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ORIGINAL ARTICLE

Prevalence of sexual violence in Brazil: associated individual and contextual factors

Janmille Valdivino da Silva[1] · Angelo Guiseppe Roncalli[2]

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Abstract

Objectives Assessing the prevalence of sexual violence in Brazil and its association with individual and contextual factors.
Methods A multilevel analysis performed with cross-sectional data from 2010. The adjusted prevalence ratio was estimated through Poisson multilevel modelling. Cross-level interactions were evaluated by the inclusion of interaction terms between socio-economic variables from the two levels.
Results Sexual violence is more prevalent in federal units that presented lower years of schooling expectancy at 18 years old (PR 1.27; CI95% 1.09–1.48), lower per capita income (PR 1.23; CI95% 1.05–1.43), lower HDI (PR 1.17; CI95% 1.01–1.37), higher proportion of poverty vulnerability (PR 1.18; CI95% 1.02–1.38), higher proportion of unemployment (PR 1.68; CI95% 1.45–1.96) and higher proportion of people who neither work nor study (PR 1.26; CI95% 1.08–1.46). Higher prevalence of sexual violence was associated with lower Gini index and greater coverage of primary health services. In analysing the tendency demonstrated a strong contextual effect between the Brazilian federative units in relation to sexual violence
Conclusions The strategy to reduce sexual violence in Brazil must be integrated with other social policies, considering both individual risk factors and macro-social determinants.

Keywords Sexual violence · Social determinants · Multilevel · Public health policy

Introduction

Sexual violence is defined as sexual intercourse or the attempt to consummate it under coercion by someone else (irrespective of the relationship to the victim). The concept also includes undesired sexual insinuation, actions to sell any form of sexuality in any place, including the household and/or the workplace (Pan-American Health Organization 2003). This kind of violence is one of the cruellest forms of gender-based violence and has been persistent throughout history. It affects women, adolescents and children in all social places, especially at home, and can be expressed as a symbolic and moral violence, producing vulnerabilities and promoting a constant feeling of insecurity, contributing to the perpetuation of a violent and patriarchal culture (Brasil 2012).

According to World Health Organization (WHO 2002), sexual violence has an effect on the physical and mental health of the victims, with consequences that are seen both immediately and many years after the action. As well as injuries, it is associated with increased risk of a range of sexual and reproductive health problems and mental health consequences. Mortality associated with sexual violence may occur through suicide, HIV infection and murder, either during the attack or subsequently in "honour killings". So it has become a public health problem recognized by WHO since 1993 (WHO 2014).

In Brazil, the largest country in Latin America and with the highest gross domestic product (GDP) in South America, studies indicate that despite the institution of government policies to combat sexual violence, the problem still affects a considerable portion of the population. Lima et al. (2017) observed that 5.7–22% of women in

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✉ Janmille Valdivino da Silva
janmillevs@yahoo.com.br

[1] Instituto Federal de Educação, Ciência e Tecnologia do Rio Grande do Norte, Natal, Brazil

[2] Universidade Federal do Rio Grande do Norte, Natal, Brazil

some Brazilian cities are victims of this type of violence and that 37.8% of female sex workers suffer sexual violence. As for Brazilian children and adolescents, it is verified that sexual abuse is the most prevalent form of violence in this age group (Silva et al. 2017), since it affected 2.9% boys and 11.7% girls in 2015 (Martins and Alencastro 2015). On the other hand, the prevalence (15.9%) of men who suffered from sexual violence with other men is much higher (Sabidó et al. 2015), whereas the prevalence of pregnant woman suffered by sexual violence is very low (2.8%) (Ribeiro et al. 2017).

Violence is a result of the reciprocal action of individual, relational, social, cultural and environmental factors, and none of these factors alone can explain why violence is more prevalent in a given population (WHO 2014). Thus, to understand how these factors are related to sexual violence is an important step that needs to be taken in terms of public policies in order to contain and prevent violence. Some studies (PAHO 2003; WHO 2010) demonstrate that individual factors, such as age, schooling, income, lifestyle (consumption of alcohol and other drugs, multiple sexual partners, marital status and sexual orientation) can partly explain a predisposition to sexual violence. However, there are several social factors that could create situations favourable to increase sexual violence, as such neighbourhood characteristics, poverty, unemployment, inequality, social support, public services offered and social policies (WHO 2002, 2014; Castaños-Cervantes and Sánchez-Sosa 2016; Antonio and Fontes 2012; Schraiber 2014).

Moreover, according to Whitehead and Dalgren's (1991) theory of social determination, such factors overlap in layers ranging from the most proximal level to individuals to a more distal level related to the context in which they live. In this sense, it is important to understand how these factors, in their different levels, can positively or negatively influence each other in the determination of sexual violence. Despite that, only few Brazilian studies about sexual violence consider multiple factors at different levels. In this perspective, the present study assessed the effect of both individual and contextual factors on sexual violence in Brazil.

Methods

Participants and databases

This study included 59,381 participants in the analysis. It used three databases from 2010: (1) the "Violence and Accidents Surveillance System" (VIVA, from the Portuguese acronym); (2) the Brazilian National Census, organized by the Brazilian section of the United Nations Development Program (UNDP); and (3) the National Registry of Health Facilities (CNES, from Portuguese acronym). The *VIVA* data set is a register of violence cases, which includes the different types of violence such as physical, psychological, torture, sexual violence, human trafficking, financial violence, neglect, child labour, legal intervention, among others. Thus, we only worked with cases of sexual violence to perform this study, meaning that our outcome is the proportion of sexual violence in relation to all other types of violence registered in Brazil in 2010. It was implemented in 2006, and its information is continuously collected from a specific notification form, established by the Act http://www.planalto.gov.br/ccivil_03/Leis/2003/L10.778.htm (Brasil 2003), which regulates the compulsory notification of all cases of violence in all health facilities all over the country. The CNES data set was instituted since 2010 in Brazil. It has a registry of all health resources in the country and provides information on the existing health care facilities in all Brazilian federal units and municipalities in the country. It provides data on installed physical capacity, available services, professionals working at health facilities, financial information and other information. The United Nations Development Program (UNDP) is an organ of the United Nations (UN) and works mainly for the combat to poverty and human development. It is present in 166 countries around the world, among them Brazil since the 1960s. UNDP provides technical support to its partners through a variety of methodologies, providing expertise, especially in the area of socio-economic information of the countries. Thus, all the data used have been gathered from consolidated information systems in the country for more than a decade, with an adequate methodology to obtain reliable data.

