Published in final edited form as:

Glob Public Health. 2020 November ; 15(11): 1639–1654. doi:10.1080/17441692.2020.1767675.

TYOLOGIES OF VIOLENCE AGAINST WOMEN IN BRAZIL: A LATENT CLASS ANALYSIS OF HOW VIOLENCE AND HIV INTERSECT

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Abstract

We address the limited understanding around the overlap between violence and HIV in Brazil. Data was from two clinic-based samples of HIV-positive ($n=1,534$) and HIV-negative women ($n=1,589$) in São Paulo and Porto Alegre. We conducted latent class analysis and identified violence typologies by type of violence, life course timing, frequency, and perpetrator, stratified by city and HIV-status. Overall, HIV-positive women experienced more lifetime physical and sexual violence than HIV-negative women. Twelve unique violence latent classes were identified. In São Paulo, HIV-positive women were likely to have endured physical violence several times (Conditional Probability [CP]: 0.80) by an intimate partner (CP: 0.85), and sexual violence several times (CP: 0.46) by an intimate partner (CP: 0.62). In Porto Alegre, HIV-positive women endured physical violence several times (CP: 0.80) by an intimate partner (CP: 0.70) during childhood/adolescence (CP: 0.48), and sexual violence several times (CP: 0.54) by an intimate partner (CP: 0.60). Findings inform interventions to educate around gender equity, violence, and the health

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Conflict of Interest:

The authors declare that they have no conflict of interest.

Ethical approval:

Ethical considerations reviewed and approved by institutional review boards (IRB) within the US and Brazil. *Ethics statement.* This study protocol was approved by the institutional review boards in Porto Alegre (Federal University of Rio Grande do Sul – UFRGS, N. 2008216; Hospital Conceição, N. 10–011100517; Hospital de Clínicas de Porto Alegre – HCPA, N. 100517; and the Municipal Secretary of Health’s Ethics Committee, N. 001.049442.09.0) and São Paulo (Municipal Secretary of Health’s Ethics Committee; the São Paulo prefecture, N. 0043/12; and the São Paulo Reference and Training Center for HIV/STD, N. 107/2011). All participants were informed of the purpose of the research and provided written informed consent form, which advised them that they could refuse to participate in the survey at any time.

effects of violence including HIV, integrate HIV and violence services, and improve the provision of bio-medical HIV prevention among HIV-negative women who experience violence.

Keywords

HIV; violence; gender; Brazil; latent class analysis

INTRODUCTION

Violence against women is a critical public health problem, and is defined as physical violence, sexual violence, threats of violence, and psychological aggression (including coerciveness) (Breiding et al., 2015). Approximately one in three women worldwide have experienced physical and/or sexual intimate partner violence or non-partner sexual violence at one point in their lifetime (World Health Organization, 2013). Moreover, violence is often cumulative, affecting women throughout their life course in childhood, adolescence, and adulthood (Scott-Storey, 2011).

Violence against women is a particular problem in Brazil (Waiselfisz, 2015), which consistently ranks among the highest in terms of the number of femicide in the world (Secretariat, 2015). Femicide is defined as the gender-based killing of women by men (Russell, 2012), and is the most extreme form of violence against women. National data indicate that between 2007 and 2017 femicide grew by 30.7%, with 4,936 women killed in Brazil in 2017. In this period, the femicide rate grew from 3.9 to 4.7 per 100,000 women. Meanwhile, the femicide rate grew from 3.47 to 5.24 in the state of Rio Grande do Sul (in the South region) and fell from 2.79 to 2.16 in the state of São Paulo (in the Southeast region) (Instituto de Pesquisa Econômica Aplicada, 2019).

Two key violence laws were enacted during this time period in Brazil, and caution should be used when interpreting the previous statistics. First, the Maria da Penha (Law No. 11.340, 08/07/2006) was passed in 2006 to enhance state punishment for domestic or family violence against women. Additionally, Maria da Penha established integrated mechanisms to prevent domestic violence, such as police removal and detention of the domestic perpetrator, Women's Police specifically for cases of domestic violence, educational campaigns for violence awareness and prevention, and support services for abused women (i.e., shelters, counseling, priority care in health networks) (Garcia et al., 2013). Some states, including Rio Grande do Sul, also adopted the Maria da Penha Patrol (Patrulha Maria da Penha), which trains local police to provide support for survivors of domestic violence, monitoring them and ensuring that protective measures are enforced. Second, The Femicide Act (Law No. 13.104, 03/09/2015) was passed in 2015 (Instituto de Pesquisa Econômica Aplicada, 2019). This law established a legal definition for femicide, and enacted harsher jail sentences (up to 30 years) for any murder of women linked to domestic violence, with tougher sentences given to the femicide of women who were pregnant, post-partum, young (less than 14 years of age), and elderly (more than 60 years of age) (Silva & Alberton, 2019).

