITH SUBSEQUENT PREGNANCY IN HIV-INFECTED WOMEN AND HIV-NEGATIVE WOMEN: EXPERIENCE FROM URBAN ZIMBABWE

Nancy L. Smee

ABSTRACT

Background: Integrating family planning services with prevention of mother-to-child transmission of HIV (PMTCT) programs are crucial in sub-Saharan Africa, where HIV seroprevalence and rates of unintended pregnancy are high. The objective of this study was to determine predictors of repeat pregnancy among HIV-positive and HIV-negative women in urban Zimbabwe.

Methods: The study was conducted at antenatal clinics in Chitungwiza, a high-density urban town on the outskirts of Harare, the capital city of Zimbabwe, where HIV prevalence among pregnant women is estimated to be around 20%. Using a cross-sectional design, 79 HIV-positive women who had participated in PMTCT during their index pregnancy and 80 HIV-negative controls were interviewed in Shona using a standardized questionnaire 24 months after delivery of their index pregnancy. T-tests, Chi-square and ANOVA were used to compare the two groups on all variables including demographics, index pregnancy, repeat pregnancy, and fertility attitude scores. Logistic regression was used to determine whether a relationship exists between repeat pregnancy and HIV-status, socio-economic status, age, fertility attitude score, and previous pregnancy outcomes.

Results: Factors increasing the likelihood of repeat pregnancy controlling for all other variables are: death of a child (OR = 3.9, p= 0.019), miscarriage (OR = 3.4, p= 0.019), and each additional child (OR = 4.6, p= 0.001). Decreased likelihood of repeat pregnancy is associated with decreased rank order of living conditions (OR = 0.75, p= 0.021), each additional year of age (OR = 0.86, p= 0.012) and higher fertility attitude score (OR = 0.76, p= 0.002). HIV-status alone was not significant as a predictor of repeat pregnancy.

Conclusions: These findings suggest the need for further investigation into cultural attitudes and sexual practices of HIV-positive women in order to minimize the threat of maternal to child transmission of HIV.

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CHAPTER 1 THE STUDY PROBLEM

Introduction

HIV-infected women in sub-Saharan Africa continue to seek pregnancy at the same rate as their uninfected peers. HIV-infected women in sub-Saharan Africa, who do not receive antiretroviral prophylaxis experience a 10-45% HIV infection rate in their infants. HIV-infected women in sub-Saharan Africa will leave 15.7 million orphans by the year 2010 (UNAIDS, 2006).

Given these statistics, "Why do these HIV-infected women keep getting pregnant and having babies?" It is a legitimate question. It is a question that, in the developed world, individuals ask, the press asks, science asks, and governmental policy-makers ask. The question represents a conundrum, a paradoxical puzzle that troubles Western sensibilities. It is not logical to persist in having more babies in the face of the potential it represents for self- and community-wounding.

Often heard within the question, however, is an answer that is an implied or even blatant accusation: "These women are irresponsible," "These women are ignorant (don't know any better)," "These women are sexually promiscuous," "These women are self-destructive." The answers are based on a rush to explain or simplify the problem, in the hope of being released from the discomfort of the paradox. But, the rush to simplicity reveals an ethnographic bias that hinders compassionate response to those who are most vulnerable and in need of equitable intercession. So, while the question of why HIV-

infected, sub-Saharan women persist in getting pregnant is legitimate, the rush to an easy answer is not.

Complex realities arise out of complex causes and conditions. The mind has to be flexible and open with an attitude of "not-knowing" in order to discover the inter-connections and subtleties in a problem. Paradox must be held, judgment suspended, and curiosity given the lead.

The conundrum of continued fertility and reproductive behavior among HIV-infected women in sub-Saharan Africa is one of these complex problems. A review of the literature reveals that there are many variables, both physiological and cultural, which affect this problem. In order to ground the investigation, HIV-infected women from Zimbabwe have been chosen as the study population. Zimbabwe is a sub-Saharan country with one of the highest HIV-positive rates among reproductive age women in the world. Concomitantly, it currently has the lowest world-wide life-expectancy rate for women, at 29.4 years (AVERT, 2006). Likewise, it is a country in the throes of a worsening economic outlook, and it represents a population that is reflective of many of the co-contributors complicating the HIV/AIDS epidemic in sub-Saharan Africa.

In order to begin to think critically about this problem, Child Replacement Theory is presented as a framework for configuring and structuring the inquiry. This theory offers insights that helped to coalesce the direction for the study and shape the major research question.

A methodology chapter is presented with justification and explanation of the study design and the statistical analyses that were implemented. This is followed by a

presentation of the results. Lastly, a discussion of the study results is presented with limitations outlined, implications for practice discussed and future research proposed.

Statement of the Problem

The continued spread of the acquired immunodeficiency syndrome (AIDS) epidemic in sub-Saharan Africa is leading to increased numbers of women of childbearing age and their partners who are infected with human immunodeficiency virus (HIV) (UNAIDS, 2006). Fertility rates remain high in many of the countries most severely affected by AIDS (Hallett et al., 2006; Ross et al., 1999). A prominent mode of transmission for HIV in the region is from infected mothers to their children during pregnancy, delivery or breastfeeding, accounting for 15% of all new infections (Russell, 2007). In developing countries, 10-45% of infants born to HIV-infected women become infected themselves (Nduati et al., 2001; UNAIDS, 2005). In some areas of sub-Saharan Africa, particularly Zimbabwe, vertical transmission of HIV has raised child mortality rates, eroding hard won gains of child survival programs (UNICEF, 2006). Moreover, children who escape infection from their HIV-infected mothers are likely to join the rapidly growing number of children orphaned by parents who have died of AIDS (Nduati et al., 2001). These orphans have a greater risk of dying in childhood or subsequently acquiring HIV infection due to transactional sexual practices required for survival (Jewkes, Levin, Loveday, & Penn-Kekana, 2003; Lewis, Ronsmans, Ezeh, & Gregson, 2004).

Fertility and reproductive behavior among HIV-infected women is poorly understood. Consistent condom use is universally prescribed by healthcare providers and funding agencies, but compliance is generally poor in this region (Grieg, 2003). Since antenatal and intrapartum access to antiretroviral (ARV) prophylaxis in Zimbabwe is still only available to 10% of those requiring treatment (AVERT, 2006), the promotion of family planning services among HIV-infected women is used as the primary method for preventing and reducing births of children who have a high probability of dying from AIDS or being orphaned upon the death of one or both of their parents. In the absence of ARV prophylaxis and treatment and affordable, safe, breast-milk substitutes, contraception as the primary prevention strategy can represent a somewhat punitive alternative especially in sub-Saharan Africa where most cultures value childbearing as the primary means for female status.

The studies that have explored the relationship between an HIV-positive diagnosis and subsequent fertility behavior have found that known HIV status or high relative risk potential has little association with childbearing (Baylies, 2000; Myer, Morroni, & Cooper, 2006; Nebie et al., 2001). For example, interventions with HIV-infected women in South Africa and Zimbabwe have not been found to motivate a significant change in reproductive outcomes. Couples cognizant of the risk of HIV infection and AIDS, particularly for their children, and even those reporting changes in contraceptive behavior, continued to have the same fertility levels as those without knowledge of their risk or HIV status (Moyo & Mbizvo, 2004; Myer, Morroni, & Cooper, 2006). In-depth interviews among women in Cote d'Ivoire who learned their HIV status during

pregnancy revealed that despite having been advised not to have more children because of their infection, most women (12 out of 15) with fewer than four children planned to become pregnant again (Aka-Dago-Akribi, 1999).

Whether women know or suspect they are infected with HIV, or fear becoming infected through unprotected sexual intercourse with their partners, a pregnancy can be seen to affirm a woman's own health, or at least her capacity to bear a healthy child. Women use pregnancy to demonstrate the absence of HIV infection and continuing good health (Ankrah, 1991). Frequently, these women cite fear of abandonment or intimate partner violence as the underlying motivation for demonstrating good health through the ability to bear a child. Reproducing, thereby, averts the suspicion of HIV infection within their families and communities (Jaggar, 2002; Jewkes, Levin, Loveday, & Penn-Kekana, 2003; Kalipeni, 2000). Even among discordant couples, where only one partner has HIV, and where both partners are aware of each other's HIV status, couples choose to have more children, despite the risk of transmission to the uninfected partner and the unborn child (Aka-Dago-Akribi, 1999; Moyo & Mbizvo, 2004).

Regardless of women's own desired reproductive response to HIV infection, many lack the ability to negotiate openly with their partners about reproductive decisions and contraceptive use (Fleshman, 2004). In Zimbabwe, husbands are more likely to want children after an HIV diagnosis than are wives, particularly wives who have been intimately involved with a relative with AIDS. Wives feel they have to accept their husband's decision or risk losing the relationship (Mahomva et al., 2006; Mhloyi, 1996).

The situation regarding childbearing for HIV-infected women in sub-Saharan Africa, and specifically in Zimbabwe, differs markedly from that in the United States of America (USA). While women in the USA constitute one of the fastest growing groups diagnosed with HIV infection (Prevention, 2005), now accounting for 27% of all new cases in the country (Kaiser, 12/2006), deaths from AIDS have decreased dramatically, largely due to advances in HIV treatment (Kaiser, 12/2006). Maternal to child transmission accounts for less than 1% of new HIV cases in the USA, and virtually all women have access to antenatal and intrapartum prophylaxis with ARVs for themselves and their infants (Kaiser, 12/2006). Anxiety, depression and psychological adjustment to parenting in the HIV-positive woman has been studied and recognized as part of antenatal care for HIV-infected women in the USA (Ickovics et al., 2001; Shannon, Kennedy, & Humphreys, 2008; Shannon, King, & Kennedy, 2007), and the recognized psychological effects on HIV disease progression are incorporated into care in the USA.

Comparison of women's level of empowerment, education and financial independence continues to be an important variable in both settings, however. In the USA, poor and minority women are disproportionately more highly represented in statistics of new cases of HIV infection, death from AIDS, and poor perinatal outcomes according to the Center for Disease Control and prevention (2005). Likewise, in the USA, women are more likely to conceive after HIV diagnosis if they are less well educated, of lower socio-economic standing, younger, and hold a more traditional view of their role as women (Forsyth, Davis, Freudigman, Katz, & Selterman, 2002). In both settings, the more vulnerable a woman is, the more likely motherhood is to be seen as a career choice

and vehicle for getting her other needs met. Kiefer (2007) describes this as self-wounding or community-wounding behavior in the service of holistic need-fulfillment.

Women's decisions about HIV risk and reproductive choices are influenced by a number of contextual factors that have only recently become targets of research and intervention. Women have social roles and must meet social expectations that may affect reproductive decision-making even when HIV-infected (Sowell, Murdaugh, Addy, Moneyham, & Tavokoli, 2002). Previous research indicates that women's reproductive choices are based on their life-circumstances and the realities of their lives, and often this represents a "disconnect" between the silent HIV infection they are experiencing and fertility decisions.

Health care providers must understand the complex interplay between needs, vulnerabilities of HIV-infected women, and the cultural milieu in which they are functioning. This understanding is critical for implementing care and for maintaining patients' optimal quality of life.

Purpose of the Study

The overall goal of this study is to conduct a secondary analysis of data from a cross-sectional study to characterize the factors associated with becoming pregnant in HIV-positive and negative women from Zimbabwe in order to determine predictors of repeat pregnancy. A further goal is to establish the psychometric properties of the Fertility Attitude Scale that was administered to study participants, and to compare HIV-positive women with HIV-negative controls on demographics, index pregnancy, follow-

up and subsequent pregnancy, and fertility attitude scores. Finally, this study seeks to describe terms of disclosure, ARV treatment, and fears faced by the HIV-infected study participants.

CHAPTER 2 LITERATURE REVIEW

The purpose of this chapter is to review the literature related to fertility following HIV diagnosis in women within a resource-poor setting in sub-Saharan Africa (Zimbabwe), in order to better understand and begin to unravel the conundrum that motivates women to continue to reproduce, even though that behavior may seem potentially self-wounding and community-wounding. This review establishes the premise for why this study was undertaken, and is an attempt to develop greater clarity for the research that is still needed, not only on how women and men make reproductive decisions, but on which, if any, interventions would assist them in making the best choices for themselves about childbearing and contraceptive use and empower them to act on those choices.

Literature Review Methods

Computer-based searches in PubMed with MeSH database, PsychINFO, CINAHL, and the Science Citation Index were used to identify social sciences, immunologic, infectious disease, fertility/infertility, gynecologic and nursing journal articles and books written in English since 1990. Keywords used in the search included: fertility, acquired immune deficiency syndrome, human immunodeficiency virus, female, Africa, sub-Saharan, Zimbabwe. In addition, references cited in the studies identified were searched for relevant information. Studies relating specifically to men's experiences surrounding fertility and HIV/AIDS were not reviewed except as they related to female outcomes.

Physiological Factors Affecting Subsequent Fertility in HIV-Infected Women

Maternal Mortality

The extent to which HIV affects pregnancy-related mortality in countries with high HIV/AIDS and maternal mortality is poorly understood. The reduction of maternal mortality is one of the major targets promoted within the Millennium Development Goals set up by the World Health Organization (WHO, 1990). In areas where AIDS has become the main cause of death among women of reproductive age, HIV and AIDS have also become an important cause of pregnancy-related mortality. The extent of the contribution of HIV/AIDS to pregnancy-related mortality is still virtually unknown (McIntyre, 2003; Tai et al., 2007). A recent study in Malawi and Zimbabwe suggests that pregnancy-related mortality may have doubled during the course of the HIV epidemic, obliterating the gains in maternal health achieved through effective safe motherhood programs (Bicego, Boerma, & Ronsmans, 2002). Similar increases in maternal mortality were not seen, however, in Tanzania (Mswia et al., 2003).

It is generally thought that HIV/AIDS puts pregnant women at increased risk of death for three principal reasons: 1) Pregnancy-associated immune suppression may accelerate HIV disease progression during pregnancy (Ahdieh, 2001; Brocklehurst & French, 1998; Rich, Siegel, Jennings, Rydman, & Landay, 1995); 2) HIV may place pregnant women at greater risk of obstetric complications (Dwyer, Carey, & McLeish, 1995; McIntyre, 2003); and 3) the detrimental effect of the HIV epidemic on the health system infrastructure may affect both access to and quality of obstetrical services. Evidence for these, however, is scant, especially in developing countries where

differentiating between perinatal and HIV-related cause of death is less well-documented (Le Coeur et al., 2005).

The limited knowledge about the relative role of pregnancy and HIV on maternal mortality in developing countries is partly due to the methodological challenges involved and lack of consistent collection of laboratory specimens to document progress of the disease due to resource limitations. Classifying deaths as either HIV and/or pregnancy-related is difficult in settings where cause of death attribution relies on verbal reporting and where HIV status is generally unknown (Bicego, Boerma, & Ronsmans, 2002).

One study using prospective mortuary investigation of all deaths in women aged 15-44 years in Pointe Noire, Congo (Le Coeur et al., 2005) attempted to quantify the excess mortality attributable to HIV during pregnancy and found that the mortality rate was 32 times higher (95% confidence interval 25-39) among HIV-positive than HIV-negative women. The relative increase in mortality associated with HIV was even higher in non-pregnant than in pregnant women, and they concluded that among HIV-infected women, pregnancy may actually have conferred a survival benefit. This could have been related to the fact that the pregnant women were more intensively involved in the healthcare system, and therefore, receiving more consistent care than the non-pregnant women, but this factor was not acknowledged by the authors.

The study, however, presented certain validity issues. While they did control for age, they were unable to adequately control for advancement of the HIV disease due to lacking CD4+ levels or viral load measurements. Even though the authors did acknowledge that women more likely to have advanced HIV disease would be less likely

to conceive, it seems premature to assume that pregnancy has any protective benefit based on this study's methodology. Furthermore, all corpses in the study were tested for HIV-infection and for pregnancy using blood samples from intra-cardiac puncture, but HCG levels fall rapidly following death, and no controls were placed on timing of sample collection. Some pregnant HIV-infected women could have been missed, especially if they were very early in their pregnancies. Perhaps the main finding to remember from this study is that in pregnant women, HIV increased mortality rate four-fold (RR = 3.9; 95% CI, 1.7-8.8).

Interest in the lymphocyte subpopulations in pregnancy has received some attention due to the theoretical risk that if CD4 count is reduced in pregnancy, it can lead to an increased risk of opportunistic infection and progression of disease classification. There is a lack of consensus in published studies as to the behavior of CD4 counts in pregnancy. One South African study (Ibrahim, Moodley, & Doorasamy, 2004) showed that absolute numbers of CD4 counts in the HIV-infected group were significantly lower than in the non-infected group for all periods of gestation studied. The more important value, however is percent of CD4, and whether this remains consistent, since hemodilution during pregnancy is a well-established fact. The CD8 counts were found to increase post delivery in the HIV-infected group, but not in the HIV-negative controls. This elevation may lower maternal to child transmission (MTCT) after delivery and during early breastfeeding. This study concluded that progressive depletion of CD4 cells may be compounded by the loss of these cells during pregnancy, placing HIV-infected pregnant mothers at a higher risk of immunodeficiency and its associated disease. This cross-

sectional study, however, included only about 20 HIV-positive cases in each of the three trimesters and postpartum groups and only slightly more HIV-negative controls in each category. Therefore, it is difficult to generalize any conclusions. Likewise, other studies (Temmerman et al., 1995; Thorne, Newell, Dunn, & Peckham, 1995) published on the changes of the lymphocyte subsets in pregnancy show no consensus as to the nature of these changes or the meaning that should be ascribed.

Studies (Minkoff et al., 2003; Tai et al., 2007) of HIV-positive women who are on highly active antiretroviral therapy (HAART) have concluded that repeat pregnancy does not have a significant effect on the course of the disease under these conditions of treatment. Pregnant women on HAART showed less likelihood for disease progression than non-pregnant controls on HAART. This was thought to be the result of a healthier immune status of women who become pregnant or possibly because there is a beneficial interaction between pregnancy and HAART (Tai et al., 2007). It must be mentioned, however, that both of these studies were conducted in resource-rich environments, and it is not known whether these results translate to sub-Saharan populations.

Breastfeeding must also be considered in any discussion of effects on mortality due to HIV and pregnancy. In a prospective randomized clinical trial of breastfeeding and formula feeding conducted in Kenya, mortality among mothers was higher in the breastfeeding group than in the formula group with 18 versus 6 deaths, log rank test, $p=0.009$ (Nduati et al., 2001). The cumulative probability of maternal death at 24 months after delivery was 10.5 % in the breastfeeding group and 3.8% in the formula group ($p=0.02$). The relative risk of breastfeeding mothers versus formula feeding mothers was

3.2 (95% CI 1.3-8.1, p=0.01) and the attributable risk of maternal death due to breastfeeding was 69%.

Lactation is a demanding metabolic process and might be especially detrimental for women who are infected with HIV. Compared with women who had CD4 counts of greater than 500 cells/mL, the relative risk of death for those with counts of 200-499 cells/mL was 2.4 (0.5-11.2, p=0.3) and 14.7 (3.2-67.4, p=0.001) for those with counts less than 200 cells/mL (Nduati et al., 2001). Two explanations were given by the authors for these results: 1) The combined metabolic burdens of HIV-1 infection and breastfeeding in a population that has inadequate nutritional intake could result in substantial nutritional impairment; and 2) Lactation might affect HIV-1 replication. Lactation is associated with raised prolactin, an immunomodulating hormone that might be immunosuppressive at high concentrations. Likewise, mastitis has been associated with increased viral load in breast milk, but whether there is a concomitant rise in plasma viral load is unknown (Semba, Kumwenda, & Hoover, 1999).

This prospective randomized controlled study was limited to only 6 months of breastfeeding in the HIV-infected women. After six months, interval data began to show the increased mortality rate in HIV-infected breastfeeding women, and the study was suspended. Still, there was an overall three-fold increased risk of dying in the HIV-infected breastfeeding group (Nduati et al., 2001). For ethical reasons, these results have not been substantiated with repeat studies. Unfortunately, this study had several confounding effects with cross-over from both groups mixing feeding methods, thus an analysis of the data based on actual feeding modality rather than assigned group would

probably underestimate mortality risk. Also, the authors do not distinguish between partial and exclusive breastfeeding. Furthermore, inability to mask feeding mechanism introduces a potential source of bias. In addition, the formula-feeding mothers might have had more extensive contact with the researchers for education about the correct way to prepare formula. Finally drop-outs from the study were not accounted for, leaving one to wonder whether a seriously ill woman might find formula preparation too demanding and drop-out of the study.

Breastfed infants of HIV-infected mothers have a 15-20% increased chance of acquiring HIV (Nduati, Mbori-Ngacha, & al., 2000) over those who are formula fed. But, these infants are at even greater risk if their mother's die. Maternal death is associated with an increased risk of subsequent infant deaths. When HIV status in the infant is controlled for; of the infants whose mother's died, there was an 8-fold increase in the likelihood of subsequent infant death (Nduati et al., 2001).

Poor HIV-infected women living in resource-poor countries where they cannot afford formula feeding, and often have no safe water supply, have no alternative except to breastfeed for at least the first 6 months postpartum until the child can be safely weaned to the family pot. These women may be more severely disadvantaged by their decision for repeat pregnancy and breastfeeding following HIV diagnosis. Likewise, when considering HIV infection in women of reproductive age in less developed countries, promotion of the survival of the mother is important, in addition to the reduction of risk of HIV infection to the infant.

Perinatal Outcomes

The association between maternal HIV infection and perinatal outcomes is not well-understood. Often studies attempting to assess the risk of an adverse pregnancy outcome occurring in women infected with HIV have been of a poor quality making comparison between studies impossible (Brocklehurst & French, 1998). Using the adverse perinatal outcomes of spontaneous abortion, fetal anomalies, premature delivery, intra-uterine growth retardation (IUGR), low birth weight, stillbirth, perinatal death, neonatal death and infant death, Brocklehurst and French (1998) conducted a systematic review of the literature and meta-analysis. Twenty-one of the 31 articles they reviewed were from developing countries, so their findings are applicable to findings expected in Zimbabwe. The authors acknowledge several limitations and confounders that could bias their findings, including: methodological bias, drug use, antibiotic treatment or its absence in the case of coexisting sexually transmitted infections (STIs), and lack of consistent matching of subjects and controls. But, when these are controlled for, there does appear to be a real and large increase in the risk of perinatal and infant death in developing countries associated with maternal HIV infection, with evidence of possible increased risk for spontaneous abortion, IUGR, low birth weight, and preterm delivery especially in more advanced HIV disease (Brocklehurst & French, 1998). No definitive data could be found on increased risk for pregnancy induced hypertension or gestational diabetes. Chorioamnionitis, especially in the event of the coexisting presence of other STIs was increased, but no direct correlation with HIV infection alone could be substantiated (Ross et al., 2004).

Results of a study on stillbirth and decreased fertility rates in Uganda concur with those of Brocklehurst and French and, in addition, establish an 18.5% early pregnancy loss rate in HIV-infected women versus a 12.2% pregnancy loss rate in HIV-negative women (Gray, Wawer, & Serwadda, 1998). In this study, decreased fertility was especially associated with a concurrent infection of syphilis, but there was no effect of other STIs on pregnancy loss rate.

HIV-1 has been detected in aborted fetuses, and in-situ hybridization studies identified the virus in fetal tissues from 60% of spontaneous fetal losses in HIV-1-seropositive women (Langston, Lewis, & Hammill, 1995). Early in-utero HIV transmission may be common and may have deleterious effects on pregnancy survival.

In a later study (Nguyen et al., 2006), utilizing viral load measurements to quantify progression of HIV disease in Ugandan women who had recently delivered a live birth as measured against non-infected sexually active women who were not using contraception, considerable difference in the ability to produce a live birth existed in women with high viral loads. Each increase in log 10 viral load after 4.5 log 10 resulted in an adjusted odds ratio (OR) of live birth which was 12% of the previous viral load category. Increased viral load seems to have a direct impact on perinatal outcome and chance of live birth. For sub-Saharan women in resource-poor environments such as Zimbabwe, where antenatal HIV testing and availability of viral load measurements and consistent ARV treatment are still inadequate, increased perinatal mortality must be expected.

Additionally, it is difficult to know the extent to which socioeconomic status of HIV-infected women affects their perinatal outcomes and the studies reviewed did not

control for this. In Zimbabwe, where poverty is escalating, medical infrastructure and availability of high quality care has declined, and malnutrition is now at 45% (UNICEF, 2006) this becomes an important third variable in the pregnancy/ HIV continuum for evaluating perinatal outcomes that needs quantifiable additional research.

Infertility

HIV infection is associated with lower fertility among women in sub-Saharan Africa, and this association is not explained by the frequency of sexual intercourse, illness, knowledge of HIV status or infection with other sexually transmitted diseases or marital instability (Ross et al., 1999). Reduced fertility has also been observed in HIV-infected women in this region where, unlike developed countries, knowledge of HIV status and contraceptive use is low and elective abortions uncommon (Fabiani, Nattabi, Ayella, Ogwang, & Declich, 2006).

Co-infection with other STIs has been implicated as a possible explanation for the reduced fertility associated with HIV infection, however current chlamydial, neisseria gonococcal, trichomonal or syphilis infections were found to have no significant impact on pregnancy prevalence in Ugandan women (Gray, Wawer, & Serwadda, 1998). The prior infection effects on tubal-patency, however, were not accounted for.