Measures

We developed a theoretical framework (Fig. 1) to guide our study based on the social determination model from Dahlgren and Whitehead (1991), where different layers represent specific levels of determination. Thus, at the proximal level, there are the individual characteristics, and at the distal level are socioeconomic, cultural and environmental factors of the context where people are living. In this sense, the variables chosen in our theoretical model were those that presented association with sexual violence from the literature findings and also had available data for the Brazilian municipalities in the national databases.

As individual characteristics, gender, age and education level were included. As contextual characteristics, *per capita* income average, Gini index, years of schooling expectancy at 18 years old, unemployment rate, proportion of people who neither work nor study, Human Development Index (HDI), population coverage of primary health

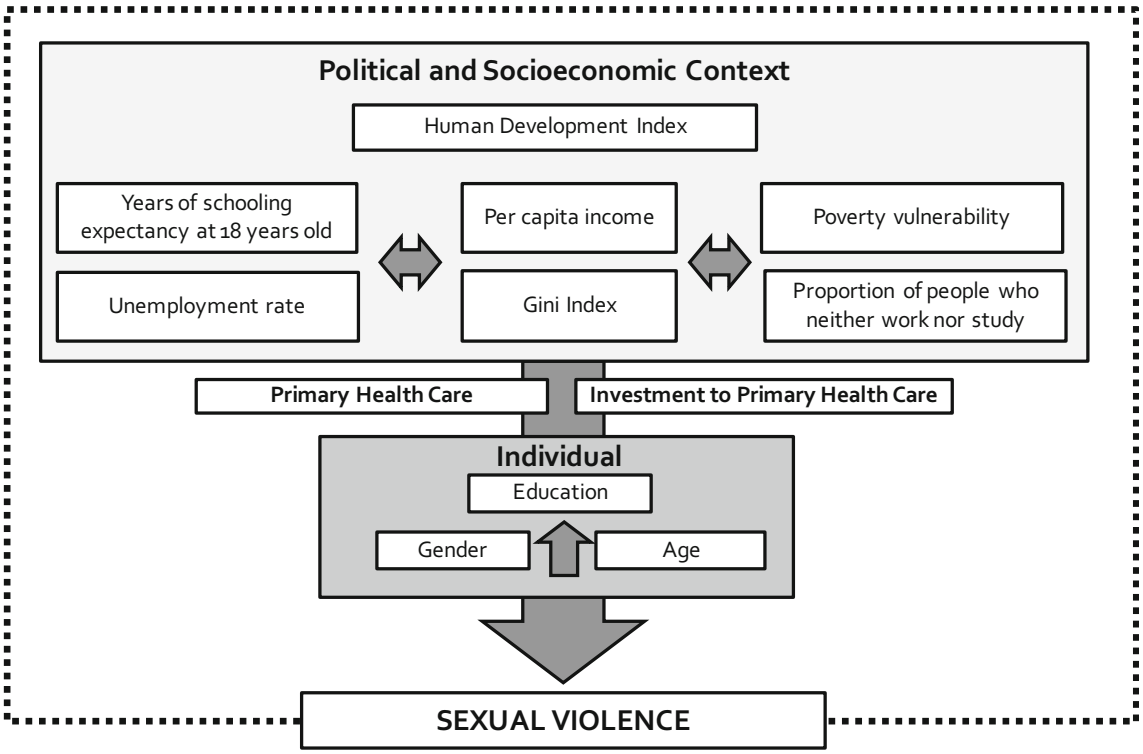

Fig. 1 Study framework

care and population rate of investments in primary care were included. The *per capita* income average is a typical socio-economic variable, and Gini index is a variable to measure income inequality. Variable years of schooling expectancy at 18 years old was included to represent the context educational level, and we used the unemployment rate to express employment conditions. In relation to vulnerability, the variables poverty vulnerability and the proportion of people who neither work nor study were included. We additionally included the Human Development Index (HDI), which is an aggregated measure, widely used in studies of social conditions that briefly evaluates the quality of life and the economic development of a population. Finally, considering that is also important to assess the contextual effect of public health policies (Montesanti and Thurston 2015), we included the population coverage of primary health care, which means the possibility of accessing this kind of health service by the population. To complete this approach, we used the population rate of investments in primary care, which may express the prioritization of the authorities for this level of care. More details of the variables' description can be found in Table 1.

Analysis strategy

Since the data were not from a cross-sectional study, they were not weighted. First, all variables were analysed in order to verify missing data and outliers. There were no outliers. There was approximately 10% of the missing data sample that was removed from the analyses. Second, a descriptive analysis was done aiming to guide the variable categorization (Table 1). After this procedure, Chi-square test for analysis of association was performed between the outcome variable (sexual violence) and all other independent variables, selecting those with a p value below 0.2 to be included in multilevel modelling (Table 2). The prevalence ratio (PR) with its respective 95% confidence interval was also estimated.