Other forms of violence against women are prevalent in the South and Southeast regions of Brazil. The state of Rio Grande do Sul has one of the highest reported rates of violence

against women in the country, whereas the state of São Paulo had the greatest reported number of women affected by violence in the country (Waiselfisz, 2015). According to multiple data sources, violence against women is consistently more frequent in Rio Grande do Sul than São Paulo. For example, the rate of violent threats against women and the rate of injuries sustained from violence against women in 2018 in Rio Grande do Sul (785 and 455 per 100,000 women 15 years and older, respectively) far surpassed that of São Paulo (303 and 268 per 100,000 women, respectively). Additionally, the rate of sexual assault against women in 2017 was higher in Rio Grande do Sul than São Paulo for both non-black women (200 vs. 185, respectively) and black women (320 vs. 264 per 100,000 women, respectively) (Alianza Latinoamericana para la Tecnología Cívica (Altec)). Although the state of Rio Grande do Sul has more laws enacted to address gender-based violence than other states (Alianza Latinoamericana para la Tecnología Cívica (Altec)), there are several contextual constraints to enforcing such laws. For example, Rio Grande do Sul has less financial resources, greater overall poverty, and more rural inhabitants than the state of São Paulo (Instituto Brasileiro de Geografia e Estatística (IBGE)); factors that also reinforce traditional gender norms and gender-based violence.

Violence against women and HIV are persistent public health problems that critically intersect to adversely affect women's health (World Health Organization, 2013). Violence has been documented as both a cause and consequence of HIV (Instituto de Pesquisa DataSenado et al., 2017). Women in violent relationships have four times the risk of testing positive for sexually transmitted infections (STIs), including HIV, and are more likely to engage in behaviors known to increase the risk for HIV infection (i.e., drug and alcohol use, condomless vaginal and anal sex, sex trade) (Campbell et al., 2008). Although the lifetime prevalence of violence against women is similar among HIV-positive and HIV-negative women in the U.S. (Cohen et al., 2000; Koenig et al., 2006; Vlahov et al., 1998; Wyatt et al., 2002), HIV-positive women are found to experience more frequent and severe abuse than HIV-negative women (Gielen et al., 2007; Gail E. Wyatt et al., 2002). Moreover, HIV-positive status may confer additional risks of violence against women related to HIV disclosure and stigma (Gielen et al., 2000; Zierler et al., 2000). In Brazil, violence against women and HIV-status appear to overlap significantly, with the majority of HIV-positive women reporting a lifetime history of violence, and most reporting violence experience prior to their HIV-positive diagnosis (Barros et al., 2011; Ceccon & Meneghel, 2015; Kiss et al., 2012; Pinho et al., 2017; Santos et al., 2009).

In addition, Brazil has the largest number of people living with HIV in Latin America (n=830,000) (Joint United Nations Programme on HIV/AIDS (UNAIDS), 2017), and is one of 15 countries that account for 75% of the number of people living with HIV worldwide (Meneghel et al., 2013). Although the HIV epidemic in Brazil is classified as stable at the national level, prevalence varies by geographic region and socio-demographic factors. Specifically, the South and Southeast regions have the highest HIV prevalence, respectively accounting for 20% and 56% of all the people living with HIV in Brazil from 1983 to 2013 (Brazilian Ministry of Health, 2017). Furthermore, the rate of HIV infection is growing among women particularly susceptible to violence victimization, increasing predominantly among adolescent girls and women over 50 years of age (Kiss et al., 2012).

Despite the likely overlap between violence against women and HIV in Brazil, there is limited understanding of women's violence experience by HIV-status. There lacks a granular understanding of violence experience in terms of the life course timing of violence, frequency and type of violence, and perpetrators of violence. Understanding the overlap of violence against women and HIV-status is critical for the development of appropriate intervention strategies to prevent violence and HIV among women. In a country as large and culturally diverse as Brazil, it is particularly relevant to examine regional nuances in the prevalence of violence and its association with HIV among women. To address these gaps, we conducted a secondary analysis on data from the South and Southeast regions of Brazil, where Porto Alegre, Rio Grande do Sul and São Paulo, São Paulo are located, respectively. We estimated latent classes that identify unique violence typologies experienced by women stratified by city and HIV-status, an innovative, person-centered, approach providing insight to the overlap of violence and HIV.

METHODS

Data

This study is a secondary analysis of cross-sectional data from the GENIH study conducted in São Paulo (Southeast region) in 2012–2014 and the Sexual and Reproductive Health of Women in the Context of HIV/AIDS (SRHW) in Porto Alegre (South region) in 2011–2013, Brazil. Data from these two studies were merged as they used identical sampling methodologies (GENIH in São Paulo, $n=1,817$ and SRHW in Porto Alegre, $n=1,306$).

Sampling

HIV-positive women were sampled from specialized HIV health care clinics, totaling seven clinics in Porto Alegre and 18 clinics in São Paulo. HIV-negative women were sampled from primary health care centers using a two-stage cluster sampling design. In the first sampling stage, primary health care centers were listed by region in each city and one was randomly sampled within each region. In Porto Alegre, 27 of 159 primary health care centers were selected. In São Paulo, 38 of 442 primary health care centers were selected. In both HIV-positive and HIV-negative samples in each city, women were randomly selected from a list of scheduled and walk-in appointments on days of interview. The number of women recruited in each health clinic was proportionate to the number of women attending the clinic on that given date in the previous year. Selected women were approached by field staff, informed consent was obtained, the purpose and procedures of the study were explained, and eligibility was confirmed with a brief questionnaire.