The biological effects of HIV infection on reducing fertility may effect an influence on women through severe weight loss in advanced disease leading to amenorrhea, higher rates of early fetal wastage, stillbirth, and possible accelerated disease progression associated with pregnancy (Fabiani, Nattabi, Ayella, Ogwang, & Declich, 2006; Ross et

al., 2004). Pathological effects on the male partner, who is also likely to be HIV-infected, such as decreased production of spermatozoa (Krieger, Coombs, & Collier, 1991; Martin, Grasesenquet, & Herve, 1992), reduced coital frequency because of illness affecting the man or his partner, and premature mortality of partners which leaves women spending more of their reproductive lifetime without a sexual partner (Ross et al., 1999) will also tend to reduce fertility in HIV-infected women.

Although HIV infection may have an impact on fertility, the reverse is, most likely also true, in that fertility problems may precede infection with HIV. Cultural pressure on a couple in sub-Saharan Africa to bear children is such that if they find themselves in a barren relationship, they are likely to divorce and remarry, or engage in extramarital relationships in an attempt to produce a child (Ties-Boerma, Gregson, Nyamukapa, & Urassa, 2003). This behavior exposes the woman to more sexual partners and to more unprotected sexual contact and, therefore, increased risk of STIs including HIV. Data from Tanzania (Sedgh, Larsen, Spiegelman, Msamanga, & Fawzi, 2005), Zimbabwe (Zaba, Terceira, Mason, & Gregson, 2003), Gabon (Schrijvers, Delaporte, Peeters, Dupont, & Meetheus, 1991), Uganda (Fabiani, Nattabi, Ayella, Ogwang, & Declich, 2006), and Rwanda (Lewis, Ronsmans, Ezeh, & Gregson, 2004) indicate that fertility problems are associated with higher risks of HIV infection, and that 50% of infertility in HIV-infected women can be accounted for by infertility existing before the HIV-infection (Ross et al., 1999).

This has important implications for the potential under-reporting of HIV-infection prevalence in sub-Saharan Africa. Since most voluntary counseling and testing (VCT)

occurs for women in connection with antenatal clinic visits (Fabiani, Nattabi, Ayella, Ogwang, & Declich, 2006; Gregson et al., 2002), and if pre-existing infertility is associated with HIV-infection in women, a whole cohort of HIV-infected women could be missed, because they never even become pregnant. This potential for bias must also be remembered when assessing fertility following HIV diagnosis in the index pregnancy, as in the current Zimbabwe study, because women with more advanced disease or unusually fewer reproductive side-effects could inadvertently be pre-selected by virtue of having already delivered one child.

Co-Morbidities and Opportunistic Infections

The confounding effects of advancing HIV disease is one of the methodological problems consistently expressed in the literature related to evaluating fertility in HIV-infected women in the developing world. Rarely are these women afflicted with only one healthcare problem. Instead, HIV-infected women in sub-Saharan Africa tend to exhibit multiple co-morbidities (Sedgh, Larsen, Spiegelman, Msamanga, & Fawzi, 2005). The impact this has, not only on conception rates and pregnancy outcomes, but also on the behaviors and practices surrounding sexuality, is difficult to assess accurately, and scant literature on attitudes and practices exists. Medical resource shortages compromise adequate confirmation of diagnostic criteria, and the rigor of laboratory and pathology evaluations in these locales is often absent (Bertozzi et al., 2006).

Although many studies have indicated that HIV-infected women experience lower pregnancy and live birth rates than uninfected women (Gray, Wawer, & Serwadda, 1998;

Le Coeur et al., 2005; Myer, Morroni, & Cooper, 2006), it seems that women at early clinical stages of infection may experience fertility rates comparable to those of uninfected women (Sedgh, Larsen, Spiegelman, Msamanga, & Fawzi, 2005). In fact, there has been little research aimed directly at examining the association between HIV disease progression, the existence of co-morbidities such as tuberculosis, pneumocystis carinii, systemic candidiasis and fertility. The link between herpes ulcers and HIV transmission in women has been well established (Bertozzi et al., 2006), as has the poorer neonatal outcome prognosis in the presence of herpetic lesions (Moore, 2005).

Early follow-up studies in Zaire (Democratic Republic of Congo) and the USA observed lower fertility among women with advanced disease compared to women with asymptomatic infection (Chu, Hanson, & Jones, 1996; Desgreesdu, Msellati, & Yao, 1997), but sample size and data limitations precluded control for potential confounders of this association. More recently, a clinic-based prospective cohort study (Sedgh, Larsen, Spiegelman, Msamanga, & Fawzi, 2005) of HIV-infected women in Dar es Salaam followed participants for up to six years. The multivariate pregnancy rate ratio (RR) of women at clinical Stage II compared with women at Stage I was 0.56 (95% CI: 0.39, 0.82), and the pregnancy RR for women at Stage III or IV compared with women at Stage I was 0.24 (95% CI: 0.16, 0.36), controlling for independent predictors of pregnancy incidence. Pregnancy rates were lower among older women, unmarried women, women who had revealed their HIV status to someone, and women who had living children from their most recent pregnancy. The association of HIV clinical progression with a decline in pregnancy incidence was not explained by weight loss,

menstrual dysfunction, or nutritional status, variables that are affected by progressing disease and co-morbidities. Therefore, it was found that pregnancy and live birth rates decline dramatically with progression of HIV-1 disease, and that this decline is not explained by observed social, behavioral or biologic factors. Clinical progression of the disease was followed at six-month intervals, using World Health Organization (WHO) clinical staging parameters and CD4+ cell counts, weight loss, menstrual dysfunction and middle upper arm circumference measurements. Clinical Stage III and IV were considered together because of the small number of pregnancies in those categories.

In this study (Sedgh, Larsen, Spiegelman, Msamanga, & Fawzi, 2005) the outcome of the index pregnancy (where HIV was diagnosed) was a strong predictor of future pregnancy incidence. Women who experienced a spontaneous abortion or stillbirth during the index pregnancy were nearly 4 times more likely to get pregnant again than women who had a living child from the index pregnancy (RR = 3.9, 95% CI: 2.6, 5.8), and child death was associated with a nearly three-fold increase in the incidence of another pregnancy (RR = 2.8. 95% CI: 2.1, 3.6). This indicates that if they were able, based on the stage of their disease, there was still high motivation to attempt to replace those lost fetuses even when the presence of staging measurements indicated worsening of the disease. This research did not control for preclinical pregnancy loss, which could have thereby underestimated actual conceptions in Stage III and IV especially. Nor did it account for possible changes in sperm motility and morphology in an infected partner or changes in behavior such as decrease in sexual activity with advancing disease. All of these can be important variables in fertility measurements with advancing disease.

Importantly, however, it was shown that HIV-infected women who had recently experienced a fetal or child loss, or did not share their HIV status with anyone, were most likely to experience a clinically recognizable pregnancy during the period after HIV diagnosis when stage of their disease was controlled for (Sedgh, Larsen, Spiegelman, Msamanga, & Fawzi, 2005).

Access to ARVs and PMTCT Program Effects

Little is known about the prevalence and determinants of fertility intentions among HIV-infected women who are receiving ARV treatment. One study (Myer, Morroni, & Rebe, 2007) of 311 individuals from South Africa who were receiving ARV treatment reported that 36% of males and 26% of females stated that they wanted to have children in the future. Fertility desire was more closely associated with male gender, younger age, lower number of children and being in a relationship less than 5 years. In addition, fertility desire was associated with increasing duration of ARV treatment among female participants, but not among males.

This study (Myer, Morroni, & Rebe, 2007) was a relatively small cross-sectional study with limited generalizability since it was conducted in a single ARV service clinic. The median age of participants was 33 years which is relatively old and outside the highest prevalence group which is 20-29 years (UNAIDS, 2006). This older age distribution should be expected, however, since individuals requiring ARV treatment have had more time elapse since infection than other HIV-infected individuals. What this study highlights is that fertility intentions may increase with the duration of ARV

treatment and that individuals in new relationships appear to be the most likely to report fertility desires compared to individuals not in a relationship or individuals in relationships of longer duration (Myer, Morroni, & Rebe, 2007).

A study from Jinja, Uganda (Nakayiwa et al., 2006) among individuals receiving antiretroviral treatment correlated increased likelihood of pregnancy with poor outcome of a previous pregnancy, and found that the only factors that were correlated with a decreased chance for pregnancy were severe immunodeficiency syndrome or a change in marital status. Otherwise participants conceived at the same rate as the general population. Other variables that were not significant in the Logistic regression of this study were demographic data, years in the program, partner's desire for pregnancy and knowledge and attitudes about HIV.

A qualitative study (Keegan, Lambert, & Petrak, 2005) done in London on 21 HIV-infected African immigrant women on HAART interviewed them on the topics of difficulties of sexual functioning, barriers to forming new relationships, fears of HIV disclosure, coping strategies and safe sex and pregnancy. Only five of the 21 women reported any incident of unprotected sexual intercourse since diagnosis, and only one pregnancy resulted. This is discrepant with the quantitative studies from sub-Saharan Africa. Due to the small number of participants in this study, it could be coincidental that these women showed less likelihood to conceive than women living in sub-Saharan Africa, it could be a function of interviewer bias, or it could mirror the cultural expectations of the new western culture in which these women were living. Relationship avoidance and discouraging sexual contact seemed to be linked mainly with the earlier

stage of HIV adjustment. This raises the question of a "sexual adjustment period" (Hankins, Gendron, Tran, Lamping, & La Pointe, 1997) with the possibility of even greater pregnancy-seeking behavior in sub-Saharan African populations with the advent of HAART roll-outs in those countries.

Likewise, no specific literature exists as to the fertility intentions of sub-Saharan African women who have undergone a prevention of mother-to-child transmission (PMTCT) intervention in an index pregnancy with documented follow-up of a subsequent pregnancy. This represents a gap in the literature, and a population that our research addresses. Better understanding of how these women relate to their HIV diagnosis, and how it affects their attitudes and reproductive practices is necessary. Furthermore, healthcare providers need to be prepared for the fact that as women feel better on ARV treatment, and symptoms begin to subside, there will likely be a natural desire to reclaim that which provided meaning, status and security from their pre-HIV-diagnosis lives (e.g. sexuality and motherhood) (Keegan, Lambert, & Petrak, 2005; Myer, Morroni, & Rebe, 2007). The confidence instilled through participating in a PMTCT intervention may inadvertently encourage the woman to feel empowered in her ability to have subsequent healthy children. This phenomenon has not been investigated in the literature, and is a focus of this investigation.

Some of the physiological factors contributing to fertility following HIV diagnosis in sub-Saharan women include maternal mortality, breastfeeding, perinatal outcomes, pre-existing infertility, co-morbidities exemplified by opportunistic infections consistent with advancing HIV disease, and the effects of access to PMTCT programs and ARVs.

This, however, represents only a fraction of the variables affecting whether HIV-infected women continue to reproduce. To begin to unravel the conundrum more fully, one must examine the cultural milieu, as well, and ask the question: What are the co-mediating factors within the culture affecting HIV-infected women's continued reproduction despite risks to the infant, the mother and the community?

Cultural Factors Affecting Subsequent Fertility in HIV-Infected Women

The Zimbabwe-Specific Political, Economic and Health Care Situation

Situated in southern Africa, the Republic of Zimbabwe with a population of approximately 13.1 million people (WorldbankOnline, 2007), borders the nations of Zambia, Botswana, Mozambique and South Africa. It has one of the world's highest rates of HIV infection with an average antenatal HIV prevalence of 24.6% (20.9% in urban areas and 28.1% in rural areas) (Ministry of Health and Child Welfare, 2003; UNAIDS, 2006). HIV/AIDS accounts for 60% of childhood mortality in Zimbabwe (Ministry of Health and Child Welfare, 2005). The HIV/AIDS burden coexists with an important economic crisis, limiting access to an already deteriorating public health service.

In the late 1990's, ten years after independence, Zimbabwe's economic growth began to spiral downward following a balance of payments crisis and repeated droughts. By 2002, Zimbabwe's economy was in trouble as a result of poor macroeconomic management, political violence and the wider impact of land reform programs (Meredith, 2007; WorldbankOnline, 2007). Moreover, with the exchange rate becoming

progressively overvalued, the government and industry started to build up large external debt. Since 1999, economic conditions in Zimbabwe have completely deteriorated, with real gross domestic product (realGDP) falling by more than 35% in cumulative terms. Inflation has skyrocketed, with official annual inflation rates reaching over 7,600% in July of 2007 (WorldbankOnline, 2007) and independent news publication accounts placing it at more than 1,500% per month so far in 2008 (Economist., 2008; Philip, 2008). Zimbabwe's high inflation has originated mainly from an extremely large public sector and subsidized loans availed to priority sectors, in particular agriculture. This has accounted for a fiscal deficit of over 80% as of 2007 (WorldbankOnline, 2007). With limited scope for external financing, a large part of the public sector financing needs were met through money creation, fueling rapid monetary expansions and a sharp rise in inflation. With the persistent high inflation, the Zimbabwe dollar has continued to lose value on the parallel market, at about 6 to 1 in comparison with the official rate as of the end of 2007 (WorldbankOnline, 2007). This has created economic chaos with two completely different money systems in operation, and most buying power side-stepping bank exchange rates and operating on a parallel market cash basis that loses value every week.

In a country with such a tense political and social climate, it has been difficult to respond to the HIV/AIDS crisis and healthcare has suffered (Meredith, 2005). President Robert Mugabe and his government have been widely criticized by the international community, and Zimbabwe has become increasingly isolated, both politically and economically (Meredith, 2007). Zimbabwe has not been a member of the

Commonwealth Countries since December 2003 and most donors have scaled-down or suspended their operations in Zimbabwe (WorldbankOnline, 2007). While campaigns to prevent and treat HIV in other African nations benefit from international aid, the political situation in Zimbabwe has caused most foreign donors either to decrease aid to the country or halt it altogether. Even though it is understandable that international donors do not want to support the Zimbabwean government under Mugabe's leadership, some have argued that it is the general population who are really affected by the lack of assistance, and women and children who suffer the most by disrupted healthcare provisions. Sebastian Chinhaira, Harare district coordinator of the Zimbabwean Network of People Living with HIV/AIDS (ZNNP+), illustrates this point by saying, "It is really true that when elephants fight, it is the grass that suffers"(Plusnewswebsite, 2006).

The development of a society, whether rich or poor, can be judged by the quality of its population's health, how fairly health is distributed across the social spectrum, and the degree of protection provided from disadvantage due to ill-health (Marmot, 2007). In every culture, indigenous people of the world have life expectancies lower than the national average and, in general, the social gradient in health shows that the lower an individual's socioeconomic position the worse their health (Marmot, 2007). If one utilizes the Commission on Social Determinants of Health criteria (Marmot, 2007) – which looks at housing and living conditions, access to safe water and good sanitation, efficient waste management systems, safety of neighborhoods, food security, and access to services such as education, health, welfare, public transportation, and child care – to evaluate the level of expected health in Zimbabwe, it is not surprising that overall life-

expectancy is down from 55 years in 1980 to 37.3 years overall (WorldbankOnline, 2007) and considerably less for women at 29.4 years.

Largely because of the AIDS crisis and worsening country conditions, between 2002 and 2006, the population is estimated to have decreased by 4 million people (Independent, 17th November 2006). Infant mortality has doubled since 1990 (UNAIDS, 2006), and Zimbabwe has a higher number of orphans, in proportion to its population, than any other country in the world according to UNICEF (2006). Most of these cases are a result of parents dying from AIDS (Ministry of Health and Child Welfare, 2005). Surrounding every hospital facility there is a thriving funeral industry with coffin makers one of the last trades to have regular work.

Because of economic constraints, a shortage of basic supplies for comprehensive antenatal and maternal child health care exists. Medicines, intravenous infusions, gloves and basic medical equipment are in short supply. Water, electricity, and telephone are often turned off in the district health centers because of inability to pay utility bills, and even in the district hospitals these services can be absent for several hours or even days at a time. Long lines for service exist in every clinic, and lack of transportation with prohibitive fuel prices mean that patients must sometimes walk long distances for care. These shortages affect services such as family planning, antenatal care, ferrous sulphate, folate and multivitamin supplementation, VCT availability, treatment of symptoms of sexually transmitted infections and pediatric follow-up (Perez et al., 2004) (personal observation).

The Zimbabwe healthcare system, administered under the Ministry of Health, is divided into eight provinces and 58 districts that offer five levels of care: 1) health post, 2) health center, 3) district hospital, 4) provincial hospital, and 5) national hospital. Each district has a different budget based on the wealth of their district, and so services and medical resources are interrupted more frequently in poorer districts. The medical infrastructure in the country has suffered significant depletion through death of workers from the AIDS epidemic, as well as a "brain-drain" from medical experts, skilled nurses, laboratory and pharmacy personnel migrating out of the country as the economy and AIDS epidemic have worsened. The healthcare workers who remain complain of significant burn-out and stress from working in resource-poor environments with increased patient census. Among many healthcare providers there is a general weariness toward HIV and AIDS that affects the workers' approach to providing service to HIV-infected women (personal communication, 2006 in country).

The main components of the Zimbabwe Prevention of Maternal to Child Transmission Program are: 1) VCT and rapid HIV testing offered to all pregnant women attending antenatal care on an opt-out basis, 2) administration of a single dose of nevirapine to the HIV-positive mothers informed of their serostatus and their newborns, following the HIVNET 012 regimen (Jackson et al., 2003), 3) post-test counseling and support for mothers to exclusively breastfeed for six months, as replacement feeding is not routinely supported, 4) continuous follow-up of mother-child pairs through routine health services, including provision of cotrimoxazole prophylaxis for opportunistic infections, and 5) promotion of consistent family planning with dual methods, one of

which is a condom. Unfortunately, unless patients are enrolled in a study with on-going research protocols and material provisions to meet those protocols, there is a tendency for services to be erratic and maddeningly available, or not, at the discretion of the over-seeing matron.

Land reform, a history of racial violence, and political violence and intimidation between indigenous groups and political parties has had a major destabilizing effect on the culture and well-being of Zimbabweans (Economist.com, 2007). Land redistribution has occurred along racial lines, but it has also occurred among political party and tribal sectors with nepotism by Mugabe toward his own relatives, friends and loyalists, who receive the major benefit. Little or no benefit has been realized by the poor of the nation (Meredith, 2007).

The land redistribution campaign is thought to have contributed to the AIDS epidemic in several ways. As farming communities were disrupted, the economy deteriorated, leading to increased poverty and reduced access to education and healthcare. Many farm workers were forced to move to different areas in search of work and in some cases families were separated; both factors that are likely to have widened sexual networks and increased the risk of HIV transmission along migrant trucking routes (McGuire, 1998). Consistent with these upheavals, there has been a growing trend to move away from rural life with strong tribal governance, and this has undermined family cohesion, the meaning of culture, and has especially devalued the role of women, casting them largely as disenfranchised urban poor (Economist.com, 2007) .

The Role of Women: The Case of the Little Hen Not Wanting To Be a Broiler

In Zimbabwe, the desire of women to have children is rooted in a context of a need for both love and financial security. Women are profoundly economically vulnerable in this male-dominant culture that lacks inheritance rights for women. This imposed lack of agency makes being married fundamental to a woman's economic well-being. Marriage has four basic levels (Jaggar, 2002): 1) Religious, 2) civil, 3) traditional with "lobola" or bride-price being paid, and 4) cohabitation. Even if the couple is quite casually engaging in sexual relations, the woman will refer to herself as her partner's "wife" and to the man as "her husband," although he may be currently living with a legal wife. This fact makes history-taking difficult in terms of acquiring an accurate picture of family networks.

In all unions, numbers of children and spacing is primarily male driven as dictated by the man's family. This is especially true if bride-price or a dowry known as "lobola" has been paid by a man's family to the bride's family. Lobola is paid on the expectation of having children (Fleshman, 2004), and the woman, therefore, has less negotiating power. In a context where more than 90% of marriages involve payment of lobola, as in Zimbabwe, this puts a heavy burden on the necessity to persist in reproducing; even in the face of recurrent fetal loss, infant mortality, MTCT of HIV, or worsening of the woman's own disease status (Ross et al., 1999). A heavy burden of stigma is placed on women who fail to produce multiple offspring in a marriage. Blame for infertility is automatically attributed to the woman rather than her partner, resulting in her loss of status within the family and the community, an increased chance for abandonment, and often physical violence (Jewkes, Levin, Loveday, & Penn-Kekana, 2003). Women often

feel oppressed by their in-laws' demands for children, and especially their mother-in-laws' demands. Interestingly, these mothers-in-law are the same women who felt oppressed by their in-laws one generation before, but now have earned the "right" to dictate the reproductive futures of their sons and daughters-in-law to insure that they will be taken care of into old age and have the family's wealth expanded. Zimbabwean women describe a wife who fails to bring children into the husband's family as equivalent to being a "broiler chicken—one who just eats and eats, and gets fat, but never lays any eggs or is productive" (Smee, 2006). Zimbabwean women are well aware of what happens to broilers, in that they ultimately get eaten by the family.

In the case of HIV-infected women, the stigma of being barren is multiple and at cross-purposes with the prevention of MTCT. If the woman knows her HIV-positive status and seeks to act responsibly, by requiring condom use, she sabotages her status as wife and hastens her potential abandonment and descent into increased poverty. This results in the need for her to find another husband and prove her fertility potential with him. This type of scenario increases the potential for denial of disease status, the likelihood of infecting her new partner and the potential for vertical transmission to yet another infant (Fabiani, Nattabi, Ayella, Ogwang, & Declich, 2006).

Depending on the community, some premarital sexual experimentation is sanctioned in both sexes. It is seen as advantageous to prove that a potential female partner is fertile before taking her as a wife (Mill & Anarfi, 2002). Once married, women are expected to be faithful, and yet male infidelity is largely ignored and tolerated (Lawoyin & Larsen, 2002). Informal polygamy is popular. A common belief is that a

man will become ill if he does not have regular intercourse with a woman (Lawoyin & Larsen, 2002). This type of thinking increases the risk of the recent trend in partners spending more time apart, as either wives are sent back to rural tribal lands with the children in an effort to save money, or husbands are forced to take migrant work which keeps them away from home for two to three months at a time (McGuire, 1998).

Poverty Effects

The socioeconomic situation is a determining factor in the distribution and continued prevalence of HIV among women and their children in Zimbabwe. The socioeconomic inequalities are reflected in the material conditions that influence the risk of infection, namely the lack of financial resources, which puts young women at the mercy of the sexual demands of men; unsafe neighborhoods, which increase the risk of violence; mothers working far from home as domestics and needing to leave their children alone; and less knowledge and education about how the disease is transmitted, how it can be prevented and individual rights (Kalipeni, 2000).

For the individual woman in Zimbabwe, socioeconomic difficulties, violence and migration are often interwoven into a sad reality. This is especially true for young women from poor rural areas with no economic resources other than their bodies, who engage in 'survival sex' (Grieg, 2003). Inter-generational sex with "Sugar Daddies" has been especially problematic (Kalipeni, 2000). One must be cautious, however, because this image of multiple sexual partners, even out of financial necessity, that is readily generalized, can be dangerous and unfounded when attempting to approximate the factors

explaining the epidemic's continued virulence. It is dangerous because it is precisely by means of such stereotypes focused on sexual promiscuity that African women have been stigmatized and, in reaction, have developed resistance to 'racist' AIDS prevention campaigns (Fassin, 2003). It is unfounded, because epidemiological data have established that high rates of infection are not necessarily correlated with unusual or promiscuous sexual behaviors (Hallett et al., 2006; Pettifor et al., 2005).

In an ethnographic study of 34 sex workers, (Gysels, Pool, & Nnalusiba, 2002), poverty was identified to be the most incriminating factor driving high-risk sexual practices among women. Likewise, fulfillment of "the utilitarian-economic values attributed to children" (Moyo & Mbizvo, 2004) was found to drive the desire to reproduce in Zimbabwean women, even in the face of acknowledged self-perceived high risk to themselves and their offspring. Both of these studies failed to document the women's HIV status, relying instead on their self-perceived risk of HIV.

Unless they are domestics, or trained as nurses or teachers, most women are not legitimately employed outside of the home (Jaggar, 2002). They are permitted some selling of goods in the local markets or along the roadways but, otherwise, professions are largely inaccessible to women, and especially in an environment where there is 80% unemployment for men and women, which is the case in Zimbabwe (UNICEF, 2006).

The inability of people to lead flourishing lives is a basic detriment to good health (Marmot, 2007). In Zimbabwe, where the gross national income (GNI) has decreased by one-fourth between 2000 and 2005, and the gross domestic product (GDP) fell by one-half during those years (WorldbankOnline, 2007), very little flourishing is going on

except at the most elite levels of society. The unequal distribution of resources affects people's freedom to enjoy the lives they value and has a powerful effect on their sense of empowerment. Dimensions of empowerment interconnect the material, the psychosocial and the political (Adler et al., 1994). Any discussion of alleviating the poverty effects on disease outcome, however, is incomplete without also addressing the need for empowerment of those most affected and addressing the differential status of not only the rich and the poor, but also the entrenched inequity between men and women (Marmot, 2007) that exists in Zimbabwe.

Violence Effects

Rape, intimate partner abuse, and the fear of violence have been attributed to the on-going transmission of HIV and continued reproduction by HIV-infected women from several authors (Astatke & Serpell, 2000; Grieg, 2003; Gysels, Pool, & Nnalusiba, 2002; Jewkes, Levin, Loveday, & Penn-Kekana, 2003; Mill & Anarfi, 2002). Kathleen Cravero, UNAIDS deputy director, sums it up best by saying, "A woman who is a victim of violence or the fear of violence is not going to negotiate anything, let alone, fidelity or condom use" (Fleshman, 2004).

