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COVID-19 vulnerability among Brazilian sexual and gender minorities: a cross-sectional study

Vulnerabilidade à COVID-19 entre as minorias sexuais e de gênero no Brasil: um estudo transversal

Vulnerabilidad al COVID-19 entre minorías sexuales y de género en Brasil: un estudio transversal

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Abstract

Minority groups are more prone to worsen their personal and social vulnerabilities during the COVID-19 pandemic. This study aimed to identify factors associated with the highest COVID-19 vulnerability in the Brazilian sexual and gender minorities. This is a cross-sectional study based on 826 respondents of the Brazilian LGBT+ Health Survey, *conducted online from August to November 2020. The COVID-19 vulnerability was based on a previous vulnerability index created by an LGBT+ institution, which comprises three dimensions (income, COVID-19 exposure, and health). The outcome was the highest score quartile. Statistical analysis was based on logistic regression models. The COVID-19 vulnerability was higher in heterosexual and other scarce sexual orientations (OR = 2.34; 95%CI: 1.01-9.20, vs. homosexual), cisgender men (OR = 3.52; 95%CI: 1.35-4.44, vs. cisgender women), and those aged ≥ 50 years (OR = 3.74; 95%CI: 1.24-11.25, vs. 18-29 years old). A negative association was found with complete graduate education (OR = 0.06; 95%CI: 0.02-0.22, vs. complete high school), being white (OR = 0.44; 95%CI: 0.23-0.83), and proper facemask use (OR = 0.31; 95%CI: 0.13-0.76). Except for proper facemask use, factors associated with higher COVID-19 vulnerability are structural determinate and suggest overlapping vulnerabilities, as described by the syndemic model. It guides strategies to deal with the pandemic, which includes a joint approach to the common epidemic that affects sexual and gender minorities, broadening the intersectoral approach to decrease inequalities.*

Sexual and Gender Minorities; Coronavirus Infections; Social Vulnerability Index

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Introduction

People have been encouraged to stay in their homes during the COVID-19 pandemic. In Brazil, the initial social distancing strategies were implemented in late March 2020 [1]. Personal, social, and programmatic vulnerabilities [2] quickly worsened in the Brazilian sexual and gender minorities (i.e., lesbian, gay, bisexual, transsexual, *travesti*, and related identities – LGBT+) and flagged the COVID-19 pandemic as a syndemic. A syndemic is a set of closely intertwined and mutual enhancing health problems that significantly affect the health of the most socially vulnerable groups [3]. Thus, noxious social conditions and prior worse health epidemic conditions synergistically interact with COVID-19 exposure, comprising a mutually caused epidemic [4].

A syndemic might occur in historically neglected populations such as sexual and gender minorities, which are more prone to worsen their personal and social vulnerabilities, leading to higher disease susceptibility [2] due to the structures that define the availability of resources in the health-disease process [3]. Personal vulnerability includes cognitive and behavioral aspects linked to disease awareness and the possibility of change. Social vulnerability refers to the social aspects of personal vulnerability, such as political decisions and cultural barriers. Programmatic vulnerability constitutes the social level of the government, which includes the commitment to promote preventive and education actions to avoid diseases [2]. Sexual and gender minorities are crossed by a personal vulnerability related to minority prejudice events that might cause chronic stress and biological processes to compensate them, such as elevated blood pressure and proinflammatory cytokines [5,6]. Biological processes and higher rates of substance use [7,8] to deal with stress are associated with a higher cardiometabolic risk during the sexual and gender minorities' lifetime [9] and worse health than cisgender heterosexuals [7,10].

Prejudice events are mostly related to heteronormative sociality and lack of family support [11], along with multilevel, psychological, and social stressors, including exposure to discrimination and violence [5]. For example, one study conducted in 12 Brazilian capital municipalities in 2016 with men who have sex with men showed that 65% reported discrimination based on sexual orientation in the last 12 months, and 23.5% experienced physical violence [12]. Discrimination occurred mainly from classmates, family, and neighbors [12]. According to official violence records against sexual and gender minorities in 2015-2017, homes were the main place of violence, ranging from 54.6% in teenagers to 78.9% in older adults [13]. Increased tweets related to family violence revealed a higher vulnerability among sexual and gender minorities during the pandemic [14]. Moreover, adverse psychological distress [15,16], including increased loneliness, social isolation, and reduced emotional support [17,18], has increased during the COVID-19 pandemic. These adverse mental outcomes were also observed in Brazil [19].