Survey data collection

Survey data was collected via electronic netbooks with QDS software in São Paulo and Sphinx software in Porto Alegre. The survey was comprised of a comprehensive set of questions on sociodemographic characteristics, and sexual and reproductive health outcomes related to sexual partners, contraception and condom use, pregnancy, abortion, HIV diagnosis, and violence experiences across the life course.

Dependent variables

The primary outcome variable for this study is lifetime experience of physical and sexual violence, which was adapted from measures used in the WHO Multi-Country Study on Women's Health and Domestic Violence (Garcia-Moreno et al., 2006). For physical and sexual violence, women were asked about lifetime and past 12-month occurrence of violence, frequency, life course timing (occurred in childhood/adolescence or not), and perpetrator (intimate partner, family member, friend, boss/colleague, stranger) of the violence.

Statistical analysis

All analyses were stratified by city and HIV-status as both lend important contextual differences to experiences of violence and HIV. We conducted a descriptive analysis of the entire sample by socio-demographic characteristics and a summary of violence experiences across the life course. Latent Class Analysis (LCA) was performed to distinguish groups of women with unique violence victimization profiles based on their discrete responses to the violence questions. We chose best fit LCA models to determine the number of latent classes based on several model fit criteria, including BIC (Bayesian Information Criteria), AIC (Akaike Information Criteria), Likelihood ratio test, and Entropy. We also estimated Scree-Plots to assess model fit. For each LCA model, we estimated the conditional item response probabilities by outcome variables for each class. Conditional probabilities within each violence latent class indicate the chances that an individual who falls within a particular latent class would respond "yes" to that variable. A conditional probability of greater than 0.4 was used to characterize the violence latent classes. The `poLCA` – package from R software (Version 3.4.4) was used to run the LCA.

RESULTS

Table 1 describes the frequency distributions of socio-demographic characteristics of our sample, by city and HIV-status. In São Paulo, 955 of the women who completed the survey were HIV-negative and 862 were HIV-positive. In Porto Alegre, 634 of the women who completed the survey were HIV-negative and 672 were HIV-positive. The median age for the four groups ranged from 31 to 39. In both São Paulo and Porto Alegre, women who were HIV-negative were on average younger, had one less child, were more educated, were less likely to have a source of income, had fewer lifetime sexual partners and reported less drug use and less early sexual initiation than women who were HIV-positive. Regarding violence, women who were HIV-negative in São Paulo and Porto Alegre reported never experiencing physical or sexual violence (66% and 62%, respectively), experiencing physical violence only (26% and 26%, respectively), experiencing sexual violence only (3% and 5%, respectively), and experiencing both physical and sexual violence (6% and 7%, respectively). Among HIV-positive women in São Paulo, 50% had some postsecondary education, 78% had a source of income, 51% reported never experiencing physical or sexual violence, 29% had experienced only physical violence, 6% had experienced only sexual violence, and 14% experienced both physical and sexual violence. Among HIV-positive women in Porto Alegre, 34% had some postsecondary education, 86% had a source of income, 55% reported never experiencing physical or sexual violence, 27% had experienced

only physical violence, 6% had experienced only sexual violence, and 12% experienced both physical and sexual violence.

Table 2 reports the lifetime physical and sexual violence experience of women in our sample by city and HIV-status, including variables that make up the LCA. In São Paulo, 32% of HIV-negative and 44% HIV-positive women experienced physical violence in their lifetime, with 19% of HIV-negative and 31% of HIV-positive women experiencing physical violence several times in their lifetime. In terms of sexual violence, 9% of HIV-negative and 20% of HIV-positive women in São Paulo experienced sexual violence in their lifetime, with 3% of HIV-negative and 9% of HIV-positive women experiencing sexual violence several times in their lifetime. In Porto Alegre, 33% of HIV-negative and 39% of HIV-positive women experienced physical violence in their lifetime, with 21% of HIV-negative women and 26% of HIV-positive women experiencing physical violence several times in their lifetime. In terms of sexual violence, 12% of HIV-negative and 18% of HIV-positive women Porto Alegre experienced sexual violence in their lifetime, with 5% of HIV-negative and 9% of HIV-positive women experiencing sexual violence several times in their lifetime.

Table 3, and Figure 1, illustrate the fit statistics used to determine the number of latent classes that make up the best-fit model. Model selection to determine the number of latent classes was based on the best overall model fit indices using BIC, AIC, and Likelihood Ratio. Results demonstrated that model fit became better with the addition of each class and, leveled off after the fourth class. Therefore, we determined that the 4-class solution was the most parsimonious of the seven models.