Surveys of and testimonies from victims attest to the ordinariness of rape and, more generally, 'unwanted sex under constraint,' including between regular partners and married couples (Jewkes, Levin, Loveday, & Penn-Kekana, 2003). It has been shown (Hindin, 2003) that one in six women in Zimbabwe have been sexually abused by a man. Although historical studies attest to the existence of pre-colonial tribal violence, there is

no doubt the colonization of Africa brought further radicalization of social violence (Meredith, 2005). First came the colonizers' direct violence, followed by the Southern Rhodesia Ian Smith government's violence against Blacks. Then, through 25 years of civil war, everyday violence and defense against violence were completely normalized in the Zimbabwean psyche (Fuller, 2003, Meredith, 2005). This twofold strategy of excessive power, and power exercised by default, made illegitimate violence the ordinary substance of social relations.

Three different studies looking at intimate partner violence and the factors associated with violence against women identify increased incidence with males having other sexual partners, females having less education, and lower household income (Hindin, 2003; Marman et al., 2002; McCloskey, Willaims, & Larsen, 2005). The study from Zimbabwe (Hindin, 2003) additionally found that women of a younger age and living in a rural area were more likely to experience partner violence, while the other two studies (Marman et al., 2002; McCloskey, Willaims, & Larsen, 2005) found that longer relationships, if the woman had borne five or more children, or if there was any history of conception problems were more highly associated with experiencing partner violence. One of the studies (Marman et al., 2002) compared HIV-infected women against non-infected women, and found that HIV-infection status is significantly associated with an increased chance for intimate partner violence (OR=2.63, 95% CI =1.23, 5.63). This speaks directly to the vulnerability of the HIV-infected woman in sub-Saharan Africa.

There is another type of violence, however, that women in Zimbabwe experience, and that is what Jaggar (2002) calls "built-in violence" or structural violence that

perpetuates harm to women from the very societal structure that is designed to support these women. Structural adjustment programs, which are recommendations for lowering the debt/income ratio of developing countries in sub-Saharan Africa by neo-liberal globalization organizations such as the World Bank and the International Monetary Fund, have actually undermined women's health in the global South (Gloyd, 2004). Trade liberalization, government expenditure reduction, devaluation of currencies, reduction of controls over foreign currency, and trade union restrictions actually have had dramatic negative effects on women and children in terms of quality of care, health service utilization, changes in mortality and morbidity, nutritional status and deteriorated educational systems. This must be acknowledged for the structural violence against women that it is, and that is endemic in the infrastructure of the culture.

The process of impoverishment through structural violence affects women more than men, in particular because structural adjustment programs reinforce an already existing process of marginalization of women's production (Gloyd, 2004). The structural adjustment programs stimulate the production of cash crops for export, such as corn, cotton, tea, and coffee, but often to the detriment of household consumption (Macdonald, 1996). The increase in cash crop production, usually controlled by men, also increases workloads for female family members (Jaggar, 2002). Further, women must bear the brunt of the social consequences of adjustment measures. Since they are also responsible for social and health aspects within the family (Susser & Stein, 2000), it is they who must cope with disease and hunger. Structural assessment programs have disproportionately

increased women's workload in Zimbabwe, without yielding any real economic or empowerment benefit (Jaggar, 2002).

Religious Effects

Although a substantial portion of the Zimbabwean population belongs to a Christian congregation or church (60-70%), people retain many of the customs and beliefs in traditional religions such as the Shona or Ndebele religions (Moyo, 1988). Zimbabweans blend the Christian and the traditional into a religious syncretism. It is not possible to fully understand contemporary Zimbabwean society without the religious dimension, particularly the traditional religious dimensions. As one qualitative study (Gregson, Zhuwau, Anderson, & Chandiwana, 1999) explained:

> It is very true that, the bus turned over and it caught fire and about 45 people died last year. It's just a plain area where there is a straight road, and for the whole of that week, about four accidents occurred on the very same spot until some elders from churches whose ancestors used to reside there were called by the government to cleanse the area and to talk to the spirits, and nothing happened after; they just passed there.

The first mission station was opened close to Bulawayo in 1859 by the London Missionary Society (Gregson, Zhuwau, Anderson, & Chandiwana, 1999). Christianity was turned into an ideology that could be used to convince people not to resist white domination. Religion was used to legitimate, sustain and even promote political tyranny and oppression, as well as for reasons of political liberation of the people (Moyo, 1988).

Regardless of claims that the missionaries regarded themselves as opposed to the colonial ideology, they were part of the colonial structure and brought with them religions, beliefs and practices that were alien to the area. In the words of Father Wolf Schmidt, "The early missionaries did not differentiate between their faith and their culture"(Gregson, Zhuwau, Anderson, & Chandiwana, 1999). As scientists and researchers in Africa, it is important to avoid that same disclaimer by insuring differentiation of our medicine from our culture. This can be done through accountability to the complexities and differences in cultural factors influencing disease transmission and progression. Moreover, commitment and interest in what it means to the lives of others and their struggles for self-representation and self-determination in the face of their disease is crucial. And finally, tailoring interventions that are culturally-conversant rather than scientist-convenient is important so that medicine and science do not become another form of colonialism like religion was historically.

In Zimbabwe, the most common form of Christianity practiced today is Catholicism with about 17% of the population belonging to that faith. A good number of indigenous Christian sects or independent spirit-type or Pentecostal churches have developed as outgrowths of the mainstream mission denominations. They can be differentiated in terms of population dynamics by the fact that the spirit-type churches have greater restrictions on alcohol consumption and extramarital sexual restrictions. They have practiced a greater restriction on birth control and abortion and their practitioners have generally been poorer and less well-educated with higher birth and infant mortality rates. Recently however, increased mortality rates in adult age categories have been noted

among the practitioners of the mission churches, which is thought to reflect a more liberal sexuality and increased number of AIDS deaths (Gregson, Zhuwau, Anderson, & Chandiwana, 1999).

No specific statistics exist as to the HIV prevalence in other religious groups within the country. Judaism, Hinduism, Buddhism, and the Jehovah's Witnesses are all represented in very small numbers. The Muslim community makes up about 1% of the population of Zimbabweans and is largely located in the two major urban centers around Harare and Bulawayo (Gregson, Zhuwau, Anderson, & Chandiwana, 1999).

Contraceptive Practices

Since 1996 there is evidence (Gregson, Zhuwau, Anderson, & Chandiwana, 1998; Hallett et al., 2006; Mahomva et al., 2006; Udjo, 1996) in Zimbabwe of increased condom use with resulting cautious association with declining HIV prevalence especially in the 15-19 year age range. The age of sexual debut has been reported in some studies (Gregson et al., 2002; Mahomva et al., 2006) to be delayed slightly, and reports of greater acceptance of barrier methods by men is promising. Some couples in the region are limiting family size due to concerns about HIV, but a shared sense of limited control over fertility involving both men and women, and wider health and economic concerns over the use of contraceptives are still prevalent in both sexes (Baylies, 2000). Few studies have looked at the specific contraceptive practices and intentions of HIV-infected individuals in sub-Saharan Africa, but in those that have (Mhloyi, 1996; Moyo & Mbizvo, 2004; Myer, Morroni, & Rebe, 2007; Nebie et al., 2001; Oladapo, Daniel, Odusoga, &

Ayoola-Sotubo, 2005) a large proportion of both men and women desire future childbearing.

The extent of the fertility desires and intentions of these patients poses a threat to the preventive strategies against vertical and heterosexual transmission of HIV in the region. In view of their compelling desire for parenthood, it may be wise for caregivers to desist from the conventional systematic advice against pregnancy. Instead, new insights into the motivation, attitudes and behavioral practices must be understood for the context that these people inhabit, so that adequate information on practicable reproductive options for harm reduction for HIV-infected individuals can be delivered.

Summary

It is a well-substantiated fact that pathogens and cultures evolve together, and that cultural practices affect the spread of epidemics and their physiological outcomes (Tanaka, Kumm, & Feldman, 2000). The evolution of HIV, however, is also represented by a new kind of equilibrium or balance of counteracting forces involving behavioral heterogeneity that represents a combination of widely dissimilar and varied behaviors. It is an endemic or location-specific type of balancing-act that also asks what effects infectious diseases have on the evolution of cultural practices; thereby reversing the question traditionally addressed. Pathogens, cultures and individuals all nest together within a patterned context that exerts reciprocally rebounding and interactional effects. To overlook any part of that patterned context is to lose sight of the awareness of the

epidemic's evolution and the strategies that will ultimately be most effective in controlling its continued spread.

The complex topic of continued fertility in sub-Saharan women following a diagnosis of HIV infection is a conundrum that must be understood within the contextualized pattern of pathogen, culture and individual. In this chapter, the physiological effects on subsequent fertility in HIV-infected women were presented in terms of maternal mortality, breastfeeding, perinatal outcomes, infertility, co-morbidities and opportunistic infections. Likewise, the cultural influences of the Zimbabwe specific situation, the role of women within the culture, poverty, violence, religion and contraceptive practices were also discussed.

According to the existing literature, it has been insufficient for healthcare providers to advise systematically against pregnancy and attempt to pressure dual contraceptive coverage or abstinence in the HIV-infected sub-Saharan woman, thinking that these admonitions will somehow 'handle it'. The literature has shown that this strategy has not worked. HIV-infected individuals in this region of the world have the same intention to get pregnant and, in fact, in the face of non-escalating HIV symptoms, do get pregnant at the same rate as their non-infected counterparts.

The ability to care for vulnerable women in a cultural milieu that values them most highly for their reproductive capacity and stigmatizes them for any interference in ability to reproduce demands understanding of all of the factors that drive these women's choices. Little is known about the attitudes and behaviors of women surrounding sexuality and fertility practices following an HIV diagnosis in sub-Saharan Africa, and

even less in Zimbabwe. The literature has serious gaps in the areas of correlates and predictors for pregnancy intent within this group of women. Physiological markers of the disease, as well as knowledge, attitudes and practices need to be measured to better understand the factors associated with reproductive choices and sexuality practices in HIV-infected women. In populations such as Zimbabwe, where prevalence of HIV-1 in women is high and the likelihood of transmission to offspring and additional partners is great, there exists an urgency for understanding these factors so that care can most effectively serve the individual as well as quell the epidemic.

CHAPTER 3 THEORETICAL FRAMEWORK

Theories provide tools to think about problems, establish frameworks for research and analysis, and help to explain interrelationships of concepts being investigated. They also help to provide a structure for testing those relationships. The purpose of this chapter is to provide a theoretical context for the study of fertility in Zimbabwean women and to offer partial explanation for what may be driving the reproductive choices of HIV-infected women in particular.

Child Replacement Theory was chosen because it addresses the importance of real and perceived loss that motivates reproductive behaviors. It is a functional theory that has been used across disciplines. This chapter will provide a chronological description of the origins of the theory and how it has been used in research, followed by a critique of the theory using the Walker and Avant criteria for theory analysis (Walker & Avant, 2005). Figure 3.1, Chronological Development of Child Replacement Theory, is presented in order to outline major periods of influence on the theory and the corresponding researcher's contributions. Figure 3.2, Conceptual Model of Mechanisms Affecting Fertility in HIV-Positive and HIV-Negative Women in Sub-Saharan Africa, diagrams the integration and interrelationships of the three contributing theorists' concepts.

Child Replacement Theory

Origins and Evolution of Meaning/Concept Relationships

As early as the mid-1800's, census data collected in England linked rates of infant mortality and female fertility. By the late 19th century, social reformers generally understood that during periods of decreased infant mortality, fertility and birth rates would correspondingly decline. Likewise, in boroughs and counties where infant mortality and child death rates were very high, a corresponding rise in fertility rates was noticed to follow closely (Cohen & Montgomery, 2004).

By the 1950's F.W. Notestein, Princeton Professor of Demography, recognized and began to emphasize one particular implication, the effects of mortality decline on the motivation for high fertility. The initial formulations of demographic transition theory (Notestein, 1953) gave prominence to this theme, and it continues to serve as a unifying feature in models of fertility and related demographic behavior (Cohen & Montgomery, 2004). Even when first articulated, the mechanisms of infant and child mortality and subsequent female fertility were understood to be complex, involving both individual and societal-level responses (Notestein, 1953) as shown by the solid and dotted line circles in Figure 3.2.

In 1978, another Princeton professor, S.H. Preston, studying the problem from an economics viewpoint coalesced the Child Replacement Theory in his landmark publication, *The Effects of Infant and Child Mortality on Fertility* (Preston, 1978). He enumerated four mechanisms by which child mortality might affect fertility. First, parental expectations of child loss might be expressed in insurance or "hoarding"

behavior, causing fertility to be higher than if survival were assured. This is known as a hazard model, and it tests the hypothesis of child survival effects. It suggests the importance of a perceived threat or personal experience with child loss leading to expectations of poor reproductive outcomes and concomitant behavioral influences to overcome these outcomes. The center boxes near the top of Figure 3.2 relate to this phenomenon.

According to Preston, in the event of an infant or child death, two additional mechanisms could come into play: lactation interruption effects and behavioral replacement strategies. Both of these mechanisms have the effect of decreasing time intervals between pregnancies. The fourth mechanism delineated by Preston provides a clear place for societal-level effects, those having to do with institutional forces that had long served to maintain high fertility in the face of high mortality and which would, therefore, continue to shape the fertility response to mortality increase or decline. These include such things as religious beliefs, male dominance patterns, and status/wealth perceptions of having many children. They are listed in Figure 3.2 under cultural or societal level effects. The volume also presented an array of applications to both aggregate and individual-level data, which provided evidence on the likely magnitude of the fertility response. These theoretical and methodological developments were set out in compelling, lucid and vivid terms. He argued for a deeper consideration of the societal-level mechanisms, including the place of "nuptiality" and emphasized the role of "mortality perceptions" (Preston, 1978) yet neither line of research was pursued until much later.

Since the 1978 Preston formulation of the Child Replacement Theory, the effects of child mortality on fertility have proceeded in three directions. First, some researchers (Bulatao, 1985; Cuthright, 1983) have continued to search for statistically significant thresholds of life expectancy or socioeconomic development that, when attained, provide motivation for couples to limit their fertility. Such studies have generally failed to identify meaningful thresholds for fertility decline. However, studies conducted in this vein were responsible for tying Maternal Child Health Services with Family Planning Clinics throughout the developing world in the hope that better perceived child survival would increase contraceptive use (Cohen & Montgomery, 2004).

The second effect of the theory has been the emergence of detailed micro-level (individual) data from developing countries that has supported a newer generation of studies of both the lactation interruption and child replacement effects (Chowdhury, 1988; Johnson & Sufian, 1992). These micro-level studies have confirmed that women who lose one or more of their children tend to have higher subsequent fertility than women whose children survived. Birth intervals tend to be considerably shorter following the death of a child, largely due to the interruption of lactation and the removal of its contraceptive protection. Although, even when lactation interruption effects are controlled, there is still a residual replacement effect in parents experiencing child loss (Benefo & Schulz, 1996; Maglad, 1994).

The third direction the theory has taken is in terms of more complex statistical models to further refine the dynamic theory that underlies modern economic models of insurance and child replacement effects (Okojie, 1991; Sah, 1991). However, the

standard methods of economic and demographic inquiry are not at all well suited to measuring such fundamental changes in psychological context. Perceptions of mortality risks and of the efficacy of health interventions are doubtless very difficult to elicit. Parents may not be able to articulate why they feel as they do, or be able to connect mortality risks to reproductive decisions or behaviors as logically as scientists would prefer.

Child replacement and insurance effects have been considered to be volitional in much of the economic and demography research. It now seems more likely, however, that child survival expectations exert their influence through a largely sub-conscious orientation derived from personal childhood experiences with death, as modified by cultural expectations, the social environment, and availability of health care services (Chesnais, 1992). The circles in the center of Figure 3.2 relate to these effects. This means that there is a complex interplay of factors that influence a woman's or a couple's drive to replace a child. Fertility control following HIV diagnosis is not merely dependent upon good contraceptive counseling or education on the risks involved with continued reproduction.

Child replacement effects are likely to be stronger among families that have not yet exceeded their ideal family size and weaker among families that have already attained satisfactory family size (Newman, Taylor, & Kelly, 1976). Sub-Saharan African parents are more sensitive to the risk of losing a child or being unable to achieve adequate family size because of an extreme fear of family extinction (Cohen & Montgomery, 2004). Loss

of a first child or, in the case of the less developed world, a male child, also increases the strength of child replacement effects (Cohen & Montgomery, 2004).

In the last ten years, significant advances have been made in the availability of solid demographic data from the developing world as well as in advances to methods of demographic analysis. By separating the effects of a death at each successive parity, it can be shown that the death of a first child has a differentially large, lasting, and significant influence over the remainder of a woman's reproductive life (Cohen & Montgomery, 2004).

While most of the published research and theory between 1950 and 1990 on child replacement and insurance effects of continued fertility was carried out by economists, sociologists and demographers interested in population control measures, the phenomenon of the "replacement child" found its way into nursing literature through the care of women experiencing perinatal loss and grief. Kristen M. Swanson, Chair of Family and Child Nursing at the University of Washington, has published extensively from 1988 to the present on early pregnancy loss, neonatal death and the desire to replace "lost children" with another pregnancy. She describes this as a way of resolving grief over the loss of the hoped for and dreamed of – essentially the loss of future, which is even more compelling than the loss of past (Swanson, 1988, 1999, 2000, 2003). She has found that women who are younger, have no other children, and are of lower socioeconomic and educational standing have more intensive grief reactions and greater likelihood for depressive sequelae (Swanson, 2000). These women also feel greater pressure for success in a subsequent pregnancy as expressed by higher personal

significance scores and passive coping scores articulated on a worry and dread scale which she developed using twenty items to measure women's magnitude of distress following miscarriage. Conceiving again within one year lowers the perceived intensity of symptoms according to Swanson (2000). Findings from her work, as well as a comprehensive literature review of 35 articles on pregnancy after perinatal loss (Hutti, 2006) concur that women least depressed after perinatal loss are the ones who give birth again.

Among women of color, Child Replacement Theory has been tested by Scrimshaw (1981) in her study entitled, "Infant Mortality and Behavior in the Regulation of Family Size", published in *Fertility Decline in the Less Developed Countries*. Specifically in Zimbabwe, Moyo and Mbizvo (2004) tested the theory in their study of desire for future pregnancy in relation to self-perceived risk of HIV, and found that higher risk status for HIV is not associated with lower desire for pregnancy. Instead, they found that increased desire for pregnancy is associated with a history of child loss irregardless of perceived HIV risk.

For the HIV-infected woman in sub-Saharan Africa this has special significance. Not only are miscarriage, stillbirth, prematurity and infant mortality increased in this population, but these women face the prospect of loss of their own future, their own being. The enormity of this, possibly, drives the desire for replacement even more passionately.

Figure 3.1: Chronological Development of Child Replacement Theory

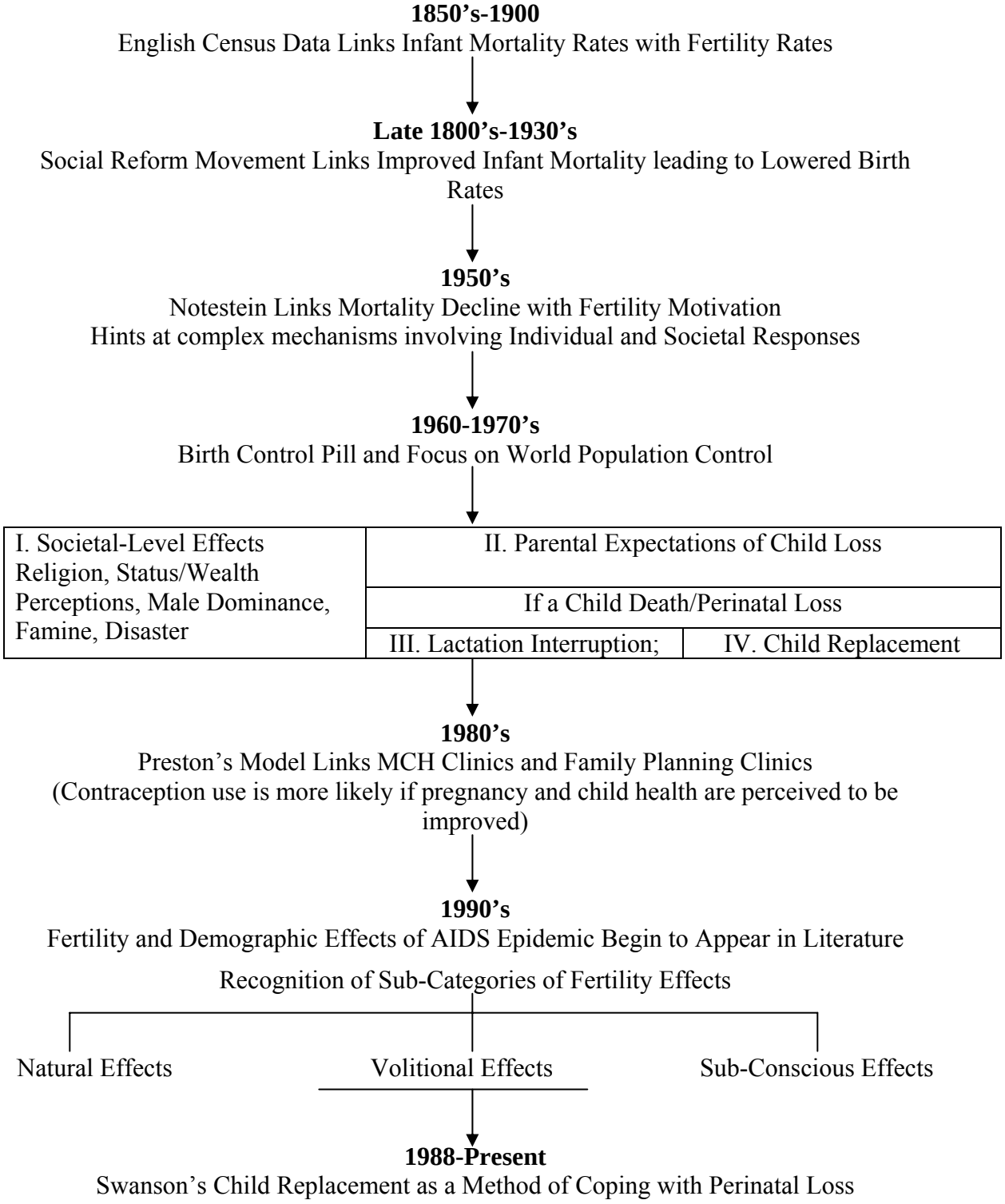
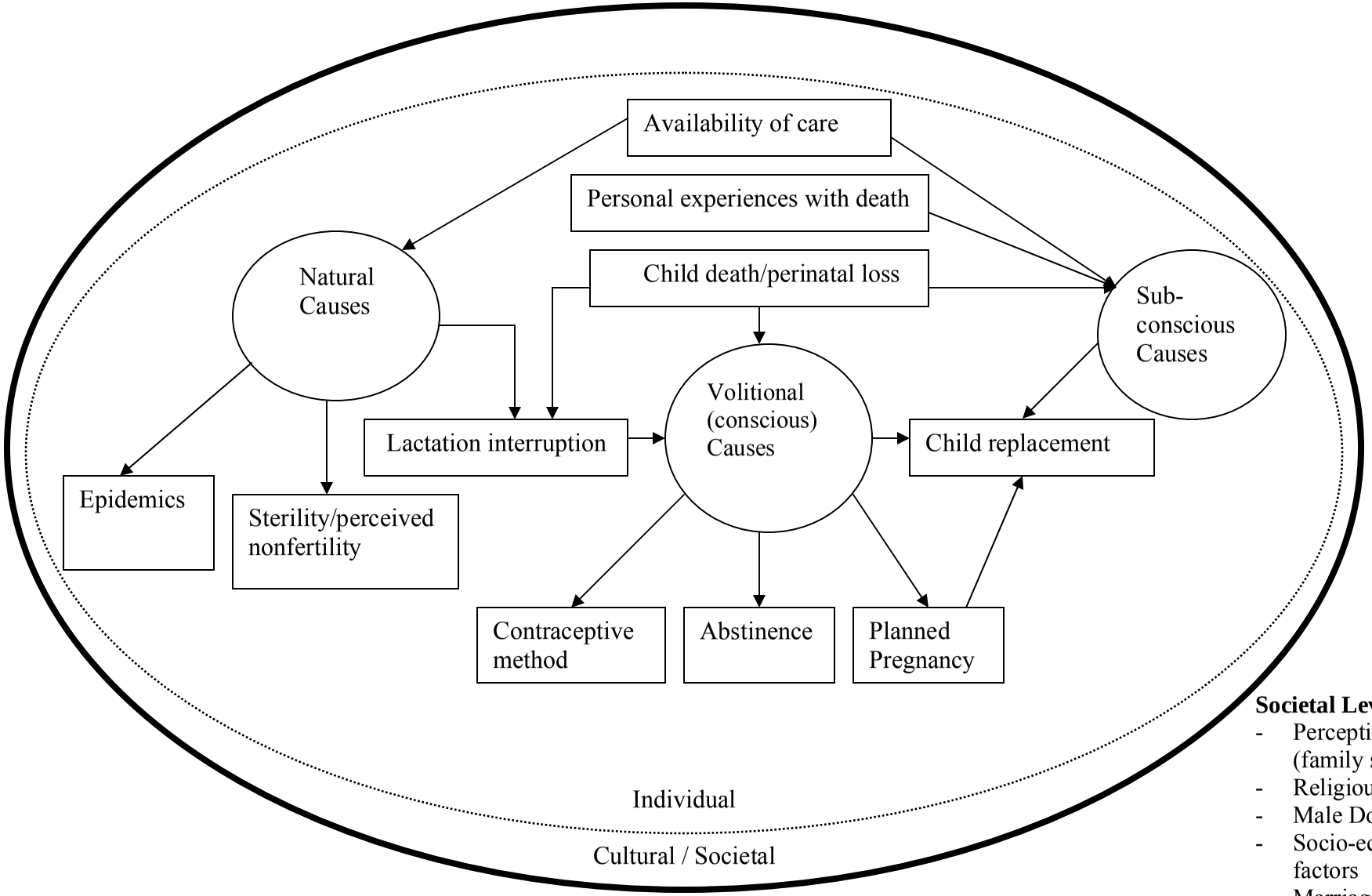


Figure 3.2: Conceptual Model of Mechanisms Affecting Fertility in HIV-Positive and HIV-Negative Women in Sub-Saharan Africa: Integrated Child Replacement Theory



Societal Level Effects

- Perception of Status (family size)
- Religious Beliefs
- Male Dominance
- Socio-economic factors
- Marriage Customs
- Natural Disasters
- Epidemics

Critique of Child Replacement Theory

A theory purporting to describe, explain, or predict something should provide the reader with a clear idea of what the phenomenon is and does, what events affect it, and how it affects other phenomena. Therefore, theory analysis is the systematic examination of the theory for meaning, logical adequacy, usefulness, generality, parsimony, and testability (Walker & Avant, 2005). These are the criteria that will be used to critique Child Replacement Theory. The purpose of theory analysis and critique is to examine both the strength and the weaknesses of a theory in order to determine the need for additional development or refinement of the original theory. Theory analysis provides a systematic, objective way of examining a theory that may lead to insights previously undiscovered (Walker & Avant, 2005) allowing a vehicle for adding to the body of knowledge. This process offers a way of determining what needs to be tested and often suggests a way to proceed with testing.