Alongside these adverse health outcomes, the pandemic exposes the social vulnerabilities caused by inequality in Brazil [20]. For example, in Belo Horizonte (Minas Gerais State), the number of hospitalizations due to nonspecified and COVID-19 was higher among people living in the most deprived areas [21]. A significant difference was also observed when comparing data on race/skin color: from March to July 2020, the standard mortality rate for white people was 115 deaths per 100,000 population, while for black people was 172 deaths per 100,000 population in the city of São Paulo [22].

Brazilian data on COVID-19 vulnerability lack information on sexual and gender minorities. Some LGBT+-related institutions and researchers provided some data, since official representative data does not account for gender identity. During the COVID-19 pandemic, 42.7% of the Brazilian sexual and gender minorities considered emotional problems the worst consequence, whereas nearly 11% considered loneliness and decreased family interactions [19]. Moreover, about one quarter reported unattainability to adhere to social distancing, which is statistically associated with being non-white and having lower schooling level or income [23].

This cross-sectional analysis aimed to identify and to better understand the factors associated with the highest COVID-19 vulnerability in the Brazilian sexual and gender minorities.

Methods

Study design and sample

The *Brazilian LGBT+ Health Survey* is a cross-sectional online study of individuals who identified themselves as sexual and gender minorities. The study sample comprised a convenience sample with all individuals who met the inclusion criteria and agreed to anonymously participate by an online link. Inclusion criteria were: individuals who self-declare in one of the sexual and gender minority categories, aged ≥ 18 years, living in Brazil, having Internet and computer, tablet, or smartphone access to answer the questionnaire, and understanding the questions.

Initially, the link to the survey was divulgated on social media (i.e., Facebook, Instagram, and WhatsApp), on the official website of the participating universities, face-to-face contact with students of the universities, and via radio and online press. Groups and associations of pro-sexual and gender minorities from different Brazilian regions were contacted and the study was divulgated in some primary health care units from Belo Horizonte and Rio de Janeiro to achieve more participants. The answering period of the survey was from August 19 to November 30, 2020, about five months after the national initial social distancing strategies. On August 19, new daily cases were 48,800, with 1,100 daily deaths, which means a decreasing tendency that achieved 639 daily deaths in late November [24]. Further details can be found elsewhere [25].

The *Brazilian LGBT+ Health Survey* was approved by the Ethics Research Committee of the Minas Gerais Federal University (protocol 34123920.9.0000.5149). Only participants who agreed to participate (i.e., consent to participate after a brief description of the aims of the research and potential risks and benefits).

COVID-19 vulnerability

A vulnerability index previously created by an LGBT+ institution was used to measure sexual and gender minorities' personal and social COVID-19 vulnerability [19], which applied the same methodology as the social vulnerability index used by the Institute of Applied Economic Research (IPEA). Three vulnerability dimensions were included: income, COVID-19 exposure, and health. The income vulnerability dimension included two aspects: (1) having up to one minimum wage before the onset of the COVID-19 pandemic in Brazil (i.e., before March), including those without wage; and (2) affording yourself for less than one month even if you lose your income resource. In the second aspect, those with missing data and who reported receiving up to one minimum wage were also considered "vulnerable" (n = 102). Different from the original vulnerability index [19], the question about "being up to 24 years old without studying or working" was excluded because it refers to a specific age (i.e., up to 24 years old) and, therefore, does not reflect an individual vulnerability for the whole population.

The COVID-19 exposure vulnerability dimension included two aspects: (1) self-reported non-adherence to social distancing measures during the pandemic, including all participants who partially disagreed with the sentence "I respected the social distancing measures imposed by health authorities"; and (2) knowing close people previously or currently diagnosed with COVID-19. Finally, the health vulnerability dimension included two aspects: (1) exclusively using the public health care system (i.e., not having a private health insurance plan); and (2) having at least one diagnosis of a chronic condition, including diabetes, hypertension, heart disease, stroke, pulmonary disease, autoimmune disease, renal disease, or cancer.

The answers from the three dimensions were summed to create an individual vulnerability score, generating a score ranging from 1 to 6, divided into quartiles. Those in the highest quartile (i.e., score of ≥ 3) were considered "high vulnerability", and those in other quartiles were considered "low vulnerability". The three dimensions were also used separately, considering the highest vulnerability when the participants positively scored in both questions of each dimension.