Table 4 (and Figure 2) presents the conditional probabilities for each latent class for the HIV-positive and HIV-negative subgroups in São Paulo and Porto Alegre. There was a total of 16 latent classes, and 12 unique violence latent classes including physical violence in childhood/adolescence (several times); sexual violence (1–2 times); and physical and sexual IPV (several times). In São Paulo, HIV-negative women were likely to have endured physical violence several times (Conditional Probability [CP]: 0.55), by an intimate partner (CP: 0.50) and likely during childhood/adolescence (CP: 0.51). In São Paulo, HIV-positive women were likely to have endured physical violence several times (CP: 0.66), by an intimate partner (CP: 0.58), and likely during childhood/adolescence (CP: 0.39). HIV-negative women were likely to have endured sexual violence once or twice (CP: 0.96), whereas HIV-positive women were likely to have endured sexual violence several times (CP: 0.42) by an intimate partner (CP: 0.42). In terms of women who experienced both physical and sexual violence, HIV-negative women were likely to have endured physical violence several times (CP: 0.88) by an intimate partner (CP: 0.83), and sexual violence several times (CP: 0.53) by an intimate partner (CP: 0.74). HIV-positive women were likely to have endured physical violence several times (CP: 0.80) by an intimate partner (CP: 0.85), and sexual violence several times (CP: 0.46) by an intimate partner (CP: 0.62).

In Porto Alegre, HIV-negative women were likely to have endured physical violence several times (CP: 0.58) and often during childhood/adolescence (CP: 0.57). HIV-positive women were likely to have endured physical violence several times (CP: 0.62), by an intimate partner (CP: 0.60). HIV-negative women likely endured sexual violence once or twice (CP:

0.70) by an intimate partner (CP: 0.53) and likely during childhood/adolescence (CP: 0.50), whereas HIV-positive women were likely to have experienced sexual violence either once or twice (CP: 0.65) likely during childhood/adolescence (CP: 0.48). In terms of women who experienced both physical and sexual violence, HIV-negative women were likely to have endured physical violence several times (CP: 0.79) by an intimate partner (CP: 0.70) during childhood/adolescence (CP: 0.49), and likely experienced sexual violence several times (CP: 0.51) by an intimate partner (CP: 0.57) likely during childhood/adolescence (CP: 0.53). HIV-positive women were likely to have endured physical violence several times (CP: 0.80) by an intimate partner (CP: 0.70) during childhood/adolescence (CP: 0.48), and likely experienced sexual violence several times (CP: 0.54) by an intimate partner (CP: 0.60) likely during childhood/adolescence (CP: 0.47).

DISCUSSION

The current study examined the violence profiles experienced by women across the life course in São Paulo and Porto Alegre, Brazil stratified by HIV status and by city. Using LCA, we identified 12 unique violence latent classes. This analysis demonstrated a critical disparity in violence experienced by HIV-status. HIV-positive women experienced more cumulative violence (both physical and sexual violence across various stages of the life course) than HIV-negative women in both São Paulo and Porto Alegre. Furthermore, HIV-positive women reported more exposure to sexual violence, and a greater number and range of perpetrator types than HIV-negative women. We also found differences between regions in Brazil in terms of the life course timing, frequency of violence and perpetrator of violence regarding physical and sexual violence. To our knowledge, this is the first study to identify violence profiles among a clinic-based sample of HIV-negative and HIV-positive women in Brazil.

Our study documented the prevalence of cumulative violence among a clinical sample of Brazilian women by HIV-status and city. Women reported a wide range of violence prevalence, with more HIV-positive women reporting lifetime physical and/or sexual violence (45–46%) than HIV-negative women (34%–38%). By city, we find comparable prevalence with 38–45% of women in Porto Alegre and 34–49% of women in São Paulo reporting lifetime physical and/or sexual violence. Our prevalence findings are comparable to those from the WHO multi-country, population-based study that reported between 15–71% of women worldwide reported experiencing physical and/or sexual violence by a partner in their lifetime (Ellsberg et al., 2008). However, our clinic-based data indicate a greater prevalence of lifetime physical and/or sexual violence (34–49%) than that reported in the WHO study for Brazil (29%) (Ellsberg et al., 2008). Likewise, a cross-sectional study among a clinical sample in São Paulo found that 57% of HIV-negative women and 72% of HIV-positive women reported lifetime experiences of violence (Barros et al., 2011). It is important to note that we are limited in terms of comparing violence prevalence across studies, due to differing measures of violence (e.g., time period, perpetrator) and varying social contexts the influence constructions of violence (regional, socioeconomic, and socio-cultural contexts).