As the PR is the most appropriate measure for sectional data, we decided to use the Poisson multilevel modelling with mixed effects, which is able to estimate both the unadjusted and adjusted PR for each independent variable (Espelt et al. 2017). A multilevel model was carried out in order to assess the effect of both individual and contextual factors. Generally speaking, the different levels in a multilevel analysis can be considered as social clusters, which would have a significant effect on the behaviour of their members. Therefore, in population studies, individuals can be the first level, while the context (neighbourhood, cities or states) would be the second level (Puente-Palacios and

Table 1 Individual and contextual variables. General description and adaptation strategies of the analysis model

	Variable	Source	Description	Original categories (new categories)
Dependent	Sexual violence	Brazilian Violence and Accidents Surveillance System of Brazil (VIVA, from the Portuguese acronym)	Report of having suffered sexual violence in the interview	Original variable
Independent (individual)	Gender	Brazilian Violence and Accidents Surveillance System of Brazil (VIVA, from the Portuguese acronym)	Gender of interviewee	Male and Female, no modification
	Age	Brazilian Violence and Accidents Surveillance System of Brazil (VIVA, from the Portuguese acronym)	Age, in years, at the moment of interview	Years, from 0 to 99, categorized to: 60 years and older 35–59 years old 20–34 years old 12–19 years old 0–11 years old
	Education	Brazilian Violence and Accidents Surveillance System of Brazil (VIVA, from the Portuguese acronym)	Formal education level	Education level categorized to: University High school Elementary school Functionally illiterate
Independent (context)	Years of schooling expectancy at 18 years old	National Census, performed by the Brazilian Institute of Geography and Statistics (IBGE, from the Portuguese acronym)	Average of years of schooling that a child should complete before 18 years old	Numeric value, categorized from tercis in: 9.92 years and more 9.04–9.91 years Up to 9.03 years
	Gini index	National Census, performed by the Brazilian Institute of Geography and Statistics (IBGE, from the Portuguese acronym)	An index to measure the inequality in the distribution of per capita income. Ranging from 0, where there is no inequality, to 1 when all income is concentrated in one single individual	Numeric value, categorized from tertiles in: Up to 0.47 0.48–0.52 0.53 and more
	Poverty vulnerability	National Census, performed by the Brazilian Institute of Geography and Statistics (IBGE, from the Portuguese acronym)	An index to measure the number of individuals at risk of poverty in a population. Proportion of individuals with per capita household income equal to or less than BR R$ 255.00 per month	Numeric value, categorized from tertiles in: Up to 24.60% 24.61–55.74% 55.75% and more
	Unemployment rate	National Census, performed by the Brazilian Institute of Geography and Statistics (IBGE, from the Portuguese acronym)	An index to measure the difficulty of employment. Percentage of economically active population who was unemployed, but had sought work during the month prior to the survey	Numeric value, categorized from tertiles in: Up to 5.39% 5.40–8.19% 8.20% and more
	Per capita income	National Census, performed by the Brazilian Institute of Geography and Statistics (IBGE, from the Portuguese acronym)	The sum of the income of all household members, divided by the number of residents	Numeric value, categorized from tertiles in: BR R$640.60 and more BR R$ 364.39 to 650.59 Up to BR R$364.38
	Proportion of people who neither work nor study	National Census, performed by the Brazilian Institute of Geography and Statistics (IBGE, from the Portuguese acronym)	Proportion of individuals aged 15–29 who did not study or work	Numeric value, categorized from tertiles in: Up to 7.98% 7.99–18.02% 18.03% and more

Table 1 (continued)

Variable	Source	Description	Original categories (new categories)
Human Development Index (HDI)	Brazilian agency of the United Nations Development Program (UNDP)	Geometric average of three other indices related to education, income and longevity, with equal weights	Numeric value, categorized from tertiles in: 0.718 and more 0.635–0.717 Up to 0.634
Health Primary Care coverage	National Health Facilities Register (CNES from the Portuguese acronym)	Population teams divided by number of primary health care the in the same year	Numeric value, categorized from tertiles in: 2.798 and more 1.371–2.797 Up to 1.370
Investment in Health Primary Care	National Health Facilities Register (CNES from the Portuguese acronym)	Financial resources (in reais—Brazilian currency) invested in primary health care divided by the number of people	Numeric value, categorized from tertiles in: BR R$ 52.18 and more BR R$ 35.77 to R$ 52.17 Up to BR R$ 35.76

Laros 2009). In this study, the characteristics of the individuals were used for the first level of analysis and the contextual characteristics of the Brazilian municipalities were used for the second level of the multilevel analysis. For all analyses, we used Stata software version 14.

A null model was initially performed aiming to verify the isolated effect of the context and to decide on the feasibility of the multilevel approach. Next, variables were included according to levels: model 1 with only individual variables, and model 2 with contextual variables, analysing the changes in variance for examining the model fit. The method used for estimating the parameters was maximum likelihood, because it is recommended for large samples and it is applicable to most models and different types of data and produces the most accurate estimates. Random effect was used for modelling. As the final step, we created interaction terms between socio-economic variables from the two levels to verify the cross-level interaction.

Results

Preliminary analysis

Descriptive analysis showed that 65.5% (46,857) of the valid data were female subjects, most of them young adults aging from 20 to 34 years old (31.4%; 22,192) with college education (38.8%; 20,786). The prevalence of sexual violence in general was 20.4%.

Bivariate analysis (Table 2) at the individual level showed that the prevalence of sexual violence in Brazilian women is twice as high as in men (PR = 2.35, CI95% 2.23–2.47). A decreasing gradient in the sexual violence prevalence according to age was observed. Children suffer sexual violence seven times more than older people (PR = 7.41, CI95% 6.10–9.01), and adolescents suffer sexual violence six times more (PR = 6.40, CI95% 5.26–7.78). The educational level has a similar pattern, i.e. the higher the educational level, the lower the prevalence of sexual violence. Functionally, illiterates have a prevalence of sexual violence almost double (PR = 1.98, CI95% 1.85–2.12) than people with higher education.

