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Preventing Syndemic Zika Virus, HIV/STIs, and Unintended Pregnancy: Dual method use and consistent condom use among Brazilian women in marital and civil unions

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Abstract

Syndemic Zika Virus, HIV and unintended pregnancy call for an urgent understanding of dual method (condoms with another modern non-barrier contraceptive) and consistent condom use. Multinomial and logistic regression using data from the *Pesquisa Nacional de Demografia e Saúde da Criança e da Mulher (PNDS)*, a nationally representative household survey of reproductive aged women in Brazil, identified the socio-demographic, fertility, and relationship context correlates of exclusive non-barrier contraception, dual method use, and condom use consistency. Among women in marital and civil unions, half reported dual protection (30% condoms, 20% dual methods). In adjusted models, condom use was associated with older age and living in the Northern region of Brazil or urban areas, whereas dual method use (versus condom use) was associated with younger age, living in the Southern region of Brazil, living in non-urban areas, and relationship age homogamy. Among condom users, consistent condom use was associated with reporting Afro-religion or other religion, not wanting (more) children, and using condoms only (versus dual methods). Findings highlight that integrated STI prevention and family planning services should target young married/in union women, couples not wanting (more) children, and heterogamous relationships to increase dual method use and consistent condom use.

Keywords

condom; HIV prevention; reproductive health; relationship context; Brazil

Introduction

The emergence of the Zika virus infection (Zika) has brought concern for dual protection (ie the simultaneous prevention of unintended pregnancy and STIs) – back to the forefront of

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public health. Zika, transmitted by the *Aedes aegypti* mosquito and through sexual transmission, has been found to cause brain abnormalities (e.g., microcephaly) in the fetuses of infected women (Oliveira Melo et al. 2016; Ventura et al. 2016; Brasil et al. 2016) and neuropathies (e.g., Guillain-Barre, encephalitis, myelitis, encephalomyelitis) in adults (Broutet et al. 2016). In response to the Zika epidemic, health ministries across Latin America recommend that women postpone pregnancy for up to 2 years (Roa 2016). Implicit within these recommendations is that couples at risk for the Zika are also urged to use condoms.

The recommendation for women to control their fertility and use condoms is seemingly unrealistic, especially for women in Brazil, who are among the hardest hit by the Zika. Despite Brazil's socialised healthcare system, women still report a substantial unmet need for modern contraception, persistent barriers to family planning, and low quality of family planning services (Ferreira et al. 2010; Malta et al. 2010). In the most recent Brazilian national survey on women's health, 55% of all births were reported as unintended (25% mistimed and 30% unwanted) (Viellas et al. 2014). Furthermore, despite Brazil's nationwide condom literacy educational program and condom use campaigns, only 57% of women reported past year condom use (Brasil 2008).

In addition to the public health threats posed by Zika, Brazilian women are affected by syndemic HIV and unintended pregnancy (Tsuyuki et al. 2016). In Brazil, HIV infections among women are on the rise in regions that also have a high prevalence of unintended pregnancy and Zika (e.g., South, North, Northeast) (MOS 2014; Coelho et al. 2012; Prietsch et al. 2011; Oliveira Melo et al. 2016). Furthermore, syndemic HIV and unintended pregnancy disproportionately affect women with low socio-economic status (Malarcher, Olson and Hearst 2010; Brasil 2008; Coelho et al. 2012; Fusco and Andreoni 2012; Prietsch et al. 2011; UNFPA 2008; Ferreira et al. 2010; Malta et al. 2010), which is also likely the case with Zika.

Dual protection against HIV/STIs and unintended pregnancy is essential for reproductive health, but condoms are still the mainstay for dual protection (Berer 2006). As noted in previous research, condoms are male controlled, require partner coordination, interfere with intimacy, and couples often grow tired of using them (Rosenthal, Gifford and Moore 1998; Flood 2003; Westhaver 2005; Chimbiri 2007); making them undesired in long-term relationships such as marriage and civil union. Research has found that as women progress through relationships, they tend to prioritise modern contraception over condom use (Tsuyuki et al. 2016; Upadhyay, Raifman and Raine-Bennett 2016). Although there is a sizeable literature of contraception and dual methods among women living with HIV (Chibwesha et al. 2011; Antelman et al. 2015) and women in the general population (MacPhail et al. 2007; Higgins et al. 2014; Pazol, Kramer and Hogue 2010), examining this issue in the presence of Zika and among women in Brazil is novel. Less is known about how women manage their overlapping vulnerabilities to Zika, unintended pregnancy, and STIs through dual method use – using a modern non-barrier contraceptive method in conjunction with condoms. Furthermore, the disparities in modern non-barrier contraception, condom use consistency, and dual method use are not well understood in the context of relationship homogeneity.

