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Dual Protection, Relationship Dynamics, and Women's Empowerment in Brazil

A dissertation submitted in partial satisfaction of the
requirements for the degree Doctor of Philosophy
in Public Health

by

Kiyomi Tsuyuki

2013

ABSTRACT OF THE DISSERTATION

Dual Protection, Relationship Dynamics, and Women's Empowerment in Brazil

by

Kiyomi Tsuyuki

Doctor of Philosophy in Public Health

University of California, Los Angeles, 2013

Professor Donald E. Morisky, Chair

The global syndemic of HIV and unintended pregnancy has prompted research on dual protection, the simultaneous protection against HIV and unintended pregnancy. Dual protection can be achieved through *single method u*se (condoms) or *dual method use* (condoms + another contraceptive method). Studies find that the use of a modern contraceptive method (other than condoms) may affect whether condoms are used and condom use consistency. Various individual-level factors and relationship context are thought to influence this dynamic and to exacerbate the risk socially disadvantaged women have of experiencing both HIV and unintended pregnancy. Furthermore, studies find that as romantic partners transition into a more committed and stable relationship, condoms are replaced with non-barrier contraception for increased trust, pleasure, and intimacy. However, women in committed relationships are the hardest hit by the HIV epidemic and bear the burden of unintended pregnancy.

The overall goal of this study is to understand how women in Brazil use dual protection through single method use (condoms) and dual method use (condoms + another contraceptive

method). The primary aims of this study are to: 1) describe the level of consistent condom use among women in Brazil, 2) to examine how individual-level socio-demographic factors, early sexual risk, fertility, and relationship context affect dual protection, and 3) to examine the indirect effects of individual-level factors on condom use and contraception via relationship context. This study uses data from the 2006 PNDS, a nationally representative household survey of women of reproductive age in Brazil. Using this data, I apply the theory of gender and power, social exchange theory, and the concept of women's empowerment to elucidate how social inequalities influence contraception and condom use consistency. I address the study aims in three distinct, but sizeable, sub-groups of women in the Brazilian population: 1) fecund women in the general population, 2) fecund women who use dual protection (comparing condom use consistency in dual methods users versus single method users), 3) and in sterilized women.

This study has three main findings. *First*, this study identifies formal education and risk at sexual debut as key factors that promote condom use consistency across all three sub-groups of women in Brazil. Additionally, region was a salient positive indicator of use of a modern contraceptive method and age was a salient negative indicator of condom use consistency. *Second*, this study tests the dual methods hypothesis to understand how consistent condom use is affected by the use of another modern method of contraception. Findings from this study support that women who use another modern form of contraception in addition to condoms have lower odds of consistent condom use than women who use condoms only. This study also finds that sterilized women do not use condoms nearly as consistently as women who use dual methods (condoms + another method of contraception). *Third*, this study finds that relationship context is a critical consideration when studying condom use consistency. Relationship status is a strong predictor of dual protection consistency in women of the general population and in sterilized

women. Women in more committed relationships (e.g. in civil union and married) report much less condom use and more exclusive contraceptive use (aside from condoms) than women who were not in relationships (e.g. single and separated). In addition, relationship status and educational asymmetry mediate the association between individual-level factors and consistent condom use.

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DEDICATION PAGE

I dedicate this dissertation to my family. Mom and Dad, you have taught me discipline, dedication, and to aim for my dreams. Your unconditional love and support have helped me to stop only when I make my dreams a reality. I appreciate all of the sweat, tears, and your hard work to provide us with everything the world has to offer. Korissa and Leilan, it seems like just yesterday that I was forcing you to do math homework and bossing you around. Our shared sense of humor and unconditional love has taught me to fly with the wind and enjoy life. I have truly enjoyed watching you guys grow into the amazing people you.

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PAPERS AND PRESENTATIONS

Tsuyuki, Kiyomi, Barbosa, Regina M., and Pinho, Adriana A. (2013). Dual Protection and Dual Methods in Women Living with HIV: The Brazilian Context. *Journal of Sexually Transmitted Diseases*, vol. 2013, Article ID 540789, 8 pages.

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CHAPTER 1: Introduction

Introduction

The global syndemic of HIV and unintended pregnancy has prompted research on dual protection, the simultaneous protection against HIV and unintended pregnancy (Berer 1997). Dual protection can be achieved through *single method u*se (condoms) or *dual method use* (condoms + another contraceptive method).

Considering condom use and contraception from a dual protection lens is important for several reasons. First, studies have found that use of a non-barrier contraceptive decreases the odds of condom use and condom use consistency (Steiner and Joanis 1993; Cooper, Agocha et al. 1999; Cates and Steiner 2002; MacPhail, Pettifor et al. 2007). One explanation is that, as partners transition into a more committed relationship, condoms are replaced with non-barrier contraception for increased pleasure and intimacy. Also, partners in a committed relationship build up trust and fidelity in their relationship and eventually decide to forgo condom use for non-barrier contraception because HIV/STI transmission is no longer a perceived risk. However, stable partners are the hardest hit by the HIV and unintended pregnancy syndemic. More research is necessary to elucidate the socioeconomic, fertility, and relationship factors operative in condom use, contraception, and dual method use behaviors. Second, Brazil has invested billions into HIV prevention, HIV care, and condom use mass media campaigns. One unanticipated consequence of condom promotion for HIV prevention has been a decline in non-barrier contraceptive use associated with a subsequent increase in unintended pregnancy and abortion (Bajos, Warszawski et al. 2001). Although condoms can be a very effective contraceptive with perfect clinical use, condom use is often hindered by a slew of user-based

errors (e.g. not having a condom, beginning sex before condom is applied, condom slippage, male partner doesn't want to use a condom etc.) that deem condoms a less effective contraceptive in typical use (Crosby, Salazar et al. 2007). It is critical to identify the factors associated with condom use consistency and inconsistency in women who report only using condoms in Brazil.

Brazil is an ideal country to research dual protection and relationship context for many reasons, yet to my knowledge there has been no national study of socioeconomic status, relationship context and dual protection. First, over a third of all the people living with HIV in Latin America and the Caribbean live in Brazil and women are a growing demographic in Brazil's HIV epidemic; the male to female ratio of new HIV infections fell dramatically from 26.5:1 in 1985 to 1.5:1 in 2006 (MOS 2008). Heterosexual transmission in stable relationships plays an important role in the spread of the HIV epidemic (Parker 2000; MOS 2008). Moreover, the HIV and unintended pregnancy syndemic in Brazil disproportionately affect women in the lower socioeconomic segments of society. Second, the comprehensive condom use promotion in Brazil coupled with a lack of comprehensive family planning for decades makes it a compelling context to study how condom use and contraception overlap. Female sterilization is still one of the most popular contraceptive methods in Brazil, especially among poor, black women. Third, there is an overall lack of studies in Latin America and Brazil that consider socioeconomic status, fertility, and the relationship context when elucidating mechanisms to explain condom use, contraception, and dual method use behaviors.

Specific Aims

The overarching goal of this study is to understand how women in Brazil use dual protection through condom use and dual method use. I apply a health disparities framework, the

theory of gender and power, and the concept of women's empowerment to elucidate how socioeconomic status, early sexual risk experiences, fertility, and relationship context explain dual protection in women of reproductive age in Brazil. Specific aims, research questions, and hypothesis are:

The primary goals of the proposed study are to: 1) Describe the level of consistent condom use among women in Brazil (e.g. in the general population, dual methods users, and in sterilized women); 2) To examine how socio-demographic factors, early sexual risk, fertility, and relationship context affect dual protection among women in Brazil (e.g. in the general population, dual methods users, and in sterilized women); and 3) To examine the indirect effects of socio-demographic factors, early sexual risk, and fertility on condom use and contraception among women in Brazil (e.g. in the general population, dual methods users, and in sterilized women).

Specific Aim 1: To examine how socio-demographic factors, early sexual risk, fertility, and relationship context affect consistent condom use.

Research question:

1) Are socio-demographic factors significantly associated with consistent condom use?

   Hypothesis 1: Socio-demographic factors correlated with high socioeconomic status will be associated with greater odds of consistent condom use than low socioeconomic status.

   *Note: Socio-demographic factors correlated with high socioeconomic status are: High educational attainment, white race, formally employed, greater monthly income, and living in urban, south/southeast regions of Brazil.

2) Is early sexual risk associated with consistent condom use?

Hypothesis 2: Early sexual risk (no condom or contraceptive use at sexual debut) will be associated with lower odds of consistent condom use than no early sexual risk.

3) Are fertility desires associated with consistent condom use?

Hypothesis 3: Desire to have children will be associated with lower odds of consistent condom use than no desire to have children.

4) Are factors of relationship context associated with consistent condom use?

Hypothesis 4: Marriage will be associated with lower odds of consistent condom use than civil union.

Hypothesis 5: Heterogamous partners will have lower odds of consistent condom use than homogamous partners.

Hypothesis 6: Partners that communicate about family planning will have lower odds of consistent condom use than partners that do not.

Hypothesis 7: Women who are more empowered in decision-making will have greater odds of consistent condom use than women who are less empowered.

Specific Aim 2: To examine the indirect effects of socio-demographic factors, early sexual risk, and fertility (as mediated by relationship context factors) on consistent condom use among women in relationships.

Research question:

5) Is the association between socio-demographic factors and consistent condom use mediated by relationship context factors?

Hypothesis 8: The association between socio-demographic factors and consistent condom use will be partially mediated by relationship context factors.

6) Is the association between early sexual risk and consistent condom use mediated by relationship context factors?

Hypothesis 9: The association between early sexual risk and consistent condom use will be partially mediated by relationship context factors.

7) Is the association between fertility and consistent condom use mediated by relationship context factors?

Hypothesis 10: The association between fertility and consistent condom use will be partially mediated by relationship context factors.

Specific Aim 3: To consider aims (1 – 2) among dual method users in order understand consistent condom use in light of the competing risks of HIV/STI and pregnancy prevention.

Research question:

All research questions and hypotheses of the sub-group analysis of dual method users are the same with the exception of those outlined below:

8) Are socio-demographic factors significantly associated with consistent condom use in dual methods users?

Hypothesis 11: Socio-demographic factors associated with high socioeconomic status will be highly correlated with consistent condom use in dual method users.

9) Are factors of relationship context associated with consistent condom use in dual methods users?

Hypothesis 12: Single or separated relationship status will be highly associated with consistent condom use in dual method users.

Hypothesis 13: Partner communication around family planning will not be associated with consistent condom use in dual method users.

10) Is the association between socio-demographic factors and consistent condom use mediated by relationship context factors in dual method users?

Hypothesis 14: The association between socio-demographic factors and consistent condom use will not be mediated by relationship context factors in dual method users.

11) Is the association between early sexual risk and consistent condom use mediated by relationship context factors?

Hypothesis 15: The association between early sexual risk and consistent condom use will not be mediated by relationship context factors in dual method users.

Specific Aim 4: To consider aims (1 – 2) among sterilized women to better understand consistent condom use when condom use decisions are not affected by the risk of pregnancy.

Research question:

All research questions and hypotheses of the sub-group analysis of dual method users are the same with the exception of those outlined below:

12) Is the association between socio-demographic factors and consistent condom use mediated by relationship context factors?

Hypothesis 16: The association between socio-demographic factors and consistent condom use will not be mediated by relationship context factors in sterilized women.

13) Is the association between early sexual risk and consistent condom use mediated by relationship context factors?

Hypothesis 17: The association between early sexual risk and consistent condom use will not be mediated by relationship context factors in sterilized women.

*Note: Fertility desires were not measured in sterilized women.

CHAPTER 2: Background and Significance

Research on HIV in women has placed growing emphasis on the interconnections between HIV risk and fertility. This trend reflects the need to understand the bi-directional association between HIV and pregnancy prevention. On the one hand, research has shown that condom use promotion for HIV prevention has increased condom use, but has also caused a decrease in contraception use among women (Bajos, Warszawski et al. 2001). On the other hand, fertility desires inherently increase women's exposure to HIV infection through a lack of contraception and no use of condoms. Furthermore, women who are in long-term committed relationships (e.g. like marriage and civil union) are less likely to use condoms and more likely to have fertility desires, but are also at the greatest risk for HIV infection.

This bi-directional association makes the adoption of the syndemic theory to study the prevention of HIV and unintended pregnancy compelling because each co-occur, and likely interact synergistically, to contribute to an excess burden of disease in women (Singer 1994; Singer, Erickson et al. 2006; Singer 2009). Health disparities among women are evidenced in higher rates of HIV infection and a greater burden of unintended pregnancy in socially disadvantaged women both globally and in Brazil. A syndemic approach can elucidate the linkages between HIV prevention through use of condoms and the prevention of unintended pregnancy through use of non-barrier contraceptives. Additionally, a syndemic approach can identify how structural barriers, power dynamics in romantic relationships, and fertility desires may operate on different dimensions to exclusively or collectively affect HIV and unintended pregnancy prevention.

The global syndemic of HIV and unintended pregnancy in women has prompted a body of research focused on dual protection. Dual protection is defined as the simultaneous protection

against sexually transmitted infections (STIs) including HIV and unintended pregnancy (Berer 1997). Dual protection can be achieved through *single method u*se (condoms) or *dual method use* (condoms + another contraceptive method).

This chapter will describe the HIV and unintended pregnancy syndemic in Brazil using a health disparities framework. HIV prevention and fertility control are explained in the context of Brazil's National AIDS Program, history of family planning policies, and relationship dynamics; these factors have played a dynamic role in shaping the current contraceptive mix in Brazil. Dual method use and consistent condom use are then explained using a relationship perspective.

HIV Epidemic

HIV/AIDS has become one of the world's most serious health challenges, exacerbating social inequality and leaving an imprint in history and in public health. By the end of 2011, an estimated 34 million people were living with HIV worldwide, which translates to 8 out of every 1,000 people of reproductive age (15 to 49 years) (UNAIDS 2012). Although the social demographics of the HIV epidemic vary considerably by region and country, the overall HIV incidence (new infections) has declined by 20% since 2001 and AIDS-related deaths have declined by 24% since the peak in 2005 (UNAIDS 2012). Figure 1 shows variation in HIV incidence by region.

Although there have been sharp declines in HIV incidence in regions like Sub-Saharan Africa (25% lower than in 2001) and the Caribbean (42% lower than in 2001), HIV incidence has declined only modestly in Latin America (10% lower than in 2001). In 2011, there were an estimated 1.4 million people living with HIV and 83,000 new HIV infections in Latin America (UNAIDS 2012). Over a third of all people living with HIV in

Latin America and the Caribbean live in Brazil, which is estimated at 490,000 people and an 18,000 new HIV infections every year (UNAIDS 2011).

Brazil now has a concentrated HIV epidemic, which means that more than 5% of people in behavioral risk groups have HIV and less than 5% of women undergoing prenatal care have HIV (Biehl 2004). Brazil has a stabilized prevalence of 0.3% after over two decades of aggressive efforts by the Brazilian government and civil society to curb the growth of HIV (UNAIDS 2011) . Mother-to-child transmission accounts for approximately 3% of all HIV/AIDS cases in Brazil and the overall prevalence of new HIV infections among pregnant women is 0.41% (Szwarcwald and Souza-Junior 2006). HIV has been reported in all of Brazil's five regions, but the geographic distribution is concentrated in the Southeast (59% of all HIV/AIDS cases), the South (19%), and the Northeast (12%) (MOS 2010). Figure 2 is a map of HIV incidence in Brazil in 2009. Even though the epidemic has largely stabilized, HIV/AIDS prevalence and incidence continue to rise in the Northeast region and in vulnerable populations including men who have sex with men, injection drug users, and the urban poor (Dourado, Veras et al. 2006). Furthermore, heterosexual transmission of HIV is the primary mode of transmission of HIV in Brazil (Figure 3) (Berkman, Garcia et al. 2005).

Feminization of HIV

Over the past decade, there has been a strong trend toward the feminization of the HIV epidemic. By the end of 2009, slightly more than half of the estimated 33.3 million adults with HIV were women (UNAIDS 2010). Most HIV infections in women are through heterosexual transmission and more than 80% of new HIV infections occur in women in committed relationships (e.g. married or in a long-term relationship) (UNAIDS 2010).

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The feminization of HIV is attributed to women's heightened physiological and social risk. Physiologically, women are at a greater risk of acquiring HIV through heterosexual transmission than men. The risk of HIV transmission from men to women is from two to eight times greater than from women to men (Padian, Marquis et al. 1987; Padian, Shiboski et al. 1991; Nicolosi, Leite et al. 1994; Royce, Sena et al. 1997; Mastro and Kitayaporn 1998). This heightened biological risk for women is due to at least five phenomena. First, women physiologically have a greater mucosal surface area exposed during sexual intercourse than men. Second, women are more likely than men to have asymptomatic sexually transmitted infections, like Gonorrhea or Chlamydia, that they are unaware of; if left untreated will heighten their susceptibility to HIV infection (Wasserheit 1992; Cohen 1998; Moench, Chipato et al. 2001). Third, fluctuations in hormone levels during pregnancy and postpartum can increase a women's susceptibility to HIV (Lavreys, Baeten et al. 2004; Quinn and Overbaugh 2005). Fourth, women who use hormonal contraception or other modern non-barrier methods are less likely to also use condoms as a barrier method which puts them at greater exposure and risk for HIV infection (Ku, Sonenstein et al. 1994). In addition, hormonal contraception (like Depo-provera, Norplant, and oral contraceptive pills) are thought to significantly thin the vaginal epithelium leading to an increased susceptibility to HIV (Martin, Nyange et al. 1998; O'Farrel 2001). Fifth, women are generally physically smaller than men, are thus more susceptible to a man's threat of physical violence, coercion, and/or forced sex than vice versa; this could increase their HIV risk through various mechanisms including lowering the chance of condom negotiation and use, having the frequency and type of sex dictated to them, and enduring vaginal/anal trauma during rough sexual intercourse. Lastly, young women are more

susceptible to HIV transmission than older women because of the developmental

physiology of the cervix. Young women have a larger cervical area covered by ectropion,

a fragile, thin, and highly vascularized epithelium which compromises the mucosal barrier

that normally protects women against sexually transmitted infections like HIV (Moscicki,

Ma et al. 2001).

Like most countries affected by HIV, the epidemiological profile of HIV in Brazil

has dramatically become feminized. To exacerbate women's heightened physiological risk

of HIV, social and gender norms instill and perpetuate barriers to HIV education,

economic independence, sexual empowerment, partner communication and negotiation,

and condom use. Since 1993, heterosexual transmission has largely fueled the epidemic

and HIV spread beyond the confines of urban areas to all the geographic regions of Brazil,

infecting a disproportionate number of women (Bastos, Nunn et al. 2009). The

feminization of HIV in Brazil has steadily progressed throughout the years. The male to

female ratio has changed from 40:1 in 1983 to 6:1 in 1990, to 3:1 in 1996, and then to

1.6:1 in 2009 (Figure 4) (Biehl 2004; MOS 2009). Most new HIV cases in women are

among women of reproductive age (83%) and nearly all women acquire HIV through

heterosexual transmission with partners in a committed relationship (96%) (Parker 2000;

Oliveira, Kerr et al. 2007; MOS 2008).

Social disparity in HIV

HIV in Brazil is growing among the most socioeconomically disadvantaged segments of

society. Brazil has one of the most inequitable societies in the world. In 2005, 50% of Brazil's

national income was controlled by the richest 10% of the population, whereas less than 1% was

controlled by the poorest 10% (Bastos, Nunn et al. 2009). Growth of the HIV epidemic reflects

this inequality. Although the epidemic is still concentrated in large, urban centers of Brazil, the incidence rate of HIV in smaller cities is growing at a much faster rate (Szwarcwald, Bastos et al. 2000; Bastos, Nunn et al. 2009).

The HIV epidemic in Brazil has disproportionately spread in individuals with low levels of education. Over the last two decades, the proportion of new HIV cases has grown among unemployed and unskilled workers (Bastos, Nunn et al. 2009). Further, HIV incidence has exploded in individuals with an elementary school education or less. In 1985, almost 70% of all HIV/AIDS cases were in individuals who had either finished high school or had a college education whereas, in 2002, almost 70% of HIV cases were illiterate or had finished only elementary school (Figure 5) (Berkman, Garcia et al. 2005).

Racial and ethnic disparities in HIV persist in Brazil. HIV in Brazil is also growing faster amongst blacks than whites; the ratio of whites to blacks living with HIV decreased for men from 17:10 in 2001 to 12:10 in 2007, and for women from 16:10 in 2001 to 11:10 in 2007 (MOS 2008). The rapid growth of HIV in women in socioeconomically disadvantaged groups of society requires a nuanced approach to HIV risk and vulnerability.

HIV Prevention and Treatment in Brazil

Unlike many countries, especially in Latin America and the Caribbean, Brazil undertook an aggressive approach to HIV prevention early on. Within a few years, Brazil's early and aggressive response to the HIV epidemic had reduced the AIDS-related morbidity and mortality by half of what had been forecasted, gaining international acclaim for their success (Marins, Jamal et al. 2003; Okie 2006). The Brazilian response to the HIV epidemic can be divided into two phases: the first phase can be characterized by grass-roots activism and the second phase can be characterized by governmental action and treatment (Okie 2006; Nunn, Fonseca et al. 2009)

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The first phase of the Brazilian response to the HIV epidemic (late–1980s to mid–1990s) coincided with Brazil's transition from a repressive military dictatorship to a national democracy. In 1988, Brazil's constitution declared universal healthcare a "right of all and the duty of the state." Using momentum from the universal healthcare movement, AIDS activist groups demanded a national response to AIDS (Okie 2006). AIDS activist groups and non-governmental organizations (NGOs) organized the campaigning for and the development of HIV prevention strategies for vulnerable populations like men who have sex with men, sex workers, and intravenous drug users (Bastos, Nunn et al. 2009). Eventually, the AIDS activist groups and NGOs gained support from and formed alliances with the Brazilian government, the churches, union officials, and health advocates.

Since the early 1990s, the Brazilian AIDS Program and Ministry of Health has maintained close alliances with AIDS activist groups and NGOs and has provided core funding to them for HIV prevention activities. Mass media campaigns using radio, television, and newspapers have raised awareness of HIV transmission. These campaigns have aimed to decrease the stigma against people living with HIV/AIDS and are among the most explicit of any governmental campaign in the world (Bastos, Nunn et al. 2009). Targeted education brings sex education and condom use literacy to schools. Condoms are widely distributed and condom use is strongly promoted. There has been significant governmental support for targeted community-based HIV prevention programs (Berquo, Souza et al. 2000; Berkman, Garcia et al. 2005).

The second phase of the Brazilian response to the HIV epidemic began in 1996 with the passing of a federal law that guarantees universal access to antiretroviral treatment; the results were dramatic. From 1996 to 2002, the AIDS-related mortality in Brazil fell to 50% and AIDS-related hospitalizations fell by 80% (Okie 2006). However, the success of universal antiretroviral

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treatment came at a prohibitive cost for the Brazilian government, who between 1997 and 2005 had spent $3.5 billion in their AIDS response, of which $2 billion was for antiretroviral treatment alone (Okie 2006). Although a very politically divisive move, in 2001, Brazil began to domestically produce generic antiretroviral medicines, reducing the annual cost of antiretroviral therapy from an average of $6,240/patient (1997) to $1,336/patient (2004) (Okie 2006; Nunn, Fonseca et al. 2009). By the time universal antiretroviral therapy was introduced in Brazil, the HIV prevention efforts to educate people and to promote condom use had already began to show signs of reduced HIV incidence and a controlled HIV epidemic (Okie 2006); timing that sets Brazil's HIV prevention program apart from other programs in the world.

Condom promotion remains a sturdy backbone of HIV prevention efforts in Brazil, especially in adolescents and women (Miranda, Figueiredo et al. 2011). In 2008, the Brazilian Ministry of Health provided states and municipalities with 19.5 million condoms for free distribution. In addition, condom use social marketing campaigns gear up each carnival with a new condom use slogan that embraces sexual culture and encourages HIV prevention. For example, in 2008, the condom use slogan was, '*Be good in bed, use a condom*' (Miranda, Figueiredo et al. 2011). Free condoms are often distributed with other cleaver prevention tactics, for example, in 2008 100,000 temporary tattoos were handed out with the slogan '*I've got attitude. I use condoms*' (Miranda, Figueiredo et al. 2011); this not only normalizes condom use behavior, but also may help casual sex partners overcome barriers condom negotiation.

The extensive HIV prevention knowledge and condom literacy in Brazil provides a complex context to study condom use as dual protection against HIV and unintended pregnancy. Although condom use is not explicitly framed with a dual protection lens in Brazil, several studies with small samples of the population acknowledge that condoms offer dual protection

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while other contraceptive methods do not. For example, in a nationally representative study of women of reproductive age, 90% of the women sampled reported that condoms are used to protect against both pregnancy and sexually transmitted infections like HIV (Brasil 2008). In a qualitative study in the Northeast, Brazilian youth mentioned that condoms offer dual protection against pregnancy and sexually transmitted infections (Juarez and LeGrand 2005). Furthermore, women living with HIV in Brazil have made clear distinctions between barrier methods and other contraceptive methods (da Silveira Rossi, Fonsechi-Carvasan et al. 2005).

Despite evidence that suggests that Brazilians may understand that condoms provide dual protection, to my knowledge there has been no national study to examine dual protection in the context of how condom use overlaps with the use of other contraceptive methods. Furthermore, there are only a few studies that consider how social disparities may affect condom use and HIV prevention. In addition to a compelling HIV climate, Brazil has struggled to provide comprehensive family planning as part of its social health care system, leading to a large unmet need for family planning and exacerbated levels of unintended pregnancy and abortion.

Unintended Pregnancy and Abortion

Unintended pregnancy is one of the most salient and preventable public health challenges worldwide. Unintended pregnancy is defined as a pregnancy that is either mistimed or unwanted. A mistimed pregnancy occurs earlier than desired whereas an unwanted pregnancy occurs when no pregnancy was desired (Santelli, Rochat et al. 2003). Unintended pregnancy reflects a lack of access to modern contraception and results from the failure of public health systems to provide sufficient family planning healthcare. The lack of access and use of contraception to control fertility and space births are also

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influenced by romantic partners, violence, sexual abuse, and coercion (Cleland, Bernstein et al. 2006).

Unintended pregnancy is linked to adverse health outcomes for women (Santelli, Rochat et al. 2003; Gipson, Koenig et al. 2008). Unintended pregnancy is associated with increased maternal risk behaviors during pregnancy such as alcohol use, illicit drug use, and cigarette smoking during pregnancy (Kost, Landry et al. 1998; Joyce, Kaestner et al. 2000; Korenman, Kaestner et al. 2002; Santelli, Rochat et al. 2003; Sangi-Haghpeykar, Mehta et al. 2005; Gipson, Koenig et al. 2008) and negatively associated with the initiation and frequency of antenatal care visits (Weller, Eberstein et al. 1987; Eggleston 2000; Magadi, Madise et al. 2000; Marston and Cleland 2003; Gipson, Koenig et al. 2008). Furthermore, unintended pregnancy that results in birth has been associated with physical abuse and violence during pregnancy (Goodwin, Gazmararian et al. 2000), maternal depression (Lara, Navarro et al. 2006; Lau and Keung 2007; Nakku, Nakasi et al. 2007), anxiety (Najman, Morrison et al. 1991), and poor psychological health (Hardee, Eggleston et al. 2004).

Unintended pregnancy is also linked to adverse health outcomes for children (Santelli, Rochat et al. 2003; Gipson, Koenig et al. 2008). Births that result from unintended pregnancies have an increased risk of congenital anomalies, spontaneous abortion, premature delivery and low birth weight (Kost, Landry et al. 1998; Sable and Wilkinson 2000; Eggleston, Tsui et al. 2001; Gipson, Koenig et al. 2008). Children born from unintended pregnancies have lower odds of being breastfed or are breastfed for a shorter duration (Korenman, Kaestner et al. 2002; Taylor and Cabral 2002; Gipson, Koenig et al. 2008), greater odds of having stunted growth (Marston and Cleland 2003),

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and greater odds of experiencing less favorable parenting styles (Baydar 1995) compared to children born from intended pregnancies.

Rates of unintended pregnancy are greater in developing regions of the world compared to developed regions of the world. In 2012, an estimated 80 million unintended pregnancies occurred in developing countries as a result of contraceptive failure and contraceptive non-use by women who did not want a pregnancy (Singh and Darroch 2012).

The rate of unintended pregnancy is especially disconcerting in Latin America and the Caribbean (Figure 6). Compared to the overall unintended pregnancy rate among women of childbearing age worldwide (55 pregnancies per 1,000 women), developing regions are disproportionately burdened by unintended pregnancy (57 pregnancies per 1,000 women). Latin America and the Caribbean has one of the highest rates of unintended pregnancy (72 pregnancies per 1,000 women) than any other region in the world only second to Africa (Singh, Sedgh et al. 2010). When disaggregated by area of Latin America and the Caribbean, women in South America report the greatest proportion of unintended pregnancies (64% of all pregnancies) than women in Central America (43%) and the Caribbean (63%) (Singh, Sedgh et al. 2010).

Unintended pregnancy is moderate in Brazil despite the near universal use of contraception. According to the most recent national estimates, 29.7% of births in the previous five years were reported as mistimed (wanted later) and 17.8% of all births were reported as unwanted (Brasil 2008). Other studies in Brazil report that unintended pregnancy may be higher in some regions than in others. A study in the Northeast region of Brazil reports that more than 66% of women sampled report an unintended pregnancy

(Coelho, de Souza Andrade et al. 2012). Similarly, a population-based survey in the Southern region of Brazil found that 65% of women had experienced an unintended pregnancy (Prietsch, Gonzaez-Chica et al. 2011). High levels of unintended pregnancy reflect low control over fertility and an unmet need for contraception.

Half of all unintended pregnancies in the developing world end in abortion. Of the 80 million unintended pregnancies in developing countries in 2012, 50% are estimated to end in abortion, 37.5% in unplanned births, and 12.5% in miscarriage (Singh and Darroch 2012). The prevention of unintended pregnancy is critical in contexts where women do not have access to safe and legal abortion. Most abortions that occur in the developing world (an estimated 74%, excluding China) are unsafe abortions (Sedgh, Henshaw et al. 2007). Unsafe abortions are defined as a procedure used to terminate an unintended pregnancy carried out by an unskilled provider and/or in an environment which lacks the minimal medical standard (WHO 2011). Anywhere from 17% to 53% of all unintended pregnancies in South America end in unsafe abortion each year (Barbosa, Pinho et al. 2009; Singh, Sedgh et al. 2010). Limiting women's access to safe and legal abortion comes at a cost to public health. Unsafe abortions cause an estimated one in eight maternal deaths (WHO 2011) and result in the hospitalization of an estimated five million women in the developing world each year (Singh 2006).

Unintended pregnancy in Brazil is exacerbated as a public health issue because women do not have access to safe and legal abortion (Diniz 2007). Abortion is illegal except when it is the only option to save a woman's life or if the pregnancy is the result of rape (Villela, Barbosa et al. 2012). Although it is illegal, abortion is common in Brazil. Estimates of abortion rates, however, vary by the survey technique used. According to

records from the public health system, the total number of unsafe abortions in Brazil ranges from 750,000 to 1.5 million each year (Fusco and Andreoni 2012). According to records of women with post-abortion complications interned in public health hospitals, 2.07 of every 100 women of reproductive age had an abortion in 2005 (Monteiro and Adesse 2006). The national study of abortion in Brazil, a direct survey of urban women of reproductive age, found that 15% of women reported an abortion in their lifetime; this figure ranged from 6% of women ages 18-19 to 22% of women ages 35-39 (Diniz and Medeiros 2010).

Unsafe abortion in Brazil is accessible through various means that vary substantially in their cost, safety, and effectiveness. Women can obtain an unsafe abortion through a private health care provider in a clandestine abortion clinic, which is costly at several thousand dollars, but is relatively safe and effective. The national study of abortion in Brazil reports that almost half the women they surveyed aborted with the illicit use of misoprostol (also known as cytotec), a synthetic prostaglandin that induces abortion, and then seek care at public health clinics in the event of complications. Misoprostol became popular on the black market in Brazil in the 1990s and is sold for a few hundred dollars (Barbosa and Arilha 2008). Lastly, women can also abort using teas or other less successful and more dangerous methods (Diniz, Correa et al. 2009; Menezes and Aquino 2009).

The great extent of unsafe abortion in Brazil paired with the excess morbidity, mortality, and expense caused to public health has elevated abortion to a national public health priority. Unsafe abortions caused an estimated 11.4% of all maternal mortality in 2002 (Menezes and Aquino 2009). Unsafe abortions have also been linked to

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hemorrhaging and infection in women and birth defects in infants (Menezes and Aquino 2009). The leading causes of maternal death in Brazil in 2007 were hypertensive disorders (23% of maternal deaths), sepsis (10%), hemorrhage (8%), and abortion complications (8%) (Victora, Aquino et al. 2011); unsafe abortion is associated with three of the four leading causes of maternal death. Beyond maternal mortality, obstetric complications are the second leading cause of hospital admissions for women of reproductive age (a total of 1,060,538 in 2008), second only to uncomplicated deliveries (Victora, Aquino et al. 2011).

Social Disparity in Unintended Pregnancy and Abortion

Social disparities in unintended pregnancy and abortion reflect socioeconomic inequalities in access to healthcare in Brazil. Unintended pregnancy disproportionately affects women who have a low socioeconomic status (Malarcher, Olson et al. 2010). For example, unintended pregnancy in Brazil is most common in women who are young, Black, low-income, have little formal education (e.g. less than four years), who are single, who have a high parity, and who are in less developed regions of Brazil such as the North and Northeast (Brasil 2008; Prietsch, Gonzaez-Chica et al. 2011; Coelho, de Souza Andrade et al. 2012; Fusco and Andreoni 2012). The social disparity in unintended pregnancy demonstrates persistent structural barriers to family planning health care.

Abortion, maternal mortality, and abortion-related complications also disproportionately affect women who are socially disadvantaged. Studies of abortion in Brazil find that abortion is most common among women who are young (18 to 29 years), single, and who have low levels of education (Diniz, Correa et al. 2009; Menezes and Aquino 2009; Diniz, d'Oliveira et al. 2012; Fusco and Andreoni 2012). Although abortion is equally common in women of all segments of society, maternal mortality and abortion-

related complications disparately affect socially disadvantaged women. Studies on unsafe abortion in contexts where abortion is illegal find that women with higher income and social status have greater access to illegal abortion under safer conditions than women with low income and low social status (Malarcher, Olson et al. 2010). Maternal mortality as a result of abortion-related complications disproportionately affects women who are young, black, urban, poor, and with low levels of education (Martins, Costa et al. 1991; Diniz and Medeiros 2010; Malarcher, Olson et al. 2010; Fusco and Andreoni 2012). One study found that Black women have three times greater odds of dying from an unsafe abortion than are white women (Martins, Costa et al. 1991).

Socially disadvantaged women are the most vulnerable to the syndemic of HIV and unintended pregnancy in Brazil. This highlights a need to better understand condom use and contraception among this population. In addition, relationship dynamics and gender in society play a large role at creating this social and gender disparity in HIV. In the next section, I will review Brazil's history of family planning, fertility, and contraception. I also give a context for union formation and relationship dynamics in Brazil.