Regarding the context, it was observed that sexual violence is more prevalent in those federative units that presented lower years of schooling expectancy at 18 years old, lower per capita income, lower HDI, higher proportion of poverty vulnerability, higher proportion of unemployment and higher proportion of people who neither work nor study. Among the contextual variables that had the greatest effect was the unemployment rate. Brazilian federative units with unemployment above 8.2% had a prevalence of sexual violence almost twice as high as those with a unemployment rate below 5.3% (PR = 1.68, CI95% 1.45–1.96). In relation to health services, higher prevalence of sexual violence was associated with a lower investment in primary health care and with higher primary health care coverage. People living in places with higher coverage of primary services had almost twice the prevalence of sexual violence (PR = 1.71, CI95% 1.47–2.00).

Multilevel analysis

In the multilevel modelling, it was observed from the analysis of the null model that there is a strong contextual

Table 2 Bivariate associations between outcome and the independent variables according to the levels Brazil, 2010

	Sexual violence				*p*	PR (95% CI)
	No		Yes			
	n	%	*n*	%		
1st level (individual)						
Gender						
Male	18,245	91.1	1786	8.9		1
Female	28,932	73.6	10,353	26.4	< 0.001	2.35 (2.23–2.47)
Age						
60 years and older	2847	96.4	105	3.6		1
35–59 years old	11,071	93.4	776	6.6	< 0.001	1.88 (1.53–2.31)
20–34 years old	16,637	91.0	1637	9.0	< 0.001	2.45 (2.01–2.99)
12–19 years old	9082	69.1	4054	30.9	< 0.001	6.40 (5.26–7.78)
0–11 years old	7602	57.7	5569	42.3	< 0.001	7.41 (6.10–9.01)
Education						
Higher education	14,660	89.1	1791	10.9		1
High school	4675	87.2	689	12.8	< 0.001	1.29 (1.17–1.41)
Elementary school	12,638	79.1	3334	20.9	< 0.001	1.76 (1.65–1.88)
Functionally illiterate	5787	70.9	2378	29.1	< 0.001	1.98 (1.85–2.12)
2nd level (state)						
Years of schooling expectancy at 18 years old						
9.92 years and more	25,731	84.6	4679	15.4		1
9.04–9.91 years	16,911	73.3	6146	26.7	< 0.001	1.31 (1.14–1.51)
Up to 9.03 years	4577	77.8	1309	22.2	0.002	1.27 (1.09–1.48)
Poverty vulnerability (%)						
Up to 24.60	29,725	81.1	6918	18.9		1
24.61–55.74	14,937	76.8	4502	23.2	0.133	1.11 (0.97–1.28)
55.75 and more	2557	78.2	714	21.8	0.031	1.18 (1.02–1.38)
Per capita income						
BR R$650.60 and more	35,758	79.6	9166	20.4		1
BR R$364.39–650.59	9275	80.1	2303	19.9	0.164	1.10 (0.96–1.27)
Up to BR R$ 364.38	2186	76.7	665	23.3	0.009	1.23 (1.05–1.43)
Unemployment rate (%)						
Up to 5.30	8663	88.2	1155	11.8		1
5.40–8.19	19,333	80.8	4595	19.2	< 0.001	1.46 (1.26–1.70)
8.20 and more	19,223	75.1	6384	24.9	< 0.001	1.68 (1.45–1.96)
Proportion of people who neither work nor study (%)						
Up to 7.98	28,656	81.4	6569	18.6		1
7.99–18.02	15,751	76.8	4767	23.2	0.013	1.19 (1.04–1.37)
18.03 and more	2812	77.9	798	22.1	0.003	1.26 (1.08–1.46)
Human Development Index (HDI)						
0.718 and more	35,836	79.2	9424	20.8		1
0.635–0.717	9093	81.6	2051	18.4	0.998	1.00 (0.87–1.15)
Up to 0.634	2290	77.7	659	22.3	0.039	1.17 (1.01–1.37)
Gini index						
Up to 0.47	10,989	80.9	2591	19.1		1
0.48–0.52	11,802	81.4	2699	18.6	0.121	1.12 (0.97–1.30)
0.53 and more	24,428	78.1	6844	21.9	0.213	1.10 (0.95–1.27)

Table 2 (continued)

	Sexual violence				*p*	PR (95% CI)
	No		Yes			
	n	%	*n*	%		
Investment in primary health care						
BR R$52.18 and more	2478	83.9	474	16.1		1
BR R$35.77–52.17	8272	82.7	1726	17.3	0.460	1.07 (0.90–1.26)
BR R$ up to 35.76	36,465	78.6	9934	21.4	< 0.001	1.42 (1.21–1.66)
Primary health care coverage						
2.798 and more	3536	86.1	573	13.9		1
1.371 to 2.797	11,653	87.0	1744	13.0	0.169	1.12 (0.95–1.32)
Up to 1.370	32,020	76.5	9815	23.5	< 0.001	1.71 (1.47–2.00)

CI confidence interval, *PR* prevalence ratio

effect in the prevalence of sexual violence, considering the federative units as clusters. This result can be verified through the analysis of variance, which is nonzero (0.98; CI95% 0.87–1.09) and also confirmed by the significance of the likelihood ratio (LR) test (< 0.001), as we can see in Table 3. Model 1 was built with only individual variables, and all of them remained significant, observing a slight adjustment in relation to bivariate analysis. The greatest adjustment was observed in the gender, where the prevalence of sexual violence in women increased after adjusting for age and education (PR = 3.20, CI95% 2.97–3.43).

When we added the contextual variables, the individual variables presented slight adjustments in their prevalence ratio but remained significantly associated with sexual violence. The prevalence ratio decreases slightly for gender (PR = 3.17, CI95% 2.95–3.41) and age (PR = 7.59, CI95% 6.05–9.53) while education presented a small increase in its prevalence ratio (PR = 1.44, CI95% 1.34–1.55). The contextual variables poverty vulnerability (PR = 0.67, CI95% 0.40–1.10), proportion of people who neither work nor study (PR = 1.12, CI95% 0.81–1.55), HDI (PR = 1.02, CI95% 0.82–1.25) and investments in primary health care (PR = 1.18, CI95% 0.96–1.44) lost their significance, probably due to collinearity. These variables presented high correlation with all contextual variables and hence were removed. The Gini index remained statistically insignificant (PR = 0.86, CI95% 0.74–1.01) as in the bivariate analysis.