Homogamy Theory (e.g. homophily, assortative mixing) is central to understanding the effect of relationship context on dual protection behaviour because it situates relationship context within a larger social structure (McPherson, Smith-Lovin and Cook 2001). Relationship heterogamy occurs when partners differ from each other on important social markers like age, education, race, and income, and is a measure of relationship structure and a gauge of power. According to the theory, relationship ties between individuals with similar characteristics are typically closer than ties between individuals who are dissimilar (McPherson, Smith-Lovin and Cook 2001). On the one hand, similarities between individuals in a relationship are thought to represent shared knowledge and experiences, both which are hypothesised to facilitate communication and coordination around condom use and contraception (McPherson, Smith-Lovin and Cook 2001). On the other hand, relationship heterogamy is thought to represent differences in maturity levels, social networks, and sexual experiences, contributing to a power imbalance where one partner has more control over decisions than the other (Abma, Driscoll and Moore 1998; Ford, Sohn and Lepkowski 2002; Stein et al. 2008). Relationship heterogamy has been linked to shorter relationship duration, less commitment, and less condom use, but findings are mixed. For example, some studies report that age heterogamy predicts decreased condom use (Darroch, Landry and Oslak 1999; DiClemente et al. 2002; Kusunoki and Upchurch 2011; Manning, Longmore and Giordano 2000; Marin et al. 2000), whereas others do not find an association at all (Ford, Sohn and Lepkowski 2001; Manlove, Ryan and Franzetta 2003, 2004).

The effects of relationship heterogamy on modern contraception, condom use consistency, and dual method use are largely unknown in Brazil. Nevertheless, it is common for young women to date or marry older men and racial mixing is normative. These rules of pairing have roots in socio-structural inequity (Bastos and Szwarcwald 2000), providing a compelling case to use relationship heterogamy as a proxy for relationship power. This study aims to identify the socio-demographic, fertility, and relationship context correlates of modern contraception, dual method use, and consistent condom use among Brazilian women in marital/union relationships. We hypothesise that women in heterogamous marriages or civil unions will have greater odds of reporting non-barrier contraception (or no method) than barrier contraception (dual method use or exclusive condom use) compared to women in homogamous relationships, as barrier contraception requires more partner communication and negotiation.

Methods

Data

We conduct a secondary analysis of data from the *Pesquisa Nacional de Demografia e Saúde da Criança e da Mulher (PNDS)*, a cross-sectional household survey of Brazilian women of reproductive age that utilises a two-stage stratified sampling design (Brasil 2009). In the first sampling stage, ten strata were composed to include rural and urban areas of the five Brazilian macro-regions. Using sectors established by the 2000 census, 1,088 census sectors were randomly selected using simple random cluster sampling. A total of 760 urban and 328 rural PSUs were selected. In the second sampling stage, 12 households were randomly selected per sector. When the household did not have an eligible woman (15–49 years)

present, it was substituted by an eligible household closest on the list. A total of 14,617 households were chosen, yielding 17,456 eligible women, 15,575 of whom were interviewed (89% response rate) (Brasil 2009).

Sample weights included household weights to adjust for non-responsiveness in sectors, accounted for the presence of more than one woman in a household, and adjusted for absence/refusal to participate (Brasil 2009). Grand sample weights were calibrated (based on PNAD 2006 (IBGE 2007)) using key variables, including sample strata (region, rural/urban), sex, age distribution, total number of households with an eligible woman, and total number of households (Blavatsky 2008) (detailed here (Brasil 2008)).

Sample

This study analysed data for fecund, sexually active women in married/civil union relationships for which there existed complete data (n=4,674). Sexual active women were defined as women who self-reported having ever been sexually active, and reported being sexual activity with a male partner within the last 12 months. Civil union (*união estável*) among heterosexual partners has been legally recognised in Brazil since 2002, and grants the parties most of the same legal benefits as marriage. We also examined consistent condom use among a sub-sample of condom users (n=2,240). Women who used traditional contraceptive methods (n=360; 4%) were excluded from our analysis and were more likely to be older, white, have more children, to be married, and to be in educationally homogamous relationships where both partners had a below average education.

Measures

The main outcomes for this study included dual protection and consistent condom use in the past 12 months. Relationship context measures included relationship status, age heterogamy, and educational heterogamy. Covariates included socio-demographic factors, number of children and the desire for children.