Associated factors

Three categories of associated factors were included: gender-related, sociodemographic, and health-related characteristics.

Gender-related characteristics: sexual orientation (homosexual, bisexual, or heterosexual (considering only those transgender) and other scarce sexual orientations (i.e., asexual, pansexual, or queer), gender identity (cisgender women, cisgender men, or transgender, and other scarce gender identities (i.e., *travesti* or non-binary);

Sociodemographic characteristics: age groups (18-29, 30-39, 40-49, or ≥ 50 years), schooling level (complete high school, complete undergraduate education, or complete graduate education), race/skin color (non-white or white), living alone (yes or no), the mean number of people per room in the household (1 or > 1), Brazilian region (North, Northeast, Southeast, South, or Central-West), current work status (at home, as usual, or unemployed), and receiving government income support during the COVID-19 pandemic (yes or no);

Health-related characteristics: self-rated health (very good/good, fair, or very poor/poor), self-reported diagnosis of depression (yes or no), positive COVID-19 test during the pandemic (yes or no), proper facemask use during the pandemic, including all participants who totally agreed with the sentence "I properly used facemask outside the home" (yes or no), and perceiving worse mental health during the pandemic (yes or no).

Statistical analysis

Differences across the COVID-19 vulnerability categories were estimated using the Pearson's chi-square test. Logistic regression models were used to estimate the odds ratios (OR) and their 95% confidence intervals (95%CI) to assess factors associated with the highest COVID-19 vulnerability. Multivariate analyses were sequentially performed by adding blocks of characteristics in the following order: (1) gender-related characteristics; (2) sociodemographic characteristics; and (3) health-related characteristics. The fully adjusted model included only variables with $p < 0.20$ in the block analyses due to evidence of multicollinearity (variance inflation factor > 5). Hosmer-Lemeshow goodness-of-fit test was implemented to assess model fit after fitting the logistic regression final models. Post-stratification was used to estimate weights according to Brazilian regions, considering the population estimates of the general Brazilian population aged ≥ 18 years used in the 2019 *Brazilian National Health Survey* (PNS 2019). This procedure was used to enhance representativeness, since the participants' selection probability was unknown [26] and the participants were concentrated in the Southeast Region. All analyses were performed using Stata 14.0 SE (https://www.stata.com).

Results

Out of 976 individuals who agreed to participate and met the inclusion criteria, 826 participants had complete information to classify the COVID-19 vulnerability and were included in our analysis. Details on the flow of original participants until inclusion in the *Brazilian LGBT+ Health Survey* were described elsewhere [27]. Table 1 describes the characteristics of the study population and according to the COVID-19 vulnerability (total and by the three aspects). The mean age was 31.8 years (± 11.2). The participants were mainly homosexual (75.7%), cisgender men (58.2%), and white (54.6%). Total COVID-19 vulnerability statistically varied according to sexual orientation, age groups, schooling level, mean number of people per room in the household, Brazilian region, and self-rated health. Regarding the separate vulnerability aspects, COVID-19 exposure showed more participants (n = 241), followed by income vulnerability (n = 221), and health vulnerability (n = 94). A higher proportion of heterosexual and other scarce sexual orientations showed income vulnerability (11.9%) than the non-vulnerable, whereas transgender and other scarce gender identities showed a lower proportion (8.8%). Moreover, they also showed a higher proportion of COVID-19 exposure (14.9%) than non-vulnerable.

Table 1

Gender-related, sociodemographic, and health-related characteristics and according to the high COVID-19 vulnerability. *The Brazilian LGBT+ Health Survey*, August-November, 2020.