The final model included all individual variables and the contextual variables that presented in the model 1 significance in some category, such as years of schooling expectancy at 18 years old (PR = 1.19, CI95% 1.04–1.36), unemployment rate (PR = 1.38, CI95% 1.18–1.63), per capita income (PR = 1.69, CI95% 1.03–2.77) and primary health care coverage (PR = 1.35, CI95% 1.14–1.59). Despite the statistical insignificance of the Gini index in model 2, we decided to keep it in modelling for theoretical reasons. We believe in the importance of income inequalities in determining health problems. All of them remained significant in the final model. The LR test showed that the contextual effect remained significant as well. In analysing the tendency of variance from the null to the final model, a decrease of 54.1% was observed in the variance, which demonstrates a strong contextual effect between the Brazilian federative units in relation to sexual violence.

Interaction effects

We performed an interaction analysis in the modelling including the interaction terms created from an individual variable (formal education) with three different combinations of contextual variables (schooling expectation, per capita income and unemployment rate). The inclusion of these interaction terms did not significantly alter the variance in the final model. Confirming this result, stratified analyses were carried out by calculating the prevalence ratios for formal education and sexual violence in different strata of years of schooling expectancy at 18 years old, per capita income and unemployment rate. As we can see in Fig. 2, there are no significant differences in the PR values, indicating an absence of cross-level interaction.

Discussion

Multilevel modelling allowed us to identify that both individual and contextual factors are associated with sexual violence in Brazil, just as the World Health Organization (WHO) has pointed out for the whole world (WHO 2002). Therefore, in order to tackle the problem of sexual violence and to promote a culture of peace in Brazil, integrated work between different sectors of the society will be necessary,

Table 3 Poisson multilevel regression analysis for sexual violence according to individual and contextual variables Brazil (2010)

Variables	Null model	Model 1 (n = 45,941)		Model 2 (45,910)		Final Model (n = 45,912)	
	(n = 59,381)	PR (95%CI)	p	PR (95%CI)	p	PR (95%CI)	p
1st level (individual)							
Gender							
Male		1		1		1	
Female		3.20 (2.97–3.43)	< 0.001	3.17 (2.95–3.41)	< 0.001	3.17 (2.95–3.41)	< 0.001
Age							
60 years and older		1		1		1	
35–59 years old		1.58 (1.25–2.00)	< 0.001	1.58 (1.25–2.00)	< 0.001	1.58 (1.25–2.00)	< 0.001
20–34 years old		1.97 (1.57–2.48)	< 0.001	1.96 (1.55–2.46)	< 0.001	1.95 (1.55–2.46)	< 0.001
12–19 years old		5.47 (4.36–6.85)	< 0.001	5.36 (4.28–6.73)	< 0.001	5.37 (4.28–6.73)	< 0.001
0–11 years old		7.74 (6.16–9.71)	< 0.001	7.59 (6.05–9.53)	< 0.001	7.60 (6.05–9.54)	< 0.001
Education							
University		1		1		1	
High school		1.50 (1.36–1.65)	< 0.001	1.53 (1.39–1.68)	< 0.001	1.53 (1.39–1.68)	< 0.001
Elementary school		1.35 (1.27–1.45)	< 0.001	1.38 (1.29–1.47)	< 0.001	1.38 (1.29–1.47)	< 0.001
Functionally illiterate		1.42 (1.32–1.53)	< 0.001	1.44 (1.34–1.55)	< 0.001	1.44 (1.34–1.55)	< 0.001
2nd level (state)							
Years of schooling expectancy at 18 years old							
9.92 years and more				1		1	
9.94–9.91 yeas				1.19 (1.04–1.36)	0.009	1.19 (1.04–1.36)	0.009
Up to 9.03 years				1.10 (0.91–1.32)	0.314	1.10 (0.92–1.30)	0.287
Gini index							
Up to 0.47				1		1	
0.48–0.52				0.98 (0.85–1.13)	0.795	0.97 (0.84–1.11)	0.657
0.53 and more				0.86 (0.74–1.01)	0.056	0.83 (0.72–0.96)	0.010
Poverty vulnerability (%)							
Up to 24.60%				1			
24.61–55.74%				0.93 (0.73–1.18)	0.550		
55.75% and more				0.67 (0.40–1.10)	0.116		
Unemployment rate							
Up to 5.39%				1		1	
5.40–8.19%				1.27 (1.10–1.47)	0.002	1.29 (1.11–1.49)	0.001
8.20% and more				1.38 (1.18–1.63)	< 0.001	1.41 (1.22–1.64)	< 0.001
Per capita income							
BR R$ 650.60 and more				1		1	
BR R$ 364.39–650.59				1.13 (0.92–1.40)	0.243	1.08 (0.94–1.24)	0.263
Up to R$ 364.38				1.69 (1.03–2.77)	0.038	1.27 (1.06–1.52)	0.011
Proportion of people who neither work nor study							
Up to 7.98%				1			
7.99–18.02%				1.07 (0.86–1.32)	0.560		
18.03% and more				1.12 (0.81–1.55)	0.508		
Human Development Index (HDI)							
0.718 and more				1			
0.635–0.717				1.02 (0.82–1.25)	0.888		
Up to 0.634				1.09 (0.73–1.69)	0.655		

Table 3 (continued)