Dual protection type—Dual protection type combined responses to questions on condom use and modern contraception variables. Condom use was asked of all sexually active women with the question, “*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 dichotomised (yes/no) as only 0.47% reported female condom use. Contraceptive use was asked of all sexually active women with the question, “*Do (you/your husband/partner) currently use any method to avoid becoming pregnant? If so, what method do you currently use?*” Responses were re-categorised into: 1) no method, 2) traditional contraceptive method (including coitus interruptus and calendar method) and 3) modern contraceptive method (including the oral contraceptive pill, intrauterine device - IUD, injectable hormone, hormonal implant - Norplant, and the diaphragm). These were re-categorised as affirmative if the participant reported using a non-barrier *modern* contraception only (birth control pill, hormonal injection/implant, IUD). Final outcome categories included: 1) condom only, 2) no method, 3) contraceptive only (non-barrier), and 4) dual methods (i.e., condom use in conjunction with another modern contraceptive). Condom only use included those who reported condom use at last sex, including 97% of women who reported condom use as their

current contraceptive method. Dual method use was defined by current use of a non-barrier method of contraception together with condom use at last sex. Participants were allowed multiple responses and several participants reported in the contraceptive method question to have used both male condoms along with the pill (2.6%), hormonal implants (1.0%), or traditional contraceptive methods (2%). A very small percentage (0.2%) of women reported using condoms as their current form of contraception, but did not use condoms at last sex, whereas 80% of women who reported using condom at last sex also reported condoms as their current form of contraception.

Consistent condom use—Consistent condom use combined responses with the previous condom use question, which was asked of all participants, with a second question which was asked of women who reported condom use: “*In the last 12 months, you used a male condom during sexual relations: 1) Always, every time, 2) Sometimes, or 3) Never?*” Responses to these two questions were used to construct the consistent condom use outcome with the categories always (consistent) or sometimes (inconsistent).

Relationship context—Relationship context measures included relationship status, age heterogamy, and educational heterogamy.

Relationship status was measured in the survey by asking women their civil status. Responses included: 1) single, 2) currently formally married, 3) currently in union, 4) widowed, 5) separated, and 5) divorced. Women were included in the analysis if they were currently in a marital or civil union relationship (dating relationships were not measured).

Age heterogamy compared women’s age measured by date of birth to her report of her male partner’s age (Luke 2003, 2005). Age heterogamy cut-offs were selected by subtracting the mean age of the partner (34.6 years) by the mean age of women (30 years), generating an average partner mean age difference between 4–5 years. Therefore, age homogamy was defined as being within 4 years of age of the male partner, and age heterogamy was defined as being either 5 or more years older or younger than the male partner. We operationalise this definition of age heterogamy because (a) the partner age gap is large enough to have implications for differences in relationship power dynamic as a result of social factors and (b) we wanted to ensure that we categorised the variable with enough distribution to support the multinomial logistic regression with covariates, especially with the woman 5 years older than her male partner category.¹ To address the discrepancy in age heterogamy operationalisation, we ran several models defining age heterogamy with different cut-off points. Despite variable operationalisations of age heterogamy, our findings remained relatively unchanged with only slight variations in the size and significance level of the coefficient.

Educational heterogamy compared women’s educational attainment to her partner’s educational attainment (Kalmijn 2010; Manlove, Ryan and Franzetta 2003; Manning et al. 2009). The educational attainment of the male partner was measured categorically thus, for

¹It is noteworthy that there is no consensus about difference in years between partners that constitutes age heterogamy, with considerable variation in how researchers have operationalised age heterogamy (Shehan et al. 1991, Drefahl 2010, Atkinson and Glass 1985).

comparison, the same categorical measures were constructed for women's educational attainment. Average 2006 educational attainment in Brazil was 7.2 years and was used to categorise male and female educational attainment as: 1) low (no education or elementary school) or 2) high (junior high school or more) (Bruns, Evans and Luque 2011). The educational heterogamy variable included the categories: 1) Both partners below average education, 2) Woman above/man below average education, 3) Woman below/man above average education, and 4) Both partners above average education.

Covariates—Covariates included *socio-demographic* factors such as age, education, race, religion, region, urban, household wealth, the number of children, and whether the women want to have (more) children.

Household wealth was a composite measure of household ownership of assets (electricity, number of rooms), source and means of water supply, sanitation facilities, and type of flooring (Filmer and Pritchett 2001, Vyas and Kumaranayake 2006). Responses to categorical variables were first dichotomised, Principal Component Analysis was conducted to identify one principal factor ($\alpha=0.78$), and we created a standardised summative score.

Desire for children was asked of non-surgically sterilised women to gather their current desire to conceive with the question, “Do you want to have a/another child, or do you prefer to not have a child/another child? 1) I do not want to have (more) children, 2) I am unable to get pregnant (infertility), and 3) Do not know” Responses were categorised based on whether women wanted (more) children: 1) No, 2) Yes, and 3) Don't know.