Characteristics	Total (n = 826)	Vulnerability			
		COVID-19 general vulnerability (n = 234)	Income dimension (n = 221)	COVID-19 exposure dimension (n = 241)	Health dimension (n = 94)
	%	%	%	%	%
Gender-related					
Sexual orientation					
Homosexual	75.7	**66.3**	**60.4**	76.0	74.1
Bisexual	19.5	**21.8**	**27.7**	19.1	16.4
Heterosexual * and other scarce sexual orientations	4.7	**11.9**	**11.9**	4.9	9.5
Gender identity					
Cisgender women	31.2	27.2	**47.7**	**16.9**	22.9
Cisgender men	58.2	60.3	**43.5**	**68.2**	72.2
Transgender and other scarce gender identities	10.6	12.5	**8.8**	**14.9**	4.9
Sociodemographic					
Age groups (years)					
18-29	52.4	**64.5**	**84.5**	**46.5**	**54.7**
30-39	25.0	**17.0**	**9.0**	**35.8**	**13.5**
40-49	13.7	7.7	**4.1**	10.0	11.0
≥ 50	8.9	**10.8**	2.4	7.7	20.7
Schooling level					
Complete high school	12.3	**23.3**	**25.2**	**8.7**	21.3
Complete undergraduate education	46.3	**55.6**	**65.8**	**37.1**	47.0
Complete graduate education	41.4	**21.1**	**9.1**	**54.2**	31.6
White race/skin color	54.6	**40.5**	**44.3**	57.0	**24.2**
Living alone	19.2	17.8	**9.1**	**25.8**	28.6
Mean number of people per room in the household > 1	5.6	**10.3**	8.9	6.0	**14.5**
Brazilian region					
North	18.7	**28.8**	24.0	22.9	30.1
Northeast	36.6	**36.8**	36.9	37.4	34.7
Southeast	20.1	**16.2**	19.3	15.2	14.1
South	14.2	**9.1**	13.7	16.0	5.2
Central-West	10.5	**9.0**	6.1	8.5	15.9
Current work status					
At home	44.1	35.8	**26.1**	49.1	40.3
As usual	31.2	32.2	**22.8**	33.1	30.5
Unemployed	24.8	32.0	**51.1**	17.8	29.1
Receiving government income support during the COVID-19 pandemic	24.6	31.3	**41.3**	18.8	33.3
Health-related					
Self-rated health					
Very good/Good	71.4	**59.2**	**53.0**	74.6	54.6
Fair	22.9	**33.4**	**35.5**	21.2	33.7
Very poor/Poor	5.7	**7.4**	**11.5**	4.2	11.7
Diagnosis of depression	27.4	29.9	**42.6**	23.5	30.4
Positive COVID-19 test during the pandemic	9.8	15.2	6.2	14.7	5.4
Proper facemask use during the pandemic	83.3	78.8	89.2	**67.4**	82.9
Worse mental health during the pandemic	31.6	35.3	**46.4**	28.9	34.4

Note: values in bold, $p < 0.05$.

* Considering only transgender individuals.

We also described our sample by age groups since age significantly influences the composition of sexual orientation and gender identity in non-representative samples. Figure 1 shows that regarding sexual orientation, bisexual, heterosexual, and other scarce sexual orientations are mostly concentrated at younger ages: only 1.6% bisexual and 1.3% heterosexual and other scarce sexual orientations were aged ≥ 50 years. The same pattern did not occur with gender identity, although transgender and other scarce gender identities showed a proportion of 5.4% among individuals aged ≥ 50 years.

Table 2 shows the results of multivariate associations between participants' characteristics and the highest COVID-19 vulnerability. The fully adjusted model showed higher odds of the COVID-19 vulnerability among heterosexual and other scarce sexual orientations (OR = 2.34; 95%CI: 1.01-9.20, compared to homosexual), cisgender men (OR = 3.52; 95%CI: 1.35-4.44, compared to cisgender women), and those aged ≥ 50 years (OR = 3.74; 95%CI: 1.24-11.25, compared to 18-29 years). Lower odds of COVID-19 vulnerability included individuals with complete graduate education (OR = 0.06; 95%CI: 0.02-0.22, compared to complete high school), being white (OR = 0.44; 95%CI: 0.23-0.83), and reporting proper facemask use (OR = 0.31; 95%CI: 0.13-0.76).

Discussion

This study found that some sexual and gender minorities are more prone to higher COVID-19 vulnerability. They included heterosexual and other sexual orientation minorities, cisgender men, and those aged ≥ 50 years. Moreover, individuals with higher schooling level, white race/skin color, and reporting proper facemask use were less likely to have a higher COVID-19 vulnerability.

By establishing the analysis standpoint in the collective dimension as producer and reproducer of mechanisms of illness and vitality, based on historically constructed social vulnerabilities, human beings assume the character of a product of civilization and, therefore, the status of a social product [28]. Health is understood as the full development of the human potentialities, according to the level of progress achieved by society in a specific historical period, depending on the anatomical and

Figure 1

Participants' sexual orientation and gender identity according to age group. *The Brazilian LGBT+ Health Survey*, August-November, 2020.