Any time a theory evolves across multiple disciplines, there is a potential for inconsistent use of concepts and blurring of definitions and meaning. In the case of Child Replacement Theory, pregnancy loss, infant mortality, and childhood death are commonly used interchangeably in the economics and population data. Likewise, in the medical literature, spontaneous abortion, miscarriage, perinatal loss, pregnancy loss, stillbirth and early infant demise are blurred and rarely defined or differentiated. For the purpose of this study, loss of a pregnancy once a woman knows she is pregnant, or any death of a child up through 5 years of age is considered as child loss, and will be

expected to have implications for triggering mechanisms of replacement leading to increased potential for fertility.

Likewise, the concept's macro-level influences versus micro-level influences are rarely defined, and are used interchangeably with societal or aggregate effects versus individual effects. For the purpose of this study, macro-level influences are the same as cultural, aggregate or societal effects, reflecting the community at large. Micro-level influences equate with individual effects.

The logical adequacy of this theory has been tested across differing populations, and refers to the logical structure of the concepts and statements independent of their meaning. At the micro-level, Child Replacement Theory has a high degree of logical adequacy and predictive findings have good consistency. However at the macro-level, some discrepancy has been noted between the developing world and the developed world (Cohen & Montgomery, 2004). One must conclude that aggregate-level studies have usually failed to document any clear effect of mortality decline on fertility in the under-developed world, whereas individual-level studies have consistently found a significant increase in fertility response to child loss. Child survival rates do not seem to predict decreased pregnancy and birth rates in the under-developed world without there being a concomitant increase in the status of women through education, employment and inheritance rights (Beckerman, 2002). This finding correlates with findings from the Commission on Social Determinants of Health (Marmot, 2007) and underscores the importance of research investigation accessing a milieu outside of the developed world and with highly vulnerable women.

Child Replacement Theory has its origins in demography, economics, and population control, with broad implications for nursing, medicine and the social sciences. This allows for a high degree of generalizability within the special confines noted above. The theory has been widely tested in multiple settings during Preston's long career and subsequently by other researchers (Hutti, 2006; Mhloyi, 1996; Ntozi, 2002; Scrimshaw, 1981; Zaba, Terceira, Mason, & Gregson, 2003) and makes a strong case for the drive to replace child loss if the ideal family size has not been achieved. The specific response of HIV-infected women is unknown in relationship to this theory. This research attempted to clarify that question.

Child Replacement theory is parsimonious and explainable, though it requires some integration of different researchers' contributions by correlating Notestein's (1953) demographic transition theory, Preston's (1978) four mechanisms whereby child loss affects fertility, and Swanson's (2000) psychological and grief motivation effects. This is offered in the Conceptual Model (Figure 3.2). The theory is couched within a more comprehensive theory of fertility fluctuations and population dynamics that could have benefited from a visual diagram of conceptual relationships rather than just survival curve estimations in the original research citations. It is a theory that is measurable through outcome measures of pregnancy rates and birth rates as well as through measurement of knowledge, attitudes and practices of subjects, so therefore, its testability is high, making it useful for research purposes.

Summary

Child Replacement Theory is a key piece to understanding not only the micro and macro-population/demography dynamics, but also the economics of loss and grief leading to the desire for replacement of lost future. As Swanson's work reveals, the younger the woman, the lower her socio-economic class and educational status, and if she has no other children, the more likely she is to experience the most severe grief and have the strongest desire for a replacement pregnancy. If a woman has nothing except her status as a mother to bring her respect within her patterned social structure – then it becomes all the more important to her that she maximize that need-fulfillment strategy and create offspring to provide some sense of security for her position within the family and the community. Certainly, Child Replacement Theory must be considered as one of the primary theoretical tools for understanding and researching the questions regarding fertility and reproductive behavior after HIV diagnosis in sub-Saharan Africa.

CHAPTER 4 METHODOLOGY

Research Aims and Questions

The overall goal of this study is to conduct a secondary analysis of a cross-sectional study design to characterize the factors associated with becoming pregnant in HIV-positive and negative women from Zimbabwe. The study aims are:

1. To establish the psychometric properties of the Fertility Attitude Scale.
2. To compare HIV-positive and HIV-negative study participants on demographics, index pregnancy, follow-up and subsequent pregnancy, and fertility attitude scores.
3. To test whether there is a relationship between subsequent pregnancy and HIV status (positive or negative), socio-economic status, age, previous pregnancy outcomes and fertility attitude scores.
4. To describe terms of disclosure, ARV treatment and fears faced by the HIV-infected study participants.

Aim 1 establishes the psychometric properties (factor analysis and alpha estimates) of the Fertility Attitude Scale. Aim 2 is an exploratory analysis using simple T-test, Chi-square, and ANOVA comparisons of HIV-positive and HIV-negative study participants. Significant factors from these analyses were used in Aim 3. Subsequent pregnancy is a measure of whether the woman became pregnant (yes/no). Aim 3 includes the main hypotheses of the study:

Ho3a: There is no relationship between subsequent pregnancy and HIV status.

Ho3b: There is no relationship between subsequent pregnancy and socio-economic status.

Ho3c: There is no relationship between subsequent pregnancy and age.

Ho3d: There is no relationship between subsequent pregnancy and previous pregnancy outcomes.

Ho3e: There is no relationship between subsequent pregnancy and fertility attitude score.

Aim 4 used a qualitative approach to analyzing the HIV-positive group (N = 79) on factors of disclosure, ARV treatment and fears they expressed.

Design

This study utilizes a secondary analysis of a cross-sectional design study supported by grants from Women's Global Health Imperative and the Elizabeth Glaser Foundation and from a University of Zimbabwe-University of California, San Francisco Research Project Collaborative in Women's Health. Individual datasets on participants were collected between January 2002 and December 2003. Yvonne Maldonado and Mike Chirenje were the Co-Principal Investigators.

Setting

The study was conducted at antenatal clinics in Chitungwiza, a high-density urban town on the outskirts of Harare, the capital city of Zimbabwe, located in the North Central region of the country. Seroprevalence of HIV among pregnant women in this

area is 20-21%. English and Shona are the official languages, but most inhabitants of this area are native Shona speakers. Economic and political insecurity are part of everyday life (as discussed in the literature review chapter). Healthcare for this population is administered in public clinics under the jurisdiction of the Ministry of Health.

Protection of Human Subjects

Approval from the Medical Research Council of Zimbabwe through the University of Zimbabwe was obtained for the original study in 2001. For the purpose of secondary analysis in this study, exempt certification was granted through the University of California, San Francisco in September 2007.

Sample Size and Recruitment

Seventy-nine HIV-positive women who had participated in a PMTCT intervention in their index pregnancy and 80 HIV-negative controls from the same clinic populations were recruited by convenience sampling 24 months after the delivery of their index pregnancy to participate in this follow-up study of obstetrical outcomes, attitudes and practices related to fertility. All interviews took place between January 2002 - December 2003. All of the participants were between 18-40 years old and consented in writing in their native language to the one-time administration of a standardized questionnaire/ structured interview which lasted 1½ – 2 hours and was conducted in a private office apart from the public clinic buildings. Participants were insured anonymity in that only numbers were used for identification in any of the codebooks, and initial registration

documents and consents have remained locked in the program director's personal file cabinet. On-going health care at the municipal clinic was not dependent upon participation in the study. Participants were provided with refreshments for their participation.

Instruments

Demographic data, obstetrical history, physiological markers, outcomes, attitudes and practices related to fertility were measured via a standardized questionnaire and structured interview administered by one of three specially-trained research RNs. The questionnaire was developed in English and translated and administered in Shona (See Appendix A and B for both translations). Prior to administering the questionnaire to participants, it was independently checked by two linguistic experts from the University of Zimbabwe for correctness of translation and idiom. No item validity studies were conducted prior to administration of the questionnaire/interview.

HIV status was confirmed by two rapid HIV testing methods on each participant using the Unigold Recombigen HIV rapid immuno-assay by Trinity Biotech, plc, Bray Co., Wicklow, Ireland, and the Multispot HIV-1/ HIV-2 rapid test by BioRad Laboratories, Redmond, VA. If the results of these two tests did not match, a third tie-breaker, in the form of the Coulter HIV-1 Antigen ELISA Test System by Coulter Corp., Miami, FL was administered.

The PMTCT intervention administered to all HIV-positive participants in the index pregnancy consisted of HIV testing, education regarding MTCT and all other potential

transmission routes, ARV prophylaxis made available during labor for the HIV-positive woman and for her newborn within 72 hours postpartum, and counseling regarding contraception use and the importance of consistent condom use. Exclusive breastfeeding for six months followed by abrupt weaning was encouraged in all HIV-positive women if they could not afford formula feeding. HIV-positive mothers and their babies were followed monthly after delivery. Infants were started on Cotrimoxazole at six weeks postpartum to prevent opportunistic infections and treated continuously until final HIV testing on them could be administered at 18 months of life.

Prenatal care during the index pregnancy was conducted in one of four municipal clinics in the Chitungwiza area for all study participants. Both HIV-positive cases and HIV-negative controls followed the same visit-frequency protocol.

Analysis

Power Analysis

Determining an adequate sample size for this study depends on three factors: power, effect size, and significance level. Power is defined as the likelihood of rejecting the null hypothesis when the null hypothesis is indeed not true (avoiding a type II error) (Munro, 2005) and was set at 80%. Because of the paucity of studies in this area, need for accurate effect size cannot confidently be predicted. A sample size of 79 in each group will have 80% power to detect an effect size of 0.740 using a two group t-test with a 0.050 two-sided significance level (Dixon & Massey, 1983; O'Biren & Muller, 1983). Significance level is the probability of rejecting a true null hypothesis (making a type I

error) (Munro, 2005). Since significant findings were obtained among the different statistical analyses performed, it is assumed that the power is adequate (Paul, S., personal communication, 2008). If detecting a smaller effect size were to be desired, more subjects would be required, but since this was a secondary data analysis, there was no possibility of increasing sample size.

Statistical Analysis

Using the SPSS Program 14.0 Statistical Package, T-tests, Chi-square and ANOVA were used to compare the two groups of HIV-positive cases and HIV-negative controls on all variables including demographics, index pregnancy, repeat pregnancy, and fertility attitude scores. Multiple Logistic regression occurring over four blocks was used to determine whether a relationship exists between repeat pregnancy and HIV-status, socio-economic status, age, fertility attitude score, and previous pregnancy outcomes.

Data specific to the HIV-positive cases included: 1) years since diagnosis, 2) disclosure rate and to whom, 3) antiretroviral prophylaxis received by mother and infant, and 4) fears related to pregnancy and issues faced by HIV-positive women. These were all tabulated and categorized.

Psychometric Analysis

Prior to comparative or Logistic regression analysis, the variable derived from the *Attitudes About Fertility and HIV Inventory* on the questionnaire was subjected to exploratory factor analysis and configured as an optimized fertility attitude score.

CHAPTER 5 RESULTS

This chapter summarizes the results of the study, based on each research aim.

Aim 1: To establish the psychometric properties of the Fertility Attitude Scale

Factor Analysis

The 25-item *Attitudes About Fertility and HIV Inventory* was submitted to an exploratory factor analysis (EFA) using varimax rotation to disallow for correlated factors. This method seeks a linear combination of variables such that the maximum variance is extracted from the variables (O'Connor, 2000). It then removes this variance and seeks a second linear combination that explains the maximum proportion of the remaining variance, and so on. This is called the principal components analysis (PCA) method and results in orthogonal (uncorrelated) factors for the purpose of discovering the individual factors being investigated on the inventory (Pett, Lackey, & Sullivan, 2003). The EFA was done with an understanding that doing a repeated examination of these data that differed both demographically and methodologically from the original modeling scenario may lead to a sample-specific solution that may or may not generalize to new samples.

Item 21 was automatically eliminated because all respondents answered in the same way. The inventory was then renumbered to reflect a 24 item scale. The initial PCA factor analysis resulted in selection of three factors using all items, but accounting for only 33.4 % of the total variance.

Using the principal components analysis extraction method and dropping nine items (24, 11, 1, 22, 16, 21, 23, 20, & 4) explained 56.8 % of the variability. However, this solution combined attitude items in ways that were not interpretable. Based on reviewing the clusters of items, the factor loadings, and reliability estimates (Cronbach's alpha) a two-factor solution was forced with the reduced 13 items, but this explained only 39.3 % of the total variance. By additionally dropping items 2 and 5, the two-factor solution accounted for 44.0 % of the variance although the reliability of the two-factor structure was poor (0.44) for the second factor.

Ultimately, a one factor solution was tested with five items (Cronbach's alpha = 0.63), with 13 items (Cronbach's alpha = 0.76) and with eight items (Cronbach's alpha = 0.82). The eight-item scale retained items 3, 13, 14, 15, 17, 18, 19, & 24 and was renamed *Fertility Attitude* (ATTIOPT in SPSS output). This single factor solution comprised of eight items was selected because it yielded the most interpretable results while explaining 45.6 % of the variance.

The decision to select a single final factor solution was based on the results of principal components analysis (PCA) and Scree plot review. This analysis was done to uncover the underlying structure and to validate the index by: 1) demonstrating that the constituent items load on the same factor, 2) discovering what that factor is, and 3) dropping items that cross load. Reliability analysis was additionally considered in the final decision.

Table 5.1: Factor Loadings from Principal Components Analysis of Eight-Item Fertility Attitudes Scale

Item	Factor Loading	Communality
15	.81	.65
17	.79	.62
18	.76	.57
14	.71	.50
19	.68	.46
13	.59	.35
25	.50	.25
3	.49	.24
Eigenvalue	3.65	
% of Variance	45.58	

Construct Validity

Construct validity has traditionally been defined as the experimental demonstration that a test is measuring the construct it claims to be measuring (Nunnally & Bernstein, 1994). It can be demonstrated from more than one perspective, and confidence in the measurement of the construct is increased by using more than one strategy (Lune, Parke, & Stone, 1998).

In establishing construct validity regarding the fertility attitude inventory for this study, the eigenvalues were also reviewed in the different factor solutions as estimates of the amount of explained variance by each factor relative to the total variance of all the items in the instrument (Nunnally & Bernstein, 1994). The single-factor solution revealed an eigenvalue of 3.65, indicating good matrix consistency and it had the highest eigenvalue of all the factor solutions evaluated.

Individual review of the eight items ultimately retained in the scale reveals that six speak to the reasons why HIV-positive women get pregnant, again elaborating these reasons as: 1) to conceal their HIV status, 2) because they do not believe their status, 3) because they have a need for love, 4) because they have a need for financial security, 5) because they think the drugs at the clinic will keep their baby from getting HIV, and 6) because they think the researchers at the clinic will keep their baby from getting HIV. One of the items on the inventory was similar, but addressed the idea that some HIV-positive women want to have children while they know the researchers with drugs are still in the clinics. The final item addressed the value motherhood holds in the Zimbabwean culture by stating that if a woman is not a mother she is not a real woman.

Together these individual items form the fertility attitude scale, and the rating on this scale is one of the variables in the overall study model that has significance in identifying the relationship between subsequent pregnancy and HIV status in this population.

Internal Consistency Reliability

Internal consistency reliability is used to asses the consistency of results across items within a test or inventory. The reliability of the instrument is estimated by how well the items that reflect the same construct yield similar results. Reliability is necessary, but not confirmatory of validity. In this instance, Cronbach's alpha which is a computer generated equivalent to the average of all possible split half correlations was run for the derived single factor, *Fertility Attitude*, and found to be 0.82, indicating good internal consistency of the eight items.

Aim 2: To compare HIV-positive and HIV-negative study participants on demographics, index pregnancy, follow-up pregnancy and fertility attitude

Demographics

1. Age: The average age of the sample (N = 159) was 27.7 years (SD = 5.0). All of the participants ranged in age between 18-40 years. HIV-positive cases (N = 79) averaged 29.5 years (SD = 4.6) and HIV-negative controls (N = 80) averaged 26.0 years (SD = 4.8). Independent sample t-test comparing the mean scores of the two groups indicates a significant difference in age ($t(157) = 4.70$, $p < 0.001$) with the HIV-positive cases being significantly older than the HIV-negative controls by 3.5 years.

2. Education: At the time of the index pregnancy 16.9% (27) of the total sample (N = 159) had completed only a primary school education while 81.3% (130) had completed secondary (middle school), and 1.3% (2) had completed high school. Only 0.6% (1) had attended any tertiary or college-level courses. There was no significant difference in level of education at the time of the index pregnancy between cases and controls (chi square (3) = 1.11, p = 0.35). Likewise, current education level was not significantly different between the cases and controls (chi square (3) = 1.45, p = 0.23) with only two additional women in the control group taking some tertiary level (college) courses since the index pregnancy.

3. Where Living: Place of residence at the time of the index pregnancy is used as a means of evaluating socio-economic well-being when the woman was diagnosed with HIV. Women capable of renting or owning their place of residence are considered more financially solvent than those living in staff quarters as a domestic worker, or living with

relatives, or than those in the "other" category, which most often translated to a return to tribal lands and subsistence farming or homeless. Renting a room is the most commonly represented category with 45.6% (36) HIV-positive cases and 39.5% (32) HIV-negative controls in this category. The next most common place of residence at the time of the index pregnancy is "other" with 16.5% (13) of cases represented here and 35.8% (29) of controls. Living with relatives represented 13.9% (11) of the HIV-positive cases and 11.1% (9) of the controls, while owning one's home represented 7.6% (6) of the cases and 11.1% (9) of the controls. The two groups did not significantly differ (chi square (1) = 3.51, $p = 0.06$) as to place of residence or socio-economic well-being at the time of HIV diagnosis.

Table 5.2: Demographic Data

	HIV+ (N = 79)			Control (N = 80)			Total (N = 159)	
	Mean (SD)	Percentage (N)	Range	Mean (SD)	Percentage (N)	Range	Mean (SD)	Percentage(N)
Age	29.5 (4.6)		20-40	26.0 (4.8)		18-37	27.7 (5.0)	
Education Level (index)								
Primary school		15.2% (12)			18.5% (15)			16.9% (27)
Secondary school		82.3% (65)			80.2% (65)			81.3% (130)
High School		2.5% (2)			0			1.3% (2)
Tertiary		0			1.2% (1)			0.6% (1)
Education Level (current)								
Primary school		15.2% (12)			18.5% (15)			16.9% (27)
Secondary school		81.0% (64)			76.5% (62)			78.8% (126)
High School		3.8% (3)			1.2% (1)			1.3% (2)
Tertiary					3.7% (3)			0.6% (1)
Where living (index)								
Own house		7.6% (6)			11.1% (9)			
Rent house		5.1% (4)			2.5% (2)			
Rent room		45.6% (36)			39.5% (32)			
Staff quarters		11.4% (9)			0			
Relatives		13.9% (11)			11.1% (9)			
Other		16.5% (13)			35.8% (29)			

Table 5.3: Comparative Demographic Data

	HIV+ (N = 79)			Control (N = 80)			Total (N = 159)		
	Mean (SD)	Percentage (N)	Range	Mean (SD)	Percentage (N)	Range	Test value	df	p value
Age	29.5 (4.6)		20-40	26.0 (4.8)		18-37	4.70	157	≤ 0.001
Education Level (index)							1.11	3	0.35
Primary school		15.2% (12)			18.5% (15)				
Secondary school		82.3% (65)			80.2% (65)				
High School		2.5% (2)			0				
Tertiary					1.2% (1)				
Education Level (current)							1.45	3	0.23
Primary school		15.2% (12)			18.5% (15)				
Secondary school		81.0%(64)			76.5% (62)				
High School		3.8% (3)			1.2% (1)				
Tertiary					3.7% (3)				
Where living (index)							3.51	1	0.06
Own house		7.6% (6)			11.1% (9)				
Rent house		5.1% (4)			2.5% (2)				
Rent room		45.6% (36)			39.5% (32)				
Staff quarters		11.4% (9)			0				
Relatives		13.9% (11)			11.1% (9)				
Other		16.5% (13)			35.8 (29)				

Test value = t-test, χ^2 or one-way ANOVA as appropriate

Index Pregnancy Data

1. Mother's Antenatal Weight: Third trimester antenatal weight during the index pregnancy ranges between 48-103 Kg (106-227 lbs) for all participants (N = 159) with a mean weight of 65.4 Kg (143 lbs) (SD 11.4 Kg /25 lb) in the HIV-positive case group and 66.3 Kg (146 lbs) (SD 11.0 Kg /24lbs) in the HIV-negative control group. There is no significant difference ($t(89) = 0.38$, $p = 0.78$) between the two groups as to maternal antenatal weight in the index pregnancy.

2. Number of Miscarriages Prior to Index Pregnancy: Nineteen women (11.9%) of the sample (N = 159) reported having at least one miscarriage prior to the index pregnancy. HIV-positive cases represent a 16.7% (13 out of 79) miscarriage rate, while HIV-negative controls show a 7.4% (6 out of 80) miscarriage rate. Even though more than twice as many miscarriages occurred in the HIV-positive cases, this difference was not statistically significant for this sample size ($t(157) = 1.78$, $p = 0.08$). The number of miscarriages since the index pregnancy all occurred in HIV-positive cases (4 out of 24 subsequent pregnancies) maintaining a 16.7% miscarriage rate in this group. There were no miscarriages out of the 14 subsequent pregnancies in the HIV-negative control group.

3. Number of Children: Overall, 21.4% (34) of the 159 participants had delivered at least one child prior to the index pregnancy. Among the HIV-positive cases, 74.7% (59) of the women had delivered at least one child, while 38.2% (31) of the HIV-negative controls had at least one or more children. The two groups differed significantly ($t(14414) = 4.50$, $p < 0.001$) with the HIV-positive cases being more likely to have had at least one child prior to the index pregnancy.

4. Outcomes of Index Pregnancy: Of the 159 children born from the index pregnancies, 93.1% (148) were alive and thriving at the time of the cross-sectional survey. HIV-positive cases reported an 88.6% (70) alive and thriving rate, while HIV-negative controls reported a 96.3% (78) rate. The babies born to HIV-negative mothers were significantly more likely (chi square (90) = 2.54, p = 0.01) to be alive and thriving up to two years after delivery than were the babies born to HIV-positive mothers. Likewise, the death rate of the index pregnancy child was 7.6% (6) of the HIV-positive cases while no index pregnancy children had died up to two years after delivery in the HIV-negative group. Both groups were approximately equal in the alive but not thriving category with 3.8% (3) of the HIV-positive cases reporting this outcome and 2.5% (2) of the HIV-negative controls.

5. Birth Weight of Index Baby: The mean weight for the babies born to HIV-positive mothers was 3.1 Kg (6.8 lbs) (SD 0.42 Kg / .93 lbs) and to the HIV-negative controls 3.0 Kg (6.6 lbs) (SD 0.6 Kg /.13 lbs). There was no significant difference in infant weight at birth (t (137) = 0.53, p = 0.60).

6. Birth Complications: Overall, 14.5% (23) women reported complications with the delivery of their index pregnancy. Complications were significantly higher (chi square (19.4) = 2.15, p = 0.04) in the HIV-positive cases with 20.3% (16) of the women reporting birth complications as opposed to 8.6% (7) of the HIV-negative controls reporting complications.

7. Breast Feeding: A total of 78.6% (125) of the 159 participants breastfed their index pregnancy infants for at least one month. Of the HIV-positive women, 68.7% (44)

breastfed, while 100% (80) of the HIV-negative controls breastfed. The HIV-negative controls were significantly more likely to breastfeed for at least one month than the HIV-positive cases (chi square (1) = 25.7, p = < 0.001).