Statistical Analysis

Data analysis began with weighted sample descriptive statistics and bivariate distributions between covariates and dual protection type. Chi-square statistics (categorical variables) and ANOVA F-statistics (continuous variables) were used to identify statistically significant differences. Then, weighted multinomial logistic regression models estimated the un-/adjusted relative risk ratios of no method, exclusive modern contraception, and dual method use (versus exclusive condom use) ($n=4,647$). Finally, among condom users ($n=2,240$), weighted logistic regression models estimated the un-/adjusted odds ratios for consistent condom use. Weighted data analysis was conducted using the `–svy–` command in STATA 14.2 (StataCorp 2014). All covariates listed above were controlled for in adjusted models, however only covariates that were significantly associated with the outcome in bivariate models were reported on.

Results

Table 1 describes the national sample of all sexually active women of reproductive age in marital/civil unions. About half of the total sample reported using dual protection by either reporting exclusive condom use (30%) or condom use in conjunction with another modern contraceptive (dual methods; 21%). Women were on average 30.11 years old, had 8.22 years of formal education, and 1.45 children. Fifty-three percent were Black, 63% were Catholic, 43% lived in South-eastern Brazil, 83% were urban residents, and 54% did not want (more) children. Over half of women were in age homogamous relationships (52% within four years

of age of their partner) and educational homogamous relationships (57%) in which both partners had an above national average education.

Women differed from each other by marital/union relationship status on most variables, with no significant differences in terms of type of contraceptive method used (Table 1). Married women were, on average, older, more educated, White, of Evangelical religion, and residents of the Southeast region of Brazil compared to women in civil union. In terms of fertility variables, there were no significant differences by relationship type. In terms of relationship context variables, married women reported on average being significantly less years younger than their spouse, with 54% reporting age homogamy, compared to women in civil union (49% report age homogamy). Lastly, significantly more married women reported being in highly educated and education homogamous relationships (62%) compared to women in civil union (52%).

In the weighted, adjusted multinomial logistic regression model (Table 2), women had significantly *greater adjusted relative risk ratio* of exclusive modern, non-barrier contraception (versus condom use) if they lived in the Southern region of Brazil (RRR=2.03, 95%CI=1.43,2.87), whereas women had significantly *lower adjusted relative risk ratio* of exclusive contraception (versus condom use) if they were younger in age (RRR=0.97, 95%CI=0.95,0.99), lived in the Northern region of Brazil (RRR=0.61, 95%CI=0.45,0.85), and lived in urban areas (RRR=0.61, 95%CI=0.45,0.85), compared to their respective reference groups. Compared to the unadjusted models, relative risk ratios in the adjusted models became attenuated for Southern region of Brazil (in magnitude of association) and living in urban areas (in significance and magnitude), but became stronger for age (in significance and magnitude) and Northern region of Brazil (in magnitude).

Women had a significantly *greater adjusted relative risk ratio* of dual method use (versus condom use) if they lived in the Southern region of Brazil (RRR=1.81, 95%CI=1.24,2.64), whereas women had a significantly *lower adjusted relative risk ratio* of dual method use (versus condom use) if they were younger in age (RRR=0.92, 95%CI=0.89,0.94), lived in the Northern region of Brazil (RRR=0.45, 95%CI=0.30,0.68), lived in urban areas (RRR=0.66, 95%CI=0.46,0.93), and were in age heterogamous relationships where the woman is 5 years younger in age than their partner (RRR=0.65, 95%CI=0.47,0.90), compared to their respective reference groups. Compared to the unadjusted models, relative risk ratios in the adjusted models became attenuated for Southern region of Brazil (in significance and magnitude) and women in age heterogamous relationships where the woman is 5 years older in age than their partner (in significance and magnitude), but became stronger for age (in significance and magnitude), Northern region of Brazil (in significance and magnitude), living in urban areas (in magnitude), and women in age heterogamous relationships where the woman is 5 years younger in age than their partner (in significance and magnitude).

In weighted, adjusted binomial logistic regression models among women who used condoms (Table 3), women had a significantly *greater adjusted odds ratio* of consistent condom use (versus inconsistent condom use) if they were of Afro- or Other religion (AOR=2.67, 95%CI=1.15,6.20), and did not want (more) children (AOR=1.96, 95%CI=1.31,2.94),

whereas women had significantly *lower adjusted odds ratio* of consistent condom use if they used dual methods (AOR=0.12, 95%CI=0.08,0.17), compared to their respective reference groups. Compared to the unadjusted models, odds ratios in the adjusted models became attenuated for all variables except for dual protection type

Discussion

This study sought to describe dual protection behaviour and identify socio-demographic and relationship context correlates of condom use, dual method use, and consistent condom use in a national sample of reproductive aged Brazilian women in marital and civil unions. Half of our sample reported no condom use (13% no method at all) whereas the other half reported dual protection (30% condoms only, 21% dual methods). Condom use among women in marital and civil union relationships was associated with older age and living in the Northern region of Brazil or urban areas, whereas dual method use (versus condom use) was associated with younger age, living in the Southern region of Brazil, living in non-urban areas, and relationship age homogamy (woman within 4 years of their partner). Among condom users, consistent condom use was associated with reporting Afro-religion or other religion, not wanting (more) children, and using condoms only (versus dual methods).