Family Planning in Brazil

The dynamic political, economic, and social contexts in Brazil have shaped fertility and contraceptive choice. Brazil was under military rule between 1964 and 1985 (Correa, Piola et al. 1998). In the 1970s, Brazil's economy was in crisis with continuous cycles of inflation. As a result of a severe economic recession in the 1980s, public health expenditures dropped, health services and infrastructure deteriorated, and the provision of health care services, which focused on treatment rather than prevention, were fragmented between several public and private entities (Correa, Piola et al. 1998). Up until the mid–

1980s , family planning services and contraceptive methods were provided on a limited basis by non-governmental family planning programs (Correa, Piola et al. 1998). Figure 7 shows the various stages of political, economic, and public health care in Brazil (Victora, Aquino et al. 2011).

In 1984, in the early stages of health reform in Brazil, the Ministry of Health acknowledged the importance of basic reproductive health care and developed the National Women's Health Program (or PAISM, O Programa de Assistência Integral á Saúde Mulher). PAISM was created to be included in the basic public health network, but was implemented as a vertical (separately managed) program (Mayhew, Nzambi et al. 2001). Nevertheless, PAISM was a comprehensive program aimed to integrate pre-natal care, delivery, and post-natal care; breast and cervical cancer screening; STD care; adolescent and menopausal care; treatment of reproductive tract infections; infertility services; family planning education; and contraception counseling (Correa, Piola et al. 1998; Harmeling 1999). Despite PAISM's creation, efforts to provide comprehensive family planning, education, and counseling remained a challenge. Because PAISM was not incorporated into the public health care system (also SUS- Sistema Único de Saúde), it was implemented to varying degrees across the Brazilian municipalities (Harmeling 1999).

Since its conception, PAISM has undergone numerous revisions. With the continual decentralization of the SUS continued throughout the mid-1990s, it was clear that a vertical approach to PAISM was unrealistic (Harmeling 1999). As late as 1995, the public health services still lacked basic interventions like prenatal care, maternity care, and cervical and breast cancer screening and treatment (Harmeling 1999). As a result, PAISM was incorporated into the municipal-level primary health services provided by SUS; this

move resulted in improvements in basic interventions such as prenatal care and maternity care (Harmeling 1999). Although some of the family planning-related services had been incorporated into SUS, "important constraints in the availability of and access to family planning services and severe deficiencies in the quality of care" have still been noted (Diaz, Simmons et al. 1999).

Since then, several policies have been passed to address barriers to family planning in Brazil. In 2005, the Ministry of Health launched the National Policy on Sexual and Reproductive Rights with one of the objectives to broaden SUS's provision of reversible contraceptive methods. As a result, the Ministry of Health took on full responsibility for buying contraceptive methods for SUS users. Up until that point, the Ministry of Health was only supplying between 30% – 40% of the contraceptive methods and the state and municipalities were responsible for providing the remaining 60% – 70% (UNFPA 2008); creating gaps in contraceptive supply. In 2007, to address the persistent logistical challenges of family planning provision, the federal government of Brazil launched a National Family Planning Policy with the goal to provide free contraception and to also provide contraception at a very low cost at network pharmacies (UNFPA 2008).

Despite efforts to provide comprehensive and accessible family planning to people of reproductive age in Brazil, the SUS still faces difficulties meeting the demand for contraceptive methods with particular problems providing accessible services to lower income and isolated communities. More recent studies find persistent barriers to access to comprehensive family planning counseling in Brazil and that existing services are of low quality (Diaz, Simmons et al. 1999; Ferreira, Souza et al. 2010; Malta, Todd et al. 2010).

Fertility and Contraception

Total fertility rate is the number of children that a woman is expected to have assuming that she lives until the end of her reproductive years and that she adheres to her age-specific fertility rate. At the end of the twentieth century, the total fertility rate of Brazil dramatically dropped from a high of 6.2 children per woman in 1960 to the replacement level of 2.0 children per woman in 2006 (World_Bank 2013). The rapid rate of fertility decline in Brazil was especially noteworthy in the absence of a government-sponsored family planning program (Carvalho and Wong 1996; Martine 1996; Goldani 2001). This decline was primarily due to an increased prevalence of contraceptive methods, predominantly female sterilization, and clandestine abortion starting in the 1960s (Leone and Hinde 2005). Other factors like social development (e.g. education, employment, electricity, health, and gender equity) and relationship and family dynamics have contributed to the fertility decline to a lesser extent than female sterilization (Goldani 2001).

In the absence of a government-sponsored family planning program, women relied on nongovernmental organizations (NGOs) and the private market to supply contraceptives (Correa, Piola et al. 1998; Alves 2009). Popularity of the oral contraceptive pill grew. The number of oral contraceptive pill packs sold by NGOs and pharmacies jumped from 1.7 million in 1960 to 61.2 million in 1980 (Potter 1998). However, the lack of information and adequate screening required for pill use resulted in problems with access, contraceptive failure, and undesirable side effects. As a result, reversible methods became increasingly discredited among women (Correa, Piola et al. 1998). Female

sterilization (e.g. tubal ligation) and clandestine abortion became the leading methods for fertility control in the 1960s and 1970s (Leone and Hinde 2005).

The popularity of female sterilization grew substantially in the 1980s due to a high demand by women and to easy access provided by physicians (Leone and Hinde 2005). Sterilization first became popularized among the upper class in Brazil and later diffused to all segments of society (Goldani 2001). Sterilization was alluring to women because it was a female controlled method that offered complete fertility control without the side-effects or potential contraceptive failure associated with reversible methods (Leone and Hinde 2005). Private hospitals, contract service providers, and physicians in public hospitals played an important role in the growing trend toward female sterilization (Potter 1999; Caetano 2001). Cesarean births gained popularity (Waniez, Wurtz et al. 2006) and providers, especially in the public health system, were incentivized to practice cesarean delivery because it paid double that of a vaginal delivery (Goldani 2001). Therefore, physicians began to widely offer female sterilization at the same time as cesarean deliveries (Correa, Piola et al. 1998; Goldani 2001); this two-for-one procedure was a benefit for women because it did not require additional corporal invasion and was more cost-effective than having separate operations for delivery and sterilization (Soares and Brollo 2013).

Contraceptive use became more common among married women in Brazil increasing from 66% to 77% between 1986 and 1996, but most of the gain was in the uptake of female sterilization (Correa, Piola et al. 1998). Oral contraceptive pill use declined from 25% to 21% between 1986 and 1996. In the same period, condom use increased from 1% to 4% and male vasectomy increased from 1% to 3%. Female

sterilization became even more popular in married women increasing from 27% to 40% between 1986 and 1996 (Correa, Piola et al. 1998). Even though one of PAISM's priorities was to reduce the number of sterilizations in Brazil, the program had little impact on the popularity of sterilization.

Because of the great demand for female sterilization, in 1997 the Brazilian Congress enacted Law 9263, which for the first time legalized the practice of sterilization, but also explicitly regulated its practice (MOS 1997). The law specified that in order to request the sterilization procedure, wo-/men had a minimum 60 day waiting period, had to be at least 25 years of age, have at least two children, and if married they needed to obtain written spousal consent (Hopkins, Maria Barbosa et al. 2005). Although the law also prohibited sterilization procedures during delivery, 71% of sterilizations still occur at the time of delivery (Brasil 1996).

Female sterilization is less common than before, but it still remains a popular contraceptive method for socially disadvantaged women. With the increased availability of reversible contraceptive methods in Brazil, the proportion of women using contraception that are sterilized has decreased from 40% to 29% between 1996 and 2006 (Diniz, d'Oliveira et al. 2012). However, female sterilization is still at 39% among Black women and remains the most popular method for women with low income and less education (Diniz, d'Oliveira et al. 2012). The current disparity in women who are sterilized reflects a challenge faced by the public healthcare system in effectively integrating family planning services into primary care.

Current Contraceptive Mix

Contraceptive prevalence has increased among women reproductive age that are in union from 78% in 1996 to 81% in 2006 (Diniz 2012). The contraceptive mix among women in 2006 was: 18% no method of contraception, 27% oral contraceptive pill, 26% female sterilization, 13% condoms, 7% other methods (e.g. IUD, diaphragm, injections), 5% male sterilization, 2% coitus interruptus, and 1% periodic abstinence (Perpetuo and Wong 2006).

The social disparity in contraceptive use narrowed between 1996 and 2006, but still exists. Although a growing proportion of women of low socioeconomic class use contraception, these women still make up the majority of women who report not using any contraceptive method (Perpetuo and Wong 2006). Furthermore, the variation in contraceptive mix is still highly correlated with socioeconomic class showing that women of lower socioeconomic class have restricted access to reversible contraceptive methods and easy access to sterilization in comparison to women of higher socioeconomic class (Perpetuo and Wong 2006). The overlap between social disparity in HIV and contraceptive access gives question as to how the use of barrier methods and other contraceptives overlap, especially among sterilized women.

The popularity of female sterilization is thought to severely decrease the frequency and consistency of condom use (Villela and Barbosa 1996). A study in the Northeastern region of Brazil, that examined medical records, found that only 7% of sterilized women use condoms and an additional 68% were never asked about condom use by their health care provider (Nicolau, Moraes et al. 2011). Furthermore, although most (72%) of the sterilized women were married or in civil union, 33% reported having been recently

treated for an STI (Nicolau, Moraes et al. 2011). Women who opt for sterilization are more likely to be of low socioeconomic class and education. Condom non-use may reflect their lack of information, ability to accurately assess risk, or negotiate condoms with their partner. Although these women may have an elevated risk of contracting HIV/STI, prevention efforts have not prioritized condom promotion in this group.

Relationship factors may even further exacerbate their risk. Even though HIV is growing among women in union in Brazil, women at risk of contracting HIV/STI may not perceive a risk associated with unprotected sex because of their committed relationship status. Further, even if sterilized women were to perceive a risk of contracting HIV or a STI from their partner, it may be difficult for them to negotiate condom use because they are no longer at risk of pregnancy and condoms bring implications of relationship infidelity (Osis, Faundes et al. 1999). There is compelling evidence to promote condom use in sterilized women in Brazil, but few studies have addressed this issue.

The Dual Protection Dilemma

The global syndemic of HIV and unintended pregnancy in women has prompted a body of research focused on dual protection. Dual protection is defined as the simultaneous protection against sexually transmitted infections (STIs) including HIV and unintended pregnancy (Berer 1997). Dual protection can be achieved through *single method u*se (condoms) or *dual method use* (condoms + another contraceptive method).

Although condom use is essential to achieve dual protection, the use of a contraceptive method (other than condoms) has been shown to affect whether condoms are used and how consistently they are used (Steiner and Joanis 1993; Cooper, Agocha et al. 1999; Cates and

Steiner 2002; MacPhail, Pettifor et al. 2007); this hypothesis has been termed the *dual methods hypothesis* (Tsuyuki, Barbosa et al. 2013). Some studies have elaborated on the dual methods hypothesis to show that there is an incremental decrease in condom use associated with the increased effectiveness of the second non-barrier contraceptive.

Contraceptive effectiveness refers to how well a contraceptive method works in typical practice (real-world use) versus in clinical practice (perfect use). The most effective contraceptive methods are those with low failure rates for typical practice, which accounts for human error and behavior when using the method. On the one hand, only 0.5 of 100 of women who are sterilized end up pregnant after one year of being sterilized (Trussell 2004). On the other hand, 85% of women who use no method end up pregnant after the first year. With condom use, 15% of women would get pregnant after the first year of typical use, compared to 0.1-0.8% of IUD users and 8% of oral contraceptive pill users (Trussell 2004).

Condoms, in typical practice, are a less effective contraceptive method than the pill or female sterilization, but only because they are difficult to use correctly. Common errors made by condom users include: wanting to use a condom but not having one, not discussing condom use before sex, condom breakage or slippage, having a problem with a condom and needing another one, removing the condom before sex is over, beginning sex before condom is applied, letting condom contact sharp jewelry or fingernails, re-using a condom, using a damaged condom (Crosby, Salazar et al. 2007). Logistical use barriers to use aside, condoms are the only barrier method effective at preventing HIV and STI transmission.

As a result, some women choose to control their fertility with a more effective contraceptive method than condoms. Depending on factors like their relationship context, their perceived need to protect against HIV/STIs, and their ability to negotiate condom use, these

women may or may not pair their non-barrier contraceptive method with condoms. One can assume that with dual method use, condoms are used to protect against HIV/STIs whereas the second contraceptive method is used to protect against unintended pregnancy. Women who use both a non-barrier contraceptive method and condoms are referred to as dual method users in the duration of this text.

Dual method users who combine condoms with another user-dependent method like the pill are found to have less consistent condom use than dual method users who combine condoms with a less-demanding contraceptive method like hormonal injections (which only require an injection every few months), intrauterine devices (IUDs), and female sterilization (da Silveira Rossi, Fonsechi-Carvasan et al. 2005; Pazol, Kramer et al. 2010).

Romantic partners influence condom use and contraception. Condoms are associated with mistrust, interfere with intimacy and sensation, and couples often grow tired of using them (Rosenthal, Gifford et al. 1998; Flood 2003; Westhaver 2005; Chimbiri 2007); making them undesired in committed relationships. Studies find that, as partners transition into more committed romantic relationships, condoms are replaced with non-barrier contraception (Ku, Sonenstein et al. 1994; Chimbiri 2007). Furthermore, partners that desire to have children will eventually forgo non-barrier contraception for an extended period of time to become pregnant.

More research is needed to understand how social and contextual factors affect women's decisions to use condoms, contraceptive methods, or dual methods. Socioeconomic factors have been shown to affect access to condom use and contraception and are shown to disparately reflect trends in HIV infection and unintended pregnancy. Partner factors have been shown to influence decisions around condom use and contraceptives. Women's current and future fertility

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desires also play a key role in type of contraceptive method chosen. All of these factors affect the dynamic between condom use, contraceptive use, and dual method use.

A flaw in current dual protection studies is the inability to disentangle the competing risks of HIV and unintended pregnancy. Women and their partners who use condoms consistently are protected against both HIV and unintended pregnancy, but their motivations behind consistent condom use may relate only to STI prevention or to fertility control, and not both. A more precise approach to this dual protection dilemma would be to study dual protection behavior in samples of the population that use dual methods or are sterilized. One could make the inference that dual method users use condoms and another contraceptive method with the intention to separately prevent HIV/STIs and pregnancy. One could also make the inference that women who are sterilized are using condoms for the sole purpose of preventing HIV/STIs; therefore controlling for pregnancy prevention behavior and isolating HIV/STI prevention behavior by focusing on condom use. Doing so allows for better understanding of how partners conceptualize and use dual protection in sexual relationships. It also helps to identify the mechanisms through which socio-demographics, early sexual risk, and fertility desires affect dual protection behavior differently based on factors of relationship context.

The objective of my dissertation is to explore how women use dual protection for HIV/STI prevention and fertility control. The primary goals of the proposed study are to: 1) Describe the level of consistent condom use among women in Brazil (e.g. in the general population, dual methods users, and in sterilized women); 2) To examine how socio-demographic factors, early sexual risk, fertility, and relationship context affect dual protection among women in Brazil (e.g. in the general population, dual methods users, and in sterilized women); and 3) To examine the indirect effects of socio-demographic factors, early sexual risk,

and fertility on condom use and contraception among women in Brazil (e.g. in the general

population, dual methods users, and in sterilized women).

CHAPTER 3: Theoretical Framework and Conceptual Model

Theoretical Framework

This dissertation aims to explain variation in condom use and contraception by examining the influence of both individual and relationship characteristics. The conceptual model guiding this research integrates key components from the theory of gender and power and social exchange theory. The central hypothesis of the current study is that socio-demographics and interpersonal relationship dynamics will condition a women's choice of condom use, contraception, or dual methods.

Theory of Gender and Power

The Theory of Gender and Power is a social-structural theory that explains the relationship between gender and social inequities (Connell 1987). This theory posits that three social structures work in society to place women in a subordinate position relative to men: 1) the sexual division of labor, 2) the sexual division of power, and 3) the structure of relationship and affective attachment (Connell 1987; Wingood and DiClemente 2000). The theory of gender and power is useful in highlighting the social processes and power differentials that put women at greater social risk of HIV infection than men (Noar, Benac et al. 2007). According to the theory, inequalities in education, employment, and income; an imbalance in power between men and women; and social norms about family, sexuality, and romantic relationships work to disadvantage women's status in society and in romantic relationships (Wingood and DiClemente 2000). This dissertation will draw on the sexual division of power to explain how interpersonal power dynamics in a romantic relationship affect a women's ability to use condoms and contraception.

Social Exchange Theory

The Social Exchange Theory is a psychosocial theory that relates interpersonal power and dominance to decision-making in a relationship (Emerson 1962; Blumberg and Coleman 1989; Giles-Sims and Crosbie-Burnett 1989; Cook and Whitmeyer 1992). Social Exchange Theory situates interpersonal power as an integral component of a relationship and conceptualizes interpersonal power as the balance of power between two partners (Emerson 1972; Pulerwitz, Gortmaker et al. 2000). Interpersonal power can be further conceptualized into three components of power: the sources of power (e.g. education, income, social status, physical attractiveness; level of commitment); the processes of power (e.g. persuasion, assertiveness; negotiation); and the outcomes of power (e.g. control in a relationship and decision-making power) (French and Raven 1959; Cromwell and Olson 1975; Raven 1992). The partner who brings greater relative resources to a relationship is considered to have more bargaining power. This study will measure sources of power with relationship asymmetry, processes of power with communication, and outcomes of power with decision-making measures.

Women's Empowerment

The concept of women's empowerment is considered one of the key elements in promoting and measuring global gender equity (Malhotra and Schuler 2005). Women's empowerment refers to "processes that strengthen a woman's ability to formulate strategic choices and control resources and decisions that affect important life outcomes" (Malhotra and Schuler 2005; Leon 2013). Research on women's empowerment has generated a body of literature that addresses gender power imbalances in various dimensions of women's lives that impact sexual and reproductive health (Leon 2013).

What makes women's empowerment such a powerful concept is the use of French and Raven's (1959) components of power (e.g. sources of power, processes of power, and outcomes of power), the multidimensional spheres of empowerment, and the context-specific constructions of empowerment. Having the agency and resources to be autonomous are two defining characteristics of women's empowerment (Lee-Rife 2010). When women have agency, they able to define and act upon their goals, whereas when women have resources they are able to exercise this agency (Kabeer 1999; Malhotra and Schuler 2005; Lee-Rife 2010). Resources of women's empowerment include sources of power like education, employment, income, and social status. This study will use the concept of women's empowerment to interpret the effects of these sources of women's empowerment on relationship dynamics, condom use, and contraception.

The concept of women's empowerment is also multidimensional in nature, occurring in the economic, interpersonal, political, sexual, and socio-cultural dimensions, among others (Malhotra and Schuler 2005). While a woman may be empowered in one dimension of her life, she might not be empowered in the other dimensions (Gutierrez, Oh et al. 2000; Pulerwitz, Gortmaker et al. 2000; Williams 2005; Lee-Rife 2010; Crissman, Adanu et al. 2012). Therefore, women's empowerment can be measured at various levels (i.e. household, community, broader arenas) and dimensions. One common measure of women's empowerment is the household decision-making scale, which measures women's ability make decisions regarding her freedom of movement, agency in household purchases, and ability to access healthcare; this operationalization measures women's empowerment across socio-cultural, economic, and interpersonal dimensions.

Definitions of what women's empowerment entails are context-specific (Malhotra and Schuler 2005). In Brazil, two perspectives of how women's empowerment is defined stand out

from conversations with feminists, academics, and grassroots organizers (Sardenberg 2010).

First, women's empowerment has been associated with local understandings of *poderosas* (the powerful woman), the *batalhadora* (the fighting/struggling woman), and the *destemida* (the fearless woman). Empowered women are those who, despite their struggles and against all odds, manage to leverage their inner strength to succeed (Mosedale 2005). One woman (a female grassroots activist) stated, "I think women's empowerment has to do with the *mulher batalhadora*, that woman who has the strength to fight. Like my mother, who raised five children working as a laundress, and all of us have a diploma." Second, the notion of women's empowerment has been associated with women's autonomy. Another woman stated:

> "I believe the empowerment of women is about autonomy, for the woman to have power over the decisions she needs to make and not to let machismo take over. So, for example, at home when I was invited to come to this seminar, my husband asked me if I had asked permission to go and I said no. It is not like you are my dad. I don't need to ask, I am informing you that I am going" (Sardenberg 2010).

Definitions of women's empowerment in Brazil, thus, reflect two aspects of women's empowerment. Women who are resilient to impoverished circumstances and prevail are thought to be empowered. Also, women who are autonomous in their freedom of movement and decision-making are considered empowered. In this study, women's empowerment will be used to interpret the effect of socioeconomic conditions and relationship power dynamics on women's use of contraception and condom use.

Conceptual Framework

The conceptual model used for this study is shown in Figure 8. The conceptual model integrates key components from the theories discussed above to describe the importance of structural context, individual characteristics, and relationship context in conditioning dual

protection behavior. The conceptual model emphasizes that individual factors work directly and indirectly (through relationship context) to influence dual protection behavior.

The conceptual model demonstrates that the structural context, established by gender, health disparities, and social context, frames an individual's dual protection behavior as well as their behavior within the context of a relationship. The structural context directly influences the relationship context by establishing norms of relationship status, partner heterogamy, decision-making power, and partner communication. The structural context also determines access to HIV prevention and family planning services and therefore directly influences dual protection behavior. Although the structural context is not measured in this study, it is described in order to contextualize individual and relationship factors in this study.

Individual factors like socio-demographic characteristics, early sexual risk experiences, and fertility are posited to directly influence relationship context and dual protection behavior. Individual factors not only influences a person's preference for a certain contraceptive method, it also affects their access to certain methods, ability to assess HIV, STI, and pregnancy risk, and ability to negotiate use of a certain method with their sexual partner. Furthermore, socio-demographic background, early sexual risk experience, and fertility condition the type of relationship and power dynamic a person seeks.

Relationship context is posited to directly frame dual protection behavior. Relationship status is directly correlated with condom use behavior and also frames the context in which partners assess HIV/STI risk, build intimacy and trust, and decide to bear children or contracept.

Structural Context

Recognition of women's structural disadvantage has been the one of the most powerful and lasting contributions of the vulnerability model (Farmer, Connors et al. 1996).

Gender

Social norms work to define and reinforce ideals of femininity and masculinity, to produce cultural norms, and to enforce gender roles in society. From childhood to adulthood, societal messages about how males and females are supposed to behave are passed to individuals from their families, social networks, and social institutions (Pulerwitz, Michaelis et al. 2010). Individuals interpret, internalize, and reconstruct these gender norms to define their own, personal world view. Often times, these behavioral norms instill and reinforce unequal gender roles and responsibilities, which can engender behaviors that place women and their partners at risk of HIV, STIs, and unintended pregnancy (Pulerwitz, Michaelis et al. 2010).

Behavioral norms for men sharply contrast those for women (Gupta 2002). For men, for example, behavioral gender norms may include initiating sexual activity early in life, having multiple partners, acting knowledgeable about sex and disease prevention, and controlling their partner even when violence is required (Pulerwitz, Michaelis et al. 2010). The same behavioral gender norms that "put in men in a position of sexual dominance also limit women's ability to control their own reproductive and sexual health" (Pulerwitz, Michaelis et al. 2010). For women, behavioral gender norms include delaying sexual activity until marriage, being sexually inexperienced and naïve, taking a sexually passive role, and deferring their partner's desires. This gender-based double standard is present in Brazilian society and perpetuated by family, social networks, and the media.

Sexuality and gender norms in Brazil are deeply rooted in the "legacy of patriarchal authority in Brazilian history," and continue to shape gender and sexual life (Parker 2009). *Brasilidad*e, or Brazilianness, is encompassed by a sensual and seductive ethos rooted in the colonial period where the plantation's *casa-grande* gave birth to concubines, mistresses,

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legitimate and illegitimate children, and a hierarchical structure of patriarchal authority and

domination (Parker 2009). Using one of the most culturally significant texts of Brazil, Gilberto

Freyre's *Casa-Grande e Senzala*, Parker interprets the patriarchal origins of gender in Brazil:

> The *homen* (man) and the *mulher* (woman), and by extension, the very concepts of masculinity and femininity, were thus defined in terms of their fundamental opposition, as a kind of thesis and antithesis. With power invested entirely in his hands, the *homen* was characterized in terms of his superiority, his strength, his virility, his activity, his potential for violence and his legitimate use of force. The *mulher*, in contrast, was defined in terms of her obvious inferiority, as in all ways the weaker of the two sexes – beautiful and desirable, but nonetheless subject to the absolute domination of the patriarch….Assured, through his unquestioned domination, of his fundamental physical and moral superiority, the *homen* enjoyed an almost absolute sexual freedom. (page 32).

The sexual moral double standard permeated all aspects of daily life and sharply

differentiated the male and female spheres within the patriarchal family (Parker 2009). The man

was granted complete sexual freedom, whereas the woman was only allowed to have sex with

her husband to conceive and raise their children. The man's domain was being economically,

politically, and socially active in public, whereas the woman's domain was being inactive at

home. The sons were subjected to early sexual initiation to encourage and affirm masculinity,

whereas the daughters were subjected to strict control to protect her *virginidade* (virginity), her

father's *honra* (honor), and to be used as a commodity for exchange under the patriarchal system

(Parker 2009). Although gender and sexuality in Brazil have evolved substantially, "a lingering

vision of patriarchal life nonetheless remains and must still be confronted as at least one

important foundation for contemporary Brazilian thought" (page 35) (Parker 2009).

The sexual double standard of masculine activity and feminine passivity are reflected in

common terms used to describe male and female sexual parts and sexual roles (Parker 2009). In

Brazilian Portuguese, the most commonly cited terms to describe the penis symbolize aggression

and violence and include words like: *pau* (stick), *cacete* (club), *faca* (knife), and *cobra* (snake)

(Parker 2009). In contrast, in Brazilian Portuguese, the most commonly cited terms to describe the vagina symbolize inferiority, incompleteness, and contamination, and include words like: *buceta* (a box or receptacle), *buraco* (hole), *chochota* (from chocar, to become dry, weak, or insipid), *gruta* (cave), carne *mijada* (urine covered meat), *boca de baixo* (mouth underneath), and *baratinha* (small cockroach) (Parker 2009).

In Brazilian Portuguese, words used to describe sexual interaction also reflect the active male role and the passive female role. Words such as *comer* (to eat), *foder* (to fuck), *vencer* (to conquer), and *possuir* (to possess or to own) describe the male sexual act of penetrating in terms of taking possession and asserting ownership. Words such as *dar* (to give), *entregar* (to deliver), *abrir as pernas* (to open one's legs) describe the female sexual act of being penetrated in terms of giving and offering to be taken or possessed (Parker 2009). These terms "encode in a sexual idiom a system of cultural values, a set of social relationships" that play a crucial role in the social constructions of gender and sexual relations between men and women in Brazil (Parker 2009).

More current research on gender and sexuality in Brazil has identified the lingering effects of patriarchal gender norms, although modern representations of gender have also arisen. The active male and passive female discourse was present in an altered form in interviews and focus groups with low-income Brazilian women (Goldstein 1994). Women portrayed men as the sexually active "transgressors" and portrayed themselves as the "boundary-setters" when it came to sex; setting boundaries as to how far they would go sexually.

The importance of virginity still exists. In Goldstein's (1994) discourse analysis, women admitted to feeling strong pressure from their family and boys their age to remain a virgin until marriage in order to protect their (and their family's) honor. Adolescent women in the Northeast

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also report that losing their virginity could come with negative social consequences from their friends, neighbors, and other boys their age. These negative social consequences include being the target of gossip, being pressured by boys to have sex, and neighbors restricting their daughters from playing with them (Goldstein 1994). Furthermore, it was found that young people resort to anal sex in order to preserve a girl's virginity and to avoid pregnancy; anal sex is associated with greater risk for infection through more tears compared to vaginal sex.

There is also still value placed on women being sexually inexperienced and playing up their naïveté about sex. When reflecting on their first sexual experience in focus groups, women portrayed themselves in light of innocence and exaggerated their inexperience and fear when having sex for the first time, emphasizing that they were inexperienced and had not control over their sexual lives (Goldstein 1994). Female innocence (and male experience) very much embraces gender in Brazil at the cost of condom use negotiation. Gender norms dissuade women from buying or carrying condoms because of the implication that they intend to have sex and the risk that they are labeled as "promiscuous" (Pulerwitz, Barker et al. 2006). Furthermore, young boys and men in Brazil who subscribe to unequal gender norms had greater odds of experiencing an STI symptom, using less contraception, and being a perpetrator of physical and sexual violence against their romantic partner (Pulerwitz, Barker et al. 2006).

Data from open-ended interviews with over 500 Brazilian youth ages 14 to 20 confirm the existence of conservative gender norms in Sao Paulo, Brazil. The female participants described that being a woman meant "being dedicated to love and home life, keeping away from certain places, using moderate language, being fragile and crying easily, controlling their impulses, and keeping themselves for the right men" (Paiva 1993). The female participants described that men are "naturally aggressive, have no control, do what they want to do, think

only about sex, want to take advantage of women, and are more suited to heavy work and to street life" (Paiva 1993). The male participants described being a man as "behaving and speaking like a man, being strong and thinking a lot about sex, having fun…playing ball, catching a woman" (Paiva 1993). It is noteworthy that the males also said they "would like to marry a virgin, but they do not believe there are many virgin women left" (Paiva 1993). Furthermore, the males considered pregnancy to be a woman's problem.

The large geographic area of Brazil creates a highly complex socio-cultural environment in which modern day gender in Brazil ranges from representations of patriarchal authority (e.g., abortion is illegal and women need husband's permission to be sterilized) to modern day feminism and egalitarian sexual relations (e.g., Dilma Roussef is the first female president). The extent to which conservative gender roles are engrained in a woman's self-identity and sexuality is dependent on their exposure to conservative, cultural norms. In larger country contexts, micro- and macro-regions are formed which serve to isolate and perpetuate the social gender norms specific to that region (Barker 2000). Urban areas sustain a plethora of social norms, socioeconomic classes, individualistic self-expressions, and outward social and sexual deviance. Therefore, women in urban centers would be exposed to a wider world view and perhaps more liberal gender roles.

Gender norms that are developed in the structural context permeate every level of behavior in the conceptual model. Gender norms directly influence women's early sexual experience, ideals about and control of fertility, and her ability to become socioeconomically independent. Gender norms also form the power dynamic between partners, shaping how partners have expectations based on relationship status, socially pair with each other, and

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communicate and make decisions in their relationship. Furthermore, gender norms directly influence behaviors associated with condom and contraceptive use.

Health Disparities

The definition of a health disparity/inequality is a "particular type of difference in health or in the most important influences on health that could potentially be shaped by policies; it is a difference in which a disadvantaged social group or groups (such as the poor, racial/ethnic minorities, women, or other groups that have persistently experienced social disadvantage or discrimination) systematically experience worse health or greater health risks than more advantaged groups" (Braveman 2006). Using a health disparities framework, indicators of social advantage or disadvantage include measures of income, education, ethnic group or gender (Braveman 2006).

HIV and unintended pregnancy are framed in this study as syndemic health disparities in Brazil. Socially disadvantaged women are the most likely to experience both HIV infection and the negative consequences of unintended pregnancy. The following literature review will explain how gender and social context in Brazil influence women's individual characteristics, relationship characteristics, and dual protection behavior.

Individual

Socio-demographics

Socioeconomic inequity has had a decisive impact on the spread of HIV in Brazil (Grangeiro, Parker et al. 1994; Fonseca and Bastos 2007). Socioeconomic status is an important indicator of socialization into mainstream society and access to information, resources, and services. Socioeconomic status directly conditions an individual's access to information about

modes of HIV and STI transmission, access to resources (i.e. money for condoms) to prevent transmission, and access to services to get tested and treated for infections (UNAIDS 2012). Despite great efforts to disseminate HIV prevention information in Brazil, individuals with low socioeconomic status have less knowledge about forms of HIV transmission and prevention and are more vulnerable to HIV infection than those with higher socioeconomic status (Szwarcwald, Barbosa-Junior et al. 2005; Szwarcwald, Carvalho et al. 2005). Mass media campaigns, although widespread and cleaver, may fall short at reaching individuals with low socioeconomic status. Some have cited that condom use campaigns use inaccessible language and portray condom use as important only during the carnival season (Garcia and Souza 2010). In addition, sex has been constructed as one of life's free pleasures for people of low socioeconomic status. A qualitative study of women quotes that "poor people have nothing in life to begin with, so if you can't have sex, forget about it! The only pleasure poor people have is in bed, so if you can't do it, that's no life!" (Hebling and Guimaraes 2004). Furthermore, socioeconomic status measures, like women's educational attainment, race and ethnicity, and income and wealth also affect access to information, resources, and services (i.e. HIV testing) (Garcia and Souza 2010).

High educational attainment is consistently linked to greater access to information, resources, and the ability to prevent HIV and unintended pregnancy. In Brazil, women with low educational attainment are at greater risk of HIV infection and unintended pregnancy through various individual and partner-related mechanisms that are unfavorable to condom use and contraception (Calazans, Araujo et al. 2005; Fonseca and Bastos 2007; Paiva, Calazans et al. 2008; Garcia and Souza 2010; Miranda, Figueiredo et al. 2011). First, through educational attainment, women gain literacy, become socialized, and are exposed to school-based HIV programs and condom use campaigns. With this exposure, women have greater knowledge of

modes of HIV transmission and prevention, become aware of the family planning and HIV services available to them, and have a greater self-efficacy to use condoms and contraception (UNAIDS 2012). Literacy also broadens access to media-based (i.e. internet, tv, etc) information about their cycles of fertility, the range of contraceptive methods available to them, and HIV prevention (Fonseca and Bastos 2007). Second, education is linked to a greater potential to participate in the paid labor market and more access to capital and human resources. These additional resources can be used to buy condoms and contraception and can grant women with greater bargaining power in a relationship as well. Third, the literacy, socialization, and power associated with educational attainment may affect relationship power dynamics. Women with a less than average education have been found to begin their sexual life at an earlier age, have more sexual activity (and thus greater exposure to HIV and STIs), and have more casual sexual partners (Fonseca and Bastos 2007; Garcia and Souza 2010). In addition, women with low educational attainment frequently cite an inability to communicate with their partners about difficult issues and consistently report frustrated attempts to successfully negotiate condom use (Fonseca and Bastos 2007; Garcia and Souza 2010).

Race and ethnicity is an important measure of socioeconomic status and is associated with condom use behavior in Brazil, especially among women. In general, black women in Brazil report lower socioeconomic status (lower educational attainment, lower per capita family and individual income, and more impoverished living conditions) than non-black women (Lopes, Buchalla et al. 2007). Although the high frequency of interracial relationships in Brazil has been portrayed as an example of the country's color-blind democracy, racial mixing often times is a product of the eroticization of the poor, black, female body by white men (Goldstein 1999; Quiroga 2006). The lack of research that touches on race, negotiation, and HIV prevention in

Brazil has only helped to preserve this color-blind notion and requires attention (Goldstein 1999; Quiroga 2006). Black women consistently cite more barriers to communication, negotiation, and condom use with their partners than non-black women; this finding is independent of educational attainment, earning power, financial autonomy, and other partner-related risk factors (i.e. drug use) (Barbosa 1999; Batista 2002; Lopes, Buchalla et al. 2007). In addition, black men and women have a greater rate of AIDS mortality in Brazil possibly due to late HIV diagnosis and/or the lack of condom use (Batista 2002). Batista (2002) proposes that black people may have a lower perceived risk of HIV because the image of AIDS in Brazil has been that off white, middle class, homosexuals. Furthermore, research has pointed out a marked cultural and language barrier between doctors and marginalized patients in Brazil, which often leads to ineffective interaction, less use of health services, and an inability to broach important factors (like condom use) at doctors visits (Villela 1999; Ayres 2007).