Table 5.4: Index Pregnancy Data

	HIV+ (N = 79)			Control (N = 80)			Total (N = 159)	
	Mean (SD)	Percentage (N)	Range	Mean (SD)	Percentage (N)	Range	Mean (SD)	Percentage (N)
Mother's antenatal weight (kg) (Index)	65.4 (11.4)		48-103	66.3 (11.0)		50-102		
Miscarriages								
Number – at index		16.7% (13)			7.4% (6)			11.9% (19)
Number – since index		16.7% (4 of 24)			0 (0 of 14)			10.5% (4)
Children								
Number – at index		74.7% (59)	0-5		38.2% (31)	0-4		56.6% (90)
Number – since index		25.6% (20)	1-9		17.3% (14)	1-5		21.4% (34)
Total pregnancies at index (miscarriages + live births)		79*			81*			
Baby weight (Kg) (Index)	3.1 (.42)			3.0 (0.6)				
Birth complications (Index)		20.3% (16)			8.6% (7)			14.5% (23)
Baby thriving (index)								
Yes – alive and thriving		88.6% (70)			96.3 (78)			93.1% (148)
No – alive not thriving		3.8% (3)			2.5% (2)			3.1% (5)
Deceased		7.6% (6)			0			3.8% (6)
Breast fed at least 1 month		68.7% (44)			100% (81)			78.6% (134)

* Based on direct question of total pregnancies (example of recall bias)

Table 5.5: Comparative Index Pregnancy Data

	HIV+ (N = 79)			Control (N=80)			Total (N=159)		
	Mean (SD)	Percentage (N)	Range	Mean (SD)	Percentage (N)	Range	Test value	df	p value
Mother's antenatal weight (kg) (Index)	65.4 (11.4)		48-103	66.3 (11.0)		50-102	0.38	89	0.78
Miscarriages									
Number – at index		16.7% (13)			7.4% (6)		1.78	157	0.08
Children									
Number – at index		74.7% (59)	0-5		38.2% (31)	0-4	4.50	1441	≤ 0.001
Number – since index		25.6% (20)	1-9		17.3% (14)	1-5	4.60	40	≤ 0.001
Total pregnancies at index (miscarriages + live births)		79*			81*				
Baby weight (Kg) (Index)	3.1 (.42)			3.0 (0.6)			0.53	137	0.60
Birth complications (Index)		20.3% (16)			8.6% (7)		2.15	19.4	0.04
Babies thriving (index)							2.54	90	0.01
Yes – alive and thriving		88.6% (70)			96.3% (78)				
No – alive not thriving		3.8% (3)			2.5% (2)				
Deceased		7.6% (6)			0				
Breast fed at least 1 month		68.7% (44)			100% (81)		25.7	1	≤ 0.001

Test value = t-test, χ^2 or one-way ANOVA as appropriate

Follow-Up Pregnancy

Women were questioned about the interval between the delivery of their index pregnancy and leading up to their current status at the time of survey. The follow-up period includes their postpartum visit for the index pregnancy, contraceptive use, whether they plan additional pregnancies, whether they conceived again during the interval time period, partner status, partners' attitudes about fertility, and a re-evaluation of where they currently live as a measure of possible change in economic status.

1. Attended Postpartum Visit: Of all participants (N = 159), 95.6% (152) attended their postpartum visit 4-8 weeks after delivery of the index pregnancy. There was no significant difference between HIV-positive cases (97.4%, 76) and HIV-negative controls (93. 8%, 76) in attendance rate, establishing equivalence of follow-up care.

2. Contraception Method: Women did significantly differ in their method of contraception ($F(1) = 60.78$, $p < 0.001$) with more women in the HIV-negative control group using the progestin-only birth control pill (79.0%, 64) while women in the HIV-positive group were most likely to use condoms (49.4 %, 39) followed by the progestin-only birth control pill (29.1%, 23) and the combination pill (22.8%, 18). None of the HIV-negative controls used the combination pill, but this was probably a reflection of their 100% breast feeding and contraindication of the combination pill with breast feeding. Likewise, none of the HIV-negative controls opted for use of the Femidom female condom, while 11.4% (9) of the HIV-positive cases used this method. Use of Depo-Provera injection and Norplant were roughly equal between the two groups.

3. Resumption of Intercourse: There was no difference between the HIV-positive cases and HIV-negative controls in weeks until they resumed intercourse ($t(155) = 0.03$, $p = 0.97$) with the HIV-positive group having a mean of 7.7 weeks (SD 5.1) and the HIV-negative group a mean of 7.8 weeks (SD 3.3). The HIV-positive group had a range of 0-40 weeks until resumption of intercourse, while the HIV-negative group ranged between 0-20 weeks.

4. Resumption of Menses: There was no significant difference between the two groups in weeks until the resumption of menses ($t(104) = 1.30$, $p = 0.20$), however the HIV-positive group had a range of 0-60 weeks with a mean of 14.12 weeks (SD 14.4) while the HIV-negative controls had a range of 0-96 weeks with a mean of 18.6 weeks (SD 25.5).

5. Ran Out Of Contraception: Overall (N =159), 11.9% (19) of the participant's admitted to running out of contraception during the interval between delivery of the index pregnancy and survey collection (mean time = 24 months). HIV-positive cases represented a 7.6% (6) rate and HIV-negative controls a 16% (13) rate. Even though the HIV-negative controls were twice as likely to run out of contraception the two groups are not statistically different in their likelihood to run out of contraception ($t(1) = 3.04$, $p = 0.08$).

6. Family Planning Failure: Reasons for failing to take family planning methods did significantly differ between the two groups, however, ($t(24.1) = 3.98$, $p = <0.001$) with dizziness, breast problems, pregnancy and vulvo-vaginal symptoms being reported more frequently by the HIV-positive group.

7. Time to Next Conception: HIV-positive cases were two times more likely to conceive again within the 24-month interval period between delivery of index pregnancy and survey (24 pregnancies with N = 79) than HIV-negative controls (14 pregnancies with N = 80), and the HIV-positive women conceived again significantly sooner ($t(31) = 3.66$, $p = <0.001$). Mean time to conception for HIV-positive cases was 11.3 months (SD 9.6), while HIV-negative controls had a mean time of 22.1 months (SD 7.0).

8. Number of Additional Children Planned by Participant: Overall (N = 159), 60.4% (96) of the participants did not plan to have any more children. Eighty-five percent (67) of HIV-positive cases were in this category as opposed to 35.8% (29) of HIV-negative controls. Plans for one additional child were expressed by 25.2% (40) of the total participants with 12.7% (10) of the HIV-positive cases expressing this intention and 37.0% (30) of the HIV-negative controls. Plans for two more children were expressed by 2.5% (2) of the HIV-positive women, while 23.5% (19) of the HIV-negative controls expressed this intention. None of the HIV-positive women expressed an intention to have more than two additional children, while 2.5% (2) of the controls expressed plans to have three more children and 1.2% (1) of the HIV-negative controls expressed intention for four more children. No participants desired more than four additional children. The two groups were significantly different in their intentions for more children ($t(177) = 7.02$, $p <0.001$) with the HIV-negative controls having a stated desire for more children than the HIV-positive cases.

9. Number of Additional Children Desired by Partner: Women were questioned as to the number of additional children they perceived their partner desiring. In general,

both groups perceived that their partners desired more children than they did. Overall (N = 159), 44.7% (71) of the women participants believed that their partners did not desire any additional children. In this category, 69.4% (50) of the HIV-positive cases held this view, and 26.9% (21) of the HIV-negative controls were of this opinion. Fourteen percent (10) of the HIV-positive cases believed their partners desire one additional child, while 26.9% (21) of the HIV-negative controls held this view. Partners desiring two to three more children represent 12.6% (10) of the HIV-positive group and 37.5% (30) of the HIV-negative group. A partner's desire for four to five more children was expressed by 2.8% (2) of the HIV-positive cases, while 7.5% (6) of HIV-negative controls expressed that view. No HIV-positive women expressed a desire by their partners for five or more children, but 3.8 % (3) HIV-negative controls believed that their partners desire up to five more children. The two groups were significantly different ($t(144) = 4.86$, $p = < 0.0001$) in the perceived number of children desired by their partners.

10. Partner Changed Since Index Pregnancy: Participants were queried as to whether their partners had changed since the index pregnancy within the mean interval time of 24 months. Nine women (5.7%) of the sample (N=159) had changed partners. HIV-positive cases represent a 6.3% (5) divorce rate, while HIV-negative controls a 4.9% (4) divorce rate. Of the HIV-positive women (N = 79), 5.1% (4) women changed partners due to death of their spouse, and none of the women in the HIV-negative control group changed partners due to death of a spouse. The two groups did not vary significantly in change of partner since index pregnancy ($F(2) = 2.23$, $p = 0.11$) even

though all the deaths were in the HIV-positive cases group. This lack of statistical significance may be a reflection of the small numbers represented in each category.

11. Where Living Now: Place of residence was again assessed for where the participants resided at the time of the survey in order to determine possible change in socio-economic well-being between the two groups of cases and controls since the index pregnancy. While there was no significant difference between the groups as to place of residence during the index pregnancy, there was a significant difference for the current time ($F(5) = 3.26$, $p = 0.008$) with the HIV-positive cases showing more likelihood to be in situations of diminished socio-economic well-being; the HIV-negative controls were more likely to be able to rent or own their own place, and less likely to be living with relatives, in staff quarters, or living on tribal lands or homeless ("other" category). Specific breakdown for these categories reveals HIV-positive cases to have a 10.1% (8) chance of currently owning a house, 5.1% (4) chance of currently renting a house, 40.5% (32) chance of currently renting a room, 8.7% (7) chance of currently living in staff quarters, 15.2% (12) chance of currently living with relatives and a 20.3% (16) chance of living on tribal lands as reflected by the "other" category. This, as opposed to HIV-negative controls, who exhibit 13.6% (11) as currently owning a house, none as currently renting a house, 37% (30) as renting a room, none as living in staff quarters, 13.6% (11) as currently living with relatives, and 35.8% (29) as currently living somewhere other than the above, which was most often described as tribal lands/ subsistence farming or homeless.

12. Fertility Attitude Scale: The participants were compared on the optimized fertility attitude scale after factor analysis and validity testing was accomplished. No difference ($t(158) = 0.48$, $p = 0.63$) on the eight-item scale was found in attitudes about fertility between the HIV-positive cases (mean score = 5.5 (SD 2.6)) and the HIV-negative controls (mean score = 5.3 (SD 2.4)).

Table 5.6: Follow-up Pregnancy Data

	HIV+ (N = 79)			Control (N=80)			Total (N=159)	
	Mean (SD)	Percentage (N)	Range	Mean (SD)	Percentage (N)	Range	Mean (SD)	Percentage (N)
Attended Postpartum Visit								
Yes		97.4% (76)			93.8% (76)			95.6% (152)
No		2.6% (2)			6.2% (5)			4.4% (7)
Contraception method:								
Progestin-only pills		29.1% (23)			79.0% (64)			54.7% (87)
Combined oral contraceptives		22.8% (18)			0			11.3% (18)
Depo Provera		6.3% (5)			8.6% (7)			7.5% (12)
Norplant		3.8% (3)			3.7% (3)			3.8% (6)
Condoms		49.4% (39)			6.2% (5)			27.7% (44)
Femidom		11.4% (9)			0			5.7% (9)
Weeks until resumed intercourse	7.7 (5.1)		0-40	7.8 (3.3)		0-20		
Weeks until menses resumed	14.12 (14.4)		0-60	18.6 (25.5)		0-96		
Ran out of contraceptive		7.6% (6)			16% (13)			11.9% (19)

	HIV+ (N = 79)			Control (N=80)			Total (N=159)	
	Mean (SD)	Percentage (N)	Range	Mean (SD)	Percentage (N)	Range	Mean (SD)	Percentage (N)
Family planning – reasons for discontinuation								
Bleeding problems		8.9% (7)			16% (13)			12.6% (20)
Abdominal pain etc.		3.8% (3)			4.9 (4)			4.4% (7)
Dizziness/headache		2.5% (2)			1.2 (1)			1.9% (3)
Breast problems		1.3% (1)						0.6% (1)
Pregnancy		6.3% (5)						3.1% (5)
Vulva/vaginal symptoms		3.8% (3)						1.9% (3)
Months between index and study assessment	23.7 (10.9)			19.3 (11.1)				
Conceived again when index age	11.3 (9.6)			22.1 (7.0)				
Plans more children (#) (women)								
0		84.8% (67)			35.8% (29)			60.4% (96)
1		12.7% (10)			37.0% (30)			25.2% (40)
2		2.5% (2)			23.5% (19)			13.2% (21)
3		0			2.5% (2)			1.3% (2)
4		0			1.2% (1)			0.6% (1)

	HIV+ (N = 79)			Control (N=80)			Total (N=159)	
	Mean (SD)	Percentage (N)	Range	Mean (SD)	Percentage (N)	Range	Mean (SD)	Percentage (N)
Children desired by partner (#)								
0		69.4% (50)			26.9%(21)			44.7% (71)
1		13.9% (10)			26.9% (21)			19.5% (31)
2		11.1% (8)			30.8%(24)			20.1% (32)
3		2.8% (2)			7.7% (6)			5.0% (8)
4		2.8% (2)			3.8% (3)			3.1% (5)
5		0			3.8% (3)			1.9% (3)
Partner changed since index pregnancy		6.3% (5)			4.9% (4)			5.7% (9)
Divorced		5.1% (4)			0			2.5% (4)
Deceased								
Where living (now)								
Own house		10.1% (8)			13.6% (11)			11.9% (19)
Rent house		5.1% (4)			0			2.5% (4)
Rent room		40.5% (32)			37.0% (30)			39.0% (62)
Staff quarters		8.9% (7)			0			4.4% (7)
Relatives		15.2% (12)			13.6% (11)			14.7% (23)
Other		20.3% (16)			35.8% (29)			28.0% (45)
Attitude Scale (8 items) α=0.81	5.5 (2.6)			5.3 (2.4)			5.4 (2.5)	

Table 5.7: Comparative Follow-Up Pregnancy Data

	HIV+ (N = 79)			Control (N=80)			Total (N=159)		
	Mean (SD)	Percentage (N)	Range	Mean (SD)	Percentage (N)	Range	Test value	df	p value
Attended Postpartum Visit									
Yes		97.4% (76)			93.8% (76)		1.23	1	0.27
No		2.6% (2)			6.2% (5)				
Contraception method:									
Progestin-only pills		29.1% (23)			79.0% (64)				
Combined oral contraceptives		22.8% (18)			0				
Depo Provera		6.3% (5)			8.6% (7)		60.78	1	≤ 0.001
Norplant		3.8% (3)			3.7% (3)				
Condoms		49.4% (39)			6.2% (5)				
Femidom		11.4% (9)			0				
Weeks until resumed intercourse	7.7 (5.1)		0-40	7.8 (3.3)		0-20	0.03	155	0.97
Weeks until menses resumed	14.12 (14.4)		0-60	18.6 (25.5)		0-96	1.30	104	0.20
Ran out of contraceptive		7.6% (6)			16% (13)		3.04	1	0.08

	HIV+ (N = 79)			Control (N=80)			Total (N=159)		
	Mean (SD)	Percentage (N)	Range	Mean (SD)	Percentage (N)	Range	Test value	df	p value
Family planning – reasons for discontinuation							3.98	24.1	≤ 0.001
Bleeding problems		8.9% (7)			16% (13)				
Abdominal pain etc.		3.8% (3)			4.9 (4)				
Dizziness/headache		2.5% (2)			1.2 (1)				
Breast problems		1.3% (1)							
Pregnancy		6.3% (5)							
Vulva/vaginal symptoms		3.8% (3)							
Conceived again time from index delivery (months)	11.3 (9.6)			22.1 (7.0)			3.66	31	≤ 0.001
Number of additional children planned by participant							7.02	177	≤ 0.001
0		84.8% (67)			35.8% (29)				
1		12.7% (10)			37.0% (30)				
2		2.5% (2)			23.5% (19)				
3		0			2.5% (2)				
4		0			1.2% (1)				

	HIV+ (N = 79)			Control (N=80)			Total (N=159)		
	Mean (SD)	Percentage (N)	Range	Mean (SD)	Percentage (N)	Range	Test value	df	p value
Number of additional children desired by partner							4.86	144	≤ 0.001
0		69.4% (50)			26.9%(21)				
1		13.9% (10)			26.9% (21)				
2		11.1% (8)			30.8%(24)				
3		2.8% (2)			7.7% (6)				
4		2.8% (2)			3.8% (3)				
5		0			3.8% (3)				
Partner changed since index pregnancy							2.23	2	0.11
Divorced		6.3% (5)			4.9% (4)				
Deceased		5.1% (4)			0				
Where living (now)							3.26	5	0.008
Own house		10.1% (8)			13.6% (11)				
Rent house		5.1% (4)			0				
Rent room		40.5% (32)			37.0% (30)				
Staff quarters		8.9% (7)			0				
Relatives		15.2% (12)			13.6% (11)				
Other		20.3% (16)			35.8% (29)				
Attitude Scale (8 items) α=0.81	5.5 (2.6)			5.3 (2.4)			0.48	158	0.63

Test value = t-test, χ^2 or one-way ANOVA as appropriate

Summary of Results Comparing the Two Groups

HIV-positive cases and HIV-negative controls were compared within the four broad categories of: 1) Demographics, 2) Index Pregnancy Data, 3) Follow-Up Pregnancy Data, and 4) Fertility Attitude Scale. Each category had several variables, which are enumerated in the corresponding tables.

Specifically, the HIV-positive cases and HIV-negative controls differ in terms of demographics as to age, with the HIV-positive cases being an average of 3.5 years older than the HIV-negative controls. In terms of their index pregnancies, the two groups differ in terms of number of children at the time of the index pregnancy with the HIV-positive cases being significantly more likely to have already had a child than the HIV-negative controls, and their having more conceptions since the index pregnancy (twice as likely). The HIV-positive cases were also twice as likely to have had a miscarriage as the HIV-negative controls, but this was not statistically significant ($p = 0.08$), probably due to the small numbers represented. The HIV-positive cases were more likely to have lost a child or to have a child who was not thriving from the index pregnancy than were the HIV-negative controls, even though there was no difference in the babies' mean birth weights at the time of the index pregnancy. Birth complications at the index pregnancy were more likely in the HIV-positive case group, and likelihood of breast feeding for at least one month was significantly less likely in the HIV-positive cases than in the HIV-negative controls.

Aim 3: To test whether there is a relationship between subsequent pregnancy and HIV status (positive or negative), socio-economic status, age, fertility attitude, and index pregnancy outcomes

Research Question: Do HIV status, where a woman lives as a measure of socio-economic status, age, fertility attitude score and previous pregnancy outcomes serve as a measure of whether a Zimbabwean woman will conceive again after the index pregnancy?

Null Hypothesis: There is no relationship between subsequent pregnancy in Zimbabwean women and HIV status, where the woman lives, age, fertility attitude score, and previous pregnancy outcomes.

Since a dichotomous categorical dependent variable of pregnancy yes/no with independent variables varying from nominal to continuous was used, a forward stepwise binary logistic regression with best model construction occurring over 4 blocks was employed. This resulted in seven independent variables. The categorical co-variates are: HIV status positive/negative; housing at index pregnancy, as a categorical ordered variable on six levels (0-5); history of a child dying; history of miscarriage (SpAb); and number of living children. The continuous co-variates are: age and fertility attitude score. Marital status, birth complications in the index pregnancy, and educational level were tested and discarded as being non-contributory to the model.

Overall model adequacy was evaluated in each of the Blocks (1- 4). In Block 4, the Omnibus Tests of Model Coefficients reveals a Chi-Square (Step, Model) = 12.838, df 1, $p = .000$ and (Block) = 43.249, df 7, $p = .000$. Therefore, there is a $<.01$ probability of obtaining this Chi-Square statistic if there is in fact no effect of the independent

variables taken together on the dependent variable. The model is statistically significant, and the null hypothesis is rejected. Model significance improved at each successive Block from a beginning Chi Square (Step, Model, Block) = 8.361, df 3, p = .039.

Cox and Snell R Square and Nagelkerke R Square were computed at each Block with best values of .248 and .369 respectively in Block 4. These values represent a pseudo R Square since Logistic regression does not have the equivalent of the R Square found in Ordinary Least Squares regression, and must, therefore, be interpreted cautiously (Vittinghoff, Glidden, Shiboski, & McCulloch, 2005) as indicating that between 25-37% of the variance is explained by the variables in this model.

In Block 4, the Hosmer and Lemeshow Test gives a Chi-Square = 11.052, df 8, p = .199. The non-significant goodness of fit test indicates that the data fit the model. Overall the model predicted correctly who would become pregnant again at an 84.2% accuracy rate.

Table 5.8: SPSS Logistic Regression – Partial Output Block 4 Data

Classification Table*

Observed		Predicted: Became Pregnant Again After Index: No	Predicted: Became Pregnant Again After Index: Yes	Percentage Correct
Became Pregnant Again After Index	No	109	6	94.8
	Yes	18	19	51.4
Overall Percentage				84.2

Variables in the Equation

	B	SE	Wald	df	Sig	Exp(B)
Whether are HIV+	.348	.514	.459	1	.498	1.416
Where living at time of index pregnancy	-.318	.138	5.293	1	.021	.728
Age	-.151	.060	6.307	1	.012	.860
Fertility Attitude Score	-.276	.090	9.316	1	.002	.759
Whether had child death	1.377	.587	5.504	1	.019	3.963
Whether had miscarriage	1.218	.518	5.532	1	.019	3.382
Number of children	1.537	.462	11.052	1	.001	4.652
Constant	3.614	1.526	5.609	1	.018	37.121

Variables in the Equation

	95.0% CI for EXP(B)	
	B	**SE**
Whether are HIV+	.517	3.879
Where living at time of index pregnancy	.555	.954
Age	.765	.967
Fertility Attitude Score	.635	.906
Whether had child death	1.254	12.523
Whether had miscarriage	1.225	9.335
Number of children	1.879	11.516
Constant		

Overall the Logistic regression results reveal that where a woman lives, her age, her fertility attitude score, whether she has experienced a child dying or a miscarriage and the number of children she already has significantly predict whether a Zimbabwean woman gets pregnant again.

Using ranked order of where a woman lives at the time of her index pregnancy as a measure of socio-economic well-being, for each drop in rank the odds of a Zimbabwean woman conceiving again decrease 0.75 times controlling for all other variables in the model. For each year older a Zimbabwean woman is, the odds of her conceiving again drop 0.86 times controlling for all the other variables. For each one point increase on the Fertility Attitude Scale, a Zimbabwean woman's odds of conceiving again after the index pregnancy decrease 0.76 times when the other variables are controlled for.

For each death of a child that a Zimbabwean woman experiences, there is a four-fold increase in her odds of conceiving again if the other variables are controlled for. Likewise, each miscarriage a Zimbabwean woman experiences increases the odds of her conceiving again by 3.4 times, after controlling for all the other variables. And, each additional child a Zimbabwean woman has increases the odds of her conceiving again by 4.6 times when the other variables are controlled, except in the case of HIV-positive women, as this statistic is largely driven by the HIV-negative control group. HIV-status alone is not significant as a predictor of whether a Zimbabwean woman will conceive again.

Aim 4: To describe terms of disclosure, anti-retroviral treatment and fears faced by the HIV-infected study participants

Certain unique characteristics of the HIV-positive women (N = 79) were measured. Mean years since diagnosis for this group is 2.4 years (SD .96) at the time of study, with a range of 0-4 years. Disclosure rate to partners is measured at 75.6% (59), and disclosure of HIV status to someone other than the partner is found to be 49.4% (38).

Mothers receiving Zidovudine prophylaxis prenatally during the index pregnancy as part of a study protocol is 70.9% (56), while those receiving Zidovudine in labor is less, at 64.6% (51). This may be a reflection of women delivering in other that the protocol-participating facilities. Mothers receiving Nevirapine at delivery number 20 (25.3%). Babies from the index pregnancy (N = 79) are overall less likely to receive antiretroviral prophylaxis than their mothers with 26.6% (21) of infants receiving Nevirapine after delivery and 1.3% (1) receiving Zidovudine.

HIV-positive women (N = 79) were asked the open-ended question, "What issues must be faced in pregnancy when you are HIV-positive?" Qualitative responses were tabulated under 10 representational categories with an average of 1.7 fears/issues expressed by each participant (range of 1-3 fears expressed per woman). The most commonly fear of the women, expressed by 48% (38), is of their own illness increasing in severity. This is followed by the fear of passing the HIV infection to the baby (41.8%, 33), and fear of spontaneous abortion, still birth and/or infant loss (35.4%, 25), is the fear of spontaneous abortion, stillbirth and or infant loss. Twelve women (15.2%) feared death of self, while 10.1% (8) voiced stigma regarding their disease as an issue to be

faced. Likewise, 10.1% (8) women voiced the concern of potential abandonment by a partner due to their HIV-positive status. Weight loss and an inability to eat was articulated by 7.6% (6) of the HIV-positive women. Their infant's failure to thrive, economic hardships, and a concern for who will care for their child if they die were all evenly expressed at 2.5% (2) of the HIV-positive participants.

Table 5.9: Unique HIV Characteristics

	HIV+ (N = 79)		
	Mean (SD)	**Percentage (N)**	**Range**
Years HIV positive	2.4 (.96)		0-4
Disclosed HIV status to partner		75.6% (59)	
Disclosed HIV status to others		49.4% (38)	
Mother Zidovudine prenatal-index		70.9% (56)	
Mother Zidovudine labor-index		64.6 (51)	
Mother Nevirapine delivery -index		25.3 (20)	
Baby Zidovudine-index		1.3% (1)	
Baby Nevirapine-index		26.6 (21)	
Issues faced/fears	1.7		1-3
Self illness increases		48.1% (38)	
Passing infection to baby		41.8% (33)	
Miscarriage, stillbirth, infant loss		35.4% (25)	
Death of self		15.2% (12)	
Stigma		10.1% (8)	
Abandonment by partner		10.1% (8)	
Weight loss/inability to eat (self)		7.6% (6)	
Infant's failure to thrive		2.5% (2)	
Economic hardships		2.5% (2)	
Who will care for child if she dies		2.5% (2)	

CHAPTER 6 DISCUSSION OF FINDINGS

This is the only study of a population of sub-Saharan women that specifically compares HIV-positive women who have undergone a PMTCT intervention in their index pregnancy with HIV-negative women regarding factors that associate with subsequent pregnancies in the two groups. This chapter will present a discussion of the results as they pertain to the differences between the HIV-positive cases and the HIV-negative controls, the results specific to the HIV-positive women, and the findings of the multiple Logistic regression. Implications for practice and policy formation will be presented based on study results. Limitations of the study will be outlined as well as needs for further study.