Non-barrier contraception (versus condom use) among women in marital/civil union relationships was associated with younger age, net of other factors like fertility desires and number of children. Our finding is in contrast to that found among the Brazilian population generally, where age is consistently negatively correlated to condom use - young people use condoms at a higher frequency and with more consistency than older people (Calazans et al. 2005; CEBRAP 2000; Paiva et al. 2003; Paiva, Pupo and Barboza 2006; Pimenta et al. 2000; Pinho et al. 2002). Increased condom use in 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 et al. 2008) and, therefore, condom use is a more normalised behaviour than in older generations (Shafii et al. 2004; Teixeira et al. 2006). However, our findings may reflect young women who enter into marital/civil union relationships early, and who may not be able to (or willing to) negotiate condom use. Furthermore, our study is among the first to differentiate exclusive condom use from dual method use among women in the general population in Brazil who are in marital/civil unions.

Dual method use (versus condom use) was associated with younger age. Dual method use in younger people supports other studies (Higgins et al. 2014) and endorses the thought that condoms are viewed as less effective contraception. Therefore, young married/civil union couples may adopt non-barrier contraception in addition to condoms to prioritise better fertility control. However, the decision to adopt a non-barrier contraception in addition to condoms may be at a cost for HIV/STI prevention, as this study contributes to the literature in the finding that dual method users report less consistent condom use than exclusive condom users (Cates and Steiner 2002; Tsuyuki, Barbosa and Pinho 2013; Peipert et al. 2008; Higgins et al. 2014). Increased levels of dual method use in young people may also reflect greater access to reversible contraceptive methods (and less reliance on sterilisation) compared to older women (Hopkins et al. 2005).

There were regional differences in the relative risk ratio of using non-barrier contraception and dual methods (versus condoms) among women in marital/civil union relationships. This study finds that women in the more developed Southern and South-eastern regions of Brazil report greater relative risk ratios of using non-barrier contraception and dual methods (versus condoms) compared to women in the Northern region. Women in the North-eastern region were only slightly different in their dual method use than women in the Northern region. 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. It is noteworthy that, although the South and South-eastern regions of Brazil are among the most affected by the HIV epidemic, the North and North-eastern regions are among the hardest hit by Zika as well as a growing rate of HIV incidence (Departamento de DST Aids e Hepatites Virais 2015).

This study provides marginal support for homogamy theory as a predictor of dual protection behaviour among women in marital/union relationships in Brazil. Whereas age homogamy (woman is within 4 years of age of their partner) was associated with increased dual method use and decreased exclusive condom use, educational heterogamy was mildly associated with dual method use, and neither were significantly associated with consistent condom use. Dual method use (versus condom use) was greater in age homogamous relationships, net of other factors. Dual method use likely requires more partner coordination to use within the relationship than exclusive condom use (Karney et al. 2010). According to relationship structure, partners who are closer in age and education to each other are hypothesised to be more effectively communicate with each other about family planning and HIV/STI protection needs and are more equipped to coordinate around dual method use compared to couples who differ in age and education (McPherson, Smith-Lovin and Cook 2001). Our findings supported the hypothesis that partners in age homogamous relationships report more dual method use, a theoretically more effective dual protection behaviour in the presence of condom breakage or inconsistent condom use.

Relationship age heterogamy (woman is 5 years younger than partner) was associated with a greater likelihood of exclusive condom use (versus dual method use). A difference in partner age may affect women differently in a relationship than their men due to norms of gender and power. Because condoms are a male-controlled method, some studies have found that age heterogamy is more indicative of condom use among men than women (Bajos 1997; Manning et al. 2009). The balance of power to decide whether or not to use condoms is thus even more favourable for the man's desires when he is older than his wife or sexual partner (Connell 1987; Mason 1994). Our findings indicate that this would reflect a male preference to use condoms versus combining condoms with another contraceptive method, as with dual methods. Young women with older partners report more frequent sexual intercourse than when partners are the same age (Kaestle, Morisky and Wiley 2002). Men who are older are also more sexually experienced and have a greater prevalence of HIV and other STIs (Bastos and Szwarcwald 2000), heightening women's exposure to HIV/STIs and unintended pregnancy.