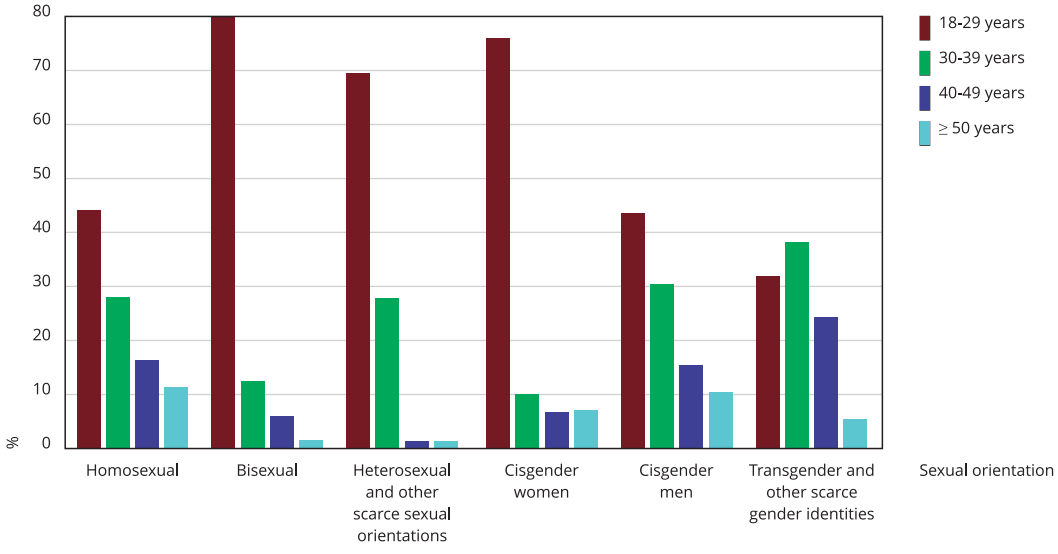

Table 2

Sequential models of the association between participant's characteristics and COVID-19 vulnerability. *The Brazilian LGBT+ Health Survey*, August-November, 2020.

Characteristics	Model 1 (n = 825)		Model 2 (n = 807)		Model 3 (n = 826)		Fully adjusted model (n = 823)	
	OR	95%CI	OR	95%CI	OR	95%CI	OR	95%CI
Gender-related								
Sexual orientation (vs. homosexual)								
Bisexual	1.75	0.81-3.78					1.37	0.52-3.66
Heterosexual * and other scarce sexual orientations	3.37	1.56-7.33					2.34	1.01-5.64
Gender identity (vs. cisgender women)								
Cisgender men	1.62	0.78-3.36					3.52	1.35-9.20
Transgender and other scarce gender identities	1.20	0.39-3.69					2.45	0.79-7.59
Sociodemographic								
Age group [years] (vs. 18-29)								
30-39			0.77	0.29-2.06			0.68	0.25-1.87
40-49			0.46	0.15-1.37			0.58	0.19-1.75
≥ 50			1.50	0.54-4.20			3.74	1.24-11.25
Schooling (vs. up to high school)								
Complete undergraduate education			0.39	0.15-1.04			0.35	0.11-1.13
Complete graduate education			0.12	0.04-0.35			0.06	0.02-0.22
White race/skin color (vs. non-white)			0.48	0.25-0.92			0.44	0.23-0.83
Living alone (vs. no)			1.60	0.78-3.28			1.14	0.48-2.67
Having more than one people by room (vs. no)			1.60	0.44-5.81			-	-
Brazilian region (vs. North)								
Northeast			0.66	0.22-1.99			0.73	0.26-2.09
Southeast			0.38	0.14-1.01			0.50	0.20-1.21
South			0.35	0.10-1.22			0.54	0.16-1.81
Central-West			0.58	0.15-2.16			0.61	0.17-2.14
Current work status (vs. at home)								
As usual			0.92	0.43-1.98			-	-
Unemployed			1.03	0.41-2.58			-	-
Receiving government income support during COVID-19 pandemic (vs. no)			1.25	0.58-2.68			-	-
Health-related								
Self-rated health (vs. very good/good)								
Fair					**2.45**	**1.25-4.79**	2.18	0.95-4.99
Very poor/poor					2.30	0.65-8.18	3.17	0.39-13.5
Diagnosis of depression (vs. no)					0.98	0.52-1.85	-	-
Positive COVID-19 test during the pandemic (vs. no)					2.10	0.87-5.07	1.70	0.60-4.78
Proper facemask use during the pandemic (vs. no)					0.54	0.62-2.09	**0.31**	**0.13-0.76**
Worse mental health during the pandemic (vs. no)					0.57	0.27-1.20	-	-

95%CI: 95% confidence interval; OR: odds ratio.