Income and wealth are common measures of socioeconomic status that have been linked to health behaviors, risk of HIV infection, and unintended pregnancy, especially in Brazil (Szwarcwald, Bastos et al. 1999; Bastos and Szwarcwald 2000; Lynch, Smith et al. 2000). Brazil has one of the most unbalanced systems of income distribution in the world (Szwarcwald, Bastos et al. 1999). In 2009, Brazil had the fourth largest Gini index, a common measure of income or wealth inequality, in the world (World_Bank 2013). The severe socioeconomic inequality feeds into nearly all of Brazil's social problems and socially and politically marginalizes most of the population (Telles 2004). Income and wealth operate through various mechanisms to place women with low socioeconomic status at greater risk for HIV and unintended pregnancy than women with high socioeconomic status. Income and wealth directly reflect the physical and social circumstances in which individuals live (Krueger, Wood et al. 1990). Economic security

affords women the ability to plan their budgets to include expenses like contraceptive methods

and condoms (Lovell 2006). Even though Brazil has a socialized healthcare system, there are still

barriers to access to services, information, and prescriptions. Making a healthcare appointment in

the public health system often entails scheduling the appointment a few days ahead of time and

waiting in long lines for hours to see a doctor; the time and money involved is often unrealistic

for preventative healthcare (Hebling and Guimaraes 2004). Once an appointment is attained

there is no guarantee that the doctor will openly discuss the full range of contraceptive methods

available. Several studies in Brazil document a severe shortcoming in the quality of family

planning services available, noting that providers offer limited information and biased

recommendations when it comes to type of contraceptive method (Diaz, Simmons et al. 1999;

Ferreira, Souza et al. 2010; Malta, Todd et al. 2010). Furthermore, income and wealth affect

women's earning power, financial autonomy, and relationship dynamics. According to the theory

of gender and power, women with high bargaining power and financial autonomy are better

equipped to buy condoms and contraception and to successfully negotiate their use in a

relationship (Wingood and DiClemente 2000).

Other important socio-demographic characteristics are age and religion. Age is treated as

an important socio-demographic variable because it captures both position within the life course

and for a cohort effect, which could skew findings in a condom and contraceptive use study. On

the one hand, a cohort effect may explain differences in condom use as younger women were

born in the AIDS era and have become sexually active in the context of HIV risk and condom

use compared to older women. As a result, young people worldwide and in Brazil are found to

use condoms more frequently and more consistently than older people (Hearst and Chen 2004;

Calazans, Araujo et al. 2005; Miranda, Figueiredo et al. 2011). However, young women are also

found to have more casual partners and partners that engage in riskier sexual behavior (i.e. concurrent partners or sex workers) than older women (Boerma, Gregson et al. 2003; Varga 2003; O'Sullivan, Harrison et al. 2006; Mah and Halperin 2010). On the other hand, age can also capture position in the life course as young women are not as experienced sexually, with fertility control, and with partner communication and negotiation as older women. The lack of experience could place young women in heightened danger of sexual violence (i.e. coercion, non-consensual sex), unintended pregnancy, or HIV infection compared to older women.

Religion is also treated as an important socio-demographic control because it can directly guide and shape an individual's definition of the appropriate timing and conditions for sexual behavior and intimate relationships (Takyi 2003). Religion also guides expectations around relationships and emphasizes ideas about fidelity, trust, and partner communication (Takyi 2003). More conservative religious affiliations (i.e. Catholic and Evangelical denominations), apply social sanctions to those who engage in pre-marital sex, use contraception and/or condoms, and practice deviant sexual behavior (Takyi 2003). Religious sanctions deter such behavior, but also encourage those that engage in sanctioned behavior to hide it from their religious group. Although religious affiliation is not typically a significant factor in predicting condom use, contraception, or sexual behavior in Brazil, few studies have found nuances between the sexual behavior of religious (i.e. Catholic and Evangelical) and non-religious individuals (Hill, Cleland et al. 2004; Hugo, Maier et al. 2011). Specifically, non-religious adolescents were found to have an earlier sexual debut than religious adolescents (Hugo, Maier et al. 2011). Evangelicals are also found to have different sexual behavior, with lower odds of unprotected extramarital sex than other religious groups (Hill, Cleland et al. 2004). Evangelicalism is a relatively new religion in Brazil and, unlike Catholicism, Evangelicalism is a religion of conversion rather than a

religion of birth (Hill, Cleland et al. 2004), which may explain differences in levels of adherence to the strict moral codes that are instilled by religion.

Early Sexual Risk Experience

Early sexual debut (before age 15) has been associated with an increased risk of HIV infection, STIs, and teen pregnancy (Pettifor, van der Straten et al. 2004; Harrison, Cleland et al. 2005; Hallett, Lewis et al. 2007). In the context of Brazil, the average age of sexual debut for young men is 14 years and young women 15 years (Borges and Schor 2005). Several mechanisms predispose women to HIV/STI infection and unintended pregnancy with early sexual debut. First, young women have an immature cervix that biologically predisposes them to HIV and STI infection if exposed (Harrison, Costin et al. 1985; Moss, Clemetson et al. 1991; Kahn, Rosenthal et al. 2002). Second, sexual debut in Brazil tends to occur between casual partners and without condom use (Paiva, Calazans et al. 2008). Principal reasons for the lack of condom use at sexual debut include not anticipating sexual relations and being unprepared, trusting that their partner is 'clean' and will not impregnate them, and at least one partner preferring sex without condoms (Paiva, Calazans et al. 2008). Third, the timing of sexual debut has been found to significantly impact sexual and marital patterns in the future (White, Cleland et al. 2000; Harrison, Cleland et al. 2005; Mpofu, Flisher et al. 2006). Early sexual debut has also been linked to an increased likelihood of engaging in risky sexual behaviors later on in life (Coker, Richter et al. 1994; Santelli, Brener et al. 1998; O'Donnell, O'Donnell et al. 2001) and to poor relationship skills (Browning and Laumann 1997; Browning 2002).

Fertility

In a study of dual protection, it is essential to control for measures of fecundity and fertility desires in order to better understand the dynamic between condom use, contraceptive use, and dual method use. Although the number of children women have is highly correlated with their desire to have (more) children, the association of both factors with condom use and contraceptive use is mixed. Mixed findings are likely due to the high correlation between condom use, contraceptive choice, and relationship status. Whereas women in long-term relationships are less likely to use condoms and more likely to use a non-barrier contraceptive method than single women, women in a long-term relationship are also more likely than single women to have immediate fertility desires which would make them less likely to use any contraceptive method.

Relationship Context

The relationship context frames the environment in which partners communicate, assess their risk of HIV, STIs, and pregnancy and decide whether or not to use condoms. The decision to use condoms and/or contraception rides on factors like the degree of relationship closeness, trust, and power dynamics. The closer partners are in a relationship, the greater their levels of communication are thought to be. The processes and outcomes of such communication and negotiation establish a power dynamic within the relationship. According to the sexual division of power, gender works to imbalance power dynamics in favor men over women. These relationship power imbalances may manifest socially, economically, psychologically, and physically to grant the male partner more power in decision making than the female partner (Pulerwitz, Amaro et al. 2002).

Relationship Status

Past research on the effect of relationship type on condom use often typifies relationships into either casual or stable sexual relationships. Although making this distinction explains some of the variation in condom use, the direction and magnitude of the association is mixed (Marsiglio 2006; Kusunoki and Upchurch 2011). Most studies indicate that partners in casual sexual relationships are more likely to use condoms and use them consistently (Ku, Sonenstein et al. 1994; Bajos 1997; Sheeran, Abraham et al. 1999; Katz, Fortenberry et al. 2000; Macaluso, Demand et al. 2000; Ott, Adler et al. 2002). This finding goes in line with the risk perceptions perspective, in which partners are believed to be more likely to perceive a greater sexual risk with a casual partner and thus be more motivated to protect themselves with a barrier method than with a serious sexual partner (Manning, Flanigan et al. 2009). In Brazil, condom use is characterized by relationship status with most single women reporting condom use and most married women reporting no condom use (Barbosa and Koyama 2008).

The theory of gender and power posits that relationship status brings with it norms of relationship behavior and emotional attachments based on one's relationship status (Connell 1987; Wingood and DiClemente 2000). For example, ideals around fidelity, norms of trust, and expectations of intimacy are stronger in formal marriages and common-law unions than in casual sexual relationships. These relationship-based ideals and norms place women in marriages and stable unions at greater risk for HIV/STIs because they are less likely than women in casual sexual relationships to: 1) to communicate with their partner about sexual risk and condom use (Amaro 1995; Amaro and Raj 2000; Wingood and DiClemente 2000; Hirsch, Higgins et al. 2002; Mumtaz, Slaymaker et al. 2005), 2) to be aware of their partner's risk behaviors (Hirsch, Higgins et al. 2002; Hirsch, Meneses et al. 2007), and 3) to use condoms (Ku, Sonenstein et al.

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1994; Wingood and DiClemente 2000; Fortenberry, Tu et al. 2002; Mumtaz, Slaymaker et al. 2005; O'Sullivan, Harrison et al. 2006).

In Brazil, the ideals around fidelity in formal marriages and common-law unions are quite different for men and women. Brazilian society and women appear to accept that it's part of men's nature to have several women, even if they are married (Hebling and Guimaraes 2004). A study in Sao Paulo found that almost half of the women interviewed had sexual relations with only one man whereas only 7% of men had had sexual relations with only one woman (Goldstein 1994). One example of the social acceptance is reflected in the use of the Brazilian Portuguese word for cheating. The word *corno* or *cornudo* means that one literally grows a horn as a symbol of losing their honor. While, *corno* and *cornudo* are used to explain the disgrace and loss of honor brought to a man when his woman cheats on him, the word is rarely used to explain a woman's loss of honor for having her man cheat on her with another woman (Goldstein 1994; Parker 2009). The use of *corno* and *cornudo* insinuate that women do not lose any honor by being cheated on. Even though Brazilian women admit to being worried that their husbands are unfaithful, they cite feeling "powerlessness" about the situation (Goldstein 1994). One qualitative study revealed that women in long-term relationships know they might be at risk of HIV, there are "two kinds of women [who] run the greatest risk [of getting HIV]: the one who stays home and trusts her husband, and the one who turns tricks" (Hebling and Guimaraes 2004).

Despite this widely accepted double standard, condom use remains low in long-term relationships likely due to the lack of trust represented by condoms, that condoms interfere with intimacy, and men, who make the ultimate decision whether or not to use condoms, have greater decision-making power in the relationship. Both women and men have reported disliking condom use in a long-term relationship because they interfere with sensation, mutual pleasure,

and disrupt the natural flow of sex (Hebling and Guimaraes 2004). Of women sampled almost all (98%) report only using condoms when they begin a relationship, but not with long-term, steady partners, even when they know their partner is unfaithful (Hebling and Guimaraes 2004).

Partner Asymmetry

Relationship asymmetry is a source of power in a romantic relationship. It is also a measure of relationship structure and occurs when partners differ from each other on important social markers like age, education, race, and income. Relationship ties between individuals with similar characteristics are more likely to be closer than ties between individuals who are dissimilar (McPherson, Smith-Lovin et al. 2001). On the one hand, similarities between individuals in a relationship are thought to represent shared knowledge and experiences, both which are hypothesized to facilitate communication about sexual histories and condom use (McPherson, Smith-Lovin et al. 2001). On the other hand, relationship asymmetry is thought to contribute to the gender-based power imbalance, granting one partner more control over condom use decisions than the other (Weisman, Plichta et al. 1991; Abma, Driscoll et al. 1998). Differences in age, education, and race may reflect differences in maturity levels, social networks, and sexual experiences, which are all factors thought to influence condom use and sexual behavior in a relationship (Ford, Sohn et al. 2002; Stein, Kaufman et al. 2008). Further, relationship asymmetry has been linked to shorter relationship duration, less commitment, and less condom use.

The direction and magnitude of the association between relationship asymmetry and condom use is not as established as other relationship measures. A central aim of prior research on age asymmetry has been to test whether women in sexual relationships with older men are more or less likely to use condoms, but the findings are mixed. Whereas most studies report that

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age asymmetry predicts decreased condom use (Morris and Kretzschmar 1995; Bajos 1997; Miller, Clark et al. 1997; Abma, Driscoll et al. 1998; Darroch, Landry et al. 1999; Glei 1999; Manning, Longmore et al. 2000; Marin, Coyle et al. 2000; DiClemente, Wingood et al. 2002; Kusunoki and Upchurch 2011), some studies find that age asymmetry is not associated with condom use at all (Weisman, Plichta et al. 1991; Ford, Sohn et al. 2001; Manlove, Ryan et al. 2003; Manlove, Ryan et al. 2004).

A gender effect may explain the discrepant findings as a difference in age of partners may affect women in a relationship differently than their male counterparts. Because condoms are a male-controlled method, some studies have found that age asymmetry is more indicative of condom use among men (Bajos 1997; Manning, Flanigan et al. 2009). The balance of power to decide whether or not to use condoms is thus even more favorable for the man's desires when he is older than his wife or sexual partner (Connell 1987; Mason 1994). Furthermore, research indicates that young women with older partners report more frequent sexual intercourse than when partners are the same age (Kaestle, Morisky et al. 2002). In Brazil, it is common for young women to date and to marry older men. These rules of pairing have roots in socioeconomic and cultural forces in many developed and developing countries (Bastos and Szwarcwald 2000). This age asymmetry has been found to increase women's risk of HIV through at least two mechanisms. First, the gender and power dynamics between men and women in age asymmetric relationships are exacerbated and if the woman is younger than she would have less experience negotiating condom use and less bargaining power to insist condom use. Second, men who are older, and more sexually experienced, have a greater prevalence of HIV and other STIs (Bastos and Szwarcwald 2000).

Educational asymmetry is a less studied dimension of relationship asymmetry. Partner similarity in educational attainment has been shown to contribute to greater relative power and presumably greater decision-making power for the partner with the highest education (Lundberg and Pollak 1996; Quisumbing and Maluccio 2003). Partner educational asymmetry has been linked to greater condom use among men (Bajos 1997). Further, educational asymmetry has also been linked to greater spousal violence, a characteristic that disfavors negotiation and condom use (Kishor and Johnson 2005).

Partner Communication

Communication between partners is a key process of power within a relationship. Communication between partners is a well-supported strategy to negotiate condom use within a relationship (Oncale and King 2001). Partner communication about sexual histories and condom use is positively associated with the actual use of condoms (Wingood and DiClemente 2000; Stone and Ingham 2002; Manlove, Ryan et al. 2003; Noar, Carlyle et al. 2006). Several studies have found that this communication process is especially important for the use of male-controlled methods like condoms (Crosby, Holtgrave et al. 2003; Miller, Murphy et al. 2004; Davies, DiClemente et al. 2006). The salience of the relationship context is important in understanding communication and decision-making around condom use, method of contraception, and fertility.

In Brazil, gender norms do not encourage dialogue between partners around contraception and condom use. The processes of sexual socialization give rise to and reinforce an elaborate hierarchical gender structure which distinguishes *homens* (men) in terms of power, authority, and dominance and *mulheres* (women) in terms of submission and subjugation (Parker 2009). Qualitative work in Brazil reveals that masculinity is characterized by, "limited male

involvement in reproductive health and child care, a sense of male entitlement to sex from women, and tolerance of violence against women" (Pulerwitz, Michaelis et al. 2010). Influences of Brazil's gender hierarchy have been a main driving force behind the great popularity of female sterilization as contraception in Brazil. Women are expected to assume the responsibility of contraception in a relationship and sterilization is a method that does not require male involvement and offers hassle-free contraception free of the daily burden associated with reversible contraception (Goldstein 1994; Villela and Barbosa 1996). Women that report communication with their partner about family planning are hypothesized to have greater levels of condom use and reversible contraception.

Decision-making Power

According to the sexual division of power, partner characteristics blend together to create a power dynamic that affects how decisions are made within a relationship (Emerson 1962; Emerson 1972; Lundberg and Pollak 1996; Woolley 2003). Each partner's relative decision-making power is determined by the amount of resources (e.g. time, money, etc.) they have (or have access to) and the extent to which they are dependent on their partner. As it relates to sexual behavior, decision-making power may affect who can initiate (or stop) sex, when to engage in sex, what type of sexual activity, whether concurrent relationships are discussed or tolerated, and whether condoms and/or contraception are used (Wingood and DiClemente 2000; Blanc 2001; Gupta 2003; Gupta, Parkhurst et al. 2008).

The household decision-making power scale is a key measure of women's empowerment in this study. As a common operationalization of women's decision-making power, this scale measures power across dimensions (e.g. economic, familial/interpersonal, and socio-cultural) and differentiates women who make decisions alone from those who make decisions with their

partner or have their partner make their decisions for them. The household decision-making measure assumes that women with greater decision-making power are at greater odds of overcoming their partners' opposition to contraception and condom use when they disagree (Mason and Smith 2000; Leon 2013). Additionally, using the measure to predict contraception and condom use assumes that the freedom of movement, authority to use economic resources, and agency to decide when to seek healthcare also grant women with greater access to negotiate and use contraception and condoms (Leon 2013).

Although there is a lack of women's empowerment studies in Brazil that utilize the household decision-making scale, a large body of research has found women's empowerment positively correlated with contraceptive use (Mason and Smith 2000; Kishor and Gupta 2009), condom use at last sex (Greig and Koopman 2003), and lower fertility (Jejeebhoy 1995). Some studies have found mixed effects or no effect at all (Morgan, Stash et al. 2002; Mumtaz and Salway 2005); this may result from the spectrum of women's empowerment definitions, to the multidimensionality of the concept, or to the context-specific nature of women's empowerment. Women with high scores on the household decision-making scale are hypothesized to be more likely to use condoms and contraception than women with low scores.

CHAPTER 4: Overview of Research Design and Methods

This chapter reviews the data and methods used in this dissertation. First, I overview the data set used which includes describing the sampling design, data components, and sample weights. Second, I operationalize the conceptual model with variables from the data. Third, I describe the exclusionary criteria for my sample, conduct a selection analysis, and describe the analytic samples. Finally, I discuss my analytic approach, describe the process involved in preparing the data, and review the statistical techniques and analytic strategies employed to achieve the aims of this dissertation.

The objective of my dissertation is to explore how women use dual protection for HIV/STI prevention and fertility control. The primary goals of the proposed study are to: 1) Describe the level of consistent condom use among women in Brazil (e.g. in the general population, dual methods users, and in sterilized women); 2) To examine how socio-demographic factors, early sexual risk, fertility, and relationship context affect dual protection among women in Brazil (e.g. in the general population, dual methods users, and in sterilized women); and 3) To examine the indirect effects of socio-demographic factors, early sexual risk, and fertility on condom use and contraception among women in Brazil (e.g. in the general population, dual methods users, and in sterilized women).

Pesquisa Nacional Demografica e da Saude da Criança e da Mulher (PNDS)

Study Design and Sample

The research aims of this dissertation are achieved by a secondary analysis of the 2006 Pesquisa Nacional Demografica e da Saúde da Criança e da Mulher (PNDS) (Brasil 2008). The PNDS is a cross-sectional, nationally representative household survey conducted in Brazil every

ten years and modeled on the Demographic and Health Surveys (DHS). The DHS are part of MEASURE DHS implemented by Macro International Inc. from 1986 to 1996 in Brazil. In 2006, the survey was taken over by the Brazilian Ministry of Health's Secretariat of Science, Technology and Strategic Inputs (MS/Decit) under the coordination of the Centro Brasileiro de Análise e Planejamento (CEBRAP) and fieldwork of the Instituto Brasileiro de Opinião Pública e Estatisticas (IBOPE). The PNDS surveys gathers information from household informants and women of reproductive age on household characteristics, nutrition, maternal and child health, and sexual and reproductive behavior. The target population for the survey was women of reproductive age (between 15 and 49 years of age).

The 2006 PNDS survey utilized a multi-stage stratified sampling design to achieve a sample representative of all women of reproductive age in Brazil who live in private households (in formal and informal neighborhoods, which includes favelas). Census sectors served as the primary sampling units (PSU) and household units served as the secondary sampling unit (SSU). In the first sampling stage, ten sampling strata were composed to include both rural and urban areas of the five geographic macro-regions of Brazil (North, Northeast, Midwest, Southeast, and South) in order to ensure that each stratum was represented in the sample. Then, using the divisions established by the 2000 National Census, 1,088 census sectors (e.g. PSUs) were randomly selected using simple random cluster sampling. A total of 760 urban PSUs and 328 rural PSUs were selected. In the second sampling stage, 12 households were selected per sector using inverse sampling, which entails randomly selecting households until 12 households with at least one eligible woman respondent are selected. Households were designated eligible if there was at least one woman present between 15 and 49 years old. In the case that the selected household did not have an eligible woman, it was substituted with an eligible household that was

closest on the list. A total of 14,617 households were chosen yielding 17,456 eligible women and, with a response rate of 89.2%, 15,575 women were interviewed.

Procedures for data collection for the 2006 PNDS were approved by the Institutional Review Board (IRB) of Macro Institutional Inc. and by the Research Ethics Committee of the Sexually Transmitted Diseases/AIDS Reference and Training Center of Sao Paulo's Health Secretariat. All survey participants provided oral informed consent and additional details on survey procedures are detailed in the PNDS final report (Brasil 2008).

Components of 2006 PNDS

There are three major components of the 2006 PNDS: a household questionnaire, a women's questionnaire, and blood tests. For each sampled household, the household questionnaire gathered information on families, education, household infrastructure, monetary transfers, household iodine test, food security, and characteristics of the household interviewee. The women's questionnaire was administered to an eligible woman between 15 and 49 years old in each sampled household. The women's questionnaire gathered data on marital/relationship history, fertility, sexual behavior, contraception, access to health services and medication, breastfeeding and nutrition, child health, cohabiting and sexual activity, education and employment, and anthropometry.

The data is suitable for the proposed study for several reasons. First, PNDS data are of high quality with exceptional contraceptive and condom use measures. Second, the data is a nationally representative sample of Brazilian women in 2006, which grant findings as generalizable to women nationwide at the time. Third, the data have validated measures of individual socio-demographic characteristics, early sexual risk experience, fertility, and relationship context.

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Sample Weights

The sample weight initially considered household weights to adjust for non-responsiveness in sectors. Later, sample weights for the women's survey, which was based on household weights, were calculated to control for the fact that more than one woman could reside in a household. Sample weights were also adjusted for absence or refusal to participate in the survey. Finally, grand sample weights were calibrated based on the results of the PNAD 2006 (IBGE 2007). Several key variables were used to calibrate the weights including sample strata (region and rural/urban area), sex, age bracket distributions, total number of households with at least one woman between 15-49 years of age, and total number of households (Blavatsky 2008).

Variables

In this section, I describe in detail how I operationalize each construct in my conceptual model.

Dependent Variable

Dual protection can be achieved through *single method use* (condoms) or *dual method use* (condoms + another contraceptive method). Most dual protection measures found in research thus far focuses on condom use to measure dual protection. However, dual protection definitions must expand to capture condom use consistency *and* to include non-barrier contraceptive methods as research shows that the use of non-barrier contraception may affect the choice to use condoms and the frequency of condom use (Berer 2006). The dual protection measures in this study are constructed using both consistent condom use and non-barrier contraceptive method measures.

There are two main outcome measures of this study, which correspond with the three analytic groups in this study: 1) <u>dual protection consistency</u> will be the outcome measure for the *full analytic sample* of sexually active, fecund women of reproductive age, 2) <u>dual method use</u> will be the outcome measure for the analytic sample of sexually active, fecund women of reproductive age that report *dual method use*, and 3) <u>consistent condom use</u> will be the outcome measure for the analytic sample of *sterilized*, sexually active women of reproductive age. Condom use consistency has been found an extraordinarily important measure of dual protection (Hearst and Chen 2004; Berer 2006; Warner, Gallo et al. 2012).

The outcome measure, <u>consistent condom use</u>, combines two questions regarding condom use. First, respondents were asked, "*Did you use a male or female condom the last time you had sexual relations? 1) Yes, male condom, 2) Yes, female condom, and 3) No.*" Responses were dichotomized because less than one percent (0.43%) of respondents reported using female condoms. Second, respondents who reported condom use were asked, "*In the last 12 months, you used a male condom during sexual relations: 1) Always, every time, 2) Sometimes, or 3) Never?*" Reponses to these two questions were used to construct the consistent condom use outcome with the following categories:

> 0) No condom use *(reference category in regression)*
>
> 1) Inconsistent condom use*
>
> 2) Consistent condom use*

* Note: The outcome variable for the analysis of dual method users excludes 'No condom use' as an outcome category because to be included into the dual method use sample women must have reported both condom use in conjunction with another contraceptive method. Furthermore, women who report using a 'traditional contraceptive method' along with condoms are not considered dual method users.

The <u>dual protection consistency</u> outcome combines the consistent condom use question with a contraception question, "*Do (You/Your husband/Partner) currently use any method to avoid becoming pregnant?" If so, what method do you currently use?*" Responses are re-categorized into: 1) No method, 2) Traditional contraceptive method (including coitus interruptus and calendar method) and 3) Modern contraceptive method (including fe-/male sterilization, oral contraceptive pill, intrauterine device (IUD), injectable hormone, hormonal implant (Norplant), and diaphragm). Then, the consistent condom use variable and the contraceptive variables were combined to construct the <u>dual protection consistency</u> outcome with the following categories:

0) Single method *(reference category in regression)*

1) Traditional contraceptive method only

2) Modern contraceptive only (excluding condoms)

3) Inconsistent condom use*

4) Consistent condom use*

* Note: Both the categories of inconsistent condom use and consistent condom use may include Both women who only use condoms and those who combine condom use with a non-barrier contraceptive.

The <u>dual method use</u> outcome combines the consistent condom use question with the contraception question, "*Do (You/Your husband/Partner) currently use any method to avoid becoming pregnant?" If so, what method do you currently use?*" Responses are re-categorized into: 1) No method or traditional contraceptive method (including coitus interruptus and calendar method) and 2) Modern contraceptive method (including fe-/male sterilization, oral contraceptive pill, intrauterine device (IUD), injectable hormone, hormonal implant (Norplant), and diaphragm). Then, the consistent condom use variable and the contraceptive variables were combined to construct the <u>dual method use</u> outcome with the following categories:

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0) Single method use (condoms) *(reference category in regression)*

1) Dual method use (condoms + modern contraceptive method)

Individual

Individual-level variables in the conceptual model include socio-demographic factors, early sexual risk experience, and fertility variables.

Socio-demographic

Socio-demographic factors include age, education, race, religion, region, employment status, household monthly income, and household wealth index.

Age is calculated using date of birth. Age is described using mean age and the standard deviation in addition to the following categories: *0) 40-49 (reference category in regression), 1) 30-39, 2) 25-29, 3) 20-24, 4) 15-19*.

Education is a self-report measure of years of formal education. Women were first asked if they had ever attended school and those who had attended school were asked the highest year of schooling they had completed. Education was re-coded into meaningful educational transitions: 0*) no education (reference category in regression), 1) elementary school (1-5 years), 2) junior high school (6-9 years), 3) incomplete high school (10-11 years), and 4) high school or more (12+ years).* The average educational attainment of women in Brazil in 2006 was eight years of formal education.

Race is measured by the question, *"If you had to classify your race into White, Black, Brown/Mixed, Asian, or Indigenous, how would you classify yourself?"* Black (Preta) and Brown/Mixed (Parda) are combined because they symbolize the Black race in Brazil (Telles 2004; IBGE 2007). Asian (3.3%) and Indigenous (1.9%) were combined into the 'Other' race

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category due to insufficient cell size. Race categories are: *0) White (reference category in regression), 1) Black/Mixed, and 2) Other*.

Religion was measured with the question, "*What is your current religion?*" Responses included: *1) Catholic, 2) Traditional Evangelical, 3) Pentecostal Evangelical, 4) Spiritualism, 5) Afro-Brazilian, 6) None, 96) Other, and 98) Don't know*. Final responses for this study include: *0) None (reference category in regression), 1) Catholic, 2) Evangelical,* and *3) Afro-religion or Other*.

Region was noted by the survey staff and was coded as the five regions of Brazil: *0) North (reference category in regression), 1) Northeast, 2) Southeast, 3) South, and 4) Mid-West*.

Urban was also noted by the survey staff and was coded as: *0) Not Urban (reference category in regression) and 1) Urban*.

Employed measured current employment status and length of time since unemployed with three questions. Workforce involvement asks, "*Aside from household work, do you work?*" and "*As you know, some women work in an occupation in which they receive cash or benefits. They sell a product, have a small business or work in a family business. Do you currently do any of these activities?*" Affirmative responses to either question were coded as currently employed. Negative responses were asked, *"Have you ever worked?"* and "*Have you worked in the past 12 months?*" Responses were coded as either unemployed within last year or never employed or unemployed for more than a year. The composite employment variable is coded as: 0*) Yes (reference category in regression), 1) No, unemployed within last year, 2) No, unemployed more than a year or never employed*.

Income was measured with one open-response question about household monthly income which asks, "*Last month, what was the total gross salary of all members in this household that*

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are working, excluding your maids and retirees?" Income categories were divided into quartiles, based on the distribution of incomes and to reflect categories relevant to social classes in Brazilian society (ABEP 2008; Brasil 2008). Household monthly income is measured in the following quartiles: 0) 280 Reis or less *(reference category in regression)*, 1) 281 Reis to 500 Reis, 2) 501 Reis to 1300 Reis, 3) 1301 Reis or more, and 4) No salary data. The lowest income category roughly corresponds to the Brazilian E class, whereas the highest income category corresponds to the Brazilian A and B classes.

Household wealth index is a validated composite measure of a household's cumulative living standard (Filmer and Pritchett 2001; Vyas and Kumaranayake 2006). The household wealth index was calculated using data on household ownership of assets, source of water supply, sanitation facilities, and type of flooring of the dwelling. Household ownership of assets was measured with the following three questions: 1) "*Does the household own/have*: Telephone or electricity, 2) "*Does the household have (and if so how many): radio, television, and refrigerator?*", and 3) "*How many rooms are used to sleep?*"

Source of water supply was measured using a composite of several questions. First, respondents were asked, "*The water supply for water used in this household is: 1) general network, 2) water spring, 3) water tank, 4) tank truck for water, 5) water well, 6) fountain, 7) bottled water, 8) other.*" Second, they were asked, "*The water used in this household arrives: 1) through pipes in at least one room, 2) through pipes only to the property or site, 3) not through pipes, 4) other.*" These responses were combined and made into the following dichotomous variables: *1) Piped into dwelling, 2) piped into yard, 3) well or spring inside/covered, 4) well/spring outside/uncovered*.

Sanitation facility questions were asked by a series of questions. First, respondents were asked, *"Is there a toilet or bathroom in this household?"* Positive responses were asked, *"What type of drainage system do you have for the bathroom/toilet? 1) Drainage system, 2) Septic tank connected to system, 3) Septic tank not connected to the system, 4) Traditional latrine/pit, 5) open ditch, 6) directly into river/ocean/lake, 7) other."* Responses were combined to the final categories: *1) Toilet to sewer/flush toilet, 2) septic tank not connected to system, 3) Traditional latrine/pit, and 4) No facility/open ditch*.

Type of flooring material was measured with the question, *"The principal material of the floor is: 1) Earth/sand, 2) Wood panels, 3) Polished wood, 4) Linoleum, 5) Ceramic tiles, 6) Cement, 7) Carpet, 8) Other."* All responses were dichotomized except for numerical responses of how many assets were owned and how many rooms were used for sleeping.

Household wealth is a robust predictor of living standards, social status, and health, but there is no consensus of how to construct the index (Filmer and Pritchett 2001; Vyas and Kumaranayake 2006). The household wealth index for this study models the methods used by Filmer and Pritchett (2001) and Vyas and Kumaranayake (2006). Filmer and Pritchett's (2001) clear methods of constructing the index are widely used to contextualize country-level wealth indices. Vyas and Kumaranayake (2006) use DHS data to construct a household wealth index in Brazil and identify important country-specific indicators for household wealth. The household wealth index was calculated using principal components analysis (PCA) on data of household ownership of assets, source of water supply, sanitation facilities, and type of flooring in dwelling.

PCA is a statistical technique that applies an orthogonal transformation to convert a set of variables into a set of linearly uncorrelated principal components. The first principal component captures the largest possible variance in the data. First, I transformed all non-ordinal categorical

variables into dichotomous (dummy) variables (Filmer and Pritchett 2001). Second, I performed median substitution on missing values for respondents that had complete data on at least 75% of the variables in the set. Third, I keyed each variable so that a larger value indicates more household wealth. Fourth, I ran PCA, included variables that loaded high on the first component in a calculation of the composite score, and calculated Cronbach's alpha (which was $\alpha=0.78$). For descriptive purposes, I modeled DHS and census treatment of household wealth score by dividing the score into five wealth quintiles.

Early sexual risk experience

Dual protection at sexual debut is a composite measure of condom use at sexual debut and contraceptive use at sexual debut. First, condom use at sexual debut was measured with the question, "*The first time, did you use a condom (male or female)?*" Contraception at sexual debut was measured with, "*Without counting condoms (male or female), did you use another form of protection against pregnancy during the first time? If so, which one?*" Responses were dichotomized into Yes/No. The dual protection at sexual debut variable is a composite of the two variables with the categories: *0) no method (reference category in regression), 1) contraceptive method only and 2) condom use*.

Fertility variables

Fertility variables are number of children and desire to have (more) children. Number of children measures the total number of live births and is a variable which asked the interviewer to sum responses to several questions. The first question was asked of women who responded affirmatively to having a child living with them, and asks the open-ended question, "*How many sons live with you? And how many daughters?*" The second question was asked of women who

responded negatively to having a child living with them, and asks the open-ended question, "*Do you have a child that does not live with you?*" The third question was asked of women who responded affirmatively to having a child who does not live with them and asks, "*How many sons do not live with you and how many daughters?*" The fourth question asks the open-response question, "*Of these children who were born alive, did any of them die?*"

Desire for children was only asked of fecund women and will not be included in the sub-group analysis of sterilized women. Desire for children was measured with the question, "*Now I would like to ask you some questions about the future. Do you want to have a/another child or do you prefer to not have a child/another child?*" Responses were re-categorized into: *0) No (reference category in regression), 1) Yes, 2) Don't know.*

Relationship Context

Relationship context variables in the conceptual model include relationship status, partner heterogamy, partner communication, and decision-making power.

Relationship Status

Relationship status, combines two questions. First, current relationship status asks, "*Are you currently married or in union with someone? 1) Yes, formally married, 2) Yes, in union with a man, 3) Yes, in union with a woman, and 4) No, not in a union.*" Second, negative responses were asked, "*Have you ever been married or in a union with someone? 1) Yes, formally married, 2) Yes, in union with a man, 3) Yes, in union with a woman, 4) No, not in a union, and 9) Refuse to respond.*" Relationship status was constructed using these two variables with the categories: *0) Married (reference category in regression), 1) Civil union, 2) Separated, and 3) Single*.

Partner Heterogamy

Relationship asymmetry measures were only asked of women who reported currently

being married or in union with someone and include age asymmetry and educational asymmetry.