We found mild support for educational homogamy as a correlate of dual protection. Dual method use (versus condom use) among women in marital/civil unions was associated with relationship educational heterogamy, but the association did not remain significant in adjusted models. However, we found that male educational attainment was more indicative of dual method use than female educational attainment. 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). Although relationship educational heterogamy has been linked to greater condom use among men (Bajos 1997), this study finds that it also correlates with greater dual method use. The average male educational attainment in Brazil (5.1 years) has lagged behind average female educational attainment (5.5 years) in recent years and the disparity is projected to worsen (Beltrao and Alves 2009). This finding indicates that improving male educational attainment may potentially improve sexual and reproductive health outcomes in women, despite relationship heterogamy.

Consistent condom use among women in marital/civil unions was associated with exclusive condom use (versus dual methods), net of other factors. This finding is corroborated by several studies that find that dual method users report significantly less consistent condom use than exclusive condom users (Cates and Steiner 2002; Tsuyuki, Barbosa and Pinho 2013; Peipert et al. 2008). Consistent dual method use may be difficult to sustain over time, especially among married/in union couples who may no longer perceive the need to protect themselves against HIV/STI. Although individuals are less likely to protect themselves within marriage, they may be at greater HIV/STI risk than expected because partner risk assessments in these contexts are often unknown or inaccurate, especially in the case of infidelity and drug use (Clark et al. 1996; Ickovics, Thayaparan and Ethier 2001). More research is needed to understand how dual methods are adopted and used within the relationship context (Higgins and Hirsch 2007). Most women in Brazil report using condoms only when they begin a relationship, but not with steady partners, even when they know their partner is unfaithful (Hebling and Guimarães 2004). Negotiated safety is a potential risk reduction strategy for married/in-union couples at high HIV/STI risk in which an explicit agreement is made between sexual partners (Corbett et al. 2009). This agreement includes getting HIV/STI tests together, communication around HIV/STI risk, establishing condom use rules outside their relationship, and may have implications for trust within the relationship (Calazans et al. 2005). Negotiated safety could also facilitate the integration of family planning and HIV counselling within the relationship context.

Findings from this study should be viewed in light of several limitations. Data are cross-sectional, which does not allow for causal inference, and based on self-report, which may introduce measurement error from recall bias or social desirability. Additionally, questions regarding sexual activity and condom use in large surveys often involve limited depth and contextualisation of behaviour. With more in-depth relationship and contraception/condom measures (length of relationship, trajectory of condom/other contraceptive use, negotiation dynamics) we could better elucidate mechanisms that influence dual method use. Furthermore, condom use questions require more precision and accuracy, they must be linked to a relationship context as women may also have concurrent sexual partners. Moreover, consistent condom use measures should gather more information than ‘always,

never, or sometimes' to capture patterns of condom use that are less than 100% consistent. Lastly, this study is limited in its generalisability in Brazil to women who are fecund, although surgical sterilisation remains a predominant form of contraception. We omitted women who are surgically sterilised because they are qualitatively different than women who use reversible contraceptive methods, with research demonstrating that sterilised women face unique barriers to condom use (Barbosa and Villela 1995).

This study identifies correlates of exclusive condom use, non-barrier contraception, dual method use, and consistent condom use among a Brazilian national sample of reproductive aged women in marital/civil union relationships. Syndemic STI and Zika prevention and family planning services may usefully target young women who are married/in union relationships, couples who do not currently want children, relationships with heterogamy (age/education), and non-exclusive relationships to increase dual method use and consistent condom use.

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TABLE 1

Weighted Percentage Distribution of Characteristics by Relationship Status in Sexually Active, Women (15–49 years), in a Relationship, Brazil 2006

% or mean (SD)	Married 54% (N=2,404)	In Union 46% (N=2,270)	TOTAL 100% (N=4,674)
<i>Outcomes</i>			
No method	12	14	13
Non-barrier Contraceptive Only	37	36	37
Oral Contraceptive Pill	84	80	82
Long-acting (hormonal injectable/implant or IUD)	16	20	18
Condom only	31	27	30
Dual Methods	19	22	20
Oral Contraceptive Pill	83	73	78
Long-acting (hormonal injectable/implant or IUD)	17	27	22
<i>Socio-demographics</i>			
Age ***	32.07 (0.34)	27.85 (0.29)	30.11 (0.25)
15–19 ***	5	14	9
20–24	17	29	23
25–29	21	21	21
30–39	34	26	30
40–49	23	11	17
Education ***	8.63 (0.14)	7.77 (0.12)	8.23 (0.10)
Primary school or less ***	22	27	25
Middle School	26	34	30
Some High School	37	32	35
High School or more	15	7	11
Race ***			
White	49	33	42
Black	47	61	53
Yellow (Asian)	3	3	3
Indigenous	1	2	2
Religion ***			
None	5	12	8
Catholic	60	66	63
Evangelical	30	18	24
Afro-religion or Other	5	4	5
Region ***			
Southeast	47	38	43
North	4	10	7
Northeast	22	27	24
South	21	17	19