One key finding of our study was that HIV-positive women in São Paulo and Porto Alegre experienced more cumulative violence across the life course compared to HIV-negative women. HIV-positive women had a greater class membership in the typologies of having experienced lifetime sexual violence exclusively, and experiencing both lifetime sexual and physical violence. These results are consistent with growing evidence linking the HIV and violence epidemics (Barros et al., 2011; Dunkle & Decker, 2013; Maman et al., 2000; Wyatt et al., 2002). Violence may expose women to greater risk of HIV via several mechanisms: Violence perpetrators have a greater likelihood of being HIV-positive; abused women are often forced or coerced into sexual intercourse; abused women are often unable to negotiate condom use; and recurrent abuse exposes women to chronic stress that physiologically enhances women's susceptibility to HIV infection (El-Bassel et al., 2011; Ipp et al., 2014; Jewkes, 2010; Jewkes et al., 2010; Shannon & Csete, 2010; Tsuyuki et al., 2019). Sexual violence is also associated with HIV risk behaviors, such as having multiple sexual partners and engaging in drug or alcohol misuse (Campbell et al., 2008; El-Bassel et al., 2011; Zablotska et al., 2009; Zierler, Witbeck, & Mayer, 1996). Despite the consistent link between violence and HIV, future longitudinal studies are needed to assess the temporal association between violence over the life course and HIV infection susceptibility. Furthermore, more research is needed around HIV-status disclosure and whether it leads to subsequent violence by intimate and non-intimate partners (Colombini et al., 2016; Gielen, Fogarty, et al., 2000; Gielen, McDonnell, et al., 2000).

We found that intimate partners were likely the primary perpetrators of violence across subgroups of women and violence latent classes in our study. This result is consistent with evidence that intimate partner violence is common and significantly associated with HIV infection (Li et al., 2014). Although HIV-negative women from both cities had less class membership in the sexual violence only and physical and sexual violence classes than HIV-positive women, they demonstrated either a comparable or greater likelihood of reporting an intimate partner perpetrator. This finding supports the critical need to promote pre-exposure prophylaxis (PrEP) among HIV-negative women who are survivors of sexual violence by an intimate partner. PrEP is a promising prevention strategy for abused women as it is an autonomous and discrete method that can be used prior to sexual activity (Braksmajer et al., 2016; Chen et al., 2011; Koechlin et al., 2017; O'Malley et al., 2019; Rubtsova et al., 2013). Although research is limited, evidence suggests that women who experience IPV, and past-year IPV, demonstrate a greater likelihood of being interested in using PrEP (O'Malley et al., 2019; Rubtsova et al., 2013). In Brazil, PrEP was approved for use in December 2017, but abused women are not included within the key populations of focus for PrEP roll-out and implementation (e.g., sex workers, men who have sex with men [MSM], transgender women) (Agência Nacional de Vigilância Sanitária [Anvisa]). Future studies among HIV-negative abused women in Brazil should assess whether they are aware of their increased risk for HIV and aware and informed of PrEP (Willie et al., 2018). Moreover, public health policymakers should encourage the inclusion of abused women as a key population for PrEP.

Our study also identified family members and strangers as key perpetrators of violence. In São Paulo, HIV-positive women who fell in the physical and sexual violence latent class had a high likelihood that the violence was perpetrated by a family member or stranger. Factors associated with prevalence of family violence in São Paulo include female sex and living

only with the father (Ralo et al., 2016), highlighting the importance of intervening with adolescent females (Cohen et al., 2004; Stein et al., 2003). In Porto Alegre, HIV-positive women who fell in the physical and sexual violence latent class had a high likelihood that the violence was perpetrated by a stranger. These instances of assault and violence by non-partners involve greater uncertainty in anticipating sexual acts and the inability to negotiate condom use. As such, policies supporting provision of HIV post-exposure prophylaxis (PEP) present an opportunity to reform and strengthen existing services for post-rape care and highlight HIV prevention among sexual violence survivors (Kim et al., 2003). PEP provision in Brazil is highly acceptable and feasible among survivors of sexual violence (Nisida et al., 2019; Pereira et al., 2019). In a study conducted among women survivors of sexual violence in São Paulo, 65% adherence to PEP was reported, with psychological care and social support enhancing PEP adherence (Nisida et al., 2019). PEP prescription post-sexual assault is estimated to have potentially averted 3,138 HIV infections in Brazil between 2009 and 2017, with PEP more commonly prescribed in the Southeast than any other region of Brazil (Pereira et al., 2019). It is critical to ensure the availability of PEP to sexual assault survivors in socio-economically disadvantaged regions of Brazil with high violence against women, such as the South.

In the current study, HIV-positive women reported a distinct pattern of timing in terms of violence exposure over their life course compared to HIV-negative women. Childhood abuse is consistently linked to increased HIV risk behaviors and subsequent violence revictimization in adulthood (Cohen et al., 2000; Jones et al., 2010; Parillo et al., 2001; Wyatt et al., 2004). Moreover, sexual violence in adulthood may intensify the negative effects of early sexual abuse and increase women's likelihood of engaging in HIV risk behaviors (Parillo et al., 2001). Cumulative lifetime violence may increase chronic stress and lead to toxic stress – the frequent and prolonged activation of the body's stress response systems and subsequent physiological dysfunction (Shonkoff et al., 2012). Although less studied, toxic stress is hypothesized to compromise the mucosal immunity in the female reproductive tract thereby increasing women's (and especially young women's) behavioral and physiological susceptibility to health problems, including HIV infection (Hickey et al., 2011; Tsuyuki et al., 2019). In addition to employing violence prevention interventions, such as bystander-based to prevent violence perpetration (Storer et al., 2016), future research is needed that examine cumulative violence, toxic stress, and HIV infection among abused women. This line of research would inform clinical-based interventions that potentially modulate the stress response among women who have previously experienced violence, thereby reducing their risk for HIV infection.