Overall, the findings of this study suggest that even though HIV-positive women who had undergone a PMTCT were on average 3.5 years older, were more likely to have had a child prior to the index pregnancy, were less likely to say they planned another child or that their partner desired another child, still conceived more frequently during the first 24 months following delivery of the index pregnancy than did the HIV-negative controls. HIV-infected women were twice as likely to have experienced a miscarriage. They were significantly more likely to have had birth complications during the index pregnancy and to have a child that was not thriving or who had died during the intervening two years. Therefore, on the basis of child loss or threatened loss, alone, these HIV-infected women conceived at roughly twice the frequency as the HIV negative women. These findings support Child Replacement Theory, being motivated by perinatal

loss/child death or perceived danger of child loss as the single most important variable. Moreover, these findings would suggest that many of these pregnancies are sub-consciously motivated, since even though the women are professing less desire for another child than the HIV-negative controls, and are saying that their partners are less desirous than the partners of the controls, still, they are conceiving at an earlier interval and higher rate.

Specific factors associated with an increased chance of Zimbabwean women conceiving another pregnancy, controlling for all other variables, are a history of miscarriage, stillbirth or loss of a child. Likewise, the more pregnancies a woman had, the more likely she was to get pregnant again in this study sample, possibly indicating religious, cultural or familial prohibitions toward contraception. Decreased likelihood of conceiving another pregnancy, controlling for all other variables, is associated with decreased socioeconomic level, increasing age, and a higher score on the Fertility Attitude Scale. HIV status alone is not significant as a predictor of repeat pregnancy in this population, which means it is not having a deterring effect on reproductive behavior among this population of HIV-positive women.

Comparison of the two groups of participants, HIV-positive cases and HIV-negative controls, reveals several significant differences that merit discussion. In terms of demographics, the HIV-positive cases were on average 3.5 years older than the controls and were significantly more likely to have already had a child at the time of the index pregnancy. Rank order of housing as a measure of socioeconomic well-being did not significantly differ between the two groups at the index pregnancy, but two years

later at the time of survey, HIV-positive cases were significantly less likely to own their own home or rent a home than HIV-negative controls. HIV-positive participants were more likely to be living with relatives or in a rented room or staff quarters than were the HIV-negative participants. This may have been a function of their worsening disease and inability to care for themselves or to participate regularly in income-earning activities, or it may reflect the increased likelihood of being widowed or abandoned by their partners as reflected in divorce and change-of-partner rates among the HIV-positive group. Both HIV-positive and HIV-negative groups had a fairly high percentage of participants (20.3% of cases and 35.8% of controls) who had returned to tribal lands to do subsistence farming by the time of survey at 24 months after delivery of the index pregnancy. This is probably a reflection of the worsening economic situation in the country, and of the increasing political instability during that time when many people from the Chitungwiza area were burned-out of their homes by government police and forced back into a more rural setting with tighter government sanctions and political controls (Economist.com, 2007; Meredith, 2005; Philip, 2008). This event must be acknowledged as a possible confounder in terms of housing in this study.

According to Child Replacement Theory, replacement effects are likely to be more pronounced the younger the woman is, if she has no other children, and the lower her socioeconomic status (Cohen & Montgomery, 2004; Hutti, 2006; Swanson, 2000). The fact that these HIV-positive women were 3.5 years older on average than the HIV-negative controls and more likely to have already had a child prior to the index pregnancy and were not different in terms of socioeconomic standing at the time of the index

pregnancy, and yet were still approximately twice as likely to conceive within the 24 months following delivery of the index pregnancy as compared with the HIV-negative controls speaks to other compelling child replacement effects among these Zimbabwean women.

Nakayiwa (2006) found that the only predictor of pregnancy among an HIV-positive population in Uganda was poor outcome of a previous pregnancy and the only factors that prevented the occurrence of pregnancy were severe immunodeficiency syndrome and a change in marital status, e.g. divorce or death of a spouse. Otherwise, pregnancy rates were equal to that of the general population. In our study, miscarriage rates in the HIV-positive cases were twice as high as in the HIV-negative controls. If the index child survived it was significantly less likely to be thriving among the HIV-positive group. Birth complications and child death in this group were also significantly more likely, which, according to Nakayiwa and others (Moyo & Mbizvo, 2004; Myer, Morroni, & Rebe, 2007) could account for the increased likelihood of the HIV-positive women conceiving again within the 24 months following delivery of the index pregnancy.

Differences in length of breastfeeding could also account for some of the variation in conception rates between the two groups, since lactation provides a certain natural decrease to fertility. The cases and controls were significantly different in their behavior surrounding breastfeeding, with 68.7% of HIV-positive mothers breastfeeding their babies up to a maximum of six months followed by abrupt weaning, and 100% of HIV-negative mothers breastfeeding anywhere from 1-24 months and freely supplementing feeding. This variation between cases and controls must be taken into account regarding

the difference between groups in mean times to conception of subsequent pregnancy, and corroborates findings described by others (Cohen & Montgomery, 2004; Scrimshaw, 1981). In the HIV-positive group, mean time to conception was 11.3 months after the birth of the index pregnancy, and in the HIV-negative group it was 22.1 months, which, again, may reflect longer lactation periods in the HIV-negative participants.

These explanations for differing conception rates and mean times to subsequent conception do not, however, explain the differences between stated contraceptive practices in the HIV-positive cases and their inverse corresponding propensity for conception. Likewise, they do not explain the stated desire for fewer additional children among the HIV-positive cases and yet higher conception rates.

In this study, even though both HIV-positive and HIV-negative participants had a high stated propensity for using contraception since the delivery of the index pregnancy, they differed significantly in the types of contraception that they used and the numbers of side-effects they had. HIV-positive women were much more likely to be using condoms, Femidom, and a combination oral contraceptive pill, while HIV-negative women were largely (79.0%) using the progestin-only contraceptive pill. HIV-negative women were twice as likely to run out of contraceptives than were the HIV-positive women, but this was not statistically significant ($p = 0.08$). Despite less stated interruptions to contraception, HIV-positive women were twice as likely to conceive again in the study period, suggesting either greater propensity for contraceptive failure or lack of consistent use.

HIV-positive women had significantly more dizziness, headaches, breast problems and vulvovaginal complaints on their contraceptives, while HIV-negative women were more represented by bleeding problems and abdominal pain from use of their contraceptive method. Presumably, this reflects the HIV-negative women's higher propensity for using the progestin-only pill or mini-pill and its widely recognized association with breakthrough bleeding and cramping. Symptoms listed most frequently by HIV-positive women are difficult to distinguish from HIV Stage II neurogenic and persistent vaginal Candidiasis complaints.

Although 84.8% of HIV-positive cases said they did not plan anymore pregnancies, they continued to conceive again sooner and at a higher rate than the HIV-negative controls, among whom only 35.8% did not plan more children. Both cases and controls represented that their partners planned more children than they did, however the two groups were significantly different in that the HIV-negative women thought their partners wanted more overall children than the HIV-positive group.

Among HIV-positive participants in South Africa, Meyer et al. (2007) found that social factors play an independent role in whether or not HIV-positive participants continued to conceive after HIV diagnosis. In their study, married women were more likely to conceive, especially if they did not disclose their status to partners. Nebie, et al. (2001) found that in Burkina Faso, HIV-positive couples differed between partners in their plans for future children. Women were more likely to want to defer having further children once they found they were HIV-positive, whereas HIV status made no difference to the reproductive plans of men.

The data from this study, supports the fact that women continue to conceive whether HIV-positive or negative. They fulfill the wishes of their husbands and the expectations of their husbands' families despite their own preferences not to conceive again. This type of behavior is representative of Kiefer's description of self-wounding and or community-wounding, but in the service of meeting other more pressing needs for well-being, e.g. for love, security, status, meaning or stimulation (Kiefer, 2007). Women living in cultures where most of their status as women is derived from their fertility, cannot be expected to limit fertility, even if they personally desire to do so. Until there is something else that brings these women status in their culture and provides them with economic security, autonomy, and a sense of fulfillment outside of their husband's and in-laws' control, family planning strategies are destined to fail. Until women feel a greater sense of empowerment and control over property, economic assets, inheritance and greater freedom in terms of mobility, agency in their reproductive choices, and control over their sexual behaviors, contraceptive counseling will continue to fall on deaf ears (Marmot, 2007).

In terms of findings unique to HIV-positive participants, these data show that disclosure rates among HIV-positive women were high, at 75.6% disclosure to partners and 49.4% disclosure of status to someone other than the partner. This differs from findings in Nigeria (Oladapo, Daniel, Odusoga, & Ayoola-Sotubo, 2005), Uganda (Nebie et al., 2001) and Cape Town, South Africa (Myer, Morroni, & Cooper, 2006; Myer, Morroni, & Rebe, 2007) where mean disclosure rates ranged between 18-32% and were significantly associated with a decreased likelihood for further pregnancies. Despite the

propensity among HIV-positive cases in our study to disclose, there was still a high propensity to conceive again, indicating little impact from knowledge of the woman's HIV-positive status on the couple's reproductive behavior.

HIV-positive cases were recruited for this study because they participated in a PMTCT intervention within their index pregnancy. Women received one of two drugs during labor or at the time of delivery (either Nevirapine or Zidovudine depending on whether they delivered in the local maternity clinics or the Central Hospital in Chitungwiza for more high-risk cases). Some women were also issued Zidovudine prenatally to be taken at the onset of labor. While 89.9% of the HIV-positive participants received the drugs intrapartally, only 27.9% of newborns received the drugs. Speculation as to reasons for this discrepancy may be due to parental refusal of ARV prophylaxis administration due to fear of drug side-effects, fear of stigma if relatives were present, lapses in pediatric dosage availability due to resource-poor conditions in the country, or due to some women delivering at home and having only the maternal dose that was issued to them prenatally. Because these HIV-positive women were part of a pilot PMTCT intervention, they and their infants were given prophylaxis at a higher rate than the widely quoted 10% in sub-Saharan Africa. Certainly this is a care and treatment point that merits closer surveillance and on-going attempts to deliver prophylaxis to all HIV-positive mothers and their newborns intrapartally.

All HIV-positive women in this study expressed at least one major fear, and some expressed up to three fears, regarding what they encounter as an HIV-positive woman during pregnancy. Most commonly expressed fears were 1) the fear of their own illness

increasing as a result of their pregnancy, 2) fear of transmission of HIV disease to their infant, and 3) fear of miscarriage, stillbirth or infant loss as a result of their HIV-positive status. The next most commonly expressed fears were death of self, fear of stigma, fear of being abandoned by a partner, and fear of weight loss and inability to eat, which probably represents an indirect expression of stigma since weight loss and lack of appetite are precursors to being identified with AIDS in the Zimbabwean culture. Least expressed fears among these women were for their infant's failure to thrive, deepening economic hardships as a result of HIV status, and a fear of who will care for the child if the woman dies (these last three expressed by only 2.5%). The low expression of these fears may represent a "normalization" of economic hardship as a reflection of the current cultural status quo or a type of hopelessness that reflects no expectation of an alternative.

Pregnancy is a time of increased vulnerability for all pregnant women (Mercer, 2006; Mercer & Walker, 2006; Swanson, 1999), but it is acutely so for the woman facing a life-threatening disease, especially when that disease can be passed on to her newborn or threaten the survival of the pregnancy. Contrary to the results of this study, in which declining maternal health was the primary concern of the HIV-positive women, concern over transmission to the infant is the most commonly described fear in the literature (Shannon, Kennedy, & Humphreys, 2008).

Very few studies have specifically addressed these issues of fear and anxiety of HIV-positive women in sub-Saharan cultures. In a presentation to the XVI International AIDS Conference in Toronto (2006), Shabangu and Sukati presented results of a small qualitative study of 12 recently delivered women from Swaziland. The results describe

the terrible tension HIV-positive women endure worrying about transmitting the virus to their child, and how this is counter-positioned with the fear they have of their husband impregnating other women if they do not continue to have more children. Similarly, women from Abidjan (Desclaux & Desgrees du Lou, 2006) describe fear and concern each time they breastfeed their infants knowing that this could be the feeding that transmits the virus to their child. These women expressed how their fear is further intensified by the frustration that they cannot afford formula to feed their infants. HIV-positive women carry a burden of increased anxiety, especially in sub-Saharan African cultures where resources are scarce, choices limited and education and psychological support often absent or scarce in the scramble to address even the most basic healthcare needs given the resource-poor environment (Bertozzi et al., 2006).

Moreover, increased anxiety and fear may also have a very tangible impact on disease progression as shown by the longitudinal study of patients from four medical centers in the United States (Ickovics et al., 2001). Anxiety and depressive symptoms in women with HIV are associated with HIV disease progression. In multivariate analyses controlling for clinical, treatment, and other factors, women with chronic symptoms were two times more likely to die than women with limited or no depressive symptoms (Ickovics et al., 2001). Certainly much more research is needed to better understand and mediate the function of increased allostatic load, and the pathophysiological costs to the individual resulting from depression and persistent anxiety, in these HIV-positive women (McEwen, 1998; Miller, Cohen, & Herbert, 1999; Shannon, King, & Kennedy, 2007). This research can inform intervention to help these women. If more studies continue to

show a somewhat reassuring trend toward decreased likelihood for disease progression during pregnancy (Tai et al., 2007), and if these results can be duplicated in under-developed and resource-poor settings, then women in Zimbabwe and other sub-Saharan countries could be given this information in order to diminish their fears.

Interpretation of the multiple Logistic regression findings reveals that death of a child, miscarriage and each additional child that a woman had were the factors associated with an increased likelihood of conceiving again among both HIV-positive and HIV-negative women in this study. While a history of child loss and miscarriage were predictable from the literature and support the child replacement effects, the finding of more overall children predicting continued childbearing does not. Most studies on developing-world populations state that women will continue to conceive until the ideal family size is achieved, usually between four and seven children (Bulatao, 1985; Chowdhury, 1988; Cohen & Montgomery, 2004). Since the number of children at the time of the index pregnancy ranged between 0-5 for the HIV-positive women and 0-4 for the HIV-negative women, it may be that the critical threshold for number of children had not been reached by most women in the study. Since the population in Chitungwiza is almost 100% Christian and the majority are Catholic or Apostolic, which frowns on birth control, a religious effect may also have contributed. In post hoc comparisons of the data, it was found that this effect was largely driven by the HIV-negative women making the adage that 'those who are fertile tend to continue to be fertile' more explainable in light of what is known about HIV disease progression and a concomitant decrease in fertility.

Child Replacement Theory as articulated by Notestein, Preston, and Swanson links decreased socioeconomic status with increased childbearing up to the point where either starvation or disordered living conditions begin to manifest. This may explain the findings in this Zimbabwean population where at the very lowest levels of socioeconomic status, the likelihood for conception diminishes. This is a culture of extreme poverty, especially among the indigenous people who are not paid in a foreign currency salary. Eighty percent of the population is unemployed, and even if money is available to buy food, availability in the markets is sorely restricted making food products such as dairy, meat, fish, fruits and cooking oil largely unavailable. Further, there is a greater trend toward disrupting family units by sending women and children back to live on tribal lands where rent does not have to be paid and subsistence farming can largely provide the diet. Therefore, at the lowest rank of housing and socioeconomic status, couples would have the greatest likelihood to be separated on a daily basis giving rise to a natural decline in fertility within this Zimbabwean study setting. Similarly, one could expect the greatest malnutrition effects at this lowest level which could have affected fertility.

The finding of a higher score on the Fertility Attitude Scale equating with a lower likelihood of subsequent pregnancy is indicative of the fact that as women have greater self-awareness of motivations for conceiving that are outside of the straightforward desire for a child, they are actually more likely to contracept. Within this study, self-awareness and awareness of cultural and community pressures for reproduction have a protective

benefit for both HIV-positive and HIV-negative women in terms of preventing continued conception.

HIV status alone was not significant as a predictor of whether Zimbabwean women in this study would conceive again. While this fact is not surprising given data from other sub-Saharan studies such as in South Africa (Myer, Morroni, & Cooper, 2006; Myer, Morroni, & Rebe, 2007), Uganda (Nakayiwa et al., 2006), Nigeria (Oladapo, Daniel, Odusoga, & Ayoola-Sotubo, 2005), and Tanzania (Sedgh, Larsen, Spiegelman, Msamanga, & Fawzi, 2005), it does deserve comment.

In African countries, knowledge of HIV seropositive status has not entailed a reduction in subsequent pregnancy incidence. Women's precarious social status, which prevents them from controlling their own sexuality and key reproductive choices, and the persistent denial of AIDS are factors that partly account for this situation. In sub-Saharan Africa, where maternity is highly valued, meeting family and social obligations concerning reproduction can be more important for an HIV-positive woman than her own health and the risk of giving birth to an HIV-infected child or leaving orphans in the future.

Initially, in the developed world, pregnancy rates in women diagnosed with HIV showed a documented drastic decline (Blair, Hanson, Jones, & Dworkin, 2004). Whether this represents more effective family planning programs, a greater propensity for women to exercise their autonomous desire to limit pregnancy, or just a greater public outrage toward HIV-positive people procreating in developed world cultures, is not known. What is known is that following the advent of successful PMTCT programs that have lowered

maternal-to-child transmission rates to a negligible level, and the widespread availability of HAART with resulting decreased viral loads and increased well-being in patients, more HIV-positive women are now electing pregnancy in the developed world, as well. The difference, however, is that they are doing it with greater safety for themselves and their offspring.

Implications for Practice

Women's decisions about HIV risk and reproductive choices are influenced by a number of contextual factors that have only recently become targets of research and intervention. Women have social roles and must meet social expectations that may affect reproductive decision-making even when they are HIV-infected. Women's choices are based on their life circumstances and realities, and often this represents a "disconnect" between the HIV infection they are experiencing, its implications for self and community, and their fertility choices and behaviors.

Understanding the complex interplay between needs, vulnerabilities of HIV-infected women, and the culture in which they live is critical for healthcare providers in order to implement effective care and maintain optimal quality of life. Further investigation into cultural attitudes and sexual practices of HIV-positive women is needed in order to minimize the threat of maternal-to-child transmission of HIV.

Empirical science reveals that contracepting in the HIV-infected sub-Saharan woman is the most efficacious and economical way to reduce transmission of HIV from mother to child or from mother to discordant partner. Where there is no child and no

unprotected intercourse, there is no risk for exposure, and therefore, no need to ensure ARV prophylaxis, offer advanced reproductive technologies for safer contraception, or provide costly follow-up of HIV-exposed, or worse, HIV-infected children. It seems like a straightforward solution. However, in a cultural milieu that would deny the woman's primary mode of need-fulfillment by encouraging her not to have children, with no replacement of status, respect or economic security, would be to further marginalize her to the side-lines of society, stigmatized not only because of her HIV status, but also because of her childlessness. This then becomes a much more complex and compelling problem for healthcare providers, policy-makers, and researchers working within resource-poor environments that are expressive of a pervasive inequity between men and women. Nursing and the social sciences are in a key position to address these issues of inequality and social justice.

This data showed that women who scored higher on the Fertility Attitude Scale had a corresponding protective effect against conceiving again. Therefore, if HIV-positive women in this setting can be aided in developing greater self-awareness surrounding their individual attitudes regarding future pregnancies, with special emphasis on what beliefs and myths might be motivating those decisions, greater conscious choice as opposed to un-empowered compliance with partner, in-law, or community expectations might be expected. Women's groups that foster education, mentoring by successful role models, such as nurses, social-critique and communication between participants on the topics of women's roles in the society would have a health-promotional effect.

Linking healthcare and family planning with empowerment strategies such as assertiveness training for women, vocational training and micro-lending opportunities for women to start small businesses would also serve to establish alternative avenues for self-esteem, economic security and creative outlets. This type of endeavor could happen in partnership with local governments, NGO's, corporate lenders, and health leaders.

In order for any of these interventions to work, however, they cannot only involve reproductive-age women. Special consideration as to the role male partners and in-laws play in shaping a woman's reproductive behavior in sub-Saharan cultures is crucial. Greater involvement of male partners in antenatal care will hopefully facilitate greater responsibility-taking on the man's part. To this end, men must be made to feel welcome within this traditionally "women's domain." Initially, this will mean more work for nurses, midwives and healthcare providers, and it will involve changes to their systems. However, including male partners and allowing them to observe and experience respect being extended toward their wives and themselves from care-providers will, in turn, provide attitude and behavior models for their own behavioral incorporation. A natural inclusion of VCT for the male partner could result, and a more informed decision-making from both partners regarding the infant's care would be expected.

Community health interventions geared toward in-laws, especially mothers-in-law, could have an impact on breaking the oppressive cycle that demands continued reproduction on the younger woman's part. This would involve sacrifice by the mothers-in-law. Because the mothers-in-law endured and complied with the expectations from their husbands' families, they have now earned the right to expect some little power to

exert their desires and get a little care-taking back from their daughters-in-law within this male-dominant society. Education campaigns that seek to unmask the role women themselves can have in oppressing younger generations would invite them to be a part of larger change. Ultimately, this can benefit all women's lives within the culture, but one or two generations of women will have to forego a modicum of gratification in order to break the cycle.

Other practice implications include integrating family planning services with prevention of mother-to-child transmission of HIV, recognizing that women who have experienced perinatal loss, miscarried or who have children that are not thriving or are HIV-infected are at the greatest risk for subsequent pregnancy even if they have other healthy children or say they do not plan more pregnancies. These programs must offer comprehensive services including, VCT, PMTCT, maternal and child health care, and family planning and abortion services, all of which make room for inclusion of the male partner's participation and co-responsibility-taking. Likewise, greater attention to HIV-positive women's anxieties and psychological symptoms is indicated within this care model based on the fears that were expressed by these women in the data.

First and foremost, however, is the need to maximize the safety of subsequent pregnancies for sub-Saharan couples who choose to continue to conceive, so that it approaches that of the developed world's standards. This can be done by optimizing care for the woman through the consistent availability of HAART in association with HIV/AIDS care in order to decrease viral load and prevent death; widespread ARV prophylaxis for all infants of HIV-positive women; the choice to safely supplement

breastfeeding in order to minimize infant transmission; and the use of advanced reproductive technologies for conception in discordant couples to decrease possible exposure to the uninfected partner. Each person's sexual rights must be respected and provision of evidence-based information and care must be made available to them.

Policy Implications

The practice guidelines outlined above are in keeping with the Millennium Development Goals to: 1) Eradicate extreme poverty and hunger, 2) Achieve universal primary education, 3) Promote gender equality and empower women, 4) Reduce child mortality, 5) Improve maternal health, 6) Combat HIV/AIDS, malaria and other diseases, 7) Ensure environmental sustainability, and 8) Develop a global partnership for development. Moreover, they reflect some of the specific recommendations made by the Commission on Social Determinants of Health (Marmot, 2007) for achieving health equity both globally and between the sexes. But beyond these, they are also reflective of the President's Emergency Plan for AIDS Relief (PEPFAR) (Sepulveda et al., 2007).

The interim PEPFAR evaluation recommends that for resource-poor countries such as Zimbabwe, the United States Global AIDS Initiative should continue to increase its focus on the factors that put women at greater risk of HIV/AIDS and to support improvements in the legal, economic, educational, and social status of women and girls. Moreover, the need to address the particular vulnerability of women and girls in terms of empowerment and ending sexual exploitation is articulated, as well as the need to address specific factors that increase the likelihood for MTCT of HIV or that increase the

likelihood for children to be orphaned through HIV/AIDS. PEPFAR acknowledges the importance of developing specific strategies to encourage men to be responsible in their sexual behavior, and toward child rearing as well as to respect women by reducing sexual violence and coercion. Finally PEPFAR goals include the description of specific strategies to increase women's access to employment opportunities, income, productive resources and microfinance programs (Sepulveda et al., 2007).

Research Implications

More research clarifying the attitudes and reproductive practices of HIV-infected women and their partners in sub-Saharan Africa is warranted. Longitudinal studies linking sexual practices and fertility attitudes of both women and men with CD4 levels, viral load measurements, WHO staging and HIV symptom experience is needed. Likewise, measurements of women's empowerment and the impact this has on fertility behavior are important parameters for further investigation.

Limitations of the Study

This study is limited by its relatively small sample size, especially in relation to overall numbers of subsequent pregnancies in the two groups. Furthermore, all of the participants are from four municipal maternal-child health clinics in the urban Chitungwiza area of Zimbabwe, making the generalizability of these findings to other sub-Saharan populations unclear.

This study is a cross-sectional design. While it occurs two years following delivery of the index pregnancy and measures interval events and attitudes, it cannot be used to predict subsequent pregnancy but, instead, only to establish associated factors with a subsequent pregnancy in HIV-positive and HIV-negative women. Further, due to the timing of the information collection, a certain amount of recall bias must be expected in the results.

No attempt was made to collect CD4 levels or viral load measurements in the HIV-infected group at initial data collection time, largely due to the resource-poor setting and lack of available laboratory support. No WHO staging criteria was established on the HIV-positive participants, thereby limiting knowledge regarding the advancement of their disease. This could be construed as a serious confounding factor.