Age asymmetry is a validated measure of relationship structure (Luke 2003; Luke 2005). Age

asymmetry compares the woman's age measured by date of birth, to her partner's age measured

with, "*What age did your partner complete on their last birthday?*" Because there is no standard

in age asymmetry measures and the magnitude of age difference that constitutes an age-

heterogamous marriage is subjective I follow the methodology based on the age distribution

within the data (Atkinson and Glass 1985). Therefore, I find the mean absolute age difference

between women and their partners to be two years. Therefore I construct a composite age

asymmetry variable to include the responses: 0) *Woman is within 2 years (reference category in*

regression), 1) Woman is 3 or more years younger, 2) Woman is 3 or more years older.

Educational asymmetry compared the woman's formal educational attainment to her

partner's formal educational attainment and is a validated measure of relationship structure in

research (Manlove, Ryan et al. 2003; Manning, Flanigan et al. 2009; Kalmijn 2010). Partner's

education was first measured with the dichotomous question, "*Has your partner ever gone to*

school?" Affirmative responses then answered, "*What was the last year they completed and*

passed?" and, "*What was the last grade or course they finished in the educational series?*"

Responses to the two questions were compared and re-categorized into: *1) no education, 2)*

elementary school (1-5 years), 3) junior high school (6-9 years), 4) incomplete high school (10-

11 years), and 5) high school or more (12+ years). Because the formal educational attainment of

the male partner is measured categorically, a categorical measure of women's educational

attainment is used for comparison rather than the continuous measure. The educational

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attainment of both women and men were then compared to the average educational attainment

for 2006, which was 7.2 years of formal education, and categorized as either *1) low (no

education or elementary school) or 2) high (junior high school or more)* (Bruns, Evans et al.

2011). The educational asymmetry variable was then constructed comparing female to male

educational attainment with the following responses: *0) Both low (reference category in

regression), 1) Woman low/man high, 2) Woman high/man low, and 3) Both high.*

Partner Communication

Partner communication was only asked of women in union and asks, "*Have you ever

discussed family planning with your husband/partner?*" Responses include: *0) Yes (reference

category in regression), 1) No.*

Decision-making Power

Decision-making power is measured with a household decision-making scale. Household

decision-making power, which is also referred to as women's empowerment, is a good indicator

of a woman's status in the household and community (Malhotra and Schuler 2005). The DHS

has validated this scale in numerous social contexts, but no consensus has been reached as to

how to construct the composite measure. Women were asked a series of questions about who in

their household makes decisions on six different dimensions. The question asked, "*In general,

which person in the household has the final say in decisions about: your own health care, your

child's health care, large household purchases, daily household purchases, visits to family or

friends, and what food to prepare daily.*" Responses include: *The woman interviewed; partner,

together with partner, parents, together with parent, and other people*. Because this measure is

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being operationalized to measure decision-making power within a relationship, the measure is only used in women who report being married or in civil union.

Leon (2013) uses Demographic and Health Survey Data from 46 countries in a study to compare the empirical validity of three different constructions of the household decision-making scale: 1) the participation model, 2) the control model, and 3) the egalitarian model. The *participation model* scores decisions made involving the participant = 1 and decisions made by the husband or someone else = 0. The *control model* scores decisions made by the husband or someone else = 0, decisions made by the respondent and someone else = 1, and decisions made by the respondent alone as = 2. The *egalitarian model* scores decisions made by the husband or someone else = 0, decisions made by the respondent = 1, and decisions made by the respondent and someone else = 2. In this study, Leon (2013) finds that the egalitarian model outperforms the other two models in 19 out of 20 countries outside of sub-Saharan Africa (as sub-Saharan Africa was considered a distinctive context). Although the egalitarian model had small and insignificant differences within countries, the overall model served as a consistent predictor of contraceptive use in women (Leon 2013). However, the control model had a greater internal consistency than the egalitarian model. In addition, communication and negotiation are central to a partner's capability to successfully coordinate together (Karney, Hops et al. 2010).

This study adopts the control model to construct the composite household decision-making measure. The household decision-making power composite score was calculated using PCA. PCA supported a five variable factor solution with an acceptable internal consistency reliability of $\alpha=0.80$. The scale was summed and averaged to create a single score that ranged from negative one to one, with one indicating the greatest household decision-making power. For

descriptive purposes, I present the household decision-making power composite score in quartiles.

Analytic Sample

Inclusionary Criteria

The full analytic sample of this study includes a subset (n=6,996) women of the full sample (N=15,575), respondents that self-report having ever been sexually active (n=13,637), were sexually active in the last 12 months (n=12,584), with a male partner (n=12,542), and who are fecund (n=7,554). Figure 1 visually represents the sample inclusion chart to demonstrate how the full survey sample (N=15,575) became the analytic sample (N=6,996). Only 195 women were excluded because they were missing outcome information and only 363 women were excluded because they were missing information on at least one independent variable.

Selection Analysis

A selection analysis was conducted to examine how women excluded from the analytic sample differed from those included in the analytic sample. To better understand how the women excluded from the analytic sample differ from those included, I conduct a logistic regression model to predict being included in the main analysis as a function of the variables included in this study. The analysis is weighted to account for the study sampling design using the –svy– command in Stata 12.1 (StataCorp 2011).

The results of the selection analysis are shown in Table 4.1. On the one hand, women in young age groups, with a formal education, who are non-white, who live in regions other than the Northeast, who live in urban areas, who are in income class D or C, with a high wealth score, who used a contraceptive method or dual protection at sexual debut, and have more children had

greater odds of being included in the analytic sample than women 40-49 years old, with no

formal education, who are white, live in the North, live in non-urban areas, who are in income

class E, and with a low wealth score. On the other hand, women who reported a religion, who

were unemployed, who wanted children or didn't know, and who were not married had *lower*

odds of being included in the analytic sample than women with no religion, who were employed,

who did not want children, and who were married. The selection criteria could have entered a

source of sampling bias because many of these factors are related to fertility (being pregnant)

and opting for sterilization as a permanent contraceptive method. Other sources of sampling bias

may include women who do not live in households (e.g. homeless – who are among the most at

risk for HIV) and household non-response.

Three Analytic Samples

This study will examine condom use consistency in three samples: 1) the *full sample* of

sexually active, fecund women of reproductive age (n=6,996), 2) the *dual method users* who are

sexually active, fecund women of reproductive age that report using condoms or condoms and

another contraceptive method (n=3,960), and 3) the *sterilized* women who are sexually active

and of reproductive age (n=3,896). These three groups are stratified for several analytical and

theoretical reasons. First, fecund and infecund women are qualitatively different in their needs to

protect against pregnancy and disease. Second, women who use condoms are analyzed separately

to allow this study to test the dual methods hypothesis that women who use dual methods will

use one or both methods less consistently than women who only use one method. Lastly, as

shown in the literature review, many social forces operate to create a disparity in the type of

women who choose sterilization for permanent contraception versus those who do not.

Therefore, in stratifying the analytic samples, I make the assumptions that individual and

relationship context factors vary and co-vary with condom use consistency differently in each sub-group.

Condom use consistency varies widely among the three samples. Table 4.2 reports the cell count and weighted percentages of the outcome measure for each sub-group in this study. In the *full analytic sample*, more than half of women report using condoms either consistently or inconsistently. Almost a third (28%) of women in the full analytic sample only use a modern contraceptive method. A little over 10% of women use either no method at all or a traditional contraceptive method. In the *dual method use sample*, more than half use a single method of dual protection (condoms only) whereas 41% use dual methods (condoms + another modern contraceptive method). Condom use consistency in this sub-group will be reported in the results section (Chapter 6). In the *sterilized sample*, only 5% of women report consistent condom use whereas the majority of women report no condom use (83%).

Data Analysis Plan

This section describes the analytic techniques applied to the PNDS 2006 and the analytic strategies used to achieve the specific aims of the dissertation. All data analysis was conducted in Stata 12.0/SE (StataCorp 2012).

The objective of my dissertation is to explore how women use dual protection for HIV/STI prevention and fertility control. The primary goals of the proposed study are to: 1) Describe the level of consistent condom use among women in Brazil (e.g. in the general population, dual methods users, and in sterilized women); 2) To examine how socio-demographic factors, early sexual risk, fertility, and relationship context affect dual protection among women in Brazil (e.g. in the general population, dual methods users, and in sterilized women); and 3) To examine the indirect effects of socio-demographic factors, early sexual risk,

and fertility on condom use and contraception among women in Brazil (e.g. in the general population, dual methods users, and in sterilized women). Details of the analytic techniques and strategy are presented below for each specific aim.

Analytic Techniques

Univariate Analysis

I conduct a univariate analysis to describe the distribution of dependent and independent variables in all three analytic samples (e.g. the *full sample*, the *dual method users*, and the *sterilized* women). I report the unweighted sample sizes with weighted percentages to control for sampling design. I also describe the mean and standard deviation for continuous variables.

Bivariate Analysis

I conduct a bivariate analysis to ascertain that the independent variables are significantly correlated with (using the chi-square coefficient). I use the chi-square coefficient to assess statistical significant differences between those who use dual protection and those who do not use dual protection on independent variables. All the assumptions for using the chi-square coefficient are tested and met.

Logistic Regression

Logistic regression is conducted to estimate the odds of consistent condom use (versus no inconsistent condom use) for dual method users and sterilized women. Models estimate the bivariate association between independent and dependent variables. Also, specified models estimate the mediating effects relationship context on the association between socio-demographic factors, early sexual risk, and fertility and consistent condom use. All the assumptions for logistic regression are tested and include the absence of multicolinearity

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between independent variables, and absence of outliers between independent variables and the log odds of consistent condom use. I use –estat gof– to assess goodness of model fit using the –svy– in Stata.

Multinomial Logistic Regression

Multinomial logistic regression is conducted to estimate the odds of consistent dual protection, inconsistent dual protection, modern contraceptive only, and traditional contraceptive only (versus no method) by individual and relationship-level factors. Models estimate the bivariate association between independent and dependent variables. Also, specified models estimate the mediating effects of relationship context on the association between individual-level factors and dual protection consistency. All the assumptions for multinomial logistic regression are tested and include the absence of multicolinearity between independent variables, absence of outliers, and a linear relationship between independent variables and the log odds of dual protection consistency. There are no statistics available to assess model fit using the –svy– with –mlogit– in STATA, but when estimates using –svy– are similar to those not using –svy–, model fit statistics without –svy– are reported.

Aim 1: Describe the level of consistent condom use among women in Brazil (e.g. in the general population, dual methods users, and in sterilized women).

To achieve this aim, I conduct a univariate analysis to describe the number and percentage of dual protection consistency among women in the *full analytic sample* of sexually active, fecund women of reproductive age; of consistent condom use among sexually active, fecund women who report *dual method use*; and of consistent condom use of *sterilized*, sexually active women of reproductive age. I also conduct a bivariate analysis among women in the full

analytic sample and women who report dual method use to assess the type of contraceptive method (aside from condoms) they use (e.g. traditional, pill, IUD, etc.).

Aim 2: To examine how socio-demographic factors, early sexual risk, fertility, and relationship context affect dual protection among women in Brazil (e.g. in the general population, dual methods users, and in sterilized women).

To achieve this aim, I conduct a univariate analysis to describe the number and percent distribution of socio-demographic factors, early sexual risk, fertility, and relationship context factors in the full analytic, dual method users, and sterilized samples. Then, I conduct several bivariate analyses. First, I examine how socio-demographic factors, early sexual risk, and fertility are distributed across outcome variables in each sample with chi-square, logistic regression, and multinomial logistic regression. Second, among women who report being in a relationship, I examine how relationship context factors are distributed across outcome variables in each sample in the same manner as before. Lastly, I find a parsimonious model to predict each outcome measure in each of the three analytic samples. This is achieved using either logistic or multinomial logistic regression along with unweighted model fit statistics (which will only be reported and analyzed if estimates are similar between the weighted and unweighted models). To construct the parsimonious model, I begin with the individual-level variables (and relationship status - the only relationship context variable measured in the full sample) that are significant predictors of the outcome according to bivariate multinomial logistic regression. I use the Wald test is to keep or eliminate each block of variables from the pool of variables until I reach a parsimonious model with variables that significantly contribute to the model.

Aim 3: To examine the indirect effects of socio-demographic factors, early sexual risk, and fertility on consistent condom use among women in Brazil (e.g. in the general population, dual methods users, and in sterilized women).

I conduct a preliminary mediation analysis using multinomial logistic regression in Stata. As relationship context factors were only collected from women who reported being either married or in a civil union, this preliminary mediation analysis will only consider women in a relationship. To achieve this aim, first I examine how socio-demographic factors, early sexual risk, and fertility are distributed across relationship status (e.g. married and in civil union) using chi-square, logistic regression, and multinomial logistic regression. Second, I only include relationship-level factors in the model that are significantly associated with both individual-level factors and the outcome measure. Likewise, only individual-level factors that significantly predict the outcome measure will be considered in the final mediation model. Third, I run two models for each set of individual-level independent variables. I first test the unadjusted effect of socio-demographic factors (early sexual risk, fertility) on the outcome variable via relationship context variables. Then I test the full effects model (i.e. controlling for all other individual-level independent variables).

CHAPTER 5: The Social Forces that Explain Condom Use Consistency and Contraception in Brazilian Women

In this chapter, I present results from analyses that describe and examine dual protection consistency in the general population of fecund women of reproductive age in Brazil. Dual protection consistency is defined as the overlap of contraception and condom use consistency to protect against unintended pregnancy and STIs including HIV. Dual protection consistency includes categories that reflect gradations of protection: 0) no method, 1) traditional method only, 2) modern method only (excluding condoms), 3) inconsistent condoms, and 4) consistent condoms.

I begin by describing the sample and relationship status in terms of individual-level factors (e.g. socio-demographic factors, early sexual risk, and fertility factors) and relationship context. Then, I examine how individual-level and relationship context are correlated with dual protection consistency. Using theoretically derived individual-level factors and the relationship status variable, I identify a parsimonious model to explain dual protection consistency in the full sample of women. Finally, among women who are married or in civil union, I test the indirect effects of individual-level factors on dual protection consistency through eligible relationship context variables.

Describing the Sample

Table 5.1 describes the full analytic sample of fecund, sexually active women of reproductive age in Brazil (n=6,996). This table reports the percentage distribution of socio-demographic factors, early sexual risk, fertility, and relationship context variables used in this analysis. Percentages and means are weighted to correct for bias introduced by the sampling frame.

Socio-demographic factors include age, education, race, religion, region, living in an urban area, employment status, household monthly income, and household wealth score. Women in this sample averaged 29 years of age with an even distribution among the age categories. Most of the sample (69%) was between 20 and 39 years of age. Women averaged 8.62 years of formal education. Most women (65%) had between six and eleven years of formal education. Most women reported being either Black (51%) or White (43%). The predominant majority of women are Catholic (63%), followed by Evangelicals (22%), no religion (9%), and Afro-religion or another religion (6%). Most women live in the Southeast region (47%), the Northeast region (22%) or the South (28%) of Brazil and most lived in an urban area (86%). Most women had a household income that corresponds to the A through C socioeconomic classes and the average monthly income was 1,343 Brazilian Reis. However, 13% of the sample did not report income data and was excluded when estimating the average household income. Household wealth score is a standardized scale measuring household assets and living standards and is evenly divided into quintiles.

Early sexual risk factors include dual protection at sexual debut. Almost half (45%) of the women in the sample reported condom use at sexual debut. The other half of women either used no method at all (34%) or a contraceptive method only (22%) during sexual debut. Roughly half of the sample wants to have more children either now or in the future whereas the other half does not want to have children.

Fertility measures include number of children and future fertility desires. Women in this sample averaged 1.19 children. A third of the women in this sample did not have any children, whereas 35% reported having one child and 33% reported having two or more children.

Relationship context measures, aside from relationship status, are only measured among women who are married or in civil union and include relationship status, age asymmetry, educational asymmetry, communication about family planning with partner, and household decision-making power. In terms of relationship status, most of the sample was either married (38%) or in civil union (32%). Among married women and those in civil union, women averaged 4.52 years younger than their partner and most (69%) are in age asymmetric relationships (60% of women are three or more years younger than their partner). The majority of women are in educationally symmetric relationships with 57% of women reporting that both partners have at least seven or more years of formal education and 18% reporting that both partners have less than seven years of formal education. Most women report having talked with their partner about family planning (77%). The household decision-making score is a standardized scale measuring women's decision-making power and is approximately divided into quintiles.

Characterizing Relationship Status

I then describe how individual and relationship-level factors vary by relationship status (Table 5.2). All socio-demographic factors are significantly associated with relationship status. Married and separated women are, on average, significantly older and less educated than single women and women in civil union. Half of married women are White, whereas around 60% of separated women and women in civil union are Black. Most women of every relationship status are Catholic. Around half of married women (47%), separated women (52%), and single women (56%) live in the Southeast region of Brazil, whereas 27% of women in civil union live in the Northeast region of Brazil. A significantly greater proportion of single and separated women live in urban areas than married women and women in civil union. A significantly greater percentage of separated women are formally employed compared to women in other relationship statuses.

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Married and single women report greater household monthly incomes than separated women and women in civil union. Household wealth is the greatest in single women, followed by married women, separated women, and women in civil union.

Early sexual risk, measured with dual protection at sexual debut, is significantly associated with relationship status. Single women, by far, report the greatest proportion of women who used condoms the first time they had sex (77%); they are followed by women in civil union (41%), separated women (37%), and married women (32%).

Fertility measures reflect the stage in childbearing in which women of different relationship statuses are in. Whereas women who are married, separated, and in civil union average 1.5 children, single women average 0.2 children. Moreover, whereas only 41% of married women report wanting more children, the majority (78%) of single women desire children now or in the future.

Relationship context variables were only measured of married women and women in civil union and are similar between the two relationship statuses with some exceptions. Slightly more married women are in age symmetric relationships (32%) or age asymmetric relationships in which they are more than three years younger (62%) than women in civil union (30% and 57%, respectively). Likewise a greater proportion of married women are in highly educated relationships (62%) compared to women in civil union (52%). Married women are also significantly more likely to report having discussed family planning with their partner (84%) than women in civil union (69%). There were no significant differences between the household decision-making power scores of married women and women in civil union.

Explaining Dual Protection Consistency

Socio-demographic Factors

I then address the first aim of this dissertation, which is to examine how socio-demographic factors, early sexual risk, fertility, and relationship context affect consistent condom use. I begin by describing how dual protection consistency varies by socio-demographic factors (Table 5.3). Women who use traditional contraceptives only were the oldest (averaging 35 years old), followed by women with no method (32.9 years old), women who use a modern contraceptive only (29.6 years old), women who use consistent condoms (28.1 years old), and women who use inconsistent condoms (27.2 years old). Education is positively associated with dual protection consistency. Women who use consistent condoms average 9.3 years of education compared to around eight years of education in women who use either a traditional contraceptive only or no method at all. Race was also significantly associated with dual protection consistency. Although most women report some form of condom use and/or contraception, a greater proportion of black women report using no method than white women or women in the 'other' racial category. Furthermore, women in the 'other' racial category report the greatest proportions of inconsistent and consistent condom use. Religion is barely significantly associated with dual protection consistency, which most likely reflects a type I error due to a large sample size and the rejection of a true null hypothesis that no association exists. Women who live in urban settings report far more consistent and inconsistent condom use than women who live in non-urban settings. Unemployed women report more consistent and inconsistent condom use than employed women. Neither household income nor household wealth score were significantly associated with dual protection consistency. Lastly, I report on bivariate multinomial logistic regressions that test direction and magnitude of significant socio-demographic factors in

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predicting dual protection consistency. This step is a preliminary test to identify socio-demographic factors that might be eligible for inclusion in the mediation model (if they are also significantly associated with the respective relationship context mediators).

Early Sexual Risk

Next, I describe how dual protection consistency varies by early sexual risk and fertility (Table 5.4). Risk at sexual debut is highly correlated with current condom and contraceptive use practices. Women who used condoms at sexual debut were more likely than others to report currently using consistent (36%) and inconsistent (32%) condoms, whereas women who only used a contraceptive method (excluding condoms) at sexual debut were more likely than others to report currently using only a modern contraceptive method (34%).

Fertility

Fertility measures are significantly associated with dual protection consistency. Average number of children is greatest for women who use traditional contraception only (averaging 1.6 children) and women who have no method (1.5 children) and smallest for women who report consistent condom use (0.9 children). Desire to have children is also significantly associated with dual protection consistency. A great proportion of women who want more children (or don't know) report using a modern contraceptive method, inconsistent condom use, or consistent condom use.

Relationship Context

Lastly, I describe how dual protection consistency varies by relationship context variables (Table 5.5). Dual protection consistency is highly correlated with relationship status. Single and separated women report the most consistent and inconsistent condom use, whereas married

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women and women in civil union report the most use of only a modern contraceptive method. Age asymmetry was not significantly associated with dual protection consistency, but educational asymmetry was. Women in educationally symmetric relationships where both partners have an above average education (seven years or more) reported the most consistent condom use and high levels of inconsistent condom use. Neither having discussed family planning with their partner nor household decision-making power score was significantly associated with dual protection consistency.

Parsimonious Model

I then estimate a parsimonious model to predict dual protection consistency. I include only the individual-level variables (and relationship status - the only relationship context variable measured in the full sample) that were significant predictors of dual protection consistency according to bivariate multinomial logistic regression. I use the Wald test is to keep or eliminate each block of variables from the pool of variables until I reached a parsimonious model with variables that significantly contributed to the model. The resulting parsimonious model includes socio-demographic factors, early sexual risk, fertility factors, and relationship status.

The parsimonious model includes socio-demographic factors of age, education, and region of Brazil, early sexual risk, the fertility variable of wanting more children, and relationship status. For every one year increase in age there is a 10% decrease in the odds of using consistent condoms, inconsistent condoms, or a modern contraceptive method only in comparison to using no method at all. Education had the opposite effect on dual protection consistency. For every one year increase in education there is a 10% increase in the odds of using consistent condoms, inconsistent condoms, or a modern contraceptive method only in comparison to using no method at all. Every region of Brazil has two times (or three times in the

case of the South) the odds of using a modern contraceptive method only than using no method at all compared to the North.

Early sexual risk, as measured by risk at sexual debut, is significantly associated with dual protection consistency. Women who report using a modern contraceptive at sexual debut had significantly greater odds of using consistent condoms (RRR=1.8), inconsistent condoms (RRR=1.6), a modern contraceptive method only (RRR=1.6), or a traditional method only (RRR=1.9) than using no method at all compared to women who did not use a method at sexual debut. Likewise, women who report condom use at sexual debut have significantly greater odds of using consistent condoms (RRR=2.6) and inconsistent condoms (RRR=1.6) than using no method at all compared to women who did not use a method at sexual debut.

The fertility measure of wanting more children is significantly and negatively associated to dual protection consistency. Women who either want more children, or don't know if they want more children, have much lower odds of using any form of barrier method or contraceptive method than using no method at all compared to women who are certain they do not want more children.

Relationship status operates as hypothesized, with women in committed relationships (e.g. married and in civil union) having much lower odds of using consistent or inconsistent condoms than using no method at all compared to single and separated women. Notably, single women have 4.6 times greater odds of using consistent condoms over no method compared to married women. Furthermore, separated women had 0.4 times lower odds of using a modern contraceptive method than no method compared to married women.

The parsimonious model identifies nuances in the dynamics of contraceptive method use and condom use consistency. Whereas some individual-level factors like age, education, early

sexual risk, and wanting more children equally affect contraception and condom use, other factors like region and relationship status have strikingly different effects on condom use versus contraceptive use. This finding will be further explored in the discussion.

Indirect Effects of Individual-Level Factors on Dual Protection Consistency: What is the mediating role of relationship status?

I then address the second aim of this dissertation, which is to test the indirect effects of individual-level factors (e.g. socio-demographic factors, early sexual risk, and fertility factors) on dual protection consistency via the relationship context. The first step in conducting the mediation test is to ascertain that each individual-level variable is significantly associated with both the mediating relationship-context variable and the outcome of dual protection consistency. I conducted these preliminary steps in Tables 5.2 through 5.5 and choose to test relationship status as the mediating relationship context variable. Aside from being highly correlated with dual protection consistency, relationship status is a key theoretical variable in predicting whether partners decide to use condoms, contraception, or both/neither. Although educational asymmetry was also significantly associated with individual-level factors and dual protection consistency, the associations were not as strong as with relationship status. Furthermore, educational asymmetry is only measured among married women and women in civil union, which would have excluded single and separated women from the analysis.

Table 5.7 and 5.8 present results from an elaboration model that examines how relationship status mediates the association between individual-level factors and dual protection consistency. Table 5.7 reports the indirect effects of socio-demographic factors via relationship status on dual protection consistency. Model 1 is the baseline model of only socio-demographic variables, controlled for differences in early sexual risk behavior and fertility. As you can see,

age is negatively associated, and education positively associated, with using consistent condoms, inconsistent condoms, and modern method of contraception over using no method at all. As in the parsimonious model, region is positively and significantly associated with using a modern contraceptive only over no method at all compared to women in the North.

Model 2 of Table 5.7 includes relationship status as the mediator variable to assess if relationship context explains the association, in terms of strength and magnitude, between socio-demographic factors and dual protection consistency. Addition of the relationship status variable to Model 2 alters the effects of education and region on dual protection consistency, although the change in relative risk ratio is not substantial. The effect of a one year increase in education on using a modern contraceptive method versus no method at all remains the same in magnitude but is diminished in strength from $p<0.001$ to $p<0.05$ significance level. Similarly, the effect of region of Brazil on inconsistent condom use and use of a modern contraceptive method only is altered by the addition of relationship status. The effect of region on inconsistent condom use decreases in both strength and magnitude to insignificance upon addition of relationship status. Although the effect of region on the use of a modern contraceptive method only versus no method at all remains at the same significance level, the effect drops slightly in magnitude for all regions in Brazil compared to the North. Although, relationship status best explained the effect of region on dual protection consistency, it appears that individual-level factors predominantly operate directly to influence dual protection consistency rather than through relationship status. However, regional differences in the access to modern contraceptive methods may reflect broader social and structural barriers to attaining fertility control and disease prevention.

Table 5.8 focuses on the indirect effects of early sexual risk and fertility on dual protection consistency. Model 1 is the baseline model of only early sexual risk and fertility

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variables, controlled for differences in socio-demographic factors. As you can see the effects of early sexual risk and fertility variables are slightly attenuated when controlled for socio-demographic factors compared to the bivariate associations reported in Table 5.4. However, the general direction, magnitude, and strength of associations are similar.

Model 2 includes relationship status as the mediator variable to assess if relationship context explains the association, in terms of strength and magnitude, between early sexual risk, fertility factors, and dual protection consistency. Addition of the relationship status variable to Model 2 alters the effects of risk at sexual debut and number of children on dual protection consistency. The effect of risk at sexual debut on all categories of dual protection consistency diminished in magnitude, and in some instances strength, upon addition of relationship status. Namely, the effect of using a contraceptive method at sexual debut on using a modern contraceptive or traditional method only versus no method diminished in both magnitude and size compared to using no method at sexual debut. Also, the effect of using a condom at sexual debut on consistent condom use and inconsistent condom use versus no method diminished in magnitude, and in the case of inconsistent condoms in strength, compared to using no method at sexual debut. Addition of relationship status explains the effect of number of children on using consistent condoms versus no method at all. This finding indicates that relationship status is salient in explaining consistent condom use, despite number of children a couple has. Overall, relationship status is not the best mediator in explaining how early sexual risk and fertility factors effect dual protection consistency.

Chapter Summary

This chapter has two key findings. First, the parsimonious model which explains dual protection consistency identifies salient factors in promoting consistent condom use and modern

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contraceptive use in this sample of women. On the one hand, education and using some form of protection at sexual debut (e.g. condom, contraception, or both) were found to promote condom use, whether consistent or inconsistent. On the other hand, age, wanting more children, and being in a committed relationship (e.g. married or in civil union) were barriers to condom use. In addition, region was a strong predictor of using a modern form of contraception which highlights the importance of region-specific barriers to access to family planning, especially in the North region of Brazil.

Second, this study found that individual-level factors operate predominately through direct effects rather than indirectly via relationship status. However, the models did find that relationship status attenuated the strength and magnitude of the effect of education, region, and risk at sexual debut on dual protection consistency (e.g. inconsistent condom use, modern method, and traditional method of contraception). Furthermore, relationship status mediated the association between number of children and consistent condom use.

CHAPTER 6: Dual Protection and Dual Method Use in Brazilian Women

In this chapter, I present results from analyses that describe, examine, and contrast two ways to achieve dual protection in a sub-sample of sexually active, fecund women of reproductive age that report using condoms. The outcome variable dual method use compares women who use dual methods (condoms + another modern contraceptive method) to women who use only a single method (condoms only) for dual protection. Although with single method use, the motivations behind condom use may be related to pregnancy prevention, disease prevention, or both, one can assume that with dual method use women intend to dual protect against both pregnancy and disease transmission. This chapter will characterize women who use dual methods and women who use a single method for dual protection. Also, by juxtaposing the two forms of dual protection with condom use consistency, individual-level factors, and relationship context, this chapter will answer several research questions. Which individual-level and relationship context factors significantly predict dual method use versus single method use? How does dual method versus single method use affect condom use consistency? Does relationship context explain the effect of individual-level factors on dual method versus single method use?

I begin by describing the outcome variable. How is dual method versus single method use associated with consistent condom use? What second modern contraceptive method do dual method users combine with condoms? I then describe the sample and dual method use in terms of individual-level socio-demographic factors, early sexual risk, and fertility factors. Next, I use a set of theoretically derived individual-level factors to identify a parsimonious model that best explains dual method versus single method use in the full sample of dual method users (n=3,960). After the parsimonious model, I describe dual method use by relationship status and

other relationship context variables (n=2,231). Through this process, I identify that age

asymmetry in a relationship as a potential mediating variable of the association between

individual-level factors and dual method use. Therefore, I then examine how individual-level

socio-demographic factors, early sexual risk, and fertility factors are associated with age

asymmetry. Finally, among women who are married or in civil union who use condoms

(n=2,231), I test the indirect effects of individual-level factors on dual method use via age

asymmetry.

Describing Dual Protection: Single method vs. Dual method

Table 6.1 describes the weighted distribution of dual method use and single method use.

This table compares condom use consistency between dual method users and single method

users. This table also explains the modern contraceptive methods combined with condoms in

dual method use. First, single method use (condoms only) is much more common (n=2,323) than

dual method use (condoms + another modern contraceptive method) (n=1,640) in Brazil. As you

can see, women who use a single method for dual protection are significantly more consistent in

their condom use compared to women who use dual methods. Most single method users report

consistent condom use (61%) compared to less than a third (27%) of dual method users who

report consistent condom use. According to the logistic regression, women who report using dual

methods have significantly lower odds (OR=0.2) of using consistent condoms compared to

inconsistent condoms than women who only use condoms (single method). Women who use dual

methods may find it difficult to sustain consistent condom use for a variety of reasons that will

be addressed in the discussion section. Of the dual method users, most women (81%) report

combining condoms with the oral contraceptive pill. Considering the large presence of reported

inconsistent condom use among dual method users, it is particularly disconcerting that most

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women also report using the oral contraceptive pill which is a birth control method that requires a consistent daily regimen in order to work effectively to prevent pregnancy.

Table 6.2 describes the sample and dual method versus single method use in terms of individual-level socio-demographic factors, early sexual risk, and fertility factors. Socio-demographic factors include age, education, race, religion, region, living in an urban area, employment status, household monthly income, and household wealth score. This sample of condom users is, on average, younger (27.6 years) and more educated (9.0 years) than the full analytic sample described in Chapter 5 (29 years old and 8.62 years of education). In terms of age and education, dual method uses are younger (average 26.0 years) and more educated (average 9.2 years) than single method users (28.7 years of age and 8.8 years of education, respectively). Race does not significantly differentiate single and dual method use. Religion is significantly associated with dual method use. A greater proportion of Catholics use dual methods (65%) than single methods (59%) and a greater proportion of Evangelicals use single methods (25%) than dual methods (18%). Region is significantly associated with dual method use and most likely reflects women's access to modern contraceptive methods as more women in the South and Southeast regions (the most developed regions of Brazil) report dual method use than women in other regions. Women in the North and Northeast regions of Brazil have greater a proportion of women using single methods than dual methods. Living in an urban area is not significantly associated with dual method use neither are employment status, household monthly income, or household wealth score; this indicates that the decision between using dual methods or a single method for dual protection is not likely influenced by economic access.

Early sexual risk, measured with risk at sexual debut, is significantly associated with dual method use. A greater proportion of women who use dual methods also report having used a

condom at sexual debut than women who use a single method. This finding goes in line with the life course perspective that condom use at sexual debut conditions condom use behavior later in life; this may occur through various mechanisms, one which might include conditioning women to negotiate and communicate condom use as a normal aspect of sexual relations. Despite this finding, almost a third of the women who report single method use reported using no method at sexual debut, which gives promise that condom use promotion after sexual debut can still be effective.

Neither fertility measure (e.g. number of children and future fertility desires) are significantly associated with condom use (either single method or dual methods) in this sample. This finding indicates that condom use may be a better indicator of motivations for disease prevention rather than fertility control in this sample of women. In contrast to dual method and single method users, I found that, in the full analytic sample in Chapter 5, both fertility measures are significant predictors of dual protection consistency; number of children was significantly associated with consistent and inconsistent condom use, whereas desire to have children was significantly associated with modern and traditional contraception.

Parsimonious Model

I then estimate a parsimonious model to predict dual method use in the full sample of dual method users (n=3,960). I include only the individual-level variables that were significantly associated with dual method use in the bivariate analysis; relationship status was omitted from consideration for the parsimonious model because it is not significantly associated with dual method use. I use the Wald test is to keep or eliminate each block of variables from the pool of variables until I reached a parsimonious model with variables that significantly contributed to the

model. The resulting parsimonious model includes the socio-demographic factors of age, education, religion, region, and condom consistency (Table 6.3).

Of the socio-demographic factors, age, education, religion, and region of Brazil are salient predictors of dual method use versus single method use for dual protection. For every one year increase in age, there is a 5% decrease in the odds of using dual methods versus a single method for dual protection (results reported to nearest tenth). In contrast, for every one year increase in education, there is a 10% increase in the odds of using dual methods versus a single method for dual protection. Region of Brazil has a strong and significant association dual method use and single method use for dual protection. Women in the South have 3.9 times greater odds of using dual methods versus a single method than women in the North. Likewise, women in the Southeast and Mid-West regions have 2.6 to 2.3 times greater the odds of using dual methods than women in the North. Women in the Northeast region have 1.4 times greater the odds of using dual methods than women in the North. Lastly, consistent condom use is very much distinct between women who use dual methods versus women who use a single method. Women who use consistent condoms have 0.2 times lower odds of using dual methods than a single method.

This parsimonious model contributes to our understanding of what salient factors drive the decision between using condoms only or condoms with another modern contraceptive method. The factors associated with this decision are very much associated with structural determinants of health, and potentially relationship context factors, rather than individual economic access, fertility desires, or relationship status. It appears that women who use dual methods may be in transition from either a less committed to a more committed relationship or may be reporting condom and contraceptive use with different partners, which is a

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methodological downfall of many measures of condom use. Next, I examine how relationship context affects the decision to use dual methods versus a single method for dual protection in married women and women in civil union.