There are several limitations to consider when interpreting these results. As the study is cross-sectional, we are unable to discern temporality between HIV status and violence latent classes. Due to the time elapsed between the women's experiences and self-reported responses in the surveys, there is a possibility that their responses to violence were affected by recall bias. Age may have confounded our findings that HIV-positive women experience more cumulative violence, as our sample of HIV-positive women were significantly older HIV-negative women in both cities and therefore had a longer window of exposure to cumulative violence. As the women in this study were a clinic-based sample from only two cities in Brazil, generalizability is limited. Our sample may not reflect the socioeconomic

and cultural diversity of the women throughout the entire country. Nevertheless, it is noteworthy that our participants were sampled from public clinics, which cover almost 70% of the population in Brazil, including those without private health insurance and women of low socioeconomic status. Furthermore, generalizability limitations mainly affect our sample of HIV-negative women, as nearly all HIV-positive women in Brazil are monitored and receive care in the public health system from where we sampled. Despite these limitations, our study has numerous strengths. The large sample size of HIV-positive and HIV-negative women increased the power in our study, allowing us to detect meaningful differences. LCA is an innovative and stronger method than other methods (i.e., logistic regression), providing a granular description how violence affects women across their life course and how violence may differ by HIV-status. LCA is a person-centered (versus variable-centered) technique, which uses maximum likelihood estimation to create classes that are internally homogeneous and externally heterogeneous (Berlin et al., 2014). LCA is also a model-based technique that provides fit statistics to indicate the most appropriate and parsimonious model for the data (Vermunt & Magidson, 2002). Lastly, LCA provides conditional probabilities, which provide information of an individual's probability of membership to variables within a particular class (Vermunt & Magidson, 2002).

CONCLUSIONS

Women in Brazil experience violence at multiple points during their life course, by different perpetrators, and with varying frequency, providing many opportunities for health care providers to intervene. Our findings highlight the critical need to develop and implement interventions for prevention of both violence (across the life course) and HIV. This emphasizes the need to integrate the violence and HIV responses in various social sectors, in particular, education, health, and safety. In terms of education, it is of fundamental importance that gender equity interventions begin with young boys and girls. Although gender has been a cross-cutting theme in the National Common Curricular Base (BNCC) in Brazil since 2007, it was eliminated from the newest version of the curriculum in 2017, representing an important setback in the prevention of gender-based violence. In addition, women must be educated about the health and behavioral risks linked to violence, with focus on HIV prevention. In terms of health, it is essential to train professionals to identify, notify, and treat different forms of violence against women, especially HIV care professionals. Furthermore, the national and state-level protocols and guidelines (Brasil Ministério da Saúde et al., 2011) for the care of violence survivors should include provision of psychological counseling and PrEP/PEP for HIV prevention among women. In terms of safety, professionals must be trained in the provision of support for survivors and ensure they comply with protective measures. Furthermore, in light of violence as a growing public health concern, more police stations specialized in dealing with violence against women must be created. Through joint action of these different sectors we could reduce and prevent gender-based violence in Brazil, and its implications on women's morbidity and mortality.

Acknowledgements:

This research was supported by the World Bank/Sexual Violence Research Initiative (SVRI) Development Marketplace for Innovation in Prevention of Gender-Based Violence (PI: Stockman and Barbosa, Co-I: Tsuyuki and Knauth). The original research, which collected the data, was funded by the National Scientific and Technological

Development Council (CNPq) in Porto Alegre (PI: D. Knauth; Process no. 478174/2009-8; MCT/CNPq 14/2009). Research in São Paulo was funded by SP Fapesp (PI: Barbosa; 2012/25239-3), CNPq (PI: Barbosa; 580; 471892/2011-4; 478296/2012-6), and the United Nations Fund for Population Activities Pan American Health Organization (PI: Barbosa; BR/LOA/1200041.001/002). Kiyomi Tsuyuki was supported by NIDA (T32 DA023356); NICHD (R01 HD077891-04S1); and NIAAA (K01AA025009). The content of this article is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

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SP HIV- **SP HIV+** **POA HIV-** **POA HIV+**

Figure 1. Scree Plots Assessing Fit of Latent Classes by City and HIV-Status
 SP: São Paulo; POA: Porto Alegre

Figure 2. Conditional Probabilities of Latent Class Membership by City and HIV-Status

Table 1.