% or mean (SD)	Married 54% (N=2,404)	In Union 46% (N=2,270)	TOTAL 100% (N=4,674)
Mid-West	7	8	7
Urban	82	84	83
Household wealth score ***	0.18 (0.04)	neg. 0.24 (0.04)	neg. 0.02 (0.03)
<i>Fertility</i>			
Number of children	1.45 (0.04)	1.45 (0.04)	1.45 (0.03)
Wants more children			
Yes	41	45	43
No	56	52	54
Don't know	3	3	3
<i>Relationship Context</i>			
Age heterogamy (mean years younger) ***	4.40 (0.19)	4.70 (0.28)	4.54 (0.16)
Woman is within 4 years of partner ***	54	49	52
Woman 5 years younger than partner	43	43	43
Woman 5 years older than partner	3	8	5
Educational heterogamy **			
Both partners below average	17	18	18
Woman above/man below average	5	9	7
Woman below/man above average	16	21	18
Both partners above average	62	52	57

p-value<0.001;

**
p-value<0.01;

*
p-value<0.05;

SD=Standard Deviation

TABLE 2

Multinomial Logistic Regression of No Method, Contraception, and Dual Method Use (vs. Condom Use) on Variables in Sexually Active, Women (15–49 years), in Relationships, Brazil 2006 (N=4,647)

RRR (95% CI)	Unadjusted			Adjusted [§]		
	No Method	Non-barrier Contraception Only	Dual Methods	No Method	Non-barrier Contraception Only	Dual Methods
Age	1.04*** (1.02, 1.06)	0.99 (0.97, 1.00)	0.94*** (0.92, 0.96)	1.10*** (1.07, 1.13)	0.97*** (0.95, 0.99)	0.92*** (0.89, 0.94)
Education	0.93*** (0.88, 0.98)	0.97 (0.93, 1.01)	1.03 (0.98, 1.08)	0.96 (0.88, 1.05)	1.03 (0.96, 1.10)	1.05 (0.97, 1.14)
Race						
White		ref			ref	
Black	1.23 (0.87, 1.76)	0.90 (0.67, 1.21)	0.88 (0.64, 1.20)	1.47* (1.01, 2.14)	1.00 (0.73, 1.38)	0.90 (0.65, 1.24)
Yellow (Asian)	0.36* (0.13, 0.94)	0.52* (0.27, 0.97)	0.80 (0.35, 1.80)	0.47 (0.18, 1.24)	0.59 (0.31, 1.12)	0.74 (0.33, 1.66)
Indigenous	0.86 (0.30, 2.45)	0.71 (0.24, 2.13)	1.02 (0.43, 2.39)	0.73 (0.23, 2.28)	0.86 (0.28, 2.65)	1.02 (0.46, 2.26)
Region						
Southeast		ref			ref	
North	1.22 (0.80, 1.87)	0.60** (0.42, 0.87)	0.59** (0.40, 0.87)	1.03 (0.66, 1.59)	0.50*** (0.34, 0.73)	0.45*** (0.30, 0.68)
Northeast	0.98 (0.64, 1.52)	1.05 (0.76, 1.47)	0.90 (0.60, 1.34)	0.81 (0.52, 1.25)	0.85 (0.61, 1.18)	0.69 (0.47, 1.03)
South	1.75* (1.11, 2.75)	2.18*** (1.57, 3.02)	1.88*** (1.28, 2.76)	1.68* (1.04, 2.71)	2.03*** (1.43, 2.87)	1.81** (1.24, 2.64)
Mid-West	1.24 (0.82, 1.87)	1.28 (0.92, 1.78)	1.09 (0.76, 1.57)	1.20 (0.80, 1.78)	1.19 (0.86, 1.65)	0.92 (0.65, 1.29)
Urban	0.68 (0.47, 1.00)	0.60*** (0.45, 0.79)	0.71* (0.50, 0.99)	0.83 (0.52, 1.31)	0.61** (0.45, 0.85)	0.66* (0.46, 0.93)
Wants (more) children						
Yes		ref			ref	
No	0.56*** (0.40, 0.77)	1.11 (0.87, 1.43)	0.82 (0.62, 1.09)	0.22*** (0.14, 0.33)	1.22 (0.90, 1.67)	1.29 (0.92, 1.80)
Don't know	1.19 (0.47, 3.00)	1.10 (0.57, 2.11)	0.74 (0.36, 1.53)	0.65 (0.28, 1.51)	1.08 (0.54, 2.15)	0.89 (0.39, 1.99)
Relationship status						
Married		ref			ref	
Civil union	1.33 (0.96, 1.83)	1.12 (0.86, 1.47)	1.33 (0.99, 1.79)	1.59* (1.10, 2.29)	1.07 (0.82, 1.39)	1.09 (0.81, 1.48)
Age heterogamy						
Woman is within 4 years of partner		ref			ref	