How Relationship Context Affects Single method vs. Dual methods for Dual Protection

All relationship context measures (aside from relationship status) are only measured among women who are married or in civil union (n=2,231). The only relationship context measure that is significantly associated with dual method use is age asymmetry. Women who use dual methods are on average 4.2 years younger than their partner, whereas women who use condoms only are on average 4.7 years younger than their partner. Therefore, women who use dual methods are, on average, younger and closer in age to their partner than women who use a single method. This factor of relationship context allows a dynamic in the relationship which allows dual method use versus only using condoms for dual protection. On other factors of relationship context, women who use dual methods do not necessarily appear any more empowered in their relationship than women who use single methods. Relationship context factors, aside from age asymmetry, do not appear to differentiate dual method users from single method users. Next, I will further explore how age asymmetry varies by individual-level factors in an effort to identify variables that will be included in the mediation model.

Characterizing Age Asymmetry

Select individual-level factors are significantly associated with age asymmetry (Table 6.5). Average age is significantly associated with age asymmetry demonstrating a potential trend towards partnerships between younger women and older men over time. Women who are three or more years older than their partner average 34.6 years old, whereas women within two years of age of their partner average 29.7 years old, and women who are three or more years younger

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than their partner average 28.3 years old. Race, religion, and region are not significantly associated with age asymmetry. Living in an urban area and employment status are significantly associated with age asymmetry. A greater proportion of women in relationships that are age symmetric relationships (within two years of age of their partner), or age asymmetric in which the woman is three or more years older than her partner, live in urban areas compared to women who are three or more years younger than their partner. Formal employment is most common in women who are three or more years younger than their partner (60%) compared to 55% of women in age symmetric relationships, and 48% of women who are three or more years younger than their partner. Household monthly income and household wealth are not significantly associated with age asymmetry. Risk at sexual debut is significantly associated with age asymmetry in a relationship. Women who are three or more years younger than their partner reported more condom use at sexual debut, whereas women who are three or more years older than their partner more frequently reported using no method at sexual debut. Fertility factors of number of children and wanting more children are not significantly associated with age asymmetry.

Indirect Effects of Individual-Level Factors on Dual Method Use: What is the mediating role of age asymmetry in a relationship?

I then address the second part of aim three of this dissertation, which is to test the indirect effects of socio-demographic factors, early sexual risk, and fertility factors on dual method use (versus single method use) via the relationship context measure of age asymmetry. The first step in conducting the mediation test is to ascertain that each individual-level variable is significantly associated with both the mediating relationship-context variable and the outcome of dual method use. I conducted these preliminary steps in Tables 6.2, 6.4, and 6.5. Age asymmetry was chosen

as the mediating relationship context variable because it is the only relationship context variable that met the criteria for a mediating variable. Age asymmetry is a compelling mediator because it can highlight the importance of relationship structure in explaining how individual-level factors affect dual method versus single method use for dual protection. However, age asymmetry is only measured among married women and women in civil union; therefore the mediation model is only tested among these women.

Table 6.6 present results from an elaboration model that examines how age asymmetry mediates the association between individual-level factors and dual protection consistency. Model 1 is the baseline model of only socio-demographic factors and early sexual risk. As you can see, age, living in an urban area, and never being employed or being unemployed for more than year are negatively associated with dual method use. Being unemployed within a year and having used contraception or condoms during sexual debut are positively associated with dual methods use.

Model 2 of Table 6.6 includes age asymmetry as the mediator variable to assess if relationship context explains the association, in terms of strength and magnitude, between individual-level factors and dual methods use. Addition of the age asymmetry variable to Model 2 alters the effect of employment status on dual method use, although the effect is not substantial. The effect of having never been employed or unemployed for over a year remains the same in magnitude but decreases in strength from $p<0.01$ to $p<0.05$ significance level. Although, age asymmetry best explained the effect of employment status on dual method use, it appears that individual-level factors predominantly operate directly to predict dual method use rather than operating through relationship context.

Chapter Summary

This chapter has three main findings. First, this study tested the dual method hypothesis was that a woman who uses dual methods will use either one or both methods inconsistently than a woman who uses single method use for dual protection. This study found that women who report using dual methods have significantly lower odds (OR=0.2) of using consistent condoms compared to inconsistent condoms than women who only use a single method (condoms only). Upon further inspection, most women who use dual methods (81%) report combining condoms with the oral contraceptive pill; a contraceptive regimen that, much like condoms, has many barriers to its consistent and daily use.

Second, this study found that neither of the measures of fertility (e.g. number of children and future fertility desires) was significantly associated with dual methods in this sample. This finding indicates that condom use may be a better indicator of disease prevention than fertility control. In contrast to dual method users, in Chapter 5, both measures of fertility were significantly associated with dual protection consistency (e.g. consistent and inconsistent condom use and modern and traditional contraception).

Third, in the parsimonious model, factors associated with dual method use over single method use included education and region of Brazil. This model indicates that structural determinants of health are potentially controlling women's access to dual method use. Furthermore, this study found that individual-level factors predominantly operate directly to predict dual method use rather than through relationship context (e.g. age asymmetry).

CHAPTER 7: Dual Protection among Sterilized Women in Brazil

In this chapter, I present results from analyses that describe and examine condom use consistency in the sub-sample of sexually active, sterilized women of reproductive age. Examining dual protection in this sub-group allows me to control for contraception behavior and isolate condom use behavior, which is assumed to be motivated by the need to protect against HIV and other STIs. The outcome variable for this analysis is consistent condom use over the last 12 months, which includes the outcome categories: 0) no condom use, 1) inconsistent condom use, and 2) consistent condom use.

I begin by describing the sample and by examining how sterilized women differ from unsterilized women based on individual-level factors. Then I describe consistent condom use in terms of individual-level factors and relationship status. Next, I use a set of theoretically derived individual-level factors to identify a parsimonious model that best explains consistent condom use in the full sample of sterilized women (n=3,896). After the parsimonious model, I describe consistent condom use by relationship context variables among sterilized women who are in a relationship (e.g. married or in civil union) (n=3,507). I then examine how individual-level socio-demographic factors, early sexual risk, and fertility factors are associated with educational asymmetry, the variable which I explore as a potential mediator in this analysis. Finally, among sterilized women who are married or in civil union, I test the indirect effects of individual-level factors on consistent condom use via educational asymmetry.

Describing Sterilized Women: How do they differ from women who are not sterilized?

Women who choose sterilization are qualitatively different from women who are not sterilized (Table 7.1). Most sterilized women do not use condoms and have 0.1 times the odds of

using consistent condoms than no condoms at all compared to unsterilized women. Sterilized women are almost a decade older (38.0 years) and more than a year less educated (6.9 years), on average, than unsterilized women (29.0 years old and 8.6 years of education). More black women and Evangelicals are sterilized than unsterilized. A greater proportion of women that live in the North and Mid-West regions of Brazil and in non-urban areas are sterilized than not sterilized. Additionally, women that are formally employed, are in the lowest income class E, and have a low household wealth score have greater odds of opting for sterilization than their counterparts. Lastly, women who report using no method at sexual debut and who report having more than two children have greater odds of being sterilized than not. In general, women who opt for sterilization have lower socio-economic standing than women who are not sterilized; this confirms what was uncovered in the literature review that access to reversible contraception in Brazil is more difficult for low income women than women with more resources.

Consistent Condom Use in Sterilized Women

Table 7.2 describes condom use consistency in sterilized women in general and also in terms of individual-level factors and relationship status. Condom use was not common at all among sterilized women with only 5% reporting consistent condom use and 13% reporting inconsistent condom use over the past year. Sterilized women who do use condoms are about one year younger, on average, than sterilized women who do not use condoms. Education is positively associated with condom use consistency. Sterilized women who use condoms consistently average 8.5 years of education, compared to 7.4 years of education for women who use condoms inconsistently and 6.8 years of education for women never use condoms. Race, religion, and region were not significantly associated with condom use consistency among sterilized women. Sterilized women who live in urban areas report more condom use than those

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who live in non-urban areas. According to multinomial logistic regression, sterilized women who live in urban areas have 2.6 times greater the odds of using condoms consistently and 2.0 times the odds of using condoms inconsistently than no condoms at all compared to women who live in non-urban areas. Employment status and household income were not significantly associated with condom use consistency, but household wealth score was. Sterilized women who report consistent condom use have much greater household wealth scores than women who did not use condoms consistently or at all.

Early sexual risk, measured with risk at sexual debut, is significantly associated with dual method use. A greater proportion of women who report using consistent condom use also report having used a condom at sexual debut, supporting the idea that condom use behaviors early on in sexual life can condition condom use practices later in life. It is noteworthy, that women who report using a contraceptive method at sexual debut also have greater odds of using consistent condoms, although the association is not significant.

Number of children is negatively associated with consistent condom use. Sterilized women who report consistent condom use and inconsistent condom use average 2.7 children compared to 3.0 children on average for women who report no condom use.

Relationship status is also significantly associated with consistent condom use. This association is especially salient in strength and magnitude for separated women. Of separated, sterilized women, 32% report consistent condom use and 28% report inconsistent condom use. Separated women are followed by single women, of whom 10% report consistent condom use.

Parsimonious Model

I then estimate a parsimonious model to predict consistent condom use in the full sample of sterilized women (n=3,896). I include only the individual-level variables (and relationship

status) that were significantly associated with consistent condom use in the bivariate analysis. I use the Wald test is to keep or eliminate each block of variables from the pool of variables until I reached a parsimonious model with variables that significantly contribute to the model.

The resulting parsimonious model includes education, risk at sexual debut, number of children, and relationship status. For every additional year of education, sterilized women have 1.2 times greater the odds of using consistent condoms over no condoms at all. Likewise, women who used condoms at sexual debut had almost three times greater odds of using consistent condoms than no condoms at all compared to women who used no method at sexual debut. Number of children is negatively associated with both consistent and inconsistent condom use, but only significantly predicts inconsistent condom use. Lastly, relationship status is strongly associated with consistent condom use among sterilized women with married women having the lowest odds of using consistent condoms or inconsistent condoms compared to no condoms at all. Separated women had, by far, the greatest odds of using condoms (either consistent or inconsistent) than using no method at all compared to married women.

The parsimonious model highlights the importance of education, the lasting effects of initiating sexual life being prepared to protect oneself, and the salience of the relationship context in conditioning preventative behaviors. As shown in Table 7.1, by stratifying this analysis to include only sterilized women, the variation in individual and relationship-level factors was minimized. Despite this fact, these variables remained important predictors of consistent condom use in sterilized women. Next, I examine how relationship context affects condom use consistency in women who are married or in a civil union.

How Does Relationship Context Affect Consistent Condom Use In Sterilized Women?

Besides relationship status, all other relationship context variable were only measured among women who are married or in civil union (n=3,507). Of these variables, only age asymmetry, educational asymmetry, and having discussed family planning with a partner significantly predicted condom use consistency. Educational asymmetry demonstrated the strongest significant association with condom use consistency of the relationship context measures. It is noteworthy that, because formal educational attainment of the male partner is measured categorically, the categorical measure of women's educational attainment is used for comparison (rather than the continuous measure) in the educational asymmetry measure. Women in relationships in which both partners have an above average education have the greatest odds of using consistent condoms over no method in comparison to women in relationships in which both partners have a below average education. Women with an above average education, with a partner with a below average education, have the second greatest odds of using consistent condoms over no method. This finding highlights the potential of women's education in the ability to negotiate condom use. Having discussed family planning with current partner is positively associated with consistent condom use, but the association is not strong (p<0.05). Next, I further explore how individual-level factors vary by educational asymmetry to identify variables that will be included in the mediation model.

Characterizing Educational Asymmetry

Most individual-level factors are significantly associated with educational asymmetry with the exception of age (Table 7.5). Socio-demographic factors significantly associated with both educational asymmetry and consistent condom use include race, living in an urban area, and household income and wealth. Race significantly predicts educational asymmetry. All

educational asymmetry categories, except the one where the women has an above average education with a partner that has a below average education, are majority black. According to the multinomial logistic regression, black women (RRR=6.9) and women in the 'other race' category (RRR=15.0) have the greatest odds of being educationally symmetric relationships with a below average education. Religion, region, and employment status only have a strong and significantly association with educational asymmetry according to the Chi-statistic, with region predicting being in a relationship where both partners have an above average education. Living in an urban area is a strong predictor of educational asymmetry. According to multinomial logistic regression, women who live in urban areas have 5.5 greater odds of being in an educationally symmetric relationship where both partners have an above average education than women who live in non-urban areas compared to women in relationships where both partners have a below average education. Household income is significantly associated with educational asymmetry in a relationship. Women in educationally symmetric relationships where both partners have a below average education are more concentrated in lower income categories compared to other asymmetry categories. Similarly, women in educationally symmetric relationships where both partners have an above average education are more concentrated in higher income categories compared to other asymmetry categories. Household wealth score demonstrates a similar association to education asymmetry as household income.

Risk at sexual debut and number of children are other individual-level variables that are significantly associated with education asymmetry. Level of education of both partners is positively associated with condom use and contraceptive use at time of sexual debut, with 74% of women in poorly educated relationships reporting no method use at sexual debut. Number of

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children is negatively associated with level of education of both partners, with the male partner education having slightly more effect on average number of children than women's education.

Indirect Effects of Individual-Level Factors on Consistent Condom Use: What is the mediating role of educational asymmetry in a relationship?

I then address the second aim of this dissertation, which is to test the indirect effects of socio-demographic factors, early sexual risk, and fertility factors on consistent condom use through educational asymmetry. The first step in conducting the mediation test is to ascertain that each individual-level variable is significantly associated with both the mediating relationship-context variable and the outcome of consistent condom use. I conducted these preliminary steps in Tables 7.2, 7.4, and 7.5. All individual-level variable associations with the outcome were affirmed using the smaller sample of only married women or women in civil union. Educational asymmetry was chosen as the mediating relationship context variable because it is the strongest variable to meet the criteria for a mediating variable. Educational asymmetry is a compelling mediator because it highlights how educational attainment of women works relative to that of their partners to influencing condom use consistency. Educational asymmetry frames the structure of the relationship dynamic which influences partners' ability to communicate, negotiate, and assess risk of HIV and STI infection.

Table 7.6 present results from an elaboration model that examines how educational asymmetry mediates the association between individual-level factors and condom use consistency. Model 1 is the baseline model of only individual-level factors. Race, living in an urban area, household wealth and using a condom at sexual debut are positively associated with consistent condom use over no condom use compared to the reference group. Living in an urban

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area, household income, and using a condom at sexual debut are positively associated with inconsistent condom use over no condom use compared to the reference group.

Model 2 of Table 7.6 includes educational asymmetry as the mediator of the association, in terms of strength and magnitude, between individual-level factors and consistent condom use. Addition of educational asymmetry in Model 2 only slightly alters the effect of race, household income, and risk at sexual debut on consistent condom use. The effect of race on consistent condom use is attenuated by the addition of educational asymmetry in both strength and magnitude. The magnitude of effect of being a sterilized black woman is reduced from a relative risk ratio of 7.6 to 6.9 and the strength of significance fell from $p<0.01$ to $p<0.05$ significance level. Likewise, the magnitude of effect of being a sterilized woman of the 'other' race is reduced from a relative risk ratio of 16.2 to 15.0 with no change to the significance level. Although the effect of household income on inconsistent condom use decreased in strength and magnitude, the change was minimal. Addition of educational asymmetry in the model mediated the association between using a condom at sexual debut and consistent condom use and resulted in non-significance. Although, educational asymmetry best explained the effect of race and risk at sexual debut on consistent condom use, it appears that individual-level factors directly affect consistent condom use in sterilized women rather than being mediated by educational asymmetry in a relationship.

Chapter Summary

This chapter has three main findings. First, women who opt for sterilization have lower socio-economic standing than women who are not sterilized. Furthermore, these analyses find that condom use was not common at all among sterilized women. Only 5% of sterilized women report consistent condom use and 13% report inconsistent condom use over the past year. This

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finding has important implications for disease prevention in Brazil as sterilization is still a popular method of contraception.

Second, the parsimonious model highlights the importance of education, the lasting effects of initiating sexual life being prepared to protect oneself, and the salience of the relationship context in conditioning preventative behaviors among sterilized women. For every additional year of education, sterilized women had significantly greater odds (RRR=1.2) of using consistent condoms over no condoms. Further, compared to women who used no method at sexual debut, sterilized women who use condoms (RRR=2.9) or even contraception (RRR=1.9) at sexual debut had significantly greater odds of using consistent condoms over no condoms at all; this supports the idea that condom use behaviors early on in sexual life can condition condom use practices later in life. Lastly, the parsimonious model reveals that condom use among sterilized and married or in union women remains a challenge.

Third, this chapter finds that consistent condom use in sterilized women follows a pattern according to the relative education of men to their female partner. In the bivariate unadjusted model and the mediation model, consistent condom use was greatest in highly educated symmetric relationships (RRR=5.6), followed by relationships where the man has a greater education than the woman (RRR=4.5), relationships where the woman has a greater education than her partner (RRR=2.8), and lastly by poorly educated symmetric relationships (RRR=1.0). The mediation model finds that the educational asymmetry mediates the association between risk at sexual debut and consistent condom use. In addition, the effect of race on consistent condom use is attenuated by the addition of educational asymmetry in both strength and magnitude. Finally, although, educational asymmetry best explained the effect of race and risk at sexual debut on consistent condom use, it appears that the direct effects of individual-level factors on

consistent condom are more salient than the indirect effects of these factors via educational

asymmetry.

CHAPTER 8: DISCUSSION

Summary of study

The overall goal of this study was to understand how women in Brazil use dual protection through condom use and dual method use (using condoms with another modern contraceptive method). The primary aims of this study were to: 1) describe the level of consistent condom use among women in Brazil, 2) to examine how individual-level socio-demographic factors, early sexual risk, fertility, and relationship context affect dual protection, and 3) to examine the indirect effects of individual-level factors on condom use and contraception via relationship context. This study uses data from the 2006 PNDS, a nationally representative household survey of women of reproductive age in Brazil. Using this data, I apply the theory of gender and power, social exchange theory, and the concept of women's empowerment to elucidate how social inequalities influence contraception and condom use consistency. I address the study aims in three distinct, but sizeable, sub-groups of women in the Brazilian population: 1) fecund women in the general population, 2) fecund women who use dual protection (comparing condom use consistency in dual methods users versus single method users), 3) and in sterilized women. This section will highlight the main findings of this study and discuss them within the context of current research and the socio-cultural environment of Brazil. I will then describe the strengths and limitations of the study and discuss the public health implications.

Discussion of Major Findings

This study has three main findings. *First*, this study identifies key influential factors of dual protection consistency and condom use consistency in women in Brazil. Formal education and risk at sexual debut are strong predictors of condom use consistency across all three sub-

groups of women. In addition, region was a salient positive indicator of use of a modern contraceptive method and age was a salient negative indicator of condom use consistency.

Second, the study tests the dual methods hypothesis to understand how consistent condom use is affected by the use of another modern method of contraception. Findings from this study support that women who use another modern form of contraception in addition to condoms have lower odds of consistent condom use than women who use condoms only. This study also elaborates on the dual method hypothesis by testing how the effect of using a reversible method on consistent condom use may differ from the effect of using an irreversible method on consistent condom use; sterilized women did not use condoms nearly as consistently as women who use dual methods (combining condoms with a reversible method of contraception).

Third, this study finds that relationship context is a critical consideration when studying condom use consistency. Relationship status was a strong predictor of dual protection consistency in women of the general population and of consistent condom use in sterilized women. Women in more committed relationships (e.g. in civil union and married) report much less dual protection and more exclusive contraceptive use (aside from condoms) than women who were not in relationships (e.g. single and separated). In addition, relationship status and educational asymmetry mediated the association between individual-level factors and consistent condom use.

Dual Protection in Brazilian Women

Dual protection has emerged as a prominent prevention strategy especially in contexts where a high rate of heterosexual transmission of HIV is paired with a high unmet need for contraception. This study, using data from 2006, finds low dual protection levels in Brazil.

Among sexually active fecund women of reproductive age, I find that 27% used condoms consistently and 30% used dual protection inconsistently over the past year. Although statistics on consistent condom use are not frequent in Brazil, these levels are similar to 28% of women who report condom use at last sex in a nationally representative study (CEBRAP 2000) and 28% of women reporting condom use at last sex in a representative sample of women in the South of Brazil (Silveira, Santos et al. 2005). They are also similar to the 20-22% of women who report condom use at last sex in two national samples in the U.S. (Sanders, Reece et al. 2010; Anderson, Warner et al. 2011) and comparable to the 12- 41% of women who report condom use at last sex in national samples of four countries in sub-Saharan Africa (Reynolds, Luseno et al. 2012). Although these frequencies are comparable to other condom use data reported in Brazil and around the world, they are remarkably lower than data collected by the Brazilian Ministry of Health in 2002 that 69% of women report using a condom at their last sexual encounter with a casual partner (BMoH 2002). This finding is troubling given that Brazil's condom social marketing campaigns that aim to normalize condom use behavior (Okie 2006), especially among youth and women (Miranda, Figueiredo et al. 2011), may not be as effective in stable romantic relationships.

Education Promotes Condom Use

In general, formal education is a strong predictor of condom use. Education was positively and significantly associated with consistent condom use in fecund women and sterilized women, net of other factors like risk at sexual debut and relationship status. In addition, education was positively and significantly associated with dual method use over single method use among women who report condom use, net of other factors like age and region. The salience of education is not surprising given the strong and consistent link between level of formal

education and condom use in the HIV prevention literature. In Brazil, education disproportionately affects people with no more than a primary school education, and this relationship has been growing in strength and magnitude (Fonseca and Bastos 2007; Bastos, Nunn et al. 2009). Furthermore, recent protests highlight the need for the Brazilian government to invest in public education and health care system.

Education can affect condom use through at least three primary mechanisms in Brazil. *First*, education is linked to better overall health and to more HIV-specific knowledge and prevention. Many of the social factors involved in attaining a formal education are also correlated to the ability and resources to access healthcare and promote healthy behaviors. *Second*, education equips individuals with the ability and autonomy to articulate needs, dictate sexual behavior, communicate personal needs, and decision-making power; all qualities associated with negotiation and condom use behavior (Kravdal 2002; Greig and Koopman 2003; Gwatkin, Rutstein et al. 2007; Coates, Richter et al. 2008; Gupta, Parkhurst et al. 2008). *Third*, the more formal education attained the more potential exposure an adolescent will have to the national-wide school-based HIV-prevention programs that began in Brazil in the mid-1990s (Camargo 2003). The timing of these school-based HIV prevention programs has been found to have an immediate effect. One study finds that level of education is linked to condom use at the time of sexual debut (Paiva, Calazans et al. 2008). The lasting effects of condom use at sexual debut have been validated in this study and in others that posit condom use at sexual debut as a primer to individual condom use habits throughout life.

Although the school-based HIV prevention and condom use promotion programs in Brazil have been overall successful, there are several shortcomings that must be addressed. The school-based programs exist in only 60% of all Brazilian public schools and are highly variable

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in their implementation (Camargo 2003). Of those schools, only 10% actually distribute free male condoms to their students; a practice mainly limited by local parental advisory boards, the Catholic Church, and conservative groups (Camargo 2003). Moreover, the school-based program covers 30% of all elementary schools and 96% of all high schools but, of the women in this sample, only 52% of women report attending some or all of high school. The reality is that many young people at risk of acquiring HIV either do not attend school at all or stop attending school before they are exposed to the HIV prevention program (Bastos, Nunn et al. 2009). Although investing in education and poverty-reduction should be the priority in Brazil, the Ministry of Health has initiated (in 2005) a program to target children and youth living on the street, in rehabilitation facilities, and in homeless shelters, but the program has yet to be evaluated (Bastos, Nunn et al. 2009).

Dual Protection at Sexual Debut

In general, condom use at sexual debut is a strong predictor of current condom use. Condom use at sexual debut was positively and significantly associated with consistent condom use in fecund women and sterilized women, net of other factors like education, fertility factors, and relationship status. Using a condom at sexual debut represents an individual's HIV/STI prevention knowledge, their access to condoms, and their ability and preparedness to negotiate and use condom.

Condom use at sexual debut can set the foundation and establish a habit to use condoms as a routine part of sex. Even though condoms are a male-controlled method, research has found a strong and consistent correlation between condom use at last sex and condom use at sexual debut among young people, despite gender (St Lawrence and Scott 1996; Miller, Levin et al. 1998; Robertson and Levin 1999; Sneed, Morisky et al. 2001). Using several waves of ADD

Health Data, Shafii et al. (2004) find that condom use at sexual debut increases the likelihood of condom use at most recent sex; they also found this effect to be largely independent of stable demographic and personal characteristics and proximate attitudinal, behavioral, and relationship factors (Shafii, Stovel et al. 2004).

This study corroborates the association between condom use at sexual debut and consistent condom use in adult women in Brazil, net of other socio-demographic and relationship characteristics. Other studies in Brazil have also found a strong relationship between condom use at sexual debut and condom use later in life (Teixeira, Knauth et al. 2006; Paiva, Calazans et al. 2008). The importance of condom use at sexual debut in conditioning current condom use together with the salience of formal education in predicting consistent condom use makes for a compelling argument to invest in education, improve educational attainment, and expand school-based HIV initiatives in Brazil.

Young Women and Condoms

This study found that age is strong negative indicator of consistent condom use in fecund women and of dual method use among women, net of factors like relationship status and years of formal education. Research in Brazil supports this association. Age is consistently negatively related to condom use whereby young people are shown to use condoms in higher frequency and with more consistency than older people (CEBRAP 2000; Pimenta MC 2000; Pinho, Berquo et al. 2002; Paiva, Venturi et al. 2003; Calazans, Araujo et al. 2005; Paiva, Pupo et al. 2006). Increased condom use in the younger Brazilians is perhaps due to the generational (cohort) effect of the HIV epidemic. Young people began their sexual lives in the age of HIV prevention and condom use social marketing campaigns (Paiva, Calazans et al. 2008). Therefore, condom use in young people is a more normalized behavior compared to older generations (Shafii, Stovel et al.

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2004; Teixeira, Knauth et al. 2006). Increased levels of dual method use in young people may also be a generational reflection of greater access to reversible contraceptive methods (and less reliance on sterilization for contraception) than older people.

Dual Method Use in Brazil

There is a heightened need to promote dual protection through dual method use in contexts with a high HIV prevalence and where there is a high unmet need for family planning, like in Brazil. Dual method use is encouraged for the degree of dual protection offered to women and for the ability to mix and match condoms with different contraceptive methods based on need and preference. A key contribution of this study is the assessment of levels of dual method use in women in Brazil. I find that dual method use is moderately low (23%) in the total sample of fecund women. Furthermore, of women who report using condoms, less than half (41%) combine condoms with another method of contraception for dual method use. The most common form of dual method use in this study combined condoms with the oral contraceptive pill (81% of dual method users). Oral contraceptive pill use was followed by 19% of women who combined condoms with a hormonal injection or patch. Another common form of dual method use in Brazil combines condoms with female sterilization, but due to the qualitative difference between fecund and infecund women, they are stratified in this study.

Consistent condom use differentiated the level of dual protection offered by the everyday use of a single versus dual methods for dual protection. Whereas 21% of women in the overall sample of fecund women report consistent condom use, this study finds that only 6% of women in this sample report using dual methods with consistent condoms. Although similar levels are found in other studies, the disparity in consistent condom use points to contextual factors that may create barriers to consistent use. One study using the South African Demographic Health

Survey finds that only 6% of women of reproductive age use dual methods for dual protection (Kleinschmidt, Maggwa et al. 2008).

The study finds that dual method use (versus single method use, or condom use only) significantly varied by age, education, and region. Although the context of age and education have already been discussed, it is noteworthy that region remained a significant and positive indicator of dual method use, net of other factors. The effect of region on access to sterilization in Brazil has been documented in other studies (Hopkins, Maria Barbosa et al. 2005). However, this study finds that women in the more developed South and Southeast regions of Brazil report 3.9 to 2.6 times the odds of using dual methods (versus single method use) compared to women in the North. Women in the Northeast were only slightly different in their dual method use than women in the North. This finding indicates that women in Brazil may have differential access to contraceptive methods in terms of knowledge of available methods, method side-effects, and cost of methods. Furthermore, this finding may reflect the effect of cultural context, relationship norms, and ensuing individual preference of condom use and contraceptive method.

Women who use dual methods for dual protection could be portrayed as the early adopters of this preventative innovation which combines condom use with another contraceptive method (Rogers 2002). In Brazil, the promotion, uptake, and use of reversible methods have caught much less momentum in the diffusion of innovation compared to that of female sterilization and condom use. Furthermore, the characteristics of women who use dual methods reflect a young, innovative group of women. Women who use dual methods are characterized as young, educated, White or Black race, Catholic, from the Southeast region, employed, and generally in the upper-middle income class. As early adopters of using dual methods for dual protection, it is of particular importance that dual method use is correct and consistent and, if not,

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that public health programs in Brazil address the barriers to proper use; this would also prevent the spread over time of incorrect and inconsistent dual method use as women increasingly uptake reversible contraceptive methods in Brazil (Rogers 2002).

Dual methods not a result of fertility desires

Women who use dual methods versus a single method for dual protection were not differentiated by fertility measures or relationship context measures, with the exception of being in an age asymmetric relationship. This finding indicates that the adoption of a contraceptive method in addition to condom use is not associated with the desire to have (or not have) children, with the number of children a woman already has, or with relationship status. One explanation is that dual method use may reflect a transition that partners make from using primarily condoms to using a reversible contraceptive method. This transition may be marked by periodic condom use that makes for overall condom use inconsistency. Another explanation, may be that dual method use may result from a contraceptive failure (or a close call) from using condoms as the sole contraception, which would prompt women (and their partner) to adopt a second method of contraceptive to secure their protection against pregnancy and a female-controlled method that requires no (or less) negotiation with their male partner than condoms. A final plausible explanation is that factors of fertility and relationship context influence the decision to use condoms (versus condom non-use) and play less of a part in distinguishing between dual method use and single method use among women who use condoms. Without longitudinal partner data, it is difficult to know for certain the mechanism that explains dual method versus single method use beyond identifying significant indicators of dual method use.

Sterilized Women Don't Use Condoms

The practice of surgical sterilization for permanent contraception is prevalent in Brazil. Although the Brazilian government's health program and the Ministry of Health in Brazil are required to ensure women's access to all contraceptive methods on the market, female sterilization remains a popular option for almost 26% of women of reproductive age (Brasil 2008). Of the women in this study, 36% (n=3,896) were sterilized. Despite the great popularity of sterilization in Brazil and the concurrent growth of HIV and STIs in women of reproductive age, there is an extraordinary dearth of research that considers the effect that female sterilization has on condom use consistency.

This study finds that the profile of sterilized women greatly contrasts to the profile of non-sterilized women. Sterilized women are, on average, older by 9 years, less educated by 1.7 years, are more Black or 'Other' race, are more Catholic or Evangelical, reside more in non-urban areas of the North, Midwest or Northeast regions of Brazil, fall in the lowest income bracket, and have much lower household wealth than non-sterilized women. In terms of early sexual risk, sterilized women have greater odds of using no method at the time of sexual debut compared to non-sterilized women. In terms of fertility factors, sterilized women have, on average, 1.7 more children than non-sterilized women.

It is noteworthy that many of the traits associated with sterilization in this study reflect the profile also described in sterilization research in Brazil (Goldstein 1994; Villela and Barbosa 1996). Brazilian women choose sterilization because it offers them with a definitive method to take control of their fertility, because sterilization provides them with an ease of use that requires minimal effort, and because some view it as a symbol of social status (Goldstein 1994; Villela and Barbosa 1996). At the same time, reasons that lead women to choose sterilization largely

overlap with structural issues that affect women like the lack of access to quality family planning

counseling, not being familiar with one's own body, lack of power in their romantic relationships

and lack of empowerment in the sexual sphere (Villela and Barbosa 1996).

Most importantly, sterilized women and non-sterilized women report drastically different

condom use behavior. Among sterilized women, this study finds that 5% use consistent

condoms, 13% use inconsistent condoms, and 83% never use condoms. Among non-sterilized

women, this study finds that 27% use consistent condoms, 30% use inconsistent condoms, and

42% never use condoms. This finding is corroborated by other studies that also find that

sterilized women report significantly less condom use than unsterilized women (Villela and

Barbosa 1996; Sangi-Haghpeykar and Poindexter 1998; Osis, Faundes et al. 1999; Sangi-

Haghpeykar, Horth et al. 2001; Wilson, Brown et al. 2004; Barbosa, Pinho et al. 2009). This

finding will be further discussed in the following section regarding the dual methods hypothesis

in sterilized women.

Dual Methods Hypothesis

Dual Methods Users: Support for the Dual Methods Hypothesis

This study finds support for the *dual methods hypothesis*, which states that women who

use dual methods for dual protection will use either one method or both methods more

inconsistently than if they were to use just one method (Cates and Steiner 2002). This study finds

that women who report using dual methods report significantly lower consistent condom use

than women who use a single method. Of condom users, most (61%) women who report single

method use report consistent condom use compared to only 27% of dual method users. Dual

method users had 0.2 times the odds of using consistent condoms versus inconsistent condoms

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compared to single method users (condoms only); this association held in strength and magnitude net of other important factors like age, education, region, religion, and region. Findings from this study align with other studies that also support the dual methods hypothesis. Both a study with college students in Canada and a nationally representative study in the U.S. report that condom use consistency is lower in women who used dual methods than in women who used only condom use for dual protection (MacDonald, Wells et al. 1990; Stephenson 1998). The finding from this study would support the explanation that women may transition from single method (condom use) to dual method use, as a precaution to ensure their protection against pregnancy, and then transition from dual method use to contraceptive use only. This transition could be a result of relationship status or other nuances in the relationship contest that would not differentiate between single method use and dual method use (but would differentiate between dual method use and contraceptive use).

Other studies arrive at inconclusive or mixed findings with regard to the dual methods hypothesis. One study in France analyzed nationally representative data found that condom use was not affected by whether or not women used hormonal contraceptive methods (Bajos, Warszawski et al. 1998). Further, a randomized-control trial was conducted among women to determine whether a theory-based intervention that provided computer-based tailored feedback was more effective in promoting dual method use and preventing STIs and pregnancy versus non-tailored feedback. Although dual method use increased in the intervention group, the number of incident STIs and pregnancies did not differ between groups (Peipert, Redding et al. 2008). The authors suggest that although dual methods use initially increased, dual method use was not likely sustained over time. It appears that dual method use, with consistent condom use,

is a difficult behavior to sustain over a period of time, especially without the support of public health programs or the romantic partner.

The dual methods hypothesis can be furthermore elaborated by stratifying consistent condom use by the effectiveness of the second method of contraception. Some researchers assert that the more effective the second contraceptive method is, the less consistent the condom use will be. Several studies find that support for the dual methods hypothesis extends to user-independent versus user dependent contraceptive methods. User-independent methods are methods, like a hormone injectable, intrauterine device, and hormonal implant or patch, which only require monthly to tri-monthly attention to be an effective contraceptive method. User-dependent methods, like the oral contraceptive pill, require a timed daily regimen that may introduce user error and result in pill fatigue. Although this study does report data on this elaboration of the dual methods hypothesis, upon closer inspection there is no significant difference in consistent condom use between women who use oral contraceptive pill and hormonal injectable or patch. The majority of women in this study who report dual method use combine condoms with the oral contraceptive pill (81%). In this sample, only slightly less women who use the oral contraceptive pill (e.g. a user-dependent method) report consistent condom use (26%) than women who use a hormonal injectable or patch (e.g. user-independent methods) (31%). One explanation could be that women who use a hormonal injectable or patch can divert their attention away from the daily burden of contraception and towards the negotiation and use of consistent condoms.