Characteristics of Brazilian Women Included in the Latent Class Analyses by City and HIV-status (n=3,123)

	São Paulo		Porto Alegre	
	HIV–	HIV+	HIV–	HIV+
n(%)	n=955	n=862	n=634	n=672
SOCIO-DEMOGRAPHIC				
Age *	31 (24, 40)	39 (33, 44)	29 (23, 38)	36 (31, 42)
Race				
Black	102 (11%)	154 (18%)	117 (19%)	174 (26%)
Brown (Mixed)	448 (47%)	334 (39%)	99 (16%)	90 (13%)
White	373 (39%)	355 (41%)	410 (65%)	399 (59%)
Number of children *	1 (0, 2)	2 (1, 3)	1 (1, 2)	2 (1, 3)
Some postsecondary education	133 (55%)	429 (50%)	249 (39%)	227 (34%)
Has a source of income	310 (32%)	675 (78%)	423 (67%)	576 (86%)
Number of lifetime sexual partners *	3 (1, 4)	4 (3, 7)	3 (2, 5)	5 (3, 9.5)
Any drug use	123 (13%)	227 (26%)	72 (11%)	151 (22%)
Sexually transmitted disease within the last 12 months	N/A	N/A	27 (4%)	47 (7%)
Lives with someone close	N/A	N/A	610 (96%)	628 (93%)
First had sex at or before age 14	126 (13%)	143 (17%)	142 (22%)	171 (25%)
VIOLENCE				
No violence	627 (66%)	436 (51%)	394 (62%)	370 (55%)
Only physical violence	244 (26%)	252 (29%)	163 (26%)	179 (27%)
Only sexual violence	26 (3%)	50 (6%)	30 (5%)	40 (6%)
Both physical & sexual violence	58 (6%)	124 (14%)	47 (7%)	83 (12%)

Source: GENIH and SRHW Study 2011–2014;

* median (range)

Table 2.

Lifetime Violence Characteristics Experienced by Brazilian Women by City and HIV-status (n=3,123)

Violence variables	São Paulo				Porto Alegre			
	HIV– (n=955)		HIV+ (n=862)		HIV– (n=634)		HIV+ (n=672)	
Physical Violence	302	32%	376	44%	210	33%	262	39%
Frequency Physical Violence								
Once or twice	116	12%	110	13%	79	12%	85	13%
Several times	186	19%	266	31%	131	21%	177	26%
Physical Violence Timing ^a								
15/16 years	141	47%	145	39%	116	55%	117	45%
15/16 years	161	53%	231	61%	94	45%	144	55%
Physical Violence Perpetrator [*]								
Intimate partner	169	56%	250	66%	98	47%	165	63%
Family member	120	40%	135	36%	80	38%	81	31%
Friend/Coworker	35	12%	31	8%	44	21%	24	9%
Stranger	12	4%	27	7%	12	6%	29	11%
Sexual Violence	84	9%	174	20%	77	12%	123	18%
Frequency Sexual Violence								
Once or twice	52	5%	96	11%	44	7%	64	10%
Several times	32	3%	78	9%	33	5%	59	9%
Sexual Violence Timing ^{**}								
15/16 years	23	27%	62	36%	40	52%	58	47%
15/16 years	61	73%	112	64%	37	48%	65	53%
Sexual Violence Perpetrator ^{**}								
Intimate partner	54	64%	98	56%	43	56%	65	53%
Family member	10	12%	32	18%	16	21%	20	16%
Friend/Coworker	13	15%	26	15%	3	4%	14	11%
Stranger	9	11%	32	18%	18	23%	39	32%

Source: GENIH and SRHW Study 2011–2014;

^a before 16 years in Sao Paulo and before 15 years in Porto Alegre;^{*} Percentage is based on the subjects who had physical violence;^{**} Percentage is based on the subjects who had sexual violence

Table 3. Comparison of fit statistics for number of latent classes for lifetime violence experience by city and HIV-status

No of Classes	São Paulo						Porto Alegre						
	HIV-			HIV+			HIV-			HIV+			
	BIC	AIC	Likelihood ratio	Entropy	BIC	AIC	Likelihood ratio	Entropy	BIC	AIC	Likelihood ratio	Entropy	
2	7841.94	7564.83	4264.30	1.00	10950.77	10679.50	6132.14	1.00	6406.10	6162.34	3398.20	1.00	8194.51
3	5545.80	5127.69	1593.17	1.00	7567.68	7163.38	2563.03	1.00	4554.41	4171.53	1359.40	1.00	5770.94
4	5084.65	4525.75	909.23	1.00	6601.90	5854.58	1291.23	1.00	4113.34	3801.35	731.22	1.00	5014.42
5	4891.54	4291.46	616.34	0.99	5452.96	5167.65	1046.29	0.98	4172.78	3531.68	603.55	0.99	5022.46
6	5055.04	4213.96	481.44	1.00	5487.64	5684.28	884.33	0.98	4250.33	3480.13	494.00	1.00	5000.89
7	5147.68	4165.61	375.09	0.99	5667.44	5906.07	783.71	0.99	4368.45	3459.13	415.00	1.00	5201.52
8	5307.64	4184.59	336.07	1.00	5995.29	5993.91	673.65	0.99	4486.64	3468.22	398.09	1.00	5338.96
9	5480.48	4216.44	309.32	1.00	6819.94	5992.54	629.18	0.99	4644.14	3466.61	326.47	1.00	5465.32

Source: GENIH and SRHW Study 2011–2014; BIC=Bayesian Information Criterion; AIC=Akaike Information Criterion

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Table 4.