Variables	Null model	Model 1 (n = 45,941)		Model 2 (45,910)		Final Model (n = 45,912)	
	(n = 59,381)	PR (95%CI)	p	PR (95%CI)	p	PR (95%CI)	p
Primary health care coverage							
2.798 and more				1		1	
1.371–2.797				0.98 (0.83–1.15)	0.790	1.01 (0.86–1.19)	
Up to 1.370				1.35 (1.14–1.59)	< 0.001	1.44 (1.24–1.68)	
Investment in health primary care							
BR R$ 52.18 and more				1			
BR R$ 35.77–52.17				1.05 (0.88–1.26)	0.597		
Up to BR R$ 35.76				1.18 (0.96–1.44)	0.121		
Fixed effects							
Intercept	0.16	0.015		0.008		0.009	
(95% CI)	(0.15–0.17)	(0.012–0.019)		(0.006–0.011)		(0.007–0.012)	
Random effects							
Variance	0.98	0.50		0.45		0.45	
(95%CI)	(0.87–1.09)	(0.44–0.58)		(0.39–0.53)		(0.39–0.53)	
LR test	9205.2	2777.13		2136.96		2155.43	
χ^2 (p-value)	2 (< 0.001)	(< 0.001)		(< 0.001)		(< 0.001)	

CI confidence interval, *PR* prevalence ratio, *LR* likelihood ratio

especially those related to public social policies. Thus, as stated by Montesanti and Thurston (2015), to focus only on individual or proximal determinants associated with violent actions would ignore the role of the larger structural systems, which are formed by economic, legal and politic factors.

An inverse social gradient of the sexual violence among Brazilian federative units was observed; i.e. worse contextual socio-economic conditions are strongly related to a higher prevalence of sexual violence. This situation of social inequality is associated with macro-social determinants such as employment, education and income. According to Montesanti and Thurston (2015), low quality of life conditions is also invisible manifestations of structural violence, which are embedded into the social fabric, creating and keeping inequalities within and between different social groups. In this perspective, our findings point to a strong association of sexual violence with years of schooling expectancy, unemployment rate and income per capita.

Thus, in agreement with our findings, Guimarães and Villela (2011) also observed a high proportion of sexual violence victims in low SES communities. Gomes et al. (2006) showed a higher prevalence of this for people living with household income below one Brazilian minimum wage in their study, while Carvalho (2007) highlighted that work means independence and social status; therefore, unemployment increases social problems such as violence.

In our study, a controversial finding was the relationship with income inequality, measured by the Gini index. We found that people living in states with a high income concentration presented lower prevalence of sexual violence, contrasting with several other studies. According to Barros, Foguel and Ulyssea (2007), despite showing better indicators in the South and Southeast regions, income inequality is still uniform throughout the whole country, probably due to the fact that inequality is more affected by national economic policies and less by state-level interventions. As Wilkinson and Pickett (2006) stated, a better association between income inequality and health usually occurs when it is studied using large units of analysis, such as countries. As they have the same economic policy for the whole territory, variations in income distribution between federative units and even between municipalities are usually rare, but when different countries with different economic models are compared, the relationship between income inequality and health is usually more frequent.

Regarding health services offered and access to primary health care, a higher prevalence of sexual violence in people living in places with higher coverage rates for this kind of service was observed. At first glance, this seems to be a paradox; however, it is not, because if we analyse the guidelines for the National Health Policy in Brazil, it has equity in the distribution of health resources as one of its core principles (Brasil 1990). In other words, the Brazilian health policy advocates greater health services offered deployed to places with the worst health conditions. Thus,