Findings related to this elaboration of the dual methods hypothesis are mixed. One study using the National Survey of Family Growth, finds the opposite of this study. The researchers find that condom use is lower for women who rely on user-independent methods (e.g., injectable,

intrauterine devices, and implants) versus the pill, net of all demographic differences (Pazol, Kramer et al. 2010). Another study finds that, although condom use was lowest in teenagers with a hormonal implant, there were no significant differences in STI incidence between those who adopted implants, oral contraceptives, or condoms alone; they also find that STI incidence was high (Darney, Callegari et al. 1999).

Sterilized Women: Support for the Dual Methods Hypothesis

The dual methods hypothesis can be furthermore elaborated in sterilized women. For example, this elaboration of the dual methods hypothesis would assert that women who use condoms in conjunction with the oral contraceptive pill will use condoms more consistently than women who combine condoms with female sterilization. One might argue the case that women who are sterilized run no risk of having an unintended pregnancy if they occasionally do not use condoms. In contrast, women who use the oral contraceptive pill run a greater risk (than sterilized women) of having an unintended pregnancy if they occasionally do not use condoms. The pill demands a consistently stable regimen in order to be effective and can furthermore lose effectiveness if taken in combination with certain medications, like antibiotics.

Although I did not test the dual method hypothesis in a sample that includes both women who combine condoms with reversible contraceptives and women who combine condoms with female sterilization, the stratified analyses support this elaboration of the dual method hypothesis. I find that 27% of fecund, dual method users report consistent condom use compared to 5% of sterilized women, a finding that highlights the gapping need to address condom use in sterilized women. The public health problem becomes even more heightened when one considers that sterilized women (n=3,896) make up a large proportion of the Brazilian population compared to fecund women (n=6,996). Several studies support the dual methods hypothesis

regardless of whether the other contraceptive method is sterilization, hormonal injectables, or hormonal implants (Sangi-Haghpeykar, Poindexter et al. 1997; Cushman, Romero et al. 1998; Sangi-Haghpeykar and Poindexter 1998). In this study, 83% of sterilized women reported never using condoms in the past year.

Despite the high prevalence of female sterilization in Brazil, there are few studies that investigate condom use consistency in this population. One study conducted in Sao Paulo, finds that sterilized women are at greater risk of HIV because they use less condoms and have a harder time negotiating changes in sexual practices with their partner (Osis, Faundes et al. 1999). Another study in Sao Paulo, finds that only 45% of sterilized women report ever using condoms and none report condom use in the past month (Villela and Barbosa 1996). A more recent study of sexually active women in the U.S. who had been previously diagnosed with an STI, finds that sterilization was significantly associated with a decreased likelihood to use condoms consistency (Wilson, Brown et al. 2004).

In addition, sterilized women have less than desirable indicators for STI prevention and report greater issues with partner negotiation than non-sterilized women. One study in Brazil finds that women who are sterilized are among the least likely to receive STI prevention counseling even though they may be at the greatest risk of contracting an STI (Villela and Barbosa 1996). The study furthermore finds that sterilized women who have revealed their sterilization to their partner can no longer use the excuse of being fertile, or wanting to avoid an unintended pregnancy, as a means to avoid sex. Instead, sterilized women in the study report a difficult time refusing sex with their partners, and would rather have sex against their will than to instigate a fight with their partner (Osis, Faundes et al. 1999). The same study finds that 28% of male partners report being more jealous as a result of their partner's sterilization procedure

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because they felt that she could now have indiscriminant sex with other men without a concern for pregnancy (Osis, Faundes et al. 1999).

Dual protection interventions and public health messages must target sterilized women in Brazil. The required counseling before the sterilization procedure could capitalize on the opportunity to ensure women who request sterilization are informed of the ease and low price of alternative family planning methods. This counseling session could also educate women of the importance of condom use, sexual negotiation, and partner communication around risk reduction strategies within and outside the relationship. This counseling appointment could also take advantage of the law that requests a husband's approval of sterilization and request that both partners of the dyad be present. A program like this could conduct couples STI testing and counseling on risk reduction behavior and how to arrive at a negotiated safety together. This type of institutional intervention to promote condom use and partner communication is especially critical to sterilized women as they face numerous barriers to condom use in stable relationships.

Relationship Context: A critical consideration

Are Stable Relationships an Institution for Unsafe Sex in Brazil?

This study finds that whether a woman is married or single strongly affects condom use consistency in both the full sample of fecund women and in sterilized women. Fecund women in relationships (e.g. in civil union and married) report less consistent condom use (e.g. 16% and 20%, respectively) than women who are not in relationships (e.g. 52% of single and 42% of separated women). The use of a modern contraceptive method only was more common among women in relationships (both at 25%) than women who are not in relationships (e.g. 10% of single and 15% of separated women use modern contraceptive methods only). By including both

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condom use consistency and contraceptive use in the same dual protection consistency outcome measure, this study captures the nuances of how HIV/STI prevention and contraceptive behavior can overlap. Women who are not in relationships appear motivated to prevent STIs and/or dual protect whereas women in relationships appear motivated to control or space their fertility with contraception use only.

Relationship status more strongly characterizes condom use in sterilized women. Less sterilized women in civil union or married report consistent condom use (3% and 2%, respectively) than women who are not in relationships (e.g. 10% of single and 32% of separated women). It appears, however that most sterilized women do not use condoms at all (85-88%) despite relationship status, with the exception of separated women (40%). Separated women may have made the decision to have the sterilization procedure while they were married or in civil union and find themselves with the need to use condoms to protect against STIs now that they are no longer in a relationship. Although a substantial proportion of separated, sterilized women use consistent condoms public health efforts in Brazil could focus more on promoting condom use, STI testing, and partner communication among sterilized women who are sexually active but not in a relationship.

It appears that stable relationships may be an institution for unsafe sex in Brazil; this finding is supported across the literature both in Brazil and worldwide. Although the magnitude of effect varies, the robustness of the correlation between relationship status and condom use holds across diverse socio-cultural, geographical, and epidemiological contexts around the globe (Carey, Herman et al. 1992; Castilla, Barrio et al. 1998; Carey, Lytle et al. 1999; Adetunji 2000; Everett, Warren et al. 2000; Holtzman, Bland et al. 2001; Lagarde, Carael et al. 2001; VanRossem, Meekers et al. 2001; Jenkins, Manopaiboon et al. 2002; Kelley, Borawski et al.

2003; Biraro, Shafer et al. 2009; Workowski and Berman 2010; Anderson, Warner et al. 2011; de Walque and Kline 2011; Reynolds, Luseno et al. 2012); in addition, these findings remain despite how relationship status is defined or measure.

Consistent condom use promotion among stable partners is a major challenge for public health. The lack of condom use in stable partners may point to a shortcoming in public health efforts, unrealistic expectations of stable partners, or a bit of both. There is no question, however, that sexually active women in Brazil are at risk of becoming infected with HIV. Most new HIV cases in women are among women of reproductive age (83%) and nearly all women acquire HIV through heterosexual transmission with partners in a committed relationship (96%) (Parker 2000; Oliveira, Kerr et al. 2007; MOS 2008). These statistics highlight the need for focus on the relationship context and partners when promoting condom use (Calazans, Araujo et al. 2005; Warner, Gallo et al. 2012). It is also evident that, although ideal, condom use within an established romantic relationship may not be a realistic preventative goal and an alternative risk reduction strategy is urgently in need. Condom promotion is efficacious where HIV transmission occurs predominantly in commercial sex settings and in male–male sexual relationships, but not in situations where heterosexual transmission is prevalent (CEBRAP 2000; Calazans, Araujo et al. 2005; UNFPA 2005). Additionally, condom use promotion is found to be considerably unattainable when romantic partners do not use condoms during their first sexual encounter, further reinforcing condom use as a habit-forming behavior especially within the context of an ongoing relationship (Shafii, Stovel et al. 2004).

A more realistic approach to dual protection within the relationship context addresses relationship ideals and partner communication. Unprotected sex within stable relationships may confer a greater risk of exposure to HIV/STIs than expected by partners because assessments of

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risk within such relationships are often unknown or inaccurate, especially when there is infidelity and drug-use (Clark, Miller et al. 1996; Ickovics, Thayaparan et al. 2001). This is especially the case in Brazil, where gender norms and partner dynamics disfavor communication about family planning and extra-relationship affairs.

Negotiated safety has priceless potential as a risk reduction strategy for stable partners. Negotiated safety is an explicit agreement made between partners (Corbett, Dickson-Gomez et al. 2009). This agreement includes getting HIV/STI tests together and communication between partners that establishes rules regarding condom use outside the primary relationship. Negotiated safety embraces condom use with casual partners in Brazil's sexual culture and encourages open partner communication (Calazans, Araujo et al. 2005). In the context of dual protection, negotiated safety would also help to integrate family planning and HIV counseling within the universal and HIV healthcare system in Brazil.

In a large, socially nuanced country like Brazil, more depth is needed in studies and interventions that address the relationship context. One example is that there is no consensus as to how to measure relationship status (Calazans, Araujo et al. 2005). There are numerous measurements of relationship status found in the literature that create and reinforce false dichotomies such as stable versus casual, marital versus non-marital, co-habiting versus non-cohabiting, committed versus non-committed (Everett, Warren et al. 2000; VanRossem, Meekers et al. 2001; Jenkins, Manopaiboon et al. 2002; Kelley, Borawski et al. 2003; Shafii, Stovel et al. 2004). However, in Brazil, research not only differentiates condom use in single versus married relationships or in casual versus stable relationships, but also finds this pattern in adults and adolescents across various degrees of relationship statuses (e.g. sex workers, one-night stands, dating, *amigos coloridos* (friends with benefits), steady, exclusively dating, marital, and

cohabiting) (CEBRAP 2000; Pinho, Berquo et al. 2002; Paiva, Venturi et al. 2003; Calazans, Araujo et al. 2005; Teixeira, Knauth et al. 2006; Paiva, Calazans et al. 2008). Adding more depth to relationship status measures may help to more clearly reveal the mechanisms through which relationship status affects choice of contraceptive method and consistency of condom use.

Does Relationship Context Explain How Individual-level Factors Affect Condom use Consistency?

Relationship Status in Full Sample of Fecund Women

This study finds that individual-level factors operate predominately through direct effects on dual protection consistency among the full sample of fecund women, rather than through indirect effects via relationship status. However, this study did find that relationship status attenuated the strength and magnitude of effect of education, region, and risk at sexual debut on dual protection consistency (e.g. inconsistent condom use, modern method, and traditional method of contraception). Although education, region, and risk at sexual debut were constant individual-level predictors of consistent condom use throughout the analysis, the relationship context sets the environment in which decisions are made regarding condom use (or non-use). Despite what an individual may have learned through education or through their socio-cultural context, the commitment and the affect and intimacy built between partners may affect or even supersede their inclinations to use condoms. It is noteworthy, that this relationship context may even affect an individual's habitual behavior of condom use established at sexual debut. Furthermore, relationship status mediated the association between number of children and consistent condom use. These findings highlight the importance of both individual and relationship–level factors.

Educational Asymmetry in Sterilized Women

This study finds that educational attainment significantly predicts consistent condom use in sterilized women and mediates several associations between individual-level factors and consistent condom use. Male educational attainment is found to be more indicative of consistent condom use than female educational attainment. For example, consistent condom use was the greatest in highly educated symmetric relationships (RRR=5.6), followed by relationships where the man has a greater education than the woman (RRR=4.5), relationships where the woman has a greater education than her partner (RRR=2.8), and lastly by poorly educated symmetric relationships (RRR=1.0). This finding demonstrates the salience of educational attainment in affecting consistent condom use in both men and women. The fact that male education is more important in predicting condom use in a relationship highlights condoms as a male-controlled method and, although education is also important for women, it is crucial that we include men when developing disease prevention and equitable gender promotion programs.

Furthermore, this study finds that individual-level factors operate predominately through direct effects on consistent condom use in sterilized women, rather than through indirect effects via educational asymmetry. However, in the mediation models I did find that educational asymmetry mediates the association between risk at sexual debut and consistent condom use. In sterilized women, relationship context appears to be more predominant than in non-sterilized women. Despite the long-term effect and potentially habit-forming behavior of condom use at sexual debut on current consistent condom use, the association becomes insignificant upon addition of educational asymmetry variable. At the same time, the categories of the educational asymmetry variable related to above average male education remain significant predictors of consistent condom use in sterilized women. This finding highlights that male education is critical

in Brazil. Male educational attainment in Brazil has lagged behind female educational attainment in recent years and the disparity is projected to worsen. On average, men attain 5.1 years of education, whereas women attain an average of 5.5 years of education (Beltrao and Alves 2009). This study reveals that educational attainment permeates all dimensions of life, including the ability to protect oneself against STIs including HIV.

Strengths and Limitations

Findings from this study should be viewed in light of several limitations. This section will first review the limitations and then the strengths of this study.

Limitations

This study should be viewed in light of several limitations. First, data are cross-sectional therefore limiting my ability to assert causal inference. However, the cross-sectional design does not necessarily invalidate the claim that relationship status is a proxy for relationship context, which conditions the environment where partners communicate and make decisions whether or not to use dual protection. The cross-sectional nature of the data, however, do limit the ability to assess selection bias into certain relationship statuses; a common limitation with relationship research. However, to overcome this bias I did make a thorough effort to describe how women in different relationship statuses differed by individual and relationship context characteristics. Furthermore, random sampling approaches would ensure that this variable is equally distributed across the sample.

Second, the data is based on self-reports and require the respondent to recall sexual activity, partnership characteristics, and condom use. This caveat may have introduced measurement error from recall bias or social desirability effects of concern about confidentiality

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from interviewer, family members, or spouse. In addition, questions regarding sexual activity and condom use in large surveys often involve limited depth and no contextualization of behavior. One example is that we are uncertain about the depth and mutual partner participation involved in reporting 'communication'. Another example occurs with condom use measures. Researchers assume that women in stable relationships report on condom use with their stable partner but, unless we ask, we cannot be certain that women are not reporting on condom use with their casual partner or with concurrent partners; inconsistent condom use may reflect consistent condom use with casual partners and no condom use with stable partners. In instances of discrepant responses, however, the PNDS survey employed standardized methods that required interviewers to clear up any inaccuracies found throughout the survey. Although measures of contraception and condom use are both validated measures it is also important acknowledge that missing data for each question may bias findings in research.

Third, the PNDS in 2006 collected limited information from male partners and even that information is limited to women who report being in civil union or married. Limited socio-demographic information was collected about sexual partners to the exclusion of key relationship context variables like length of sexual relationship and frequency of sexual relations. As noted in this study of condom use, male partner characteristics like education may take precedence over female partner characteristics when determining whether or not condoms (a male-controlled method) will be used and if so how consistently. Furthermore, as noted in the theoretical section of this study, gender norms in Brazil are greatly influential in setting the stage for partner dynamics in a relationship.

Studies would benefit from information about how partners evaluate their risk for HIV/STIs and how they communicate fertility desires. How exactly do women and men decide

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on a contraceptive method; is it a decision made together as assumed by many studies? Additionally, how is relationship commitment establish, negotiated, and abided by? Do partners have concurrent sexual relationships? Do partners have a negotiated safety agreement? Qualitative studies with romantic partners might help to answer these questions of relationship commitment, disease prevention, and fertility desires. Qualitative studies would furthermore inform large, nationally-representative surveys of the salience of the relationship context and of how to measure such phenomena.

Lastly, relationship status is a fluid concept that includes relationship with wide-ranging variation in commitment and intimacy. For example, relationship status could range from a one-night stand to a committed, loving, 50–year marriage and includes everything in between. Findings from this study suggest that transition from consistent condom use, to inconsistent dual method use, to contraceptive method use only (not including condoms) may be a result of partners transitioning towards a more committed relationship. However, without a more nuanced measure of relationships these conclusions are mere speculation.

Strengths and Public Health Implications

This study has several strengths and implications for clinical practice, health programs, and policy. First, the use of data from a large, nationally representative sample signifies that findings can be generalized to sexually active women of reproductive age living in households in Brazil in 2006. This study highlights education, condom use at sexual debut, and relationship status as the salient individual and relationship-level factors that promote condom use consistency in this sample of women. In a country where condom use has been so widely promoted, condoms have been so widely distributed, and HIV/AIDS care is available and accessible, this study has implications to develop Brazil's HIV prevention program and strategy

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around HIV education, tackling gender norms in the relationship context, and promoting condom use in sterilized women. Findings from this study highlight ways to achieve these goals. First, gaps were highlighted in the school-based HIV prevention and condom promotion program and in educational attainment in general in Brazil. Reaching more young people with this school-based program would translate to more social and economic support to poor families to keep their children and young adults in school and add value to having an education. Programs such as *Bolsa Familia* in Brazil have shown success, for example (MDS 2013). Bolsa Familia is a conditional cash transfer program run by the Brazilian government that provides poor families with a monthly stipend if they ensure their children attend school (up until fifth grade). Over one-quarter of Brazilian families receive aid from Bolsa Familia. This study recommends that the Brazilian government extend the coverage of the Bolsa Familia to provide free education for poor children for up to twelve years of education; this would not only be an investment into Brazil's future but would also lead to an immeasurable, positive impact on social development and public health.

Additionally, this study assesses how condom use consistency overlaps with use of another contraceptive method in three sub-groups of women and finds potentially different motives for using condoms, contraception only, or dual methods. Although dual protection is not explicitly promoted in Brazil, women living with HIV and Brazilian youth have been found to make clear distinctions between contraceptive methods and barrier methods (Juarez and LeGrand 2005). This evidence is a call to health care practitioners and public health programmers in Brazil to address condom use and contraception with their clients. Making clear the effectiveness of various modern and traditional contraceptive methods and emphasizing the importance of condom use and negotiated safety in a relationship must become key components of Brazil's

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HIV prevention program. Furthermore, it is critical that health care practitioners provide counseling or referrals to sterilized women regarding the importance of condom use and negotiated safety in their relationships.

Along with this strength, however, comes a limitation involved with estimating models with multiple equations using surveys with complex sampling designs in STATA. So far, using the –svy– command with –mlogit– in STATA does not allow the estimation of any model fit statistics therefore making it unfeasible to test for model fit. Although model fit statistics can be used if estimates are close enough in value between weighted and unweighted models, it appears this is not the case in this study. Use of the –svy– command to apply survey weights substantially changes estimates for weighted versus unweighted models and, therefore, unweighted fit statistics cannot be interpreted. Future research will pursue assessing model fit by estimating structural equation models in MPlus.

Second, this study tests several elaborations of the dual methods hypothesis and finds overall support for the hypothesis that women who use dual methods will use one or both methods more inconsistently than women who use a single method (condoms) for dual protection. This hypothesis held true for women who use condoms and for women who are sterilized. However, the hypothesis was not supported when comparing oral contraceptive pills to hormonal injection or a patch; women who use hormonal injection or a patch use condoms slightly more consistently than women who use pills but the association was insignificant.

Understanding the dual method hypothesis allows researchers to elucidate the mechanisms through which women negotiate HIV prevention and fertility control and has distinct implications for clinical practice, public health programs, and policy. It appears that the use of dual methods may occur during the transition from use of a single method (condoms) for

dual protection to the use of a contraceptive method only (aside from condoms). If this is the case, it is essential that healthcare providers and public health programs provide support for couples to receive couple STI testing along with counseling around effective methods of contraception and common side-effects involved. Further, contraceptive policy in Brazil could improve to ensure women in all regions of Brazil and all socio-economic classes have access to the same range of modern contraceptive methods. Offering a wide range of contraceptive methods has been found to increase the uptake of contraception and decrease the prevalence of unmet need for family planning.

Third, this study examines how the relationship context can promote or inhibit condom use in women given factors like education and condom use at sexual debut. Relationship status best explained the effect of individual-level factors on consistent condom use in the full analytic sample of fecund women. Educational asymmetry best explained the effect of individual-level factors on consistent condom use in sterilized women. Findings highlight the importance of considering the relationship context and the male partner in studies that address behavior that requires couple coordination like condom use, communication, and gender equity. Interventions that focus on the relationship dyad and that aim to transform gender norms show great promise in improving disease prevention and healthy relationships. For example, Project CONNECT (El-Bassel, Witte et al. 2003) found that women and their partners who were trained on how to communicate about condom use with each other were found to report more consistent condom use later on. Also, Program H in Brazil (n=622) used small-group interactive education sessions and a behavior change communication program (e.g., billboards) in young men ages 14 to 25 years for two years. The program was found to lower the proportion of men and young boys who

endorse gender inequitable norms, increase condom use at last sex, and reduce STI symptoms (Pulerwitz, Michaelis et al. 2010).

Lastly, this study highlights ways in which HIV and reproductive health services can be integrated to provide streamlined care. Aside from the preventative benefits of dual protection, there are also health systems and public health benefits. In many ways, dual protection serves as a symbol of how well integrated HIV services are with sexual and reproductive health services. For decades major stakeholders have struggled with ways to integrate these services in order to avoid unnecessary waste of financial and human resources (O'Reilly, Dehne et al. 1999; Spaulding, Brickley et al. 2009; Wilcher, Cates Jr et al. 2009; Kennedy, Spaulding et al. 2010). Dual protection combines strategies that address STIs (including HIV; e.g. preventing, testing, counseling, and treating STIs), family planning (e.g. fe-/male condom promotion, contraception counseling and provision, and emergency contraception), and access to abortion services and/or post-abortion care (where available). Dual protection programs and policies may lend synergistic benefits to health systems and public health as a whole (WHO 2005).

TABLES

Table 4.1. Weighted Logistic Regression Results for Exclusion from main analytic samples as a function of Independent Variables, Pesquisa Nacional Demografica e da Saúde da Criança e da Mulher, 2006

Characteristic	β (SE)	
Sociodemographics		
Age		
15-19***……………………………………….	2.4	(0.276)
20-24***……………………………………….	1.6	(0.234)
25-29***……………………………………….	1.6	(0.218)
30-39***……………………………………….	0.9	(0.146)
40-49…………………………………….…..	ref.	
Education		
No education……………………………..	ref.	
1-5 years*…………………………………..	0.6	(0.298)
6-9 years***…………………………….….	1.2	(0.323)
10-11 years***………………………….	1.5	(0.326)
12 or more years***……………………..	1.7	(0.385)
Race		
White……….………………………………..	ref.	
Black…………………..…………………....	0.1	(0.139)
Other…………….………………………....	0.4	(0.327)
Religion		
None……….…………………………….….	ref.	
Catholic….………………………………..	-0.1	(0.226)
Evangelical*…………………….....……….	-0.6	(0.235)
Afro-religion or Other*………..……….	-0.7	(0.332)
Region		
North…….…………………………….…..	ref.	
Northeast………………….....………….	-0.2	(0.169)
Southeast………………….....………….	0.3	(0.179)
South……….…………………………….	0.3	(0.192)
Mid-West……….………………………..	0.2	(0.181)
Urban		
No……….………………………………..	ref.	
Yes……….……………….....…………….	0.2	(0.157)
Employed		
Yes……….………………………………..	ref.	
No, unemployed w/in a year………….	-0.1	(0.180)
No, never or more than a year……….	-0.1	(0.147)
Household income (Reis/month)		
280 or less Reis (E class)…………….	ref.	
281 to 500 Reis (D class)………….	0.2	(0.206)
501 to 1300 Reis (C class)………….	0.1	(0.212)
1301 or more Reis (A & B class) …..	-0.1	(0.257)
No salary data…………………………..	-0.3	(0.225)
Household wealth score*………………	0.2	(0.092)

Table continued on next page

Early Sexual Risk
  Dual protection at sexual debut
    No method…………………………… | ref.
    Contraceptive only***………………… 0.8 (0.195)
    Condom**……………………………… 0.4 (0.132)
Fertility
  Number of children***………………… 0.2 (0.048)
  Wants more children
    No……………………...…………… | ref.
    Yes…………………...……………… -0.1 (0.165)
    Don't know………………...………… -0.4 (0.328)
Relationship Context
  Relationship status
    Single***…………………………..… -2.2 (0.208)
    Separated***………………………… -2.3 (0.198)
    Civil union.…………………………… -0.3 (0.187)
    Married……………………………… | ref.

Note: SE=Standard Error; ***p-value<=0.001; **p-value<=0.01; *p-value<=0.05
  Contraceptive method refers to modern methods excluding condoms

Table 4.2. Weighted Descriptive Statistics of Sample Outcomes in Sexually Active Women, of Reproductive Age (15-49 years) in Brazil, Pesquisa Nacional Demografica e da Saúde da Criança e da Mulher 2006

Sample Outcomes	N	Wgt. %
Full Analytic Sample (N=6,996)		
Dual protection consistency		
No method………………………………...……	758	11%
Traditional contraceptive only……………………	223	3%
Modern contraceptive only…………………………	2,055	28%
Inconsistent condom use……………………………	2,096	30%
Consistent condom use……………………………	1,864	27%
Dual Method Use (N=3,960)		
Single method use (condoms only)………………	2,320	59%
Dual method use (condoms + another method)….	1,640	41%
Sterilized (N=3,896)		
Consistent condom use		
No condom use……………………………………	3,186	83%
Inconsistent condom use……………………………	501	13%
Consistent condom use……………………………	209	5%

Note: Ns are unw eighted; percentages are w eighted

Modern contraceptives exclude condoms and include the pill and other hormonal methods

Table 5.1. Weighted Descriptive Statistics of Variables in Fecund, Sexually
Active Women, of Reproductive Age (15-49 years) in Brazil,
Pesquisa Nacional Demografica e da Saúde da Criança e da
Mulher 2006 (N=6,996)

Characteristic	N	Wgt. %
Sociodemographics		
Age [mean (std)]……………………………..	29.0 (0.231)	
15-19……………………………………..……	945	14
20-24………………………………..………..	1,680	23
25-29………………………………………….	1,477	20
30-39………………………………………….	1,948	26
40-49………………………………………….	946	16
Education (years) [mean (std)]………………	8.62 (0.093)	
No education………………………………….	136	2
1-5 years……………………………………..	1,596	19
6-9 years…………………………………….	2,006	28
10-11 years…………………………………..	2,382	37
12 or more years……………………………..	876	15
Race		
White……………………………………….	2,946	43
Black………………………..………………..	3,689	51
Other………………………………………….	361	5
Religion		
None………………………………………..	591	9
Catholic……………………………………..	4,644	63
Evangelical…………………..…………….....	1,408	22
Afro-religion or Other………………………..	353	6
Region		
North………………………………………....	1,095	7
Northeast…………………………..…………	1,207	22
Southeast…………………………………….	1,548	47
South………………………………………….	1,838	18
Mid-West……………………………………..	1,308	7
Urban		
No………………………………………….......	1,869	14
Yes……………………………………………	5,127	86
Employed		
Yes…………………………………………....	3,864	57
No, unemployed w/in a year………………..	879	12
No, never or more than a year………………	2,253	31
Household income (Reis/month)	1,343.09 (67.03)	
280 or less Reis (E class)…………………..	952	13
281 to 500 Reis (D class)…………………..	1,352	17
501 to 1300 Reis (C class)………………….	2,082	32
1301 or more Reis (A & B class) ………….	1,596	25
No income data………………………………	1,014	13

Table continued on next page

Household wealth score		
Lowest quintile	1,665	20
Second quintile	1,670	20
Third quintile	1,451	21
Fourth quintile	1,252	21
Highest quintile	958	18
Early Sexual Risk		
Dual protection at sexual debut		
No method	2,586	34
Contraceptive only	1,459	22
Condom	2,951	45
Fertility		
Number of children [mean (std)]	1.19 (0.029)	
None	2,070	33
1	2,266	35
2	1,532	21
3 or more	1,128	12
Wants more children		
No	3,456	48
Yes	3,345	49
Don't know	195	3
*Relationship Context**		
Relationship status		
Single	1,437	22
Separated	693	9
Civil union	2,337	32
Married	2,529	38
Age asymmetry [avg years younger (std)]	4.52 (0.16)	
Woman is within 2 years	1,498	31
Woman is 3+ years younger	2,890	60
Woman is 3+ years older	478	9
Educational asymmetry [mean cat diff (std)]	0.05 (0.03)	
Both low	1,085	18
Woman high/man low	385	7
Woman low/man high	853	18
Both high	2,543	57
Ever talked w/partner about family planning		
No	1,016	23
Yes	3,850	77
Household decisions score		
Lowest quartile	542	24
Second quartile	1,453	18
Third quartile	1,393	25
Highest quartile	1,478	33

Note: Ns are unweighted; means and percentages are weighted; std=standard deviation

Mean household income includes n=5,982 with data; Contraceptive method excludes condoms

*Relationship context variables (except relationship status) include women in civil union or married (n=4,866)

Table 5.2. Weighted Percentage Bivariate Distributions of Independent Variables by Relationship Status in Fecund, Sexually Active Women of Reproductive Age (15-49 years) in Brazil, Pesquisa Nacional Demografica e da Saúde da Criança e da Mulher 2006 (N=6,996)

	RELATIONSHIP STATUS			
	Single	Separated	Civil Union	Married
	(n= 1,437)	(n= 693)	(n= 2,337)	(n= 2,529)
Sociodemographics				
Age [mean(std)] ***……………………	23.5 (0.4)	31.7 (0.7)	28.0 (0.3)	32.4 (0.3)
Education [mean(std)] ***……………	10.0 (0.2)	8.6 (0.2)	7.7 (0.1)	8.6 (0.1)
Race ***				
White……………………………………	48	36	34	50
Black…………………...………….…..	44	58	61	46
Other……………………………………	8	6	5	4
Religion ***				
None……..……………………………..	12	11	12	4
Catholic.………………………………	64	62	66	60
Evangelical.…………………...…..….	15	20	18	30
Afro-religion or Other………………..	9	7	4	5
Region ***				
North……..……………………………..	6	7	10	4
Northeast.…………………...………..	17	20	27	22
Southeast.…………………...………..	56	52	38	47
South.…………………………………..	15	15	17	21
Mid-West.……..……………………….	6	6	8	7
Urban ***				
No.…….……………………………..	69	9	16	18
Yes.……………………...…………..	93	91	84	82
Employed ***				
Yes, formally.………………………….	57	66	50	59
No, unemployed w/in year…………	17	14	14	8
No, never or more than year……….	26	19	36	32
Household income (Reis/month) ***				
280 or less Reis (E class)…………	10	22	15	10
281 to 500 Reis (D class)………..	14	19	23	14
501 to 1300 Reis (C class)……….	27	30	35	32
1301 or more Reis (A & B class) ..	29	13	16	33
No salary data………………………..	20	15	11	11
Household wealth [mean(std)] ***	0.4 (0.1)	0.1 (0.1)	neg 0.2 (0.0)	0.2 (0.0)
TOTAL	100%	100%	100%	100%

Table 5.2., continued

	RELATIONSHIP STATUS			
	Single	Separated	Civil Union	Married
Early Sexual Risk				
Risk at sexual debut ***				
No method…………………………	18	44	42	33
Contraceptive………………………	7	19	17	35
Condom……………………………	75	37	41	32
Fertility				
Number of children [mean(std)] ***…	0.2 (0.0)	1.5 (0.1)	1.5 (0.0)	1.5 (0.0)
Wants more children ***				
No…………………...………………	19	66	53	56
Yes…………………...………………	78	33	44	41
Don't know………………...………	3	2	3	3
Relationship Context (n=4,866)				
Age asymmetry ***				
Woman is within 2 years……………			30	32
Woman is 3+ years younger………			57	62
Woman is 3+ years older………….			13	7
Educational assymetry ***				
Both low……………………………			19	17
Woman high/man low………………			9	5
Woman low/man high………………			20	16
Both high……………………………			52	62
Discuss family planning ***				
No…………………………………..…			31	16
Yes…………………………………..…			69	84
Household decisions score			0.2 (0.03)	0.2 (0.03)
TOTAL	100%	100%	100%	100%

Note: Means and percentages are w eighted; std=standard deviation

Contraceptive method refers to modern methods excluding condoms

***p-value<=0.001; **p-value<=0.01; *p-value<=0.05

Table 5.3. Weighted Bivariate Distribution of Dual Protection Consistency and Socio-demographics in Fecund, Sexually Active Women of Reproductive Age in Brazil, Pesquisa Nacional Demografica e da Saúde da Criança e da Mulher 2006 (N=6,996)

	DUAL PROTECTION CONSISTENCY								
	PERCENTAGE					BIVARIATE MULTINOMIAL LOGISTIC REGRESSION*			
	No Method	Tradition Only	Modern Only	Inconsist Condom	Consist Condom	Traditional Method Only	Contraceptive Method Only	Inconsistent Condoms	Consistent Condoms
100%	11%	3%	28%	30%	27%	RRR (SE)	RRR (SE)	RRR (SE)	RRR (SE)
Sociodemographics									
Age ***	32.9(0.5)	35.0(0.9)	29.6(0.3)	27.2(0.3)	28.1(0.5)	1.0 (0.014)	0.9*** (0.008)	0.9*** (0.008)	0.9*** (0.010)
Education ***	7.7(0.2)	8.0(0.4)	8.3(0.1)	8.8(0.1)	9.3(0.1)	1.0 (0.038)	1.0 (0.025)	1.1** (0.027)	1.2*** (0.026)
Race ***									
White……………………………	9	5	30	29	27	ref.			
Black………………...…………	13	2	27	31	26	0.4*** (0.092)	0.7** (0.093)	0.8 (0.111)	0.7* (0.117)
Other………………...…………	7	2	20	32	39	0.7 (0.485)	0.9 (0.278)	1.5 (0.425)	2.0* (0.563)
Religion *									
None……………………………	13	2	24	36	24				
Catholic………………………	11	4	30	29	27				
Evangelical………………...…	12	4	27	32	26				
Afro-religion or Other…..……	10	2	18	28	42				
Region ***									
North…………………………	14	3	19	31	32	ref.			
Northeast……………………	11	3	29	32	24	1.4 (0.434)	1.9*** (0.355)	1.3 (0.244)	0.9 (0.179)
Southeast……………………	11	4	25	30	30	1.6 (0.458)	1.8*** (0.324)	1.3 (0.247)	1.3 (0.232)
South…………………………	10	3	36	29	21	1.5 (0.395)	2.6*** (0.467)	1.3 (0.248)	0.9 (0.173)
Mid-West……………………	12	2	31	29	27	0.7 (0.228)	2.0*** (0.383)	1.2 (0.228)	1.0 (0.185)
Urban ***									
No……………………………	12	4	35	29	20	ref.			
Yes………………...…………	11	3	27	31	28	1.0 (0.258)	0.8 (0.130)	1.2 (0.198)	1.6** (0.266)
Employed **									
Yes, formally…………………	12	4	29	28	28	ref.			
No, unemployed w/in a year……	7	1	25	35	31	0.4* (0.179)	1.4 (0.348)	2.0** (0.500)	1.8 (0.559)
No, never or more than a year…	11	3	28	33	24	0.8 (0.197)	1.0 (0.167)	1.2 (0.194)	0.9 (0.144)
Household income									
280 or less Reis (E class)………	15	4	27	31	23				
281 to 500 Reis (D class)………	11	3	29	34	24				
501 to 1300 Reis (C class)………	10	4	31	30	26				
1301 or more Reis (A & B class)..	10	4	26	29	31				
No income data………………	13	3	23	30	31				
Household wealth score	0.0 (0.1)	0.1 (0.1)	0.0 (0.0)	0.0 (0.0)	0.2 (0.0)				

Note: Percentages and estimates are weighted; RRR=Relative risk ratio; SE=Standard error; Contraceptive method refers to modern methods excluding condoms
* Reference group for multinomial logistic regression is 'No method'; ***p-value<=0.001; **p-value<=0.01; *p-value<=0.05