Recent studies from sub-Saharan Africa, (Forsyth et al., 2002; Nakayiwa et al., 2006; Oladapo, Daniel, Odusoga, & Ayoola-Sotubo, 2005; Sedgh, Larsen, Spiegelman, Msamanga, & Fawzi, 2005) opine the importance of partner participation in the reproductive choices of HIV-positive women and the significance of including male attitudes in any study of reproductive behavior. While this study attempts to illicit the difference between participants' and their partners' desire for future children, it does so only through the woman's perception of what she thinks her partner's desired number of future children is. Direct measurement of male partner's attitudes would have removed this possible source of bias.

Finally, this study is limited by the lack of validity testing conducted prior to administration of the Fertility Attitudes Scale. Post hoc factor analysis and validity

testing reveal acceptable eigenvalues and Cronbach's alpha, but only after elimination of several items in the original scale. Since the inventory needed to be in the Shona language; no alternative instrument existed for use.

Conclusions

The purpose of this study was to establish the psychometric properties of the Fertility Attitude Scale that was administered in the Shona language to study participants living in Zimbabwe; to compare HIV-positive and HIV-negative participants on demographics, index pregnancy, fertility attitude, follow-up and subsequent pregnancy; to test whether there is a relationship between subsequent pregnancy and HIV status, fertility attitudes, index pregnancy outcomes, age, overall number of children, and socioeconomic status; and to describe terms of disclosure, ARV treatment and fears faced by the HIV-infected study participants. Child Replacement Theory was used a framework for the study.

Participants were found to differ on several variables but most especially on age, birth outcomes, desire for a subsequent pregnancy and mean time to next pregnancy. Factors associated with subsequent pregnancy in both HIV-infected and HIV-negative women were determined and found to suggest the special needs HIV-positive women have in terms of family planning. These women are at higher odds of conceiving again especially if they have a history of child loss, miscarriage or a child who is not thriving even though they may profess not to want additional pregnancies. Cultural factors that

drive the need for continued pregnancy, even in the face of HIV-positive status, should not be minimized.

REFERENCES

Adler, N. E., Boyce, W. T., Chesney, M., Cohen, S., Folkman, S., Kahn, R., et al. (1994). Socioeconomic status and health: The challenge of the gradient. *American Psychologist, 49*, 15-24.

Ahdieh, L. (2001). Pregnancy and infection with human immunodeficiency virus. *Clinical Obstetrics & Gynecology, 44*, 154-166.

Aka-Dago-Akribi, H. (1999). Issues surrounding reproductive choice for women living with HIV in Abidjan, Cote d'Ivoire. *Reproductive Health Matters, 7*(13), 20-29.

Ankrah, M. (1991). AIDS and the social side of health. *Social Science & Medicine, 32*(9), 967-980.

Astatke, H., & Serpell, R. (2000). Testing the application of a western scientific theory of AIDS risk behavior among adolescents in Ethiopia. *Journal of Pediatric Psychology, 25*(6), 367-379.

AVERT. (2006). HIV and AIDS in Zimbabwe.

Baylies, C. (2000). The impact of HIV on family size preference in Zambia. *Reproductive Health Matters, 8*(15), 77-85.

Beckerman, K. (2002). Mothers, orphans, and prevention of paediatric AIDS. *Lancet, 359*, 1168-1169.

Benefo, K., & Schulz, T. (1996). Fertility and child mortality in Cote d'Ivoire and Ghana. *The Wolrd Bank Economic Review, 10*(1), 123-158.

Bertozzi, S., Padian, N. S., Wegbreit, J., DeMaria, L., Feldman, B., Gayle, H., et al. (2006). *2006. Disease Control Priorities in Developing Countries* (2nd ed. Vol. 10). New York: Oxford University Press.

Bicego, G., Boerma, T., & Ronsmans, C. (2002). The effect of AIDS on maternal mortality in Malawi and Zimbabwe. *AIDS, 16*, 1078-1081.

Blair, J., Hanson, D., Jones, J., & Dworkin, M. (2004). Trends in pregnancy rates among women with human immunodeficiency virus. *Journal of the American College of Obstetricians and Gynecologists, 103*(4), 663-668.

Brocklehurst, P., & French, R. (1998). The association between maternal HIV infection and perinatal outcome: A systematic review of the literature and meta-analysis. *British Journal of Obstetrics and Gynaecology, 105*, 836-848.

Bulatao, R. A. (1985). *Fertility and mortality transition.* Washington, D. C.: The World Bank.

Chesnais, J. (1992). *The Demographic Transition: Stages, Patterns and Economic Implications.* Oxford, England: Page Clarendon Press.

Chowdhury, A. R. (1988). The infant mortality-fertility debate: Some international evidence. *Southern Economic Journal, 54*(3), 666-674.

Chu, S., Hanson, D., & Jones, J. (1996). Pregnancy rates among women infected with human immunodeficiency virus. *Obstetrics and Gynecology, 1996*(87), 195-198.

Cohen, B., & Montgomery, M. (2004). *From Death to Birth: Mortality Decline and Reproductive Change* (2nd ed.). Washington, D.C.: National Academy Press.

Cuthright, P. (1983). The ingredients of recent fertility decline in developing countries. *International Family Planning Perspectives, 9*, 101-109.

Desclaux, A., & Desgrees du Lou, A. (2006). African women faced with the AIDS epidemic. *Population & Societies, 428*(11), 1-4.

Desgreesdu, L., Msellati, P., & Yao, A. (1997). Impaired fertility in HIV-1-infected pregnant women: A clinic-based survey in Abidjan, Cote d'Ivoire. *AIDS, 13*, 517-521.

Dixon, W., & Massey, F. (1983). *Introduction to Statistical Analysis, 4th Edition*. New York: McGraw-Hill.

Dwyer, P., Carey, M., & McLeish, A. (1995). HIV infection presenting as chronic postpartum perineal sepsis. *Aust N Z Journal Obstetrics Gyneaicology, 35*(431-433).

Economist. (2008). The end of another African tragedy beckons. *The Economist, 387*(8574), 14,49-50.

Economist.com. (2007). The face of oppression [Electronic Version]. *The Economist*, 3/15.

Fabiani, M., Nattabi, B., Ayella, E., Ogwang, M., & Declich, S. (2006). Differences in fertility by HIV serostatus and adjusted HIV prevalence data from an antenatal clinic in northern Uganda. *Tropical Medicine and International Health, 11*(2), 182-187.

Fassin, D. (2003). The embodiment of inequality. *European Molecular Biology Organization, 4*(special issue), 4-9.

Fleshman, M. (2004). Women: the face of AIDS in Africa. *Africa Renewal, 18*(3), 5-9.

Forsyth, A., Coates, T., Grinstead, O., Sangiwa, G., Balmer, D., Kamengo, M., et al. (2002). HIV infection and pregnancy status among adults attending voluntary counseling and testing in 2 developing countries. *American Journal of Public Health, 92*(11), 1795-1800.

Forsyth, B., Davis, J., Freudigman, K., Katz, K., & Selterman, D. (2002). Pregnancy and birth rates among HIV-infected women in the United States: The confounding effects of illicit drug use. *AIDS, 16*, 471-479.

Fuller, A. (2003). *Don't Let's Go To The Dogs Tonight*. London: Penguin Books.

Fuller, A. (2005). *Scribbling The Cat*. London: Penguin Books.

Gloyd, S. (2004). Sapping The Poor: The Impact of Structural Adjustment Programs. In M. Fort, M. Mercer & O. Gish (Eds.), *Sickness and Wealth*. Cambridge, Massachusetts: South End Press.

Gray, R., Wawer, M., & Serwadda, D. (1998). Population-based study of fertility in women with HIV infection in Uganda. *Lancet, 351*, 98-103.

Gregson, S., Terceira, N., Kakowa, M., Mason, P., Anderson, R., Chandiwana, S., et al. (2002). Study of bias in antenatal clinic HIV-1 surveillance data in a high contraceptive prevalence population in sub-Saharan Africa. *AIDS, 16* 643-652.

Gregson, S., Zhuwau, T., Anderson, R., & Chandiwana, S. (1998). Is there evidence of behavior change in response to AIDS in rural Zimbabwe? *Social Science & Medicine, 46*, 321-330.

Gregson, S., Zhuwau, T., Anderson, R., & Chandiwana, S. (1999). Apostles and zionists: The influence of religion on demographic change in rural Zimbabwe. *Population Studies (Cambridge), 53*(2), 179-193.

Grieg, F., Koopman, C. . (2003). Multilevel analysis of women's empowerment and HIV prevention: Quantitative survey results from a preliminary study in Botswana. *AIDS and Behavior, 17*, 195-208.

Group, W. (2000). Millennium Development Goals. www.WHO.com.

Gysels, M., Pool, R., & Nnalusiba, B. (2002). Women who sell sex in a Ugandan trading town: life histories, survival strategies and risk. *Social Science & Medicine, 54*, 179-192.

Hallett, T., Aberle-Grasse, J., Bello, G., Boulos, L., Cayemittes, M., & Cheluget, B. (2006). Declines in HIV prevalence can be associated with changing sexual behaviour in Uganda, urban Kenya, Zimbabwe, and urban Haiti. *Sexually Transmitted Diseases, 82* (Suppl 1), 1-18.

Hankins, C., Gendron, T., Tran, D., Lamping, D., & La Pointe, N. (1997). Sexuality in Montreal women living with HIV. *AIDS Care, 9*, 261-271.

Hindin, M. (2003). Understanding women's attitudes towards wife beating in Zimbabwe. *Bulletin of WHO, 81*(7), 501-508.

Hutti, H. (2006). Pregnancy after perinatal loss studies: Macintosh HD.

Ibrahim, T., Moodley, J., & Doorasamy, T. (2004). Lymphocyte changes in pregnancy: A comparison of the human immunodeficiency virus infected and non-infected women. *Journal of Obstetrics and Gynaecology, 24*(5), 498-503.

Ickovics, J., Hamburger, M., Vlahov, D., Schoenbaum, P., Boland, R., & Moore, J. (2001). Mortality, CD4 cell count decline, and depressive symptoms among HIV-seropositive women: Longitudinal analysis from the HIV epidemiology research study. *JAMA, 285*(11), 1466-1474.

Independent, T. (17th November 2006). How AIDS and Starvation Condemn Zimbabwe's Women to Early Grave.

Jackson, J., Musoke, P., Fleming, T., Guay, L., Bagenda, D., Allen, M., et al. (2003). Intrpartum and neonatal single-dose nevirapine compared with zidovudine for prevention of mother-to-child transmission of HIV-1 in Kampala, Uganda: 18-month follow-up of the HIVNET 012 randomised trial. *Lancet, 362*, 859-868.

Jaggar, A. M. (2002). Vulnerable women and neo-liberal globalization: Debt burdens undermine women's health in the global South. *Theoretical Medicine, 23*, 425-440.

Jewkes, R. K., Levin, J. B., Loveday, A., & Penn-Kekana, A. (2003). Gender inequalities, intimate partner violence and HIV preventive practices: findings of a South African cross-sectional study. *Social Science & Medicine, 56*, 125-134.

Johnson, N., & Sufian, A. (1992). Effect of son mortality on contraceptive practice in Bangladesh. *Journal of Biosocial Sciences, 24*(1), 9-16.

Kaiser. (12/2006). Women and HIV/AIDS in the United States [Electronic Version]. *HIV/AIDS Policy Fact Sheet*. Retrieved 2/2007.

Kalipeni, E. (2000). Health and disease in Southern Africa: A comparative and vulnerability perspective. *Social Science & Medicine, 50*, 965-983.

Keegan, A., Lambert, S., & Petrak, J. (2005). Sex and relationships for HIV-positive women since HAART: A qualitative study. *AIDS Patient Care and STDs, 19*(10), 645-654.

Kiefer, C. W. (2007). *Doing Health Anthropology*. New York: Springer Publishing Co., LLC.

Krieger, J., Coombs, R., & Collier, A. (1991). Fertility parameters in men infected with HIV. *Journal of Infectious Diseases 164*, 464-469.

Langston, C., Lewis, D., & Hammill, H. (1995). Excess intrauterine fetal demise associated with maternal human immunodeficiency virus infection. *Journal of Infectious Diseases, 172*, 1451-1460.

Lawoyin, T. O., & Larsen, U. (2002). Male sexual behavior during wife's pregnancy and postpartum abstinence period in Oyo State Nigeria. *Journal of Biosocial Science, 34*, 51-63.

Le Coeur, S., Khlat, M., Halembokaka, G., Augereau-Vacher, C., Batal-M'Pondo, G., Baty, G., et al. (2005). HIV and the magnitude of pregnancy-related mortality in Pointe Noire, Congo. *AIDS, 19*, 69-75.

Lewis, J., Ronsmans, C., Ezeh, A., & Gregson, S. (2004). The population impact of HIV on fertility in sub-Saharan Africa. *AIDS, 18* (suppl 2), S35-S43.

Lune, R., Parke, C., & Stone, C. (1998). A framework for evaluating the consequences of assessment programs. *Educational Measurement, 17*, 24-28.

Macdonald, D. S. (1996). Notes on the socio-economic and cultural factors influencing the transmission of HIV in Botswana *Social Science & Medicine, 42*(9), 1325-1333.

Maglad, N. (1994). Fertility in rural Sudan: The effect of landholding and child mortality. *Economic Development and Cultural Change, 42*(4), 761-772.

Mahomva, A., Greby, S., Dube, S., Mugurungi, O., Hargrove, J., Rosen, D., et al. (2006). HIV prevalence and trends from data in Zimbabwe, 1997-2004. *Sexually Transmitted Diseases, 82*(Suppl I), 42-47.

Marman, S., Mbwambo, J., Hogan, N., Kilonzo, G., Campbell, J., Weiss, E., et al. (2002). HIV-positive women report more lifetime partner violence: Findings from a voluntary counseling and testing clinic in Dar es Salaam, Tanzania. *American Journal of Public Health, 92*(8), 1331-1337.

Marmot, M. (2007). Achieving health equity: From root causes to fair outcomes. *Lancet, 370*(9), 1153-1163.

Martin, P., Grasesenquet, G., & Herve, V. (1992). Decreased number of spermatozoa in HIV-1 infected individuals. *AIDS, 6*, 130-131.

McCloskey, L., Williams, C., & Larsen, U. (2005). Gender inequality and intimate partner violence in Moshi, Tanzania. *International Family Planning Perspectives, 31*(3), 124-130.

McEwen, B. (1998). Protective and damaging effects of stress mediators. *New England Journal of Medicine, 38*, 670-678.

McGuire, S. (1998). Global migration and health: Ecofeminist perspectives. *Advances in Nursing Science, 21*(2), 21-33.

McIntyre, J. (2003). Mothers infected with HIV. *British Medical Bulletin, 67*, 127-135.

Mercer, R. (2006). Nursing support of the process of becoming a mother. *Obstetrical Gynecological Neonatal Nursing, 35*(5), 649-651.

Mercer, R., & Walker, L. (2006). A review of nursing interventions to foster becoming a mother. *Obstetrical Gynecological Neonatal Nursing, 35*(5), 568-582.

Meredith, M. (2005). *The Fate Of Africa*. New York: Public Affairs.

Meredith, M. (2007). *Mugabe: Power, Plunder, and the Struggle for Zimbabwe*. New York: Public Affairs.

Mhloyi, M. (1996). *Socio-cultural milieu, women's status and family planning. Family planning, health and family well-being.* Retrieved. from.

Mill, J. E., & Anarfi, J. K. (2002). HIV risk environment for Ghanaian women: Challenges to prevention. *Social Science & Medicine, 54*, 325-337.

Miller, G., Cohen, S., & Herbert, T. (1999). Pathways linking major depression and immunity in ambulatory female patients. *Psychosomatic Medicine, 61*, 850-860.

Ministry of Health and Child Welfare, Z. (2003). *Zimbabwe national HIV and AIDS estimates 2003*. Harare: Ministry of Health.

Ministry of Health and Child Welfare, Z. (2005). *Report of the consultation of provincial medical directorates on initiating and scaling-up prevention of mother-to-child transmission of HIV infection in Zimbabwe*. Harare, Zimbabwe.

Minkoff, H., Hershow, R., Watts, H., Frederick, M., Cheng, I., Tuomala, R., et al. (2003). The relationship of pregnancy to human immunodeficiency virus disease progression. *Obstetrics and Gynecology, 189*, 552-559.

Moore, M. (2005). *Linking PMTCT to Family-Based Antiretroviral Treatment and Care: A Behavior Change Perspective*: PMTCT Program Tanzania and Guyana.

Moyo, A. (1988). "Religion and Political Thought in Independent Zimbabwe",. In C. Hallencreutz & A. Moyo (Eds.), *Church and State in Zimbabwe*. Gweru: Mambo Press.

Moyo, W., & Mbizvo, M. (2004). Desire for a future pregnancy among women in Zimbabwe in relation to their self-perceived risk of HIV infection, child mortality, and spontaneous abortion. *AIDS and Behavior, 8*, 9-15.

Mswia, R., Lewanga, M., Moshiro, C., Whiting, D., Wolfson, L., Hemed, Y., et al. (2003). Community-based monitoring of safe motherhood in the United Republic of Tanzania. *Bulletin of WHO, 81*, 87-94.

Munro, B. H. (2005). *Statistical Methods For Health Care Research* (5th ed.). Philadelphia: Lippincott Williams & Wilkins.

Myer, L., Morroni, C., & Cooper, D. (2006). Community attitudes towards sexual activity and childbearing by HIV-positive people in South Africa. *AIDS Care, 18*(7), 772-776.

Myer, L., Morroni, C., & Rebe, K. (2007). Prevalence and determinants of fertility intentions of HIV-infected women and men receiving antiretroviral therapy in South Africa. *AIDS Patient Care and STDs, 21*(4), 278-285.

Nakayiwa, S., Abang, B., Packel, L., Lifshay, J., Purcell, D., King, R., et al. (2006). Desire for children and pregnancy risk behavior among HIV-infected men and women in Uganda. *AIDS Behavior, 10*, S95-S104.

Nduati, D., Mbori-Ngacha, B., & al., e. (2000). Effect of breastfeeding and formula feeding on transmission of HIV-1: A randomized clinical trial. *JAMA, 283*, 1167-1174.

Nduati, R., Richardson, B., John, G., Mbori-Ngacha, B., Mwatha, A., Ndinya-Achola, J., et al. (2001). Effect of breastfeeding on mortality among HIV-1 infected women: A randomised trial. *The Lancet, 357*, 1-10.

Nebie, Y., Meda, N., Leroy, V., Mandelbrot, L., Yaro, S., Sombie, I., et al. (2001). Sexual and reproductive life of women informed of their HIV seropositivity: A prospective cohort study in Burkina Faso. *Journal of Acquired Immune Deficiency Syndrome, 28*(4), 367-372.

Newman, J., Taylor, C., & Kelly, N. (1976). The Child Survival Hypothesis. *Population Studies (Cambridge), 30*(2), 263-278

Nguyen, R., Gange, S., Wabwire-Mangen, F., Sewankambo, N., Serwadda, D., Wawer, M., et al. (2006). Reduced fertility among HIV-infected women associated with viral load in Rakai district, Uganda. *International Journal of STD & AIDS, 17*(12), 842-846.

Notestein, F. (1953). *Economic problems of population change.* Paper presented at the Proceedings of the Eighth International Conference of Agricultural Economists, Oxford, England.

Ntozi, J. (2002). *Impact of HIV/AIDS on fertility in sub-Saharan Africa.* Paper presented at the Fourth meeting of the follow-up committee on implementation of the DND and the ICPD-PA, Yaounde, Cameroon.

Nunnally, J., & Bernstein, I. (1994). *Psychometric Theory* (3rd ed.). New York: McGraw-Hill, INC.

O'Brien, R., & Muller, K. (1983). *Applied Analysis of Variance in Behavioral Science*. New York: Marcel Dekker.

O'Connor, B. (2000). SPSS and SASS programs for determining the number of components using parallel analysis and Velicer's MAP test. *Behavior Research Methods, Instrumentation and Computers, 32*, 396-402.

Okojie, C. (1991). Fertility response to child survival in Nigeria: An analysis of microdata from Bendel State. *Research in Population Economics, 7*, 93-112.

Oladapo, O., Daniel, O., Odusoga, O., & Ayoola-Sotubo, O. (2005). Fertility desires and intentions of HIV-positive patients at a suburban specialist center. *Journal of the National Medical Association, 97*(12), 1672-1681.

Perez, F., Orne-Gliemann, J., Mukotekwa, T., Miller, A., Glenshaw, M., Mahomva, A., et al. (2004). Prevention of mother to child transmission of HIV: Evaluation of a pilot programme in a district hospital in rural Zimbabwe. *British Medical Journal, 329*, 1147-1150.

Pett, M., Lackey, N., & Sullivan, J. (2003). *Making Sense of Factor Analysis: The use of factor analysis for instrument development in health care research*. Thousand Oaks, CA: Sage Publications.

Pettifor, A., Kleinschmidt, I., Levin, J., Rees, H., MacPhail, C., & Padian, N. S. (2005). A community-based study to examine the effect of a youth HIV prevention intervention on young people aged 15-24 in South Africa: Results of the baseline survey. *Tropical Medicine and International Health, 10*(10), 971-980.

Philip, C. (2008). Grief of a Z$1bn funeral. *The Times,* pp. 27-28.

Plusnewswebsite. (2006). Zimbabwe: HIV-positive people floundering as economy sinks.

Preston, S. H. (1978). *The Effects of Infant and Child Mortality on Fertility*. New York: Academic Press.

Prevention, C. F. D. C. A. (2005). HIV/AIDS among US women: Minority and young women at continuing risk. : National Center for HIV, STD and TB prevention Division of HIV/AIDS Prevention Fact Sheet (online).

Rich, K., Siegel, J., Jennings, C., Rydman, R., & Landay, A. (1995). CD4+ lymphocytes in perinatal human immunodeficiency virus infection: Evidence for pregnancy-induced immune depression in uninfected and HIV-infected women. *Journal of Infectious Diseases, 172*, 1221-1227.

Ross, A., Morgan, D., Lubega, R., Carpenter, L., Mayanja, B., & Whitworth, J. (1999). Reduced fertility associated with HIV: The contribution of pre-existing subfertility. *AIDS, 13*, 2133-2141.

Ross, A., Van der Paal, L., Lubega, R., Mayanja, B., Shafer, A., & Whitworth, J. (2004). HIV-1 disease progression and fertility: The incidence of recognized pregnancy and pregnancy outcome in Uganda. *AIDS, 18*(5), 799-804.

Russell, S. (2007). More people receive AIDS drugs. *Chronicle,* p. 3.

Sah, R. (1991). The effects of child mortality changes on fertility choice and parental welfare. *Journal of Political Economy, 99*(3), 582-606.

Schrijvers, D., Delaporte, E., Peeters, M., Dupont, A., & Meetheus, A. (1991). Seroprevalence of retroviral infection in women with different fertility status in Gabon, Western Equatorial Africa. *Journal of Acquired Immune Deficiency Syndrome, 4*, 468-470.

Scrimshaw, S. (1981). Infant mortality and behavior in the regulation of family size. In N. Eberstadt (Ed.), *Fertility Decline in the Less Developed Countries*. New York: Praeger.

Sedgh, G., Larsen, U., Spiegelman, D., Msamanga, G., & Fawzi, W. (2005). HIV-1 disease progression and fertility in Dar es Salaam, Tanzania. *Journal of Acquired Immune Deficiency Syndrome, 39*(4), 439-445.

Semba, R., Kumwenda, N., & Hoover, D. (1999). Human immunodeficiency virus load in breast mild, mastitis, and mother-to-child transmission of human immunodeficiency virus type 1. *Journal of Infectious Diseases, 180*, 93-98.

Sepulveda, J., Carpenter, C., Curran, J., Holzemer, W., Smits, H., Scott, K., et al. (Eds.). (2007). *PEPFAR Implementation: Progress and Promise*. Washington, D.C.: National Academies Press.

Shannon, M., Kennedy, H., & Humphreys, J. (2008). HIV-infected mothers' foci of concern during the viral testing of their infants. *Journal of Association of Nurses AIDS Care, 19*(2), 114-126.

Shannon, M., King, T., & Kennedy, H. (2007). Allostasis: A theoretical framework for understanding and evaluating perinatal health outcomes. *Obstetrical Gynecological Neonatal Nursing, 36*(2), 125-134.

Smee, N. (2006). Chitingwiza Women's Focus Group (pp. Research Notes). Harare, Zimbabwe.

Sowell, R., Murdaugh, C., Addy, C., Moneyham, L., & Tavokoli, A. (2002). Factors influencing intent to get pregnant in HIV-infected women living in the southern USA. *AIDS Care, 14*(2), 181-191.

Susser, I., & Stein, Z. (2000). Culture, sexuality, and women's agency in the prevention of HIV/AIDS in Southern Africa. *American Journal of Public Health, 90*(7), 1042-1048.

Swanson, K. (1988). There should have been two: Nursing care of parents experiencing the perinatal death of a twin. *Journal of Perinatal Neonatal Nursing, 2*(2), 78-86.

Swanson, K. (1999). Effects of caring, measurement, and time on miscarriage impact and women's well being. *Nursing Research, 48*(6), 288-298.

Swanson, K. (2000). Predicting depressive symptoms after miscarriage: A path analysis based on the Lazarus paradigm. *Journal of Women's Health & Gender-Based Medicine, 9*(2), 191-206.