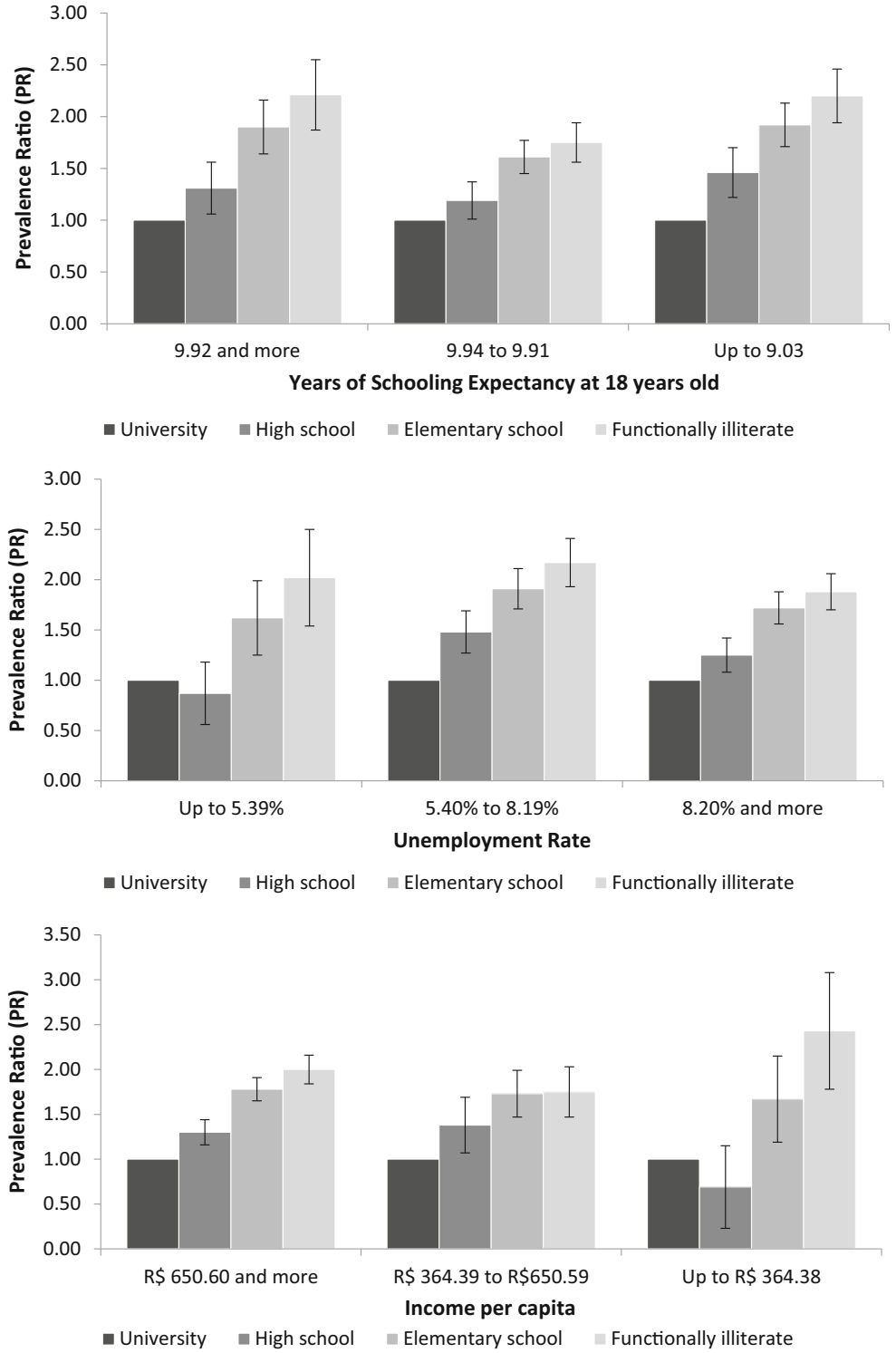

Fig. 2 Stratified analysis of the prevalence ratio of sexual violence according to contextual variables in the adjusted final model. Bars indicate a 95% confidence interval. Brazil (2010). Note: university is a reference category; R$: Brazilian currency (BRL value)

having a greater coverage of health services in states with higher prevalence of sexual violence is an important and necessary factor to prevent such an event on a long-term basis.

At the individual level, prevalence of sexual violence is threefold higher in women than in men. We believe that this fact is due to three main reasons. First, the sexualization of the female body is culturally accepted in Brazil,

which originates from a male chauvinism culture still very present, despite government actions being favourable to guaranteeing both women's rights and gender equality. Second, not only in Brazil but also in several other countries, men do not report sexual abuse very often due to shame, guilt and the fear that the authorities disbelieve their accusations (PAHO 2003). In addition, we used sexual violence notifications from the Brazilian health services for this study, and some studies have shown that men usually have lower access to health services when compared to women (Dias-da-Costa et al. 2008; Gomez 2002). Consequently, sexual violence notifications from men would be less frequent due to this fact.

Age as well as socio-economic conditions presented a strong gradient in the distribution of sexual violence, showing that young people are more likely to suffer it. Thus, it is important to highlight the very high prevalence of sexual violence in adolescence when compared with other periods of life, probably due to the greater vulnerability of this age group related to smaller autonomy of their bodies. This finding reveals the ineffectiveness of some Brazilian regulations, considering that Brazil approved the Child and Adolescent Statute in 1990, a specific law assuring the rights of Brazilian children and adolescents and their protection (Brasil 1990). However, it is noteworthy that this fact does not only occur in Brazil. A study conducted in Swaziland, a Southern African country, with girls and women from 13 to 24 years old, found that 33.2% of them related at least one episode of sexual violence before reaching 18 years old (Reza et al. 2009).

In general, people with low educational level presented higher prevalence of sexual violence compared to those with more years of schooling. Moreira et al. (2015) also found a higher prevalence of sexual violence in women with low level of formal education in their study, as well as Hohendorff et al. (2014) who also revealed high prevalence in boys with the same condition. Another study conducted by Facuri (2012) found higher prevalence in the group with less than 8 years of schooling; however, a higher prevalence was observed in the tertile corresponding to high school. Therefore, these findings do not mean an association between higher formal education and sexual violence; in fact, they reveal that these people have a better understanding about the importance of looking for assistance and reporting the cases of violence inflicted upon them.

We do believe that the findings of this study are both valid and important and will probably contribute to increasing knowledge about sexual violence in developing countries, considering the severity of this public health problem in them (WHO 2014). However, it is important to notice that this study has been conducted with information gathered from the Violence and Accidents Surveillance System (VIVA), which works with notifications that occurred in Brazilian health care services, which can generate a measurement error. Hence, we are aware that these rates are underestimated, as many individuals who are victims of violence do not look for help in public services in fear of being attacked again as retaliation from their aggressors (Batista 2008) or even due to a lack of access to these services (Kind et al. 2013). In addition, as with many other public health problems, sexual violence has other associated factors which were not included in our framework due to the absence of available data. Nevertheless, in a global context, modifying the variance in the adjusted final model means that considering the sexual violence in Brazil, the theoretical model of this study is suitable and could explain a major part of the determination of this harm. Thus, our findings point to the need to strengthen national social policies to improve the economic conditions of the population, reduce income inequalities and expand and qualify health services.

Finally, we can conclude that whatever may be the strategy to reduce sexual violence in Brazil, and even in other developing countries, it must be integrated with other social policies. Especially in Brazil, despite the existence of policies to combat and prevent sexual violence, these are still very fragmented. On the one hand, there are social policies for specific groups, such as women and children, while on the other side programs of the judiciary and dissociated health services. In addition to the coordination of existing strategies with networking, it is necessary for the government to place social issues in the foreground in the country, such as improving the level of schooling and expanding work and income in the country. It therefore must also take into account both individual risk factors and the macro-social determinants. This approach will tackle sexual violence in both ways: reducing its prevalence and its unequal distribution within the Brazilian population.