Table 5.4. Weighted Bivariate Distribution of Dual Protection Consistency, Early Sexual Risk, and Fertility in Fecund, Sexually Active Women of Reproductive Age (15-49 years) in Brazil, Pesquisa Nacional Demografica e da Saúde da Criança e da Mulher 2006 (N=6,996)

	DUAL PROTECTION CONSISTENCY												
	PERCENTAGE					BIVARIATE MULTINOMIAL LOGISTIC REGRESSION*							
	No Method	Tradition Only	Modern Only	Inconsist Condom	Consist Condom	Traditional Method Only RRR (SE)		Modern Method Only RRR (SE)		Inconsistent Condoms RRR (SE)		Consistent Condoms RRR (SE)	
	100%	11%	3%	28%	30%	27%								
Early Sexual Risk													
Risk sexual debut***													
No method……………….….	16	4	31	29	20			ref.					
Contraceptive method only .	11	6	34	28	21	2.2**	(0.58)	1.6***	(0.26)	1.5*	(0.27)	1.6*	(0.32)
Condom……………………..	7	2	23	32	36	1.1	(0.35)	1.7**	(0.30)	2.6***	(0.49)	4.2***	(0.68)
Fertility													
Number of children***………. 1.5 (0.08) 1.6 (0.12) 1.4 (0.04) 1.1 (0.05) 0.9 (0.05)						1.1	(0.07)	1.0	(0.04)	0.8***	(0.04)	0.7***	(0.04)
Wants more children***													
No………………….…..………	10	4	33	27	26			ref.					
Yes…………………...………	12	3	23	34	28	0.6*	(0.13)	0.6***	(0.09)	1.1	(0.16)	0.9	(0.16)
Don't know…………………..	14	5	29	33	20	0.8	(0.49)	0.7	(0.27)	0.9	(0.38)	0.5	(0.24)

Note: Percentages and estimates are weighted; RRR=Relative risk ratio; SE=Standard error; Contraceptive method refers to modern methods excluding condoms
* Reference group for multinomial logistic regression is 'No method'; ***p-value<=0.001; **p-value<=0.01; *p-value<=0.05

Table 5.5. Weighted Bivariate Distributions of Dual Protection Consistency and Relationship Context in Fecund, Sexually Active Women of Reproductive Age (15-49 years) in Brazil, Pesquisa Nacional Demografica e da Saúde da Criança e da Mulher 2006 (N= 4,866)

	DUAL PROTECTION CONSISTENCY												
	PERCENTAGE					RRR (SE)*							
	No Method	Tradition Only	Modern Only	Inconsist Condom	Consist Condom	Traditional Method Only		Modern Method Only		Inconsistent Condoms		Consistent Condoms	
100%	11%	3%	28%	30%	27%	RRR (SE)		RRR (SE)		RRR (SE)		RRR (SE)	
Relationship Context													
Relationship status (n=6,996)***													
Single…....………………………	5	2	10	32	52	0.7	(0.36)	0.8	(0.22)	2.9***	(0.72)	6.6***	(1.65)
Separated…………………….….	13	2	15	28	42	0.3*	(0.16)	0.4***	(0.11)	0.9	(0.22)	1.8**	(0.43)
Civil union…………………….….	14	3	35	33	16	0.4***	(0.11)	0.8	(0.13)	1.0	(0.15)	0.7*	(0.11)
Married………………………….	12	5	35	28	20				ref.				
Age asymmetry													
Woman is within 2 years………….	15	4	33	30	18								
Woman is 3+ years younger……..	11	4	36	31	18								
Woman is 3+ years older…………	15	7	36	28	14								
Educational assymetry***													
Both low………………………….	17	6	38	24	15				ref.				
Woman high/man low…………….	16	6	34	29	16	1.0	(0.43)	1.0	(0.28)	1.4	(0.44)	1.2	(0.42)
Woman low/man high…………….	12	2	40	33	12	0.6	(0.20)	1.4	(0.31)	2.0**	(0.46)	1.1	(0.38)
Both high………………………….	11	4	33	31	21	1.0	(0.29)	1.4	(0.28)	2.1***	(0.47)	2.2**	(0.66)
Discuss family planning w/partner													
No……………………………….	15	4	37	28	16								
Yes……………………………....	12	4	35	31	18								
Household decisions score…………	0.2 (0.1)	0.4 (0.1)	0.2 (0.0)	0.2 (0.0)	0.3 (0.0)								

Note: Percentages and estimates are w eighted; RRR=Relative risk ratio; SE=Standard error; Contraceptive method exludes condoms
* Reference group for multinomial logistic regression is 'No method'; ***p-value<=0.001; **p-value<=0.01; *p-value<=0.05

Table 5.6. Parsimonious Model to Predict Dual Protection Consistency in Fecund, Sexually Active Women of Reproductive Age (15-49 years) in Brazil, Pesquisa Nacional Demografica e da Saúde da Criança e da Mulher 2006 (N=6,996)

	Traditional Method Only RRR (SE)		Modern Method Only RRR (SE)		Inconsistent Condoms RRR (SE)		Consistent Condoms RRR (SE)	
Sociodemographics								
Age	1.0	(0.02)	0.9***	(0.01)	0.9***	(0.01)	0.9***	(0.01)
Education	1.0	(0.04)	1.1*	(0.03)	1.1***	(0.03)	1.1***	(0.03)
Region								
North…………………				ref.				
Northeast…………..	1.2	(0.40)	2.0***	(0.39)	1.4	(0.27)	1.0	(0.21)
Southeast………….	1.2	(0.36)	2.0***	(0.38)	1.4	(0.28)	1.0	(0.19)
South………………..	1.0	(0.30)	2.9***	(0.55)	1.4	(0.30)	0.9	(0.17)
Mid-West…………..	0.6	(0.20)	2.1***	(0.41)	1.2	(0.25)	1.0	(0.19)
Early Sexual Risk								
Risk sexual debut								
No method………….				ref.				
Contraceptive………	1.9*	(0.52)	1.6**	(0.28)	1.6*	(0.33)	1.8**	(0.41)
Condom…………….	1.1	(0.44)	1.4	(0.26)	1.6*	(0.33)	2.6***	(0.49)
Fertility								
Wants more children								
No…………………...				ref.				
Yes………………….	0.5*	(0.16)	0.3**	(0.06)	0.3***	(0.07)	0.2***	(0.06)
Don't know…………	0.9	(0.56)	0.4*	(0.18)	0.6	(0.22)	0.3**	(0.13)
Relationship Context								
Relationship status								
Single…..…………..	1.0	(0.52)	0.6	(0.17)	1.6	(0.46)	4.6***	(1.23)
Separated………….	0.3*	(0.17)	0.4***	(0.11)	0.8	(0.23)	1.7*	(0.45)
Civil union…………	0.5*	(0.14)	0.7	(0.13)	0.8	(0.14)	0.6**	(0.11)
Married…………….				ref.				

F-statistic (df, df)	*9.77 (52,1027)*
P-value	*0.000*

Note: ; ***p-value<=0.001; **p-value<=0.01; *p-value<=0.05; RRR=Relative risk ratio
* Reference group for multinomial logistic regression is 'No method'; SE=Standard error
Contraceptive methods exclude condoms

Table 5.7. Multinomial Logistic Regression Models to Assess Indirect Effects of Socio-demographic Factors on Dual Protection Consistency in Fecund, Sexually Active Women of Reproductive Age (15-49 years) in Brazil, Pesquisa Nacional Demografica e da Saúde da Criança e da Mulher 2006 (N=6,996)

	MODEL 1: Only Sociodemographics*								MODEL 2: Sociodemographics + Relationship*							
	Traditional Method Only RRR (SE)		Modern Method Only RRR (SE)		Inconsistent Condoms RRR (SE)		Consistent Condoms RRR (SE)		Traditional Method Only RRR (SE)		Modern Method Only RRR (SE)		Inconsistent Condoms RRR (SE)		Consistent Condoms RRR (SE)	
Sociodemographics																
Age	1.0	(0.0)	0.9***	(0.0)	0.9***	(0.0)	0.9***	(0.0)	1.0	(0.0)	0.9***	(0.0)	0.9***	(0.0)	0.9***	(0.0)
Education	1.0	(0.0)	1.1**	(0.0)	1.1***	(0.0)	1.1***	(0.0)	1.0	(0.0)	1.1*	(0.0)	1.1***	(0.0)	1.1***	(0.0)
Region																
North………………			ref.								ref.					
Northeast…………	1.3	(0.4)	2.2***	(0.4)	1.5	(0.3)	1.0	(0.2)	1.3	(0.4)	2.1***	(0.4)	1.4	(0.3)	1.0	(0.2)
Southeast…………	1.3	(0.4)	2.1***	(0.4)	1.5*	(0.3)	1.2	(0.2)	1.3	(0.4)	2.0***	(0.4)	1.4	(0.3)	1.0	(0.2)
South………………	1.2	(0.3)	3.2***	(0.6)	1.6*	(0.3)	0.9	(0.2)	1.1	(0.3)	3.0***	(0.6)	1.5	(0.3)	0.9	(0.2)
Mid-West…………	0.6	(0.2)	2.2***	(0.4)	1.3	(0.3)	1.0	(0.2)	0.6	(0.2)	2.1***	(0.4)	1.2	(0.3)	1.0	(0.2)
Relationship Context																
Relationship status																
Single………………									1.0	(0.5)	0.6	(0.2)	1.6	(0.5)	4.4***	(1.2)
Separated…………									0.3*	(0.2)	0.4***	(0.1)	0.8	(0.2)	1.7*	(0.4)
Civil union…………									0.5*	(0.1)	0.7	(0.1)	0.8	(0.1)	0.6**	(0.1)
Married……………													ref.			
F-statistic (df, df)			8.49 (44, 1035)								9.35 (56, 1023)					
P-value			0.000								0.000					

Reference group for multinomial logistic regression is 'No method'; ***p-value<=0.001; **p-value<=0.01; *p-value<=0.05

* Models are adjusted for Early sexual risk and fertility

Table 5.8. Multinomial Logistic Regression Models to Assess Indirect Effects of Early Sexual Risk and Fertility on Dual Protection Consistency in Fecund, Sexually Active Women of Reproductive Age (15-49 years) in Brazil, Pesquisa Nacional Demografica e da Saúde da Criança e da Mulher 2006 (N=6,996)

	DUAL PROTECTION CONSISTENCY							
	MODEL 1: Only Early Risk & Fertility*				MODEL 2: Early Risk + Fertility + Relationship Status*			
	Traditional Method Only RRR (SE)	Modern Method Only RRR (SE)	Inconsistent Condoms RRR (SE)	Consistent Condoms RRR (SE)	Traditional Method Only RRR (SE)	Modern Method Only RRR (SE)	Inconsistent Condoms RRR (SE)	Consistent Condoms RRR (SE)
Early Sexual Risk								
Risk sexual debut								
No method…………………	ref.				ref.			
Contraceptive………………	2.1* (0.6)	1.9*** (0.3)	1.7* (0.3)	1.6 (0.4)	1.9* (0.5)	1.7** (0.3)	1.7* (0.3)	1.8* (0.4)
Condom……………………	1.2 (0.5)	1.4 (0.3)	1.7** (0.4)	2.7*** (0.5)	1.1 (0.4)	1.4 (0.3)	1.6* (0.3)	2.6*** (0.5)
Fertility								
Number of children…………	1.0 (0.1)	1.1 (0.1)	1.0 (0.1)	0.8** (0.1)	1.0 (0.1)	1.1 (0.1)	1.1 (0.1)	0.9 (0.1)
Wants more children								
No……………………..……	ref.				ref.			
Yes………………...………	0.6 (0.2)	0.3*** (0.1)	0.4*** (0.1)	0.2*** (0.1)	0.6 (0.2)	0.3*** (0.1)	0.4*** (0.1)	0.2*** (0.1)
Don't know…………………	0.9 (0.6)	0.5 (0.2)	0.6 (0.2)	0.3** (0.1)	0.9 (0.6)	0.5 (0.2)	0.6 (0.2)	0.3** (0.1)
Relationship Context								
Relationship status								
Single………………………					1.0 (0.5)	0.6 (0.2)	1.6 (0.5)	4.4*** (1.2)
Separated…………………					0.3* (0.2)	0.4*** (0.1)	0.8 (0.2)	1.7* (0.4)
Civil union…………………					0.5* (0.1)	0.7 (0.1)	0.8 (0.1)	0.6** (0.1)
Married……………………					ref.			
F-statistic (df, df)	8.49 (44, 1035)				9.35 (56, 1023)			
P-value	0.000				0.000			

Reference group for multinomial logistic regression is 'No method'; ***p-value<=0.001; **p-value<=0.01; *p-value<=0.05

* Models are adjusted for sociodemographic factors

Table 6.1. Weighted Bivariate Distributions of Dual Method Use, Single Method Use, and Condom Use Consistency in Fecund, Sexually Active Women of Reproductive Age (15-49 years) in Brazil That Report Using Condoms, Pesquisa Nacional Demografica e da Saúde da Criança e da Mulher 2006 (N=3,960)

| | PERCENTAGE | | | | TOTAL | | LOGISTIC REGRESSION | |
| | Single Method Use (Condoms Only) | | Dual Method Use (Condoms + Modern) | | | | Dual Method vs. Single Method (ref.) | |
	n=2,323	59%	n=1,640	41%	N=3,960	41%	OR	SE
Condoms								
Condom Consistency ***								
Sometimes…….……………	881	39%	1,215	73%	1,215	53%	ref.	
Always………………...……	1,439	61%	425	27%	425	47%	0.2***	(0.0)
Contraception								
Modern Contraception								
Oral Contraceptive Pill……..	-		1,356	81%			-	
Hormonal Injection/Patch….	-		284	19%			-	

Note: Ns are unweighted and percentages are weighted; ***p-value<=0.001; **p-value<=0.01; *p-value<=0.05; contraception excludes condoms

Table 6.2. Weighted Bivariate Distributions of Dual Method Use and Single Method Use by Individual-level Characteristics in Fecund, Sexually Active Women of Reproductive Age (15-49 years) in Brazil That Report Using Condoms, Pesquisa Nacional Demografica e da Saúde da Criança e da Mulher 2006 (N=3,960)

	Single Method Use (Condoms Only)	Dual Method Use (Condoms + Modern)	TOTAL
	100% (n=2,323)	100% (n=1,640)	100%
Sociodemographics			
Age [mean (std)] ***	28.7 (0.5)	26.0 (0.3)	27.6 (0.3)
Education [mean (std)] *	8.8 (0.1)	9.2 (0.1)	9.0 (0.1)
Race			
White……………………………………	40	46	42
Black…………………...……………....	54	47	51
Other……………………………………	6	7	7
Religion *			
None…………………………………….	9	10	9
Catholic………………………………….	59	65	61
Evangelical……………….…...……….	25	18	22
Afro-religion or Other………………….	7	8	7
Region ***			
North……………………………………	9	5	7
Northeast……………………..………..	24	17	21
Southeast………………….…...……….	48	51	49
South…………………………………..	12	20	15
Mid-West………………………………	6	7	7
Urban			
No……………………………………….	12	13	12
Yes…………………...………………….	88	87	88
Employed			
Yes, formally…………………………..	53	57	55
No, unemployed w/in a year…………	15	14	14
No, never or more than a year……….	32	29	31
Household income			
280 or less Reis (E class)………….…	13	10	12
281 to 500 Reis (D class)………….…	17	18	17
501 to 1300 Reis (C class)………….	30	32	31
1301 or more Reis (A & B class)……	27	26	26
No salary data……………………….…	14	14	14
Household wealth score	0.1 (0.0)	0.2 (0.0)	0.1 (0.0)
Early Sexual Risk			
Risk sexual debut*			
No method………………………………	32	24	29
Contraceptive method only ………….	19	17	18
Condom…………………………………	49	58	53
Fertility			
Number of children…………………..…	1.0 (0.0)	1.0 (0.0)	1.0 (0.0)
Wants more children			
No………………………………………	46	41	44
Yes…………………...………………….	51	56	53
Don't know……………………...………	3	2	3

***p-value<=0.001; **p-value<=0.01; *p-value<=0.05

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Table 6.3. Parsimonious Model to Predict Dual Method Use in Fecund, Sexually Active Women of Reproductive Age (15-49 years) in Brazil That Use Condoms, Pesquisa Nacional Demografica e da Saúde da Criança e da Mulher 2006 (N=3,960)

| | Dual Method Use | |
	(Condoms + Modern Contraceptive)	
Sociodemographics		
Age***……………………………	1.0	(0.01)
Education**……………………	1.1	(0.03)
Religion		
None………………………	ref.	
Catholic………………………	1.2	(0.28)
Evangelical…………………	0.7	(0.18)
Afro-religion or Other……...	1.3	(0.44)
Region		
North……………………………	ref.	
Northeast*…………………..	1.4	(0.26)
Southeast***…………………	2.6	(0.46)
South***………………………	3.9	(0.69)
Mid-West***…………………	2.3	(0.37)
Condom Consistency ***		
Sometimes…….……………	ref.	
Always………………...……	0.2	(0.03)
F-statistic (df, df)	*23.7 (10,1069)*	
P-value	*0.000*	

Note: Reference group for logistic regression is 'Single Method Use (Condoms Only)'
***p-value<=0.001; **p-value<=0.01; *p-value<=0.05

Table 6.4. Weighted Bivariate Distributions of Dual Method Use and Single Method Use by Relationship-level Characteristics in Fecund, Sexually Active Women of Reproductive Age (15-49 years) in Brazil That Report Using Condoms, Pesquisa Nacional Demografica e da Saúde da Criança e da Mulher 2006 (N=2,231)

	Single Method Use (Condoms Only)	Dual Method Use (Condoms + Modern)	TOTAL
	100%	100%	100%
Relationship Context			
Relationship status (n=3,960))			
Single………………………………..…………………	31	32	31
Separated…………………………………….……...…	11	10	10
Civil union……………………………………….....	25	29	27
Married…………………………………………..………	33	29	32
Age asymmetry [avg years younger (std)]**	4.7(0.3)	4.2 (0.3)	4.5 (0.2)
Woman is within 2 years……………………….	27	36	31
Woman is 3+ years younger……………………	63	58	61
Woman is 3+ years older………………………	10	6	8
Educational asymmetry [mean cat diff (std)]	2.3 (0.1)	2.3 (0.1)	2.2 (0.1)
Both low………………………………………..………	17	11	14
Woman high/man low……………………………	7	6	7
Woman low/man high……………………………	15	20	17
Both high………………………………..………	62	63	62
Ever talked w/partner about family planning			
No…………………………………..………………	22	19	21
Yes…………………………………..………………	78	81	79
Household decisions score ………………………	0.20 (0.0)	0.20 (0.0)	0.20 (0.0)

***p-value<=0.001; **p-value<=0.01; *p-value<=0.05

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Table 6.5. Weighted Percentage Bivariate Distributions of Independent Variables by Relationship Status in Fecund, Sexually Active Women of Reproductive Age (15-49 years) in a Relationship in Brazil, Pesquisa Nacional Demografica e da Saúde da Criança e da Mulher 2006 (N=2,231)

	AGE ASSYMETRY		
	Woman 3+ yrs younger 100% (n=687)	Woman within 2 yrs of age 100% (n=1,333)	Woman 3+ yrs older 100% (n=211)
Sociodemographics			
Age [mean(std)] ***	28.3 (0.6)	29.7 (0.5)	34.6 (0.8)
Education [mean(std)]	8.4 (0.2)	8.7 (0.2)	8.6 (0.3)
Race			
White	44	41	33
Black	51	54	54
Other	5	6	13
Religion			
None	8	8	8
Catholic	62	57	64
Evangelical	25	31	21
Afro-religion or Other	5	4	7
Region			
North	8	6	9
Northeast	24	25	24
Southeast	44	46	46
South	16	16	14
Mid-West	7	6	7
Urban ***			
No	18	12	6
Yes	82	88	94
Employed *			
Yes, formally	48	55	60
No, unemployed w/in year	11	13	13
No, never or more than year	42	31	27
Household income			
280 or less Reis (E class)	13	10	9
281 to 500 Reis (D class)	18	18	23
501 to 1300 Reis (C class)	31	38	30
1301 or more Reis (A & B class)	29	25	27
No salary data	9	9	12
Household wealth [mean(std)]	0.0 (0.1)	0.1 (0.1)	0 (0.1)
Early Sexual Risk			
Risk at sexual debut ***			
No method	33	34	37
Contraceptive	24	25	26
Condom	43	41	37
Fertility			
Number of children [mean(std)]	1.4 (0.1)	1.4 (0.7)	1.6 (0.1)
Wants more children			
No	55	53	58
Yes	43	45	39
Don't know	3	2	3

Note: Means and percentages are w eighted; ***p-value<=0.001; **p-value<=0.01; *p-value<=0.05

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Table 6.6. Logistic Regression Models to Assess Indirect Effects of Individual-level Factors on Dual Method Use via Age Asymmetry in Fecund, Sexually Active Women of Reproductive Age (15-49 years) in a Relationship in Brazil Who Use Condoms, Pesquisa Nacional Demografica e da Saúde da Criança e da Mulher 2006 (N=2,231)

	DUAL METHOD USE*			
	MODEL 1: Sociodemographics		MODEL 2: Sociodemographics + Relationship	
	OR (SE)		OR (SE)	
Sociodemographics				
Age	0.9***	(0.0)	0.9***	(0.0)
Urban				
No………..……………………………..		ref.		ref.
Yes………………...……………..	0.7*	(0.1)	0.7*	(0.1)
Employed				
Yes, formally……….……………….…		ref.		ref.
No, unemployed w/in a year………	1.1	(0.2)	1.0	(0.2)
No, never or more than a year…….	0.7**	(0.1)	0.7*	(0.1)
Early Sexual Risk				
Risk sexual debut				
No method…………………………….		ref.		ref.
Contraceptive……………………….	1.3	(0.3)	1.3	(0.3)
Condom…………………………….	1.1	(0.2)	1.1	(0.2)
Relationship Context				
Age asymmetry				
Woman is within 2 years……………				ref.
Woman is 3+ years younger………..			0.6**	(0.1)
Woman is 3+ years older…………..			0.6	(0.2)
F-statistic (df, df)	*7.58 (6,1073)*		*8.91 (8,1071)*	
P-value	*0.000*		*0.000*	

Note: *Reference group for logistic regression is 'Single method use'
***p-value<=0.001; **p-value<=0.01; *p-value<=0.05

Table 7.1. Weighted Bivariate Distributions of Sterilized versus Not Sterilized Women by Individual-level Characteristics in Sexually Active Women of Reproductive Age (15-49 years) in Brazil, Pesquisa Nacional Demografica e da Saúde da Criança e da Mulher 2006 (N=10,892)

	PERCENTAGE		LOGISTIC REGRESSION	
	Not Sterilized	Sterilized	Sterilized vs. Not Sterilized (ref.)	
	n=6,996 (100%)	n=3,896 (100%)	OR	SE
Condom use consistency ***				
Never……………………………………	42	83	ref.	
Inconsistently…………………………	30	13	0.2***	(0.0)
Consistently……………………………	27	5	0.1***	(0.0)
Sociodemographics				
Age [mean (std)] ***	29.0 (0.2)	38.0 (0.2)	1.1***	(0.0)
Education [mean (std)] ***	8.6 (0.1)	6.9 (0.1)	0.9***	(0.0)
Race ***				
White……………………………………	43	36	ref.	
Black……………………….....…………	51	58	1.3***	(0.1)
Other……………………………………	5	5	1.2	(0.2)
Religion ***				
None………………………………………	9	5	ref.	
Catholic…………………………………	63	63	1.8***	(0.3)
Evangelical…………………...………	22	27	2.3***	(0.4)
Afro-religion or Other………………	6	5	1.5	(0.3)
Region ***				
North……………………………………	7	10	ref.	
Northeast………………….....…………	22	30	0.9	(0.1)
Southeast………………….....…………	47	39	0.6***	(0.1)
South……………………………………	18	11	0.4***	(0.0)
Mid-West………………………………	7	10	1.0	(0.1)
Urban **				
No………………………………….....…	14	18	ref.	
Yes……………………......……………	86	82	0.8**	(0.1)
Employed **				
Yes, formally…………………………	57	59	ref.	
No, unemployed w/in a year………	12	9	0.7**	(0.1)
No, never or more than a year……	31	32	1.0	(0.1)
Household income ***				
280 or less Reis (E class)……..…	13	18	ref.	
281 to 500 Reis (D class)………..	17	20	0.8	(0.1)
501 to 1300 Reis (C class)………	32	30	0.7***	(0.1)
1301 or more Reis (A & B class)…	25	22	0.6***	(0.1)
No salary data…………………….…	13	11	0.6***	(0.1)
Household wealth score ***	0.1 (0.0)	neg. 0.1 (0.0)	0.8***	(0.0)
Early Sexual Risk				
Risk sexual debut ***				
No method………………………….…	34	58	ref.	
Contraceptive method only ………	22	27	0.7***	(0.1)
Condom…………………………….…	45	14	0.2***	(0.0)
Fertility				
Number of children ***………………	1.2 (0.0)	2.9 (0.0)	2.8***	(0.1)

Note: ***p-value<=0.001; **p-value<=0.01; *p-value<=0.05; Contraceptive method excludes condoms

Table 7.2. Weighted Bivariate Distributions of Dual Protection Consistency, Individual-level Factors, and Relationship Status in Sterilized, Sexually Active Women of Reproductive Age (15-49 years) in Brazil, Pesquisa Nacional Demografica e da Saúde da Criança e da Mulher 2006 (N=3,896)

	CONDOM USE CONSISTENCY						
	Never n=3,186 (83%)	Inconsistent n=501 (13%)	Consistent n=209 (5%)	Inconsistent Condoms RRR (SE)*		Consistent Condoms RRR (SE)*	
Sociodemographics							
Age **……………………………	38.2 (0.2)	37.0 (0.5)	36.8 (0.7)	1.0**	(0.0)	1.0*	(0.0)
Education ***……………………	6.8 (0.1)	7.4 (0.3)	8.5 (0.4)	1.0*	(0.0)	1.2***	(0.0)
Race							
White……………………………	36	38	38				
Black……………………………	59	58	56				
Other……………………………	5	5	6				
Religion							
None……………………………	4	7	10				
Catholic…………………………	63	66	58				
Evangelical……………….………	28	23	22				
Afro-religion or Other……………	5	4	9				
Region							
North……………………………	10	12	12				
Northeast…………………...………	30	29	25				
Southeast……………………...……	39	36	42				
South……………………………	11	11	11				
Mid-West………………………	10	12	10				
Urban ***							
No……………………………	20	11	9		ref.		
Yes…………………...……………	80	89	91	2.0***	(0.4)	2.6**	(0.9)
Employed							
Yes, formally………………………	58	65	73		ref.		
No, unemployed w/in a year………	9	8	10	0.8	(0.3)	0.9	(0.6)
No, never or more than a year……	33	27	17	0.7*	(0.1)	0.4***	(0.1)
Household income							
280 or less Reis (E class)………	18	14	19				
281 to 500 Reis (D class)………	19	20	24				
501 to 1300 Reis (C class)………	30	28	24				
1301 or more Reis (A & B class)..	21	28	26				
No salary data………………………	11	10	7				
Household wealth score **…………	neg.0.1(0.0)	neg.0.1(0.1)	0.2 (0.1)	1.0	(0.1)	1.4**	(0.2)
Early Sexual Risk							
Risk sexual debut ***							
No method……………………	59	58	43		ref.		
Contraceptive method only ………	28	21	28	0.8	(0.1)	1.4	(0.4)
Condom……………………………	13	21	30	1.7*	(0.4)	3.3***	(1.1)
Fertility							
Number of children **………………	3.0 (0.1)	2.7 (0.1)	2.7 (0.1)	0.9**	(0.0)	0.8	(0.1)
Relationship context							
Relationship status ***							
Single….....……………………	88	2	10	0.2	(0.2)	5.6*	(4.5)
Separated……………………………	40	28	32	5.5***	(1.5)	41.3**	(12.5)
Civil union……………………………	85	12	3	1.2	(0.2)	1.8	(0.5)
Married………………………………	87	11	2		ref.		

* Reference group for multinomial logistic regression is 'No method'; ***p-value<=0.001; **p-value<=0.01; *p-value<=0.05
Contraceptive method excludes condoms

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Table 7.3. Multinomial Logistic Regression, Parsimonious Model to Predict
Condom Use Consistency in Sterilized, Sexually Active Women of
Reproductive Age (15-49 years) in Brazil, Pesquisa Nacional
Demografica e da Saúde da Criança e da Mulher 2006 (N=3,896)

	Inconsistent Condoms (n=501)		Consistent Condoms (n=209)	
	RRR(SE)*		RRR(SE)	
Sociodemographics				
Education…………………….	1.0	(0.0)	1.2***	(0.0)
Early Sexual Risk				
Risk sexual debut				
No method…………………		ref.		ref.
Contraceptive…………….	0.8	(0.2)	1.9*	(0.6)
Condom…………………….	1.5	(0.4)	2.9**	(1.0)
Fertility				
Number of children	0.9*	(0.1)	0.9	(0.1)
Relationship Context				
Relationship status				
Single……………………….	0.2	(0.2)	7.5**	(5.8)
Separated………………….	6.0***	(1.6)	60.5***	(20.7)
Civil Union………………….	1.2	(0.2)	2.5**	(0.8)
Married……………………..		ref.		ref.
Constant	0.2***	(0.1)	0.0***	(0.0)
F-statistic (df, df)	*13.44 (8,1078)*			
P-value	*0.000*			

Note: Wald Test; ***p-value<=0.001; **p-value<=0.01; *p-value<=0.05
* Reference group for multinomial logistic regression is 'No Condom'
Contraceptive method excludes condoms

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Table 7.4. Weighted Bivariate Distributions of Condom Use Consistency and Relationship Context in Sterilized Sexually Active Women of Reproductive Age (15-49 years) in a Relationship in Brazil, Pesquisa Nacional Demografica e da Saúde da Criança e da Mulher 2006 (N=3,507)

	CONDOM USE CONSISTENCY						
	Never n=3,016 (86%)	Inconsistent n=410 (11%)	Consistent n=81 (2%)	Inconsistent Condom Use RRR (SE)		Consistent Condom Use RRR (SE)	
Age asymmetry **							
Woman is within 2 years………………	83	15	3		ref.		
Woman is 3+ years younger…………	89	9	2	0.6**	(0.1)	0.7	(0.2)
Woman is 3+ years older……………	83	15	2	1.0	(0.3)	0.6	(0.3)
Educational assymetry **							
Both low……………………………………	91	8	1		ref.		
Woman high/man low…………………	83	15	2	2.0*	(0.6)	2.8	(1.7)
Woman low/man high…………………	87	11	3	1.4	(0.3)	4.5**	(2.2)
Both high……………………………………	84	13	3	1.7**	(0.3)	5.6***	(2.4)
Discuss family planning w/partner *							
No………………………………………..……	90	8	1		ref.		
Yes………………………………………..……	85	13	2	1.6*	(0.3)	1.8	(0.6)
Household decisions score……………	0.3 (0.0)	0.2 (0.1)	0.3 (0.1)	0.9	(0.1)	1.1	(0.2)

Note: Percentages and estimates are weighted; RRR=Relative risk ratio; SE=Standard error
* Reference group for multinomial logistic regression is 'No condom'; ***p-value<=0.001; **p-value<=0.01; *p-value<=0.05

Table 7.5. Weighted Percentage Bivariate Distributions of Independent Variables by Educational Assymetry in Sterilized, Sexually Active Women of Reproductive Age (15-49 years) in a Relationship in Brazil, Pesquisa Nacional Demografica e da Saúde da Criança e da Mulher 2006 (N=3,507)

	EDUCATIONAL ASSYMETRY										
	Percentatge				RRR (SE)*						
	Both Low	Woman High/ Man Low	Woman Low/ Man High	Both High	Woman High/ Man Low		Woman Low/ Man High		Both High	
Sociodemographics										
Age [mean(std)]………………………	38.6 (0.3)	37.9 (0.7)	37.9 (0.4)	37.6 (0.3)						
Race***										
White……………………………………	41	44	33	33			ref.			
Black………………...…………….…	54	51	54	54	0.8	(0.2)	0.9	(0.2)	0.4***	(0.1)
Other……………………………….…	6	5	13	13	0.7	(0.3)	1.0**	(0.4)	0.4**	(0.1)
Religion***										
None……………………………….…	4	7	3	5			ref.			
Catholic…………………………….…	72	57	64	56	0.4	(0.2)	1.1	(0.4)	0.6	(0.2)
Evangelical……………………...……	22	34	28	31	0.8	(0.4)	1.5	(0.6)	1.0	(0.4)
Afro-religion or Other………………	2	2	5	8	0.5	(0.4)	2.9	(1.8)	2.9*	(1.5)
Region***										
North……………………………………	11	11	11	8			ref.			
Northeast………………...…………	40	25	29	22	0.7	(0.2)	0.7	(0.1)	0.8	(0.2)
Southeast………………………………	29	41	39	47	1.5	(0.4)	1.4	(0.3)	2.4***	(0.5)
South…………………………………	10	14	9	14	1.5	(0.4)	0.9	(0.2)	2.0***	(0.5)
Mid-West………………………………	11	85	12	9	0.8	(0.2)	1.1	(0.2)	1.3	(0.3)
Urban ***										
No………………………………………	34	16	18	8			ref.			
Yes……………………………………	66	84	82	92	2.7***	(0.7)	2.4***	(0.4)	5.5***	(1.5)

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Table 7.5., continued

Employed *										
Yes, formally…………………………	52	54	59	64			ref.			
No, unemployed w/in year…………	9	7	10	8	0.8	(0.3)	1.0	(0.3)	0.7	(0.2)
No, never or more than year………	39	39	31	29	1.0	(0.2)	0.7*	(0.1)	0.6***	(0.1)
Household income*										
280 or less Reis (E class)…………	31	11	15	5			ref.			
281 to 500 Reis (D class)………..	28	24	22	10	2.5**	(0.8)	1.6*	(0.3)	2.2**	(0.5)
501 to 1300 Reis (C class)……….	24	38	41	31	4.5***	(1.4)	3.6***	(0.8)	7.8***	(2.0)
1301 or more Reis (A & B class) ..	4	11	16	44	7.3***	(3.3)	7.8***	(2.5)	61.0*'	(19.0)
No salary data………………………	13	15	6	11	3.4***	(1.2)	1.0	(0.3)	5.0***	(1.5)
Household wealth [mean(std)]***	neg.0.71(0.1)	neg. 0.07(0.08)	neg.0.21(0.06)	0.45(0.03)	1.9***	(0.2)	1.6***	(0.1)	4.5***	(0.5)
Early Sexual Risk										
Risk at sexual debut ***										
No method…………………………	74	63	59	44			ref.			
Contraceptive………………………	20	24	25	36	1.4	(0.4)	1.6*	(0.3)	3.1***	(0.5)
Condom……………………………	6	13	15	20	2.4*	(0.9)	3.0***	(0.8)	5.2***	(1.2)
Fertility										
Number of children [mean(std)]***…	3.56 (0.10)	3.08 (0.18)	2.81 (0.07)	2.45 (0.04)	0.8	(0.1)	0.7***	(0.0)	0.5***	(0.0)

Note: Percentages are w eighted; ***p-value<=0.001; **p-value<=0.01; *p-value<=0.05; Contraceptive excludes condoms.
* Reference group f or multinomial logistic regression is 'No Condom'