RRR (95% CI)		Unadjusted			Adjusted [‡]		
		No Method	Non-barrier Contraception Only	Dual Methods	No Method	Non-barrier Contraception Only	Dual Methods
Woman	5 years younger than partner	0.82 (0.57, 1.18)	0.92 (0.70, 1.20)	0.74 (0.54, 1.02)	0.91 (0.64, 1.29)	0.84 (0.64, 1.10)	0.65** (0.47, 0.90)
Woman	5 years older than partner	0.88 (0.49, 1.56)	0.73 (0.43, 1.23)	0.51* (0.28, 0.91)	0.45* (0.23, 0.89)	0.86 (0.51, 1.44)	0.91 (0.50, 1.66)
Educational heterogeneity							
Both partners below average			ref			ref	
Woman above/man below average		0.87 (0.46, 1.63)	0.88 (0.48, 1.63)	1.35 (0.69, 2.62)	0.98 (0.50, 1.89)	0.88 (0.48, 1.61)	1.18 (0.60, 2.33)
Woman below/man above average		0.81 (0.47, 1.39)	1.16 (0.70, 1.92)	2.00* (1.10, 3.62)	1.15 (0.52, 2.55)	1.05 (0.59, 1.88)	1.42 (0.70, 2.89)
Both partners above average		0.55* (0.34, 0.88)	0.74 (0.47, 1.15)	1.51 (0.90, 2.54)	0.79 (0.34, 1.82)	0.67 (0.35, 1.26)	0.99 (0.50, 1.96)

* Multinomial logistic regression reference is 'Exclusive Condoms';

RRR=Relative Risk Ratio; CI=Confidence Interval;

[‡] Adjusted model controls for age, education, race, religion, region, urban, wealth score, number of children, and desire to have (more) children

TABLE 3

Weighted Binomial Logistic Regression of Consistent Condom Use in the past 12 months on variables in Sexually Active, Women (15–49 years) in Relationships, Brazil 2006 (N=2,240)

	OR (95% CI)	AOR (95% CI)
<i>Socio-demographics</i>		
Age	1.05*** (1.04,1.07)	1.01 (0.98,1.03)
Religion		
None	ref	ref
Catholic	1.29 (0.77,2.14)	1.48 (0.82,2.69)
Evangelical	1.38 (0.84,2.27)	1.30 (0.70,2.42)
Afro-religion or Other	2.81** (1.33,5.95)	2.67* (1.15,6.20)
Household wealth score	1.33*** (1.15,1.53)	1.21 (0.99,1.48)
<i>Fertility</i>		
Number of children	1.15* (1.01,1.31)	1.00 (0.83,1.21)
Wants (more) children		
Yes	ref	ref
No	1.97*** (1.48,2.60)	1.96** (1.31,2.94)
Don't know	1.31 (0.62,2.77)	1.11 (0.53,2.32)
<i>Relationship Context</i>		
Relationship status		
Married	ref	ref
Civil union	0.69** (0.53,0.89)	1.00 (0.71,1.39)
Age heterogamy		
Woman is within 4 years of partner	ref	ref
Woman 5 years younger than partner	1.05 (0.78,1.42)	0.95 (0.70,1.28)
Woman 5 years older than partner	1.06 (0.56,1.99)	0.65 (0.31,1.35)
Educational heterogamy		
Both low	ref	ref
Woman high/man low	0.86 (0.41,1.81)	0.91 (0.40,2.08)
Woman low/man high	0.59 (0.32,1.07)	0.67 (0.30,1.47)
Both high	1.07 (0.62,1.84)	0.95 (0.39,2.35)
<i>Dual Protection Type</i>		
Condom only	ref	ref
Dual methods	0.13*** (0.09,0.17)	0.12*** (0.08,0.17)

Logistic regression reference is 'Inconsistent Condoms';

OR=Odds Ratio; CI=Confidence Interval; AOR=Adjusted Odds Ratios;

¥ Adjusted model controls for age, education, race, religion, region, urban, wealth score, number of children, and desire to have (more) children