Swanson, K. (2003). Miscarriage effects on couples' interpersonal and sexual relationship during the first year after loss: Women's perceptions. *Psychosomatic Medicine, 65*, 902-910.

Tai, J., Udoji, M., Barkanic, G., Byrne, D., Rebeiro, P., Byram, B., et al. (2007). Pregnancy and HIV disease progression during the era of highly active antiretroviral therapy. *The Journal of Infectious Diseases, 196*, 1044-1052.

Tanaka, M. M., Kumm, J., & Feldman, M. W. (2000). Coevolution of pathogens and cultural practices: A new look at behavioral heterogeneity in epidemics. *Theoretical Population Biology, 62*(10), 111-119.

Temmerman, M., Nagelkerke, N., Bwayo, J., Chomba, E., Ndinya-Achhola, J., & Piot, P. (1995). HIV-1 seropositive and HIV-1 seronegative women in Nairobi, Kenya. *AIDS, 9*, 1057-1060.

Thorne, C., Newell, M., Dunn, D., & Peckham, C. (1995). The European collaborative study: Clinical and immunological characteristics of HIV-1 infected pregnant women. *British Journal of Obstetrics and Gynaecology, 102*, 869-875.

Ties-Boerma, J., Gregson, S., Nyamukapa, C., & Urassa, M. (2003). Understanding the uneven spread of HIV within Africa: Comparative study of biologic, behavioral and contextual factors in rural populations in Tanzania and Zimbabwe. *Journal of Sexually Transmitted Diseases, 30*(10), 779-787.

Udjo, E. (1996). Is fertility falling in Zimbabwe? *Journal of Biosocial Science, 28*(1), 25-35.

UNAIDS. (2005). *Fact Sheet Africa*. Retrieved. from www.unaids.com.

UNAIDS. (2006). *Report on the global AIDS epidemic 2006: HIV/AIDS estimates and data*.

UNICEF. (2006). *Zimbabwe Statistic*. Online.

Vittinghoff, E., Glidden, D., Shiboski, S., & McCulloch, C. (2005). *Regression Methods in Biostatistics*. New York: Springer Science + Business Media Inc.

Walker, L., & Avant, K. (2005). *Strategies for Theory Construction in Nursing*. Upper Saddle River, New Jersey: Pearson Education, Inc.

WHO. (1990). Millennium Development Goals. *www.who.int/mdg/en/*

WorldbankOnline. (2007). Zimbabwe Country Brief.

Zaba, B., Terceira, N., Mason, P., & Gregson, S. (2003). The contribution of HIV to fertility decline in rural Zimbabwe, 1985-2000. *Population Studies (Cambridge), 57*(2), 149-164.

APPENDIX A: MTCT AND FERTILITY QUESTIONNAIRE (ENGLISH VERSION)

FERTILITY IN WOMEN FOLLOWING AN MTCT INTERVENTION

Introduction

DATE ☐☐ ☐☐ ☐☐

DOB ☐☐ ☐☐ ☐☐

PARTICIPANT OF: 023 ☐ Feasibility ☐ IPN ☐ Other(define) ☐ _____

Study Code for above study _____

SECTION ONE

FIRST MTCT PREGNANCY, Data recorded from: _____

DELIVERY DATE ☐☐ ☐☐ ☐☐ BIRTH COMPLICATIONS_____

MOTHER ANTENATAL WEIGHT (last before delivery) ☐☐ kg CD4 COUNT ☐☐☐☐/mL

RECEIVED ANTENATAL AZT Y / N FROM ☐☐WKS

RECEIVED AZT IN LABOUR Y / N

RECEIVED INTRAPARTUM NEVIRAPINE Y / N

BABY M / F LIVEBORN / SB TERM / PRETERM WEIGHT ☐.☐kg

RECEIVED AZT Y / N RECEIVED NEVIRAPINE Y / N

PCR RESULT AT ☐☐ wks = + / - PCR RESULT AT ☐☐ wks = + / -

BREASTFED x ☐☐ MONTHS CURRENTLY ☐☐ MONTHS OLD

CURRENTLY THRIVING / NOT THRIVING / DECEASED

SECTION TWO

6/52 POSTNATAL VISIT (for first MTCT pregnancy), Data gathered by: from: on:

1. ATTENDED Y / N
   If NO: a) Why did you not attend? _____
   b) Have you been dispensed with FP since the first pregnancy? Y/ N
   If YES, proceed to question 3
   If NO, Do you know where to get family planning? Y/N
   If YES: Please specify where _____
   If NO: Proceed to question 6
2. FAMILY PLANNING DISCUSSED Y / N
3. FP DISPENSED Y / N
   If YES, Please circle which method: POP / COC / DEPO / NORPLANT / CONDOM / FEMIDOM
4. DO YOU SOMETIMES RUN OUT OF FP? Y / N
5. PARTNER SUPPORTS/ SUPPORTED WIFE'S FP DECISION Y / N
6. AT 6/52, WERE YOU STILL WITH SAME PARTNER (AS FIRST PREGNANCY) Y / N DETAILS
7. RESUMED INTERCOURSE ☐☐ WKS POSTNATALLY
8. PERIODS BEGAN ☐☐ WKS POSTNATALLY
9. DISCLOSED HIV STATUS TO PARTNER Y / N
10. FOR HIV+ WOMEN, WHAT ISSUES MUST BE FACED IN PREGNANCY?

_____

_____

_____

11. WHO TOLD YOU THIS? _____
12. Have you changed FP methods between now and 6/52 postnatal visit? Yes No
    If YES: Specify date of change and methods: _____
13. Have you had any side-effects of FP or any problems? Yes No
    If YES: Please describe side-effects/ problems: _____
14. Do you have to hide the fact that you are taking FP from anyone? Y/ N
    If YES: From who? _____

Section Three

REPEAT PREGNANCY, Data gathered by: _____ from: _____ on:

15. At the time of the first MTCT pregnancy you had already had how many children? ☐☐
16. How many miscarriages? ☐☐
17. Since that time have you become pregnant again, including miscarriages? Yes No
    Detail_____
18. Have you had any live births since the index pregnancy? Yes No
19. Any children who have died? Yes/ No details_____
20. So, in summary you have had ☐☐ pregnancies, and you now have ☐☐ children who are alive
21. Why did you get pregnant again? _____

If mother has had a pregnancy since the first MTCT pregnancy, complete the following information:

Mother is: Currently Pregnant
Had second baby
Had miscarriage

LMP (if applicable) ☐☐ ☐☐ ☐☐ EDD or DOD ☐☐ ☐☐ ☐☐

COMPLICATIONS _____

CONCEIVED WHEN INDEX BABY WAS ☐☐ MONTHS OLD

ON FP WHEN YOU FELL PREGNANT ? Y / N DETAILS _____

MOTHER ANTENATAL WEIGHT ☐☐ kg CD4 COUNT ☐☐☐☐ /mL

RECEIVED ANTENATAL AZT Y / N FROM ☐☐WKS

RECEIVED AZT IN LABOUR Y / N

RECEIVED INTRAPARTUM NEVIRAPINE Y / N

BABY M / F LIVEBORN / SB TERM / PRETERM WEIGHT ☐.☐kg

RECEIVED AZT Y / N RECEIVED NEVIRAPINE Y / N

PCR RESULT AT ☐☐ wks = + / - PCR RESULT AT ☐☐ wks = + / -

BREASTFED x ☐☐ MONTHS CURRENTLY ☐☐ MONTHS OLD

CURRENTLY THRIVING / NOT THRIVING / DECEASED

Section Four

DEMOGRAPHICS, KAP Data gathered by: from: on:
FAMILY TREE/ DIAGRAM OF PARTNERS AND CHILDREN

Start with mother and proceed across for partners, down for children. Include miscarriages, stillbirths, abortions. Add month/year for all information

□ = male
O = female
X = deceased

Demographics

22. At the time of the index pregnancy when you first became involved with the project, what was your marital status?
- ❑ Never married/ not living with partner
- ❑ Married
- ❑ Living with partner
- ❑ Separated
- ❑ Divorced
- ❑ Widowed
- ❑ Other _____

1. What is your marital status now?
- ❑ Never married/ not living with partner
- ❑ Married
- ❑ Living with partner
- ❑ Separated
- ❑ Divorced
- ❑ Widowed
- ❑ Other _____

1. Is it the same partner? Yes No

2. Does your partner stay at home? Yes No Detail_____

3. At the time of Index pregnancy: What was the highest educational level you had achieved?
- ❑ Primary school
- ❑ Secondary School
- ❑ High School
- ❑ Tertiary

1. What is the highest educational level you have achieved now?

- ❑ Primary school
- ❑ Secondary School
- ❑ High School
- ❑ Tertiary

1. At the time of the Index pregnancy, where were you living?

- ❑ Rent house
- ❑ Rent room
- ❑ Own house
- ❑ Staff Quarters
- ❑ Stayed with relatives: specify _____
- ❑ Other _____

1. Where are you living now?

- ❑ Rent house
- ❑ Rent room
- ❑ Own house
- ❑ Staff Quarters
- ❑ Stayed with relatives: specify _____
- ❑ Other _____

Attitudes

1. How many more children do you plan to have? ☐☐ why? _____
   If "NONE": *give reasons*_____
2. Who is involved in these plans (i.e. Husband, In-laws, Own Family): _____
3. How many more children do you think your partner wants? ☐☐ _____

Knowledge about HIV and Fertility

4. If you are HIV-positive and you formula feed your child, what do you think are the chances the baby will get the virus. Are they: very high high in the middle low very low
5. If you are HIV-positive and you breastfeed your child, what do you think are the chances the baby will get the virus. Are they: very high high in the middle low very low
6. Have the counselors or nurses ever talked to you about the risks of becoming pregnant again if you are HIV positive? Yes No
   a. ***If YES:*** What did they tell you? _____
      Is there anything else you have heard from somewhere else? _____
   b. ***If NO:*** Have you heard of any risks from somewhere else?
      _____

1. Have you ever doubted the accuracy of your HIV test results? Y/N
   IF YES: Why? _____

2. Have you ever thought that your disease may be caused by witchcraft or evil spirits? Y/N
   IF YES: Why?

Practices (P) about couples communication and disclosure

3. When did you learn you were HIV-positive?
4. Did you disclose your status to your partner or partners? Yes No
   IF YES: When did you disclose your status?
   IF NO: Would you like help in disclosing your status? Yes No **(REFER TO COUNSELORS)**

5. Is there anyone else who knows your status? Yes No
   IF YES: Please list who and why that person told _____

Attitudes (A) about fertility and HIV

I will read you a list of statements. Please tell me whether you agree or disagree. There are no right or wrong answers, we just want to learn your opinions.

1. Having another child if you are HIV positive can make you weaker	Agree	Disagree
2. If you are HIV positive but still healthy, having another child will not make you weaker	Agree	Disagree
3. Some HIV positive women want to have children while they know the researchers with drug are still in the clinics	Agree	Disagree
4. Giving AZT or Nevirapine to prevent HIV going from mother to baby will not work a second time	Agree	Disagree
5. HIV positive women have the right to have as many children as they want	Agree	Disagree
6. HIV positive women have the right to have as many children as HIV negative women	Agree	Disagree
7. If the husband or partner wants more children a woman must become pregnant again	Agree	Disagree
8. If the husband's or partner's family wants more children a woman must become pregnant again	Agree	Disagree
9. There will be someone I trust who can look after my children even if I die	Agree	Disagree
10. For an HIV-positive woman, having another child is more important than risking her own health	Agree	Disagree
11. Women in Zimbabwe are expected to have more than one child	Agree	Disagree
12. If the husband pays lobola then the woman must produce a child	Agree	Disagree
13. Some HIV-positive women get pregnant again to conceal their HIV status	Agree	Disagree
14. Some HIV positive women get pregnant again because they don't believe their status	Agree	Disagree

15. Some HIV positive women get pregnant again because they have a need for love	Agree	Disagree
16. If an HIV-positive woman received AZT or NVP her infant will NOT contract the virus	Agree	Disagree
17. Some HIV positive women get pregnant again because they have a need for financial security	Agree	Disagree
18. Some HIV positive women get pregnant again because they think the drugs at the clinic will keep their baby from getting HIV	Agree	Disagree
19. Some HIV positive women get pregnant again because they think the researchers at the clinic will keep their baby from getting HIV	Agree	Disagree
20. There is an orphan crisis in Zimbabwe right now	Agree	Disagree
21. If an HIV positive woman gets pregnant again she could be creating more orphans	Agree	Disagree
22. If an HIV positive woman gets pregnant a second time, the first child will suffer	Agree	Disagree
23. An HIV positive woman can be a mother like anyone else, she doesn't have to dwell on misfortune	Agree	Disagree
24. Motherhood gives a young woman something to do	Agree	Disagree
25. If a woman is not a mother she is not a real woman	Agree	Disagree

APPENDIX B: MTCT AND FERTILITY QUESTIONNAIRE (SHONA VERSION)

FERTILITY IN WOMEN FOLLOWING AN MTCT INTERVENTION

Introduction

DATE ☐☐ ☐☐ ☐☐

DOB ☐☐ ☐☐ ☐☐

PARTICIPANT OF: 023 ☐ Feasibility ☐ IPN ☐ None ☐ Other(define) ☐ _____

Study Code/ID for above study _____

SECTION ONE

FIRST MTCT PREGNANCY, Data recorded from: _____

DELIVERY DATE ☐☐ ☐☐ ☐☐ BIRTH COMPLICATIONS_____

MOTHER ANTENATAL WEIGHT (last before delivery) ☐☐ kg CD4 COUNT ☐☐☐☐/mL

RECEIVED ANTENATAL AZT Y / N FROM ☐☐WKS

RECEIVED AZT IN LABOUR Y / N

RECEIVED INTRAPARTUM NEVIRAPINE Y / N

BABY M / F LIVEBORN / SB TERM / PRETERM WEIGHT ☐.☐kg

RECEIVED AZT Y / N RECEIVED NEVIRAPINE Y / N

PCR RESULT AT ☐☐ wks = + / - PCR RESULT AT ☐☐ wks = + / -

EIA RESULT AT ☐☐ wks = + / -

BREASTFED x ☐☐ MONTHS CURRENTLY ☐☐ MONTHS OLD

FORMULA FED x ☐☐ MONTHS

CURRENTLY THRIVING / NOT THRIVING / DECEASED

SECTION TWO **6/52 POSTNATAL VISIT (for first MTCT preg)**

1. ATTENDED Y / N
   If NO: a) Why did you not attend? _____
   b) Have you been dispensed with FP since the first pregnancy? Y/ N
   If YES, proceed to question 3
   If NO, Do you know where to get family planning? Y/N
   If YES: Please specify where _____
   If NO: Proceed to question 6

2. FAMILY PLANNING DISCUSSED AT 6/52 VISIT? Y / N

3. FP DISPENSED Y / N
   If YES, Please circle which method: POP / COC / DEPO / NORPLANT / CONDOM / FEMIDOM

4. DO YOU SOMETIMES RUN OUT OF FP? Y / N

5. PARTNER SUPPORTS/ SUPPORTED WIFE'S FP DECISION Y / N

6. AT 6/52, WERE YOU STILL WITH SAME PARTNER (AS FIRST PREGNANCY) Y / N

   DETAILS _____

7. RESUMED INTERCOURSE ☐☐ WKS POSTNATALLY

8. PERIODS BEGAN ☐☐ WKS POSTNATALLY

9. DISCLOSED HIV STATUS TO PARTNER Y / N

10. Kumadzai anehutachiona ndezvipi zvimhingamupinyi zvavanosangana nazvo mukutakura pamuviri? (For HIV+ women, what issues must be faced in pregnancy?)

_____

_____

_____

11. Makaudzwa nani izvi? (Who told you this?)
    _____

12. Makachinja here nzira yekurera nayo kubvira pa 6/52 kusvikira parizvino? Yes No
    (Have you changed FP methods between now and 6/52 postnatal visit?)
    If YES: Specify date of change and methods: _____
    If YES, WHY? _____

13. Makamboita dambudziko here nenzira dzekurera mhuri dzamaishandisa? Yes No
    Have you had any side-effects of FP or any problems?
    If YES: Please describe side-effects/ problems: _____

14. Munovanza here kuti muri pa Family Planning? Yes No
    Do you have to hide the fact that you are taking FP from anyone?
    If YES: From who? _____

Section Three **REPEAT PREGNANCY, Data gathered by: from:**

15. At the time of the first MTCT pregnancy you had already had how many children? ☐☐
16. How many miscarriages? ☐☐
17. Since that time have you become pregnant again, including miscarriages? Yes No
    Detail_____
18. Have you had any live births since the index pregnancy? Yes No
19. Any children who have died? Yes/ No details_____
20. So, in summary you have had ☐☐ pregnancies, and you now have ☐☐ children who are alive
21. Chii chakaita kuti muite pamuviri zvakare? (Why did you get pregnant again?)

_____

If mother has had a pregnancy since the first MTCT pregnancy, complete the following information:

Mother is: Currently Pregnant
Had second baby
Had miscarriage

LMP (if applicable) ☐☐ ☐☐ ☐☐ EDD or DOD ☐☐ ☐☐ ☐☐

COMPLICATIONS _____

CONCEIVED WHEN INDEX BABY WAS ☐☐ MONTHS OLD

ON FP WHEN YOU FELL PREGNANT ? Y / N DETAILS _____

MOTHER ANTENATAL WEIGHT ☐☐ kg CD4 COUNT ☐☐☐☐ /mL

RECEIVED ANTENATAL AZT Y / N FROM ☐☐WKS

RECEIVED AZT IN LABOURY / N

RECEIVED INTRAPARTUM NEVIRAPINE Y / N

BABY M / F LIVEBORN / SB TERM / PRETERM WEIGHT ☐.☐kg

RECEIVED AZT Y / N RECEIVED NEVIRAPINE Y / N

PCR RESULT AT ☐☐ wks = + / - PCR RESULT AT ☐☐ wks = + / -

BREASTFED x ☐☐ MONTHS CURRENTLY ☐☐ MONTHS OLD

FORMULA FED x ☐☐ MONTHS

CURRENTLY THRIVING / NOT THRIVING / DECEASED

Section Four

DEMOGRAPHICS, KAP Data gathered by: _____ from: _____

FAMILY TREE/ DIAGRAM OF PARTNERS AND CHILDREN

Start with mother and proceed across for partners, down for children. Include miscarriages, stillbirths, abortions. Add month/year for all information

□ = male
O = female
X = deceased

Demographics

1. At the time of the index pregnancy when you first became involved with the project, what was your marital status?

- ❑ Never married/ not living with partner
- ❑ Married
- ❑ Living with partner
- ❑ Separated
- ❑ Divorced
- ❑ Widowed
- ❑ Other _____

1. What is your marital status now?

- ❑ Never married/ not living with partner
- ❑ Married
- ❑ Living with partner
- ❑ Separated
- ❑ Divorced
- ❑ Widowed
- ❑ Other _____

1. Is it the same partner? Yes No

2. Munogara nemurume wenyu here? Yes No Detail_____
(Does your partner stay at home?)

3. At the time of Index pregnancy: What was the highest educational level you had achieved?

- ❑ Primary school
- ❑ Secondary School
- ❑ High School
- ❑ Tertiary

4. What is the highest educational level you have achieved now?
- ❑ Primary school
- ❑ Secondary School
- ❑ High School
- ❑ Tertiary

1. At the time of the Index pregnancy, where were you living?
- ❑ Rent house
- ❑ Rent room
- ❑ Own house
- ❑ Staff Quarters
- ❑ Stayed with relatives: specify _____
- ❑ Other _____

1. Where are you living now?
- ❑ Rent house
- ❑ Rent room
- ❑ Own house
- ❑ Staff Quarters
- ❑ Stayed with relatives: specify _____
- ❑ Other _____

9. If 7 and 8 differ, explain:_____

Attitudes

1. Muri kuronga kuita vamwe vana vangani? ☐☐ chikonzero chii? _____
   If "NONE": *give reasons*_____

2. Ndiyani wamunoronga naye, murume wenyu, vanavamwene kana kuti vemhuri yenyu kwamakazvarwa? : _____

3. Munogunga kuti murume wenyu angade vana vangani? ☐☐ _____

Knowledge about HIV and Fertility

4. Kana muine hutachiona hweHIV, muchipa mwana mukaka wemugaba, munofunga kuti mwana wenyu anemukana wakakura zvakadini kuwana HIV?
   Hwakakwiririsa here? Hwakakwirira here? Huripakati nepakate here?
   Hwakadzika here? Kanakuti hwakadzikisisa here?

5. Kana muine hutachiona hweHIV muchiyamwisa mwana wenyu, munogunga kuti mukana wekuti mwana awane hutachiona hweHIV hwakakura zvakadii?
   Hwakakwiririsa here? Hwakakwirira here? Huripakati nepakate here?
   Hwakadzika here? Kanakuti hwakadzikisisa here?

6. Macounsula kana manurses akambokurukura nemi here maererano nenjodzi dzekuita pamwe pamuviri muine hutachiona hweHIV? Yes No
   a] Kana mati hongu ndezvipi zvava kakutaurirai? _____
   Pane zvimwe here zvamakanzwa kubva kumwe? _____

b] Kana kwete:Makambonzwa here nezve dzimwe njodzi/ngozi kubva kumwe?

_____

7. Makambonzwa kusagutsikana here nezvakabuda paongororoyenyu yeHIV? Yes No
   IF YES: Why? _____
8. Makambofunga kuti utachiona uhu hwakakonzerwa neuroyi kana kuti nemweya yakaipa? Yes No
   IF YES: Why? _____

Practices (P) about couples communication and disclosure

1. When did you learn you were HIV-positive?
2. Did you disclose your status to your partner or partners? Yes No
   IF YES: When did you disclose your status?
   IF NO: Would you like help in disclosing your status? Yes No **(REFER TO COUNSELORS)**
3. Is there anyone else who knows your status? Yes No
   IF YES: Please list who and why that person told _____

Attitudes (A) about fertility and HIV

I will read you a list of statements. Please tell me whether you agree or disagree. There are no right or wrong answers, we just want to learn your opinions.

1. Kuita mumwe mwana kana muine utachiona hwe HIV kunoderedza hutano hwako?	Agree	Disagree
2. Kana muine utachiona hweHIV asi muine utano hwakanaka kuita mumwe mwana hakuderedzi utano hwenyu.	Agree	Disagree
3. Mamwe madzimai ane hutachiona hweHIV vanoda kuzvara vana vachiziva kuti vanoita zveongororo nemishonga vachiri mumaclinic.	Agree	Disagree
4. Kupa AZT kana Nevirapine kudziirira utachiona kubva kuna amai kuenda kumwana hazvizoshanda kechipiri	Agree	Disagree
5. Madzimai ane utachiona hwe HIV vane kodzero yekubereka vana vakawanda sekuda kwavo.	Agree	Disagree
6. Madzimai ane utachiona hwe HIV vane kodzero yekubereka vana vakawanda kufanana nemadzimai asina utachiona.	Agree	Disagree
7. Murume kana shawari ichida vana vakawanda mudzimai anofanira kuita pamwe pamuviri zvakare.	Agree	Disagree
8. Hama dzemurume dzichida vamwe vana mudzimai anofanira kuita vamwe vana.	Agree	Disagree
9. Pane munhu wandinovimba naye anozokwanisa kuchengeta vana vangu chero ndikafa.	Agree	Disagree
10. Kumadzimai ane utachiona hwe HIV kubereka mumwe mwana kwakakosha pane ngozi yeutano hwake.	Agree	Disagree
11. Madzimai emuZimbabwe anotarisirwa kubereka vana vakawanda	Agree	Disagree

12. Kana murume aroora mudzimai anofanira kubereka	Agree	Disagree
13. Mamwe madzimai ane utachiona anoita pamwe pamuviri zvakare kuedza kuvanziridza kuti vane utachiona hweHIV.	Agree	Disagree
14. Mamwe madzimai ane utachiona anoita pamwe pamuviri zvakare nokuda kwekuti havabvume kuti vanahwo.	Agree	Disagree
15. Mamwe madzimai ane utachiona anoita pamwe pamuviri zvakare nepamusana pekuda kudiwa.	Agree	Disagree
16. Kana mudzimai ane utachiona akapihwa AZT/nevirapine mwana wake haazowana utachiona.	Agree	Disagree
17. Mamwe madzimai ane utachiona anoita pamwe pamuviri zvakare nepamusana pekuda kuchengetwa.	Agree	Disagree
18. Mamwe madzimai ane utachiona anoita pamwe pamuviri zvakare nekuda kwekuti vanofunga kuti mishonga yepaclinica ichachengetedza vana vavo kuti vasawane utachiona.	Agree	Disagree
19. Mamwe madzimai ane utachiona anoita pamwe pamuviri zvakare nekuda kwekuti vanofunga kuti varidzi vezvirongwa vari paclinica ----vanoita kuti vana vavo vasawane utachiona.	Agree	Disagree
20. Pari zvino muno muZimbabwe mune dambudziko renherera.	Agree	Disagree
21. Kana mudzimai ane utachiona akaita pamuviri zvakare anogona kuwedzera nherera.	Agree	Disagree
22. Kana mudzimai ane utachiona akaita pamuviri kechipiri mwana wekutanga anowana dambudziko.	Agree	Disagree
23. Mudzimai ane utachiona akangofanana nemamwe madzimai haafanire kungofunga kuti ane rombo rakaipa	Agree	Disagree
24. Kuita amai kunoita kuti amai vechidiki vaone zvekuita	Agree	Disagree
25. Kana munhukadzi asina kuita mwana anonzi haasi mukadzi chaiye	Agree	Disagree

Nurses Comments:

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Nancy L Snee — 5-30-2008

Author Signature — Date