Table 7.6. Weighted Multinomial Logistic Models to Examine the Indirect Effects of Individual-level Factors on Consistent Condom Use via Educational Asymmetry in Sterilized, Sexually Active Women of Reproductive Age (15-49 years) in a Relationship in Brazil, Pesquisa Nacional Demografica e da Saúde da Criança e da Mulher 2006 (N=3,507)

	Model 1: Sociodemographics Only				Model 2: Sociodemographics + Educational Assymetry			
	Inconsistent Condom		Consistent Condom		Inconsistent Condom		Consistent Condom	
	RRR (SE)		RRR (SE)		RRR (SE)		RRR (SE)	
Sociodemographics								
Race								
White			ref.				ref.	
Black	0.9	(0.3)	7.6**	(6.0)	0.9	(0.3)	6.9*	(5.5)
Other	0.8	(0.3)	16.2***	(11.9)	0.8	(0.3)	15.0***	(11.0)
Urban								
No			ref.				ref.	
Yes	1.7**	(0.3)	1.6	(0.6)	1.7**	(0.3)	1.3	(0.6)
Household income								
280 or less Reis (E class)			ref.				ref.	
281 to 500 Reis (D class)	1.9*	(0.5)	0.8	(0.4)	1.9*	(0.5)	0.7	(0.4)
501 to 1300 Reis (C class)	2.1**	(0.6)	0.5	(0.3)	2.0*	(0.6)	0.4	(0.2)
1301 or more Reis (A & B class)	3.3***	(1.1)	0.8	(0.6)	3.2***	(1.1)	0.6	(0.4)
No salary data	1.9*	(0.6)	0.8	(0.6)	1.9	(0.6)	0.7	(0.5)
Household wealth	0.7**	(0.1)	1.4	(0.4)	0.7***	(0.1)	1.3	(0.3)
Early Sexual Risk								
Risk sexual debut								
No method			ref.				ref.	
Contraceptive	0.9	(0.2)	1.4	(0.5)	0.9	(0.2)	1.3	(0.5)
Condom	1.9*	(0.5)	2.3*	(1.0)	1.9*	(0.5)	2.1	(0.9)
Fertility								
Number of children	0.8*	(0.1)	0.9	(0.1)	0.8**	(0.1)	1.0	(0.1)
Relationship Context								
Educational assymetry								
Both low							ref.	
Woman high/man low					1.8	(0.6)	2.6	(1.6)
Woman low/man high					1.1	(0.3)	4.4**	(2.4)
Both high					1.2	(0.3)	5.3***	(2.5)
F-statistic (df, df)	3.58 (22,1057)				3.45 (28,1051)			
P-value	*0.000*				*0.000*			

Note: Multinomial logistic regression reference group is 'No Condom'; ***p-value<=0.001; **p-value<=0.01; *p-value<=0.05; Contraceptive excludes condoms
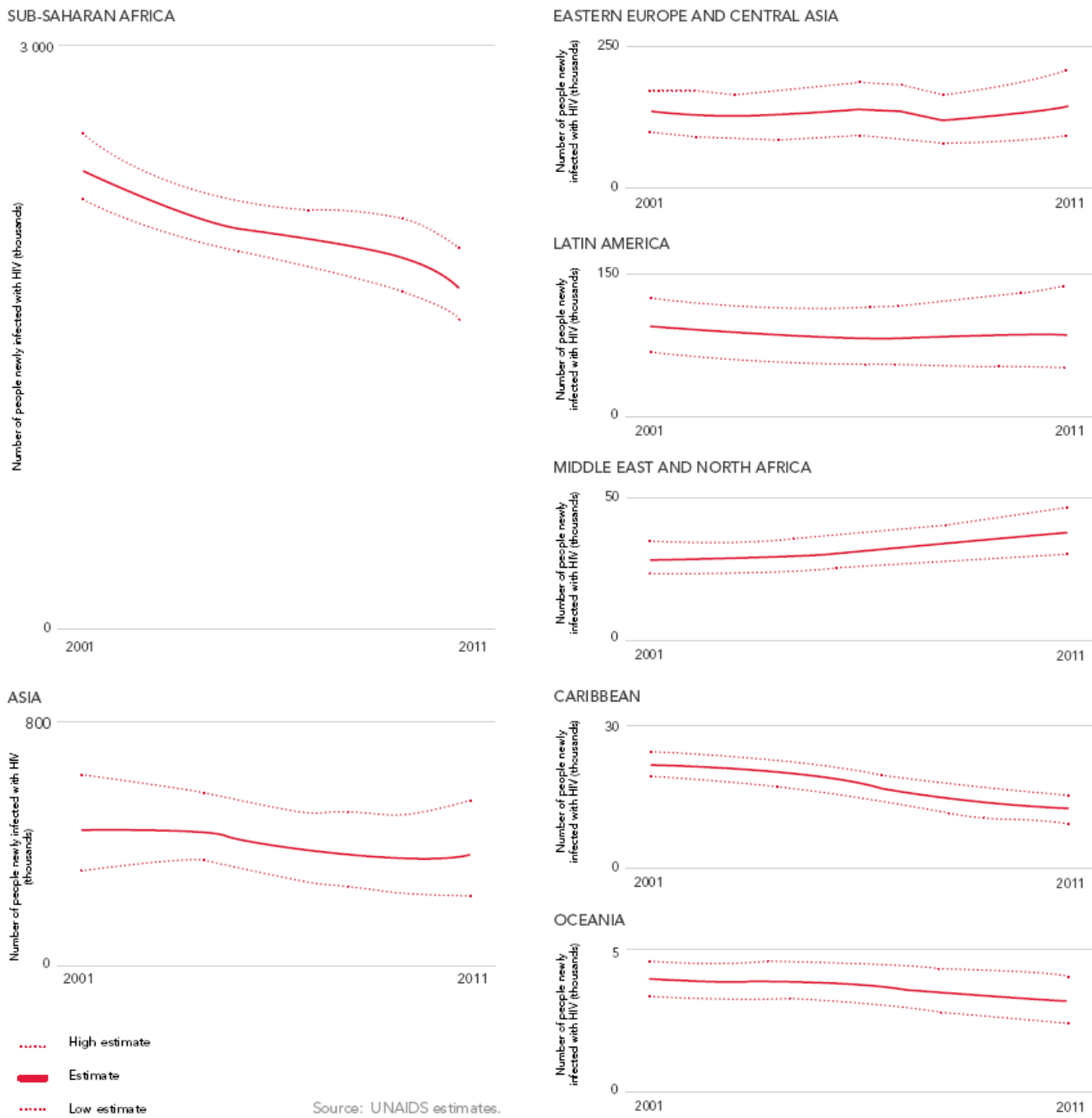
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FIGURES

Figure 1. Number of people newly infected with HIV, 2001-2011, by region of the world. Borrowed from: (UNAIDS 2012)
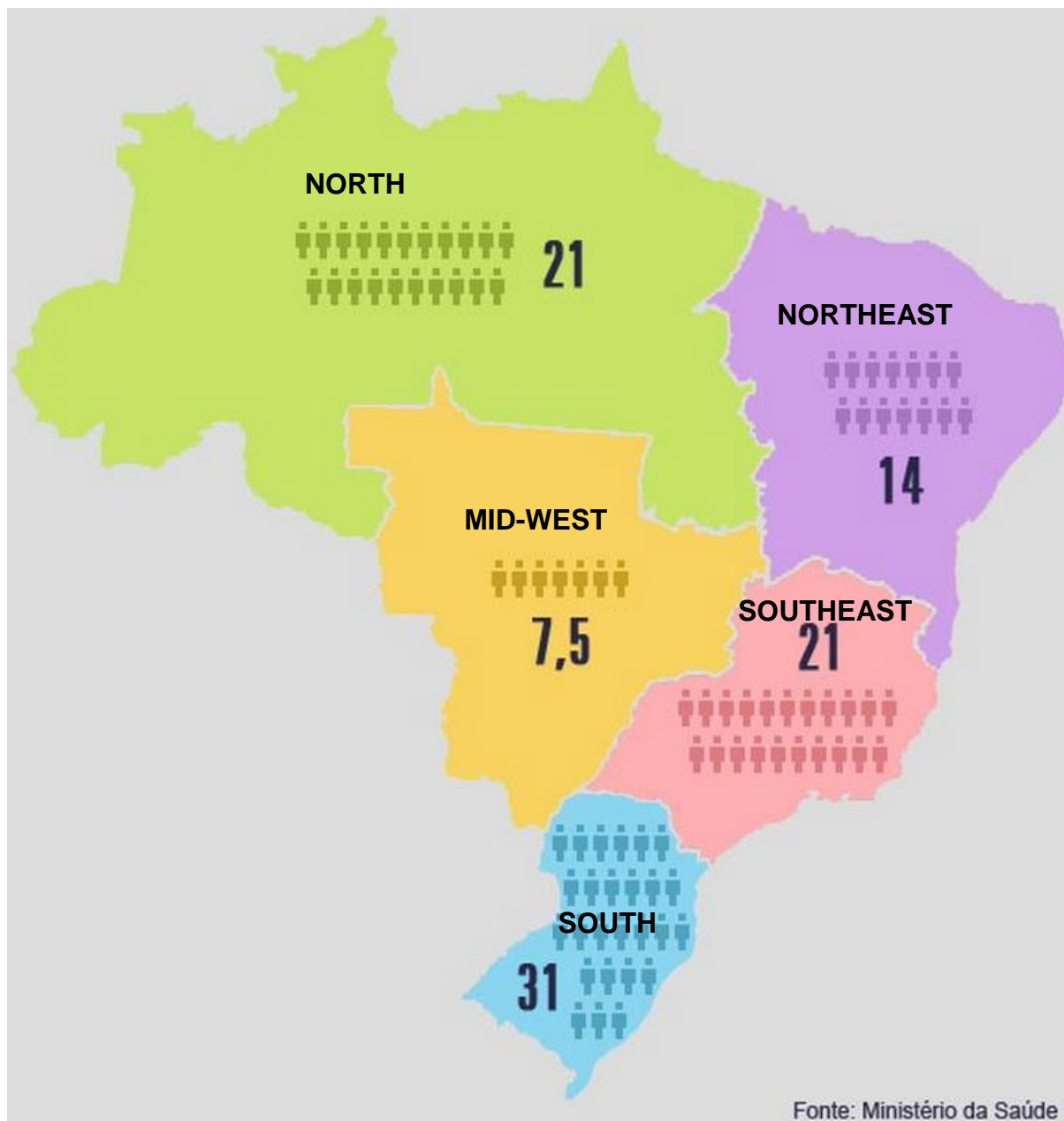
Figure 2. Map of HIV infections in Brazil for every 100,000 inhabitants by region of Brazil. Taken from: (MOS 2009)
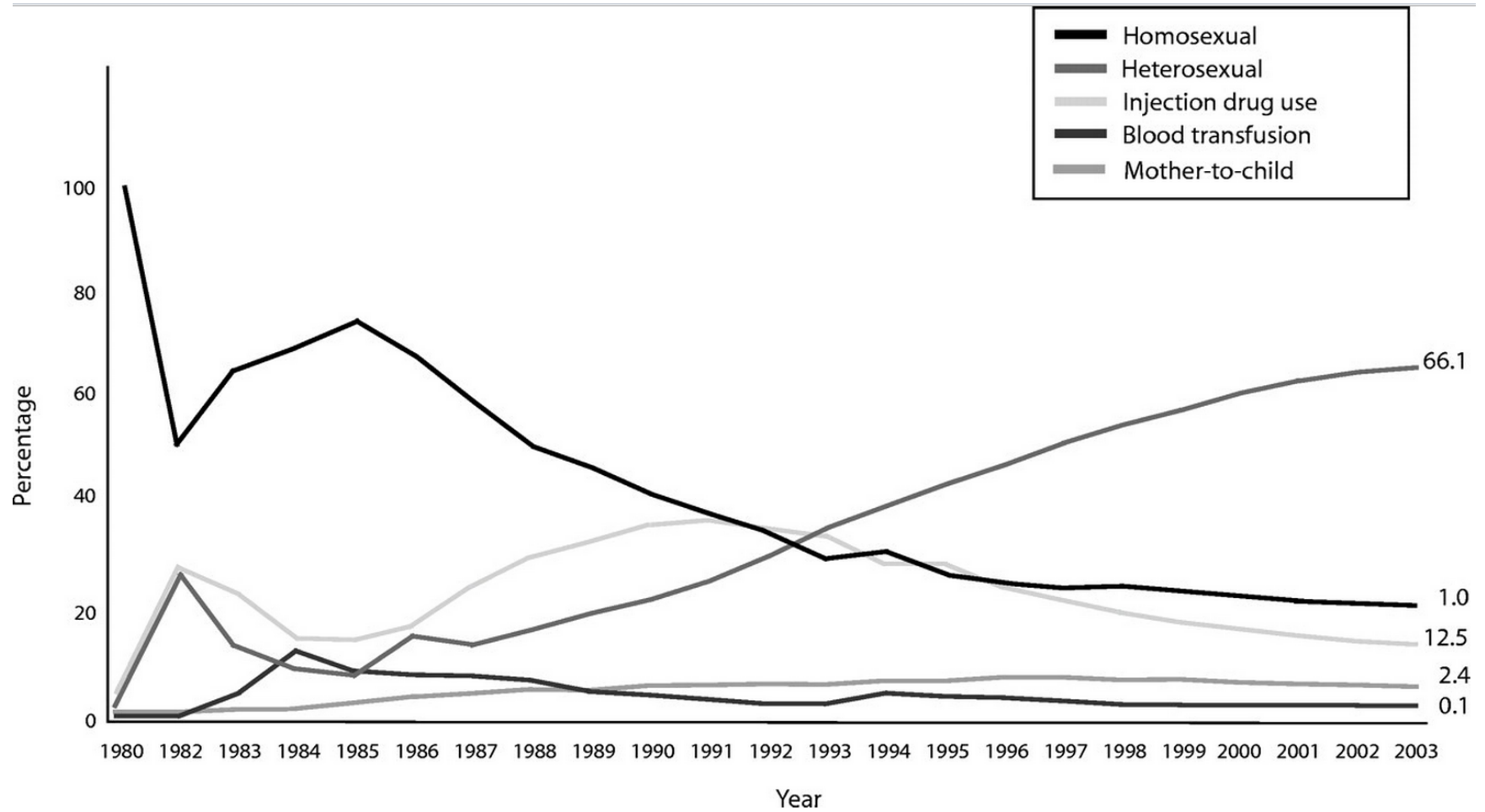
Figure 3. Percentage of AIDS cases by type of transmission and year of diagnosis: Brazil, 1980-2003. Taken from (Berkman, Garcia et al. 2005)
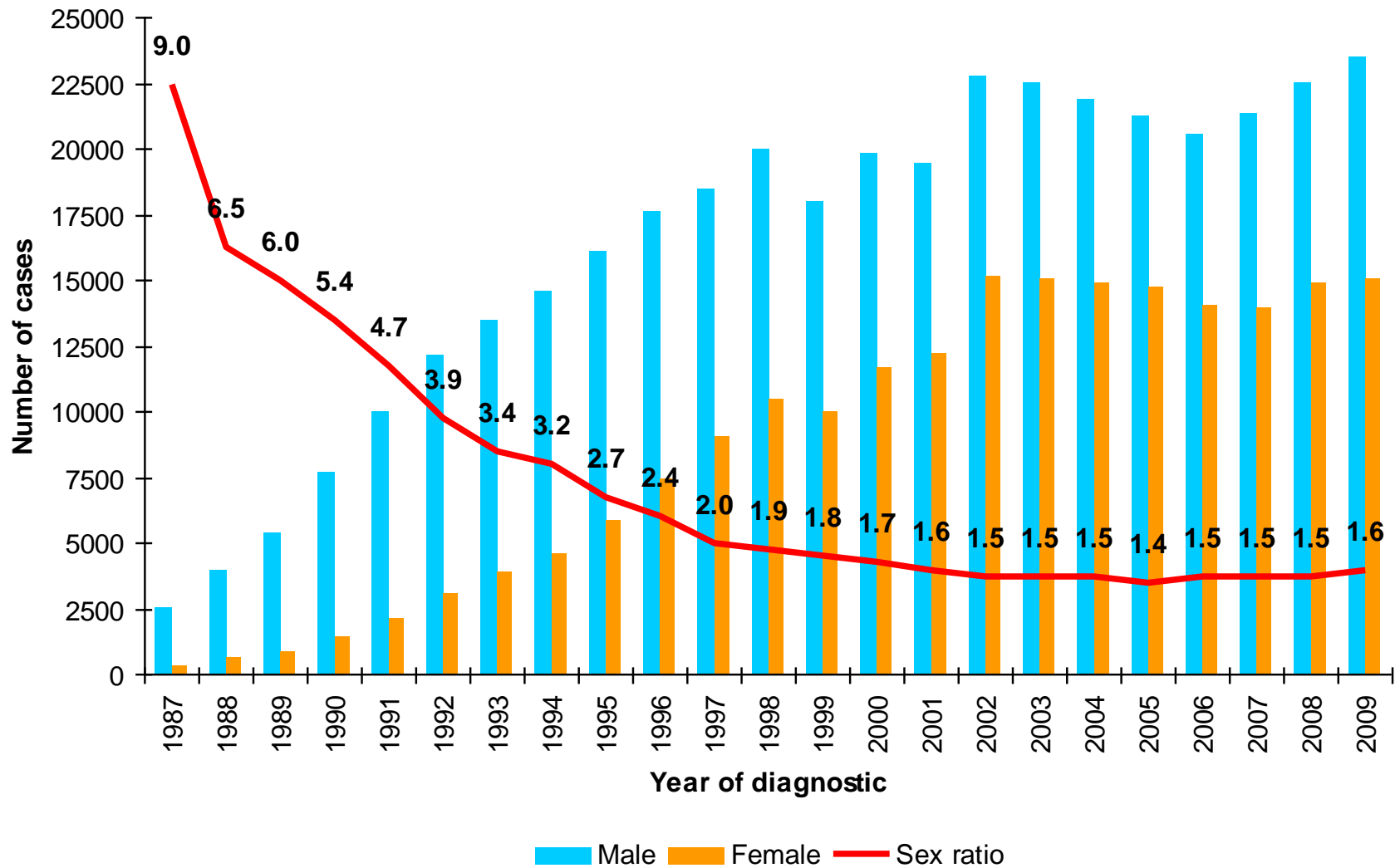
Figure 4. Feminization of HIV in Brazil: Change in male to female ratio of HIV cases, 1987-2009. Taken from: (MOS 2009)
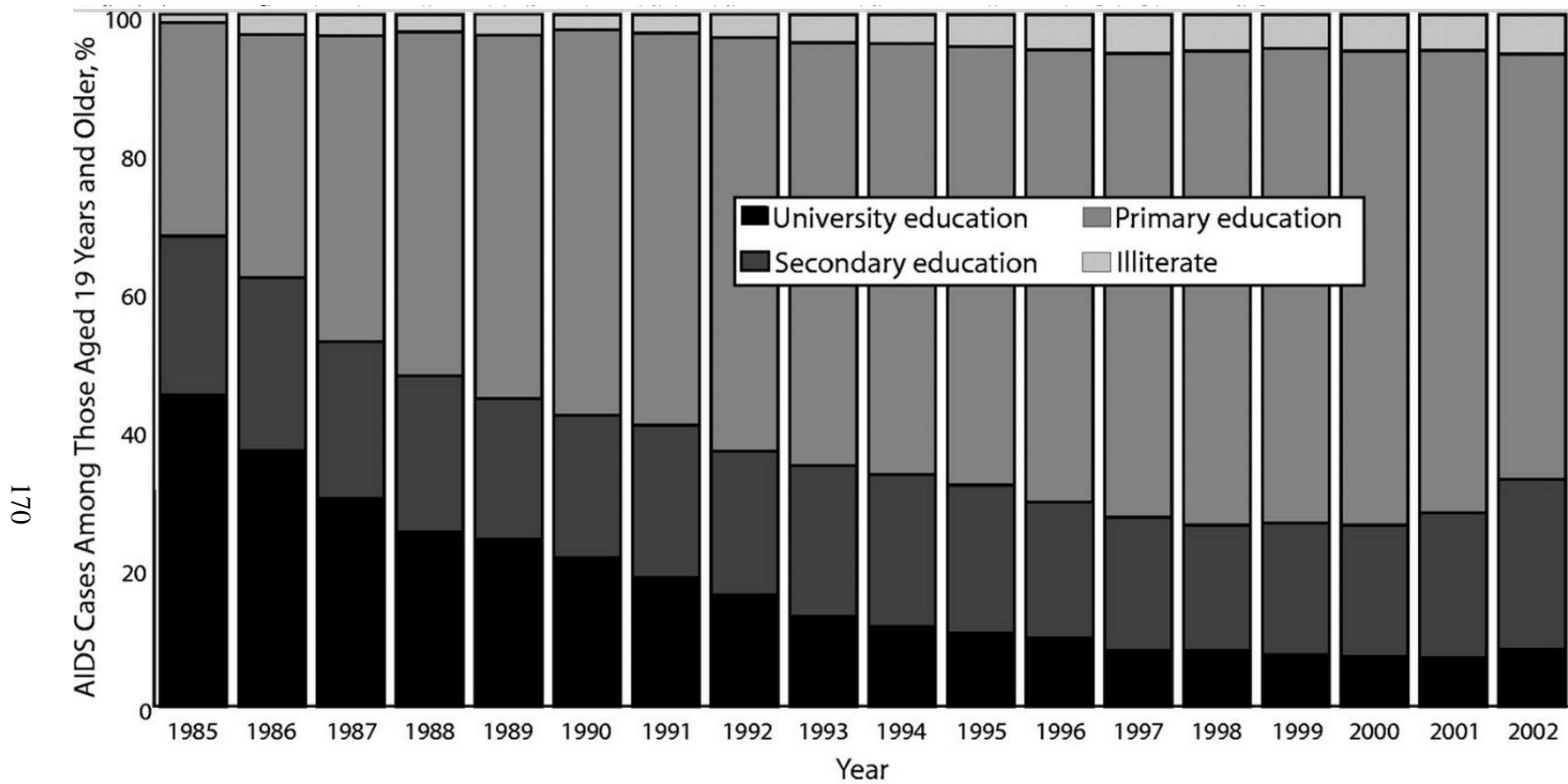
Figure 5. Percentage of AIDS cases among those aged 19 years and older, by level of education: Brazil, 1985-2002. Taken from (Berkman, Garcia et al. 2005)
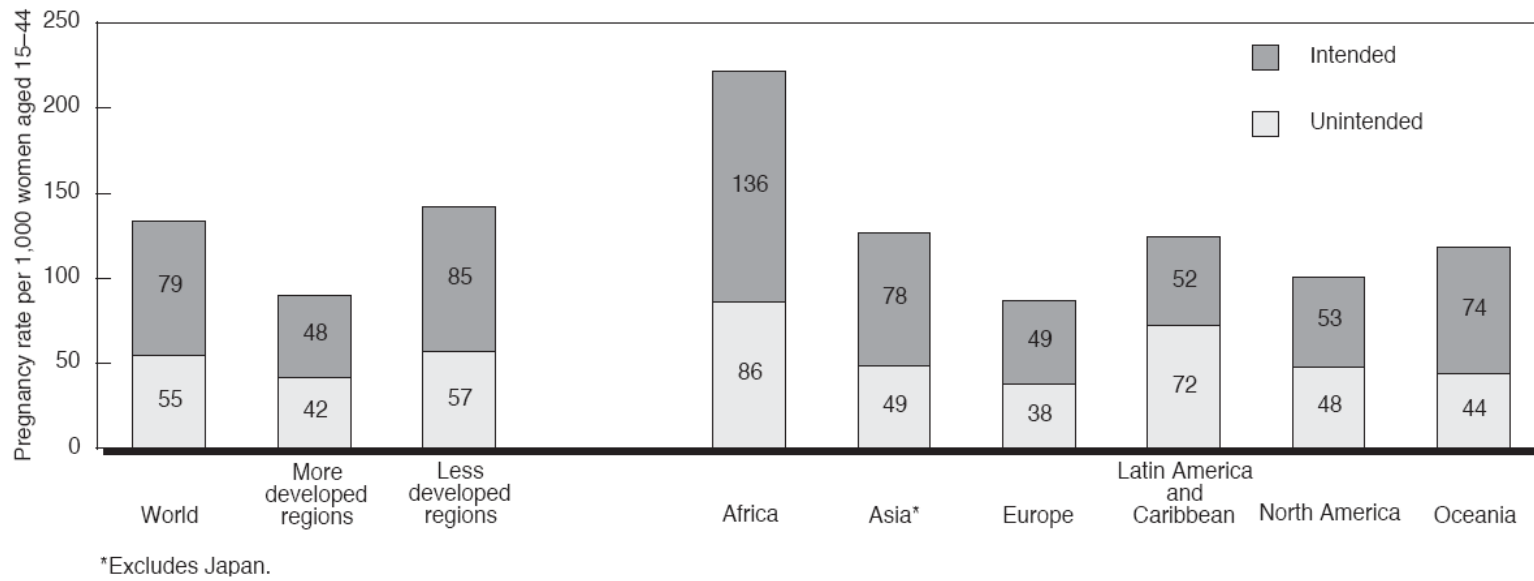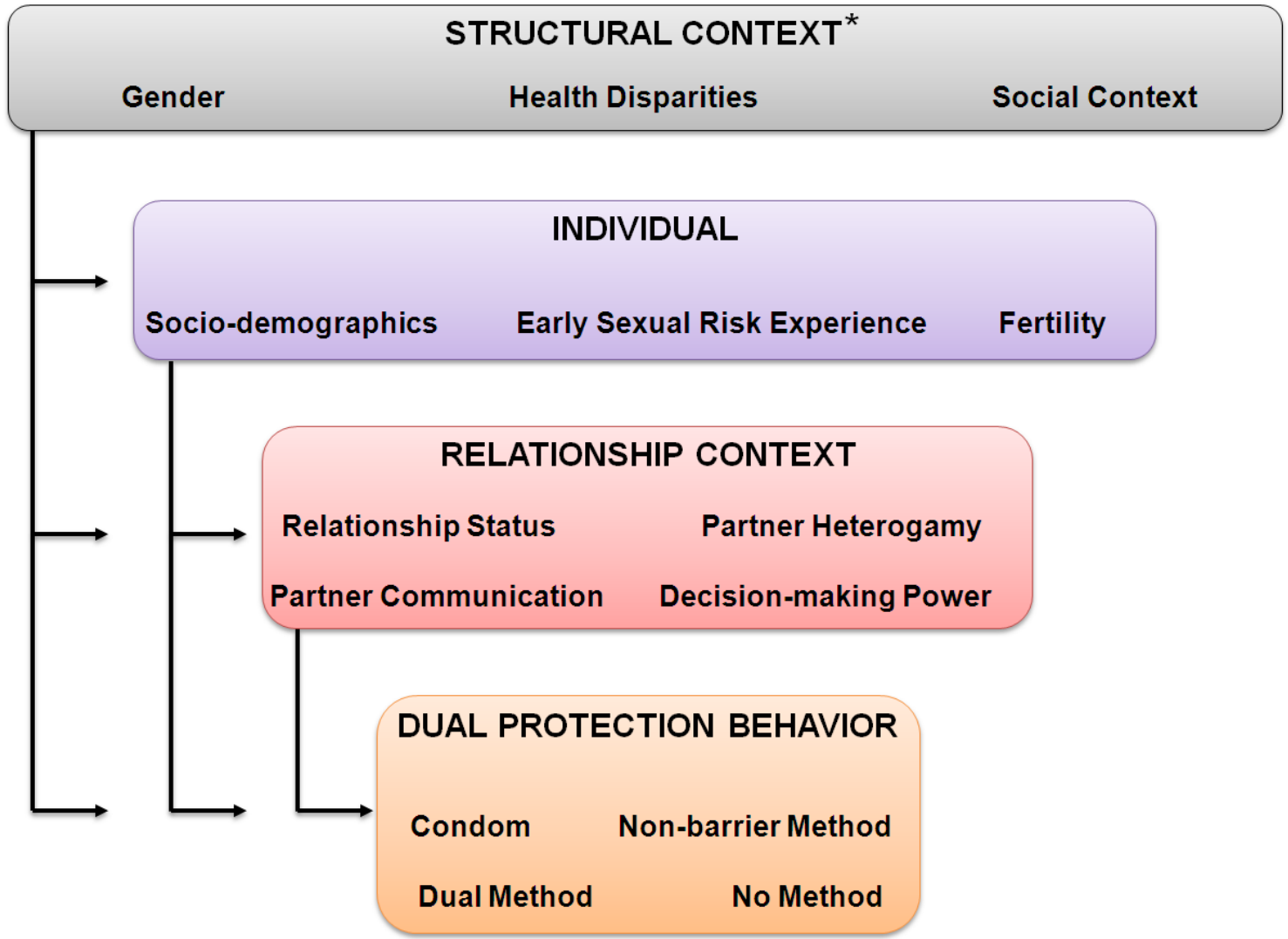
Figure 6. Rates of unintended pregnancy and intended pregnancy, worldwide and by region of the world, 2008. Taken from (Singh, Sedgh et al. 2010)

	1970s	1980s	1990s	2000s
Political background	Military dictatorship	Transition to democracy (1985)	Early democratic period with substantial instability	Stable democracy
Economic growth	Rapid economic growth (the so-called Brazilian miracle) Increasing income concentration, accompanied by some reduction in absolute poverty	Hyperinflation and foreign debt crisis Economic stagnation and recession Increase in absolute poverty and maintenance of high income concentration	Gradual control of inflation, with slow or no economic growth Little if any changes in family income, income concentration, and poverty	Moderate economic growth with gradual reduction in income inequalities and absolute poverty achieved through a combination of unemployment reduction, progressive increase in the minimum wage, and expansion of cash transfer programmes
Demographic factors	Urbanisation and decrease in fertility rate	Urbanisation and decrease in fertility rate	Urbanisation and decrease in fertility rate	Urbanisation and decrease in fertility rate
Health systems	Three-tiered system: private; social security for regularly employed workers; and Ministry of Health and charitable services for the poorest	Three-tiered system until the creation of the Unified Health System (SUS) in 1988	Consolidation of the SUS with expansion of primary, secondary, and tertiary care Creation of the community health workers programme (1991) and family health strategy (1994) to increase access to health care in the poorest areas	Consolidation and expansion of the family health strategy
Non-health sector programmes	National food supplementation programme for mothers and children (1976) Expansion of water supply and sanitation (1975)	Continuity of food supplementation programmes Expansion of water supply and sanitation	Continuity of food supplementation programmes Expansion of water supply and sanitation Universal primary education	Creation of conditional cash transfer programmes: Bolsa Escola and Bolsa Alimentação (which replaced the food supplementation programme) and unification of programmes under Bolsa Familia (2003) Expansion of water supply and sanitation Increase in secondary education
Maternal health programmes	None	National Women's Health Programme (1984)	Continued implementation of the National Women's Health Programme	National Programme for the Humanization of Pregnancy and Childbirth (2000) Pact for the Reduction of Maternal and Newborn Mortality (2004)
Child health programmes	National Immunisation Programme (1977)	Strong vertical programmes for immunisations, growth monitoring, oral rehydration, and breastfeeding promotion Mass immunisation and oral rehydration campaigns National Programme for Child Health (1984)	National Programme for the Reduction of Infant Mortality (1995)	Creation of local committees for the prevention of infant mortality (2005) Pact for Life (to reduce infant mortality; 2006)

Figure 7. Main changes in determinants of maternal and child health in Brazil. Taken from: (Victora, Aquino et al. 2011)

STRUCTURAL CONTEXT[*]

Gender   Health Disparities   Social Context

INDIVIDUAL

Socio-demographics   Early Sexual Risk Experience   Fertility

RELATIONSHIP CONTEXT

Relationship Status   Partner Heterogamy

Partner Communication   Decision-making Power

DUAL PROTECTION BEHAVIOR

Condom   Non-barrier Method

Dual Method   No Method

* Not measured in this study

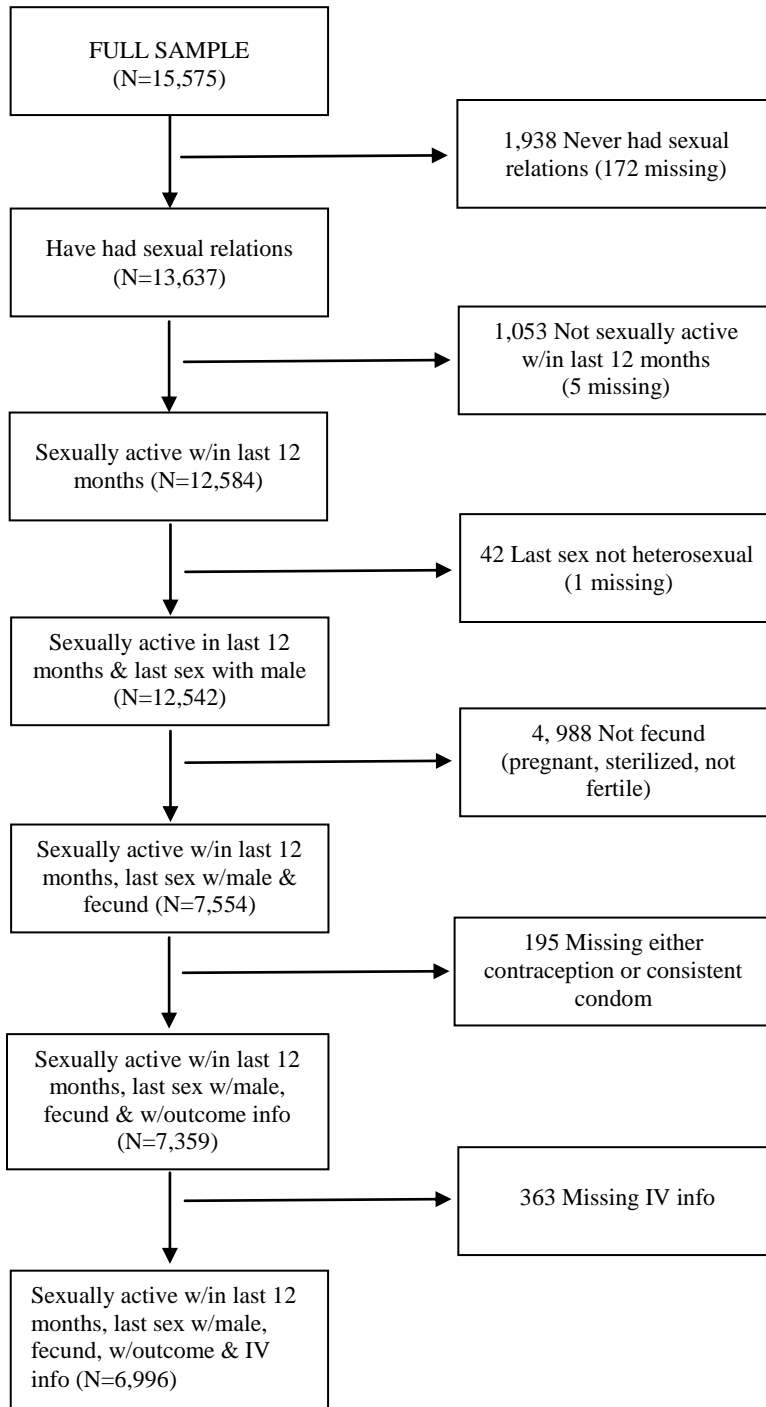**Figure 8. Conceptual Model. Adapted from (Karney et al. 2010)**

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Figure 9. Selection of Full Analytic Sample

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