References

Antonio EMR, Fontes TMR (2012) Bioethics and epidemiological aspects of victims of sexual violence in maternity hospital [Original title: Bioética e aspectos epidemiológicos de vítimas de violência sexual em hospital-maternidade]. Revista bioética (Impr.) 20(2):280–287

Barros RPO, Foguel MNO, Ulyssea GO (2007) Income inequality in Brazil: an analysis of the recent decline [Original title: Desigualdade de renda no Brasil: uma análise da queda recente], vol 2. Ipea, Brasília

Batista AP (2008) Intrafamilial child sexual abuse: underreporting and health care services. Dissertação, Universidade do Estado do Rio de Janeiro

Brasil (1990) ABC of SUS: doctrines and principles [Original title: ABC do SUS: doutrinas e princípios]. Ministério da Saúde, Brasília

Brasil.. Law n° 8.069, 13 July 1990. Statute of the Child and Adolescent [Original title: Lei n° 8.069, de 13 de julho de 1990. Estatuto da Criança e do Adolescente]. Diário Oficial da União. 1990 jul 16; Seção 1. p 13563

Brasil. Law 10778, 24 Dec 24, 2003. Establishes the compulsory notification in the national territory of the case of violence against women who is treated in public or private health services [Original title: Lei 10778, de 24 de dezembro de 2003. Estabelece a notificação compulsória, no território nacional, do caso de violência contra a mulher que for atendida em serviços de saúde públicos ou privados]. Diário Oficial da União. 2003 nov 25; Seção 1. p 11

Brasil (2012) Prevention and treatment of injuries resulting from sexual violence against women and adolescents [Original title: Prevenção e tratamento dos agravos resultantes da violência sexual contra mulheres e adolescentes]. Ministério da Saúde, Brasília

Carvalho QCM (2007) Sexual violence in childhood - perspective under maternal understanding [Original title: Violência sexual na infância – perspectiva sob a compreensão materna]. Dissertação, Universidade Federal do Ceará

Castaños-Cervantes S, Sánchez-Sosa JJ (2016) Towards a psychosocial and cultural definition of Mexican homeless girls: a qualitative approach. Anales de Psicología 32(2):516–527

Dahlgren G, Whitehead M (1991) Policies and strategies to promote social equity in health. Institute for Future Studies, Stockholm

Dias-da-Costa JS, Gigante DP, Horta BL, Barros FC, Victora CG (2008) Pattern of health services utilization by adults of the Pelotas birth cohort from 1982 to 2004-5, Southern Brazil. Revista de Saúde Pública 42(Supl. 2):1–8

Espelt A, Dell'Olmo MM, Penelo E, Bosque-Prous M (2017) Applied Prevalence Ratio estimation with different Regression models: an example from a cross-national study on substance use research. Adicciones 29(2):105–112

Facuri CO (2012) Sociodemographic characteristics and psychic symptoms of women victims of sexual violence. Dissertação, Universidade Estadual de Campinas

Gomes MLM, Neto GHF, Viana CH, Silva MA (2006) Epidemiologic clinical profile of female children and adolescents victims of violence assisted in a Women's Support Service, Recife, Pernambuco. Revista Brasileira de Saúde Materno Infantil 6(Supl 1):S27–S34

Gomez EG (2002) Género, equidad y acceso a los servicios de salud: uma aproximación empírica. Rev Panam Salud Publica 11(5/6):327–334

Guimarães JATL, Villela WV (2011) Characteristics of physical and sexual violence against children and adolescents examined at the Forensic Medicine Institute in Maceió, Alagoas State, Brazil. Cadernos de Saúde Pública 27(8):1647–1653

Hohendorff JV, Costa LS, Habigzang LF, Koller SH (2014) Sexual violence against boys in Porto Alegre. Paidéia 24(58):187–195

Kind L, Orsini MLP, Napomuceno V, Gonçalves L, Souza GA, Ferreira MFF (2013) Primary healthcare and underreporting and (in)visibility of violence against women. Cadernos de Saúde Pública 29(9):1805–1815

Lima FSS, Merchán-Haman E, Undaneta M, Damacena GN, Szwarcwald CL (2017) Factores associated with violence against female sex workers in ten Brazilian cities. Cadernos de Saúde Pública 33(2):e00157815

Martins CBG, Alencastro LCS (2015) Characteristics of violence suffered by high school adolescents in a Brazilian state capital. Revista Eletrônica de Enfermagem 17(3):1–10

Montesanti SR, Thurston WE (2015) Mapping the role of structural and interpersonal violence in the lives of women: implications for public health interventions and policy. BMC Women's Health 15(100):1–13

Moreira GAR, Soares PS, Farias FNR, Vieira LJES (2015) Reporting of sexual violence against women in Brazil. Revista Brasileira em Promoção da Saúde 28(3):327–336

PAHO (Pan American Health Organization (2003) Informe mundial sobre la violencia y la salud. PAHO, Washington

Puente-Palacios KE, Laros JÁ (2009) Multilevel analysis: contributions to studies investigating the effects of social context on individual behavior. Estudos de Psicologia 26(3):349–361

Reza A, Breiding MJ, Gulaid J, Mercy JA, Blanton C, Mthethwa Z et al (2009) Sexual violence and its health consequences for female children in Swaziland: a cluster survey study. Lancet 373(9679):1966–1972

Ribeiro MRC, Silva AAM, Alves MTSSB, Batista RFL, Ribeiro CCC, Schraiber LB, Bettiol H, Barbieri MA (2017) Effects od socieconomic status and social support on violence against pregnant women: a structural equation modeling analysis. PLOS ONE 20:1–16

Sabidó M, Kerr LRFS, Mota RS, Benzaken AS, Pinho AA, Guimaraes MDC, Dourado I, Merchan-Hamman E, Kendall C (2015) Sexual violence against men who have sex with men in Brazil: a respondent-driven sampling survey. AIDS Behav 19(9):1630–41

Schraiber LB (2014) Violence issue of interface between health and society [Original title: Violência questão de interface entre a saúde e a sociedade]. Saúde e Sociedade 23(3):727–732

Silva PA, Lunardi VL, Lunardi GL, Arejano CB, Ximenes AS, Ribeiro JP (2017) Violence against children and adolescents: characteristics of notified cases in a southern reference center of Brazil. Enfermaria Glob 46:419–431

WHO (2010) Preventing intimate partner and sexual violence against women: taking action and generating evidence. WHO, Geneva

WHO (2014) Global status report on violence prevention. WHO, Geneva

WHO (World Health Organization (2002) World report on violence and health. WHO, Geneva

Wilkinson RG, Pickett KE (2006) Income inequality and population health, a review and explanation of the evidence. Soc Sci Med 62:1768–1784