Conditional Probabilities for Violence Latent Classes by City and HIV-status

Subgroup	São Paulo										Porto Alegre					
	CLASS 1: No Violence	CLASS 2: Physical Violence in Childhood/ Adolescence (several times)	HIV- CLASS 3: Sexual Violence (1- 2 times)	CLASS 4: Physical & Sexual IPV (several times)	CLASS 5: No Violence	CLASS 6: Physical IPV (several times)	HIV+ CLASS 7: Sexual Violence (several times)	CLASS 8: Physical & Sexual IPV (several times)	CLASS No Violence	CLASS 10: Physical Violence in Childhood/ Adolescence (several times)	HIV- CLASS 11: Sexual IPV in Childhood/ Adolescence (1- 2 times)	CLASS 12: Physical & Sexual IPV in Childhood/ Adolescence (several times)	CLASS 13: No Violence	CLASS 14: Physical IPV (several times)	HIV+ CLASS 15: Sexual Violence in Childhood/ Adolescence (1- 2 times)	CLASS 16: Physical & Sexual IPV in Childhood/ Adolescence (several times)
Violence Latent Class	66%	26%	3%	6%	51%	29%	6%	14%	62%	26%	5%	7%	55%	27%	6%	12%
PHYSICAL VIOLENCE																
Frequency																
Once or twice	—	0.45	—	0.12	—	0.34	—	0.20	—	0.42	—	0.21	—	0.38	—	0.20
Several times	—	0.55	—	0.88	—	0.66	—	0.80	—	0.58	—	0.79	—	0.62	—	0.80
Perpetrator																
Intimate partner	—	0.50	—	0.83	—	0.58	—	0.85	—	0.40	—	0.70	—	0.60	—	0.70
Family member	—	0.44	—	0.21	—	0.38	—	0.31	—	0.37	—	0.43	—	0.33	—	0.27
Friend or coworker	—	0.13	—	0.07	—	0.10	—	0.06	—	0.23	—	0.13	—	0.10	—	0.07
Stranger	—	0.04	—	0.05	—	0.06	—	0.09	—	0.06	—	0.04	—	0.07	—	0.19
Life course timing																
Childhood/ adolescence	—	0.51	—	0.29	—	0.38	—	0.39	—	0.57	—	0.49	—	0.43	—	0.48
Within last 12 months	—	0.09	—	0.14	—	0.06	—	0.14	—	0.17	—	0.11	—	0.12	—	0.12
SEXUAL VIOLENCE																
Frequency																
Once or twice	—	—	0.96	0.47	—	—	0.58	0.54	—	—	0.70	0.49	—	—	0.65	0.46
Several times	—	—	0.04	0.53	—	—	0.42	0.46	—	—	0.30	0.51	—	—	0.35	0.54
Perpetrator																
Intimate partner	—	—	0.42	0.74	—	—	0.42	0.62	—	—	0.53	0.57	—	—	0.38	0.60
Family member	—	—	0.19	0.09	—	—	0.24	0.16	—	—	0.10	0.28	—	—	0.13	0.18
Friend or coworker	—	—	0.23	0.12	—	—	0.16	0.15	—	—	0.03	0.04	—	—	0.10	0.12
Stranger	—	—	0.15	0.09	—	—	0.20	0.18	—	—	0.33	0.17	—	—	0.43	0.27
Life course timing																

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Subgroup	São Paulo						Porto Alegre									
	HIV−			HIV+			HIV−			HIV+						
	CLASS 1: No Violence	CLASS 2: Physical Violence in Childhood/ Adolescence (several times)	CLASS 3: Sexual Violence (1– 2 times)	CLASS 4: Physical & Sexual IPV (several times)	CLASS 5: No Violence	CLASS 6: Physical IPV (several times)	CLASS 7: Sexual Violence (several times)	CLASS 8: Physical & Sexual IPV (several times)	CLASS No Violence	CLASS 10: Physical Violence in Childhood/ Adolescence (several times)	CLASS 11: Sexual IPV in Childhood/ Adolescence (1– 2 times)	CLASS 12: Physical & Sexual IPV in Childhood/ Adolescence (several times)	CLASS 13: No Violence	CLASS 14: Physical IPV (several times)	CLASS 15: Sexual Violence in Childhood/ Adolescence (1– 2 times)	CLASS 16: Physical & Sexual IPV in Childhood/ Adolescence (several times)
Violence Latent Class	66%	26%	3%	6%	51%	29%	6%	14%	62%	26%	5%	7%	55%	27%	6%	12%
Frequency																
Childhood/ adolescence	—	—	0.35	0.24	—	—	0.40	0.34	—	—	0.50	0.53	—	—	0.48	0.47
Within last 12 months	—	—	0.04	0.07	—	—	0.02	0.06	—	—	0.03	0.06	—	—	0.03	0.06

Source: GENIH and SRHW Study 2011–2014