Note: values in bold, $p < 0.05$. Hosmer-Lemeshow goodness-of-fit: Pearson $chi^2 = 0.68$, $p = 0.725$.

* Considering only transgender individuals.

functional regularity of the body and on the possibility to use what humanity has produced [28,29]. Hence, humans are not born ready, but acquire the human condition according to the access produced by society, such as food, education, health care services, stable and dignified employment conditions, and environmental safety. The relationships that are established within this dynamic determine different possibilities and restrictions to develop life and, consequently, different ways or possibilities of living, getting sick, and dying [28].

Despite sexual and gender minorities being treated as a whole in our analysis, the results show a different COVID-19 vulnerability according to sexual orientation and gender identity categories. Although the higher vulnerability was not significant to transgender and other scarce gender identities, heterosexual, and other scarce sexual orientations showed a higher COVID-19 vulnerability. These categories show a constructed gender identity different from the born gender [30], which increases social vulnerability due to discriminative environments. Cisgender women and men also show different gender identities, leading to different social and political constructions [30]. However, these sexual and gender minorities share social and environmental characteristics, leading to a higher COVID-19 vulnerability.

According to our results, factors associated with a higher COVID-19 vulnerability, except for proper facemask use, are structural determinates and suggest overlapping vulnerabilities, as described by the COVID-19 syndemic model [3,4]. Multiple historical and present-day factors have created the syndemic condition, including lower schooling levels, non-white race/skin color, worse working conditions or unemployment, and receiving income support during the COVID-19 pandemic. Although not all those factors were associated with higher vulnerability in the fully adjusted model, the descriptive analysis showed that they were worse in the income vulnerability dimension. Nearly 28% of the Brazilian people have received government income support during the COVID-19 pandemic [31]. Although an online-based sample inherently excludes the most vulnerable individuals, 24.6% of the participants were enrolled and received government income support. Furthermore, income vulnerability reflects vulnerability in the COVID-19 exposure dimension. A similar online survey showed that 26.3% of the Brazilian sexual and gender minorities reported difficulty to maintain social distancing and other preventive measures related to COVID-19, 42.3% due to job/salary reduced or lost, and 19.4% due to transportation availability [23]. Therefore, home-office and stay-at-home are not commonly chosen by a historically neglected and discriminated population embedded in a heteronormative [5,11] and racist [32] society, precluding them from friendly schooling environments, having better job opportunities, and economic prospects. The home can also be a discriminative environment [12], decreasing emotional support during the pandemic [19] and affecting mental health [15,16,17,19].

The income dimension, embedded in the social context, also affects the health dimension. Our findings did not show association in the fully adjusted model. Nevertheless, descriptive analysis evidenced a higher proportion of individuals diagnosed with depression and worse mental health during the pandemic in the higher income vulnerability group. For example, transgender individuals use fewer health care services due to disrespect to their social name [33] which is a barrier to health care access [34]. Moreover, they experience harassment, trauma, and mental health disorders more frequently than cisgender individuals [35], derived from higher discrimination in several life aspects [36]. The non-white race/skin color is an essential determinant of poor access to health care and higher job losses during the pandemic [37], which partially explains the higher COVID-19 mortality rates among non-whites in Brazil [38]. Data from the United States show that non-white and sexual and gender minorities are worse economically affected than non-LGBT+ counterparts: 15% non-white LGBT+ individuals recently laid off work, whereas this proportion is only 11.5% among non-LGBT+ counterparts [32]. Moreover, the literature reports that minority ethnic groups, minority gender-related groups, and people living in areas of higher socioeconomic deprivation generally experience long-term exposures that may cause an unequal COVID-19 vulnerability distribution [3,39,40].

A total of 83.3% reported proper facemask use. Among the Brazilian sexual and gender minorities, proper facemask use was lower among those individuals with increased alcohol use during the pandemic [27], which might derive from worse mental health during the pandemic [15,16,17,19]. Although worse mental health during the pandemic did not increase in the COVID-19 exposure vulnerability in our study, the proportion increased in the income vulnerability. Proper facemask use indirectly reflects synergic overlapping across vulnerability dimensions. However, lower facemask use might

be related to lack of COVID-19 awareness, leading to lower perceived susceptibility and worry or greater self-confidence in coping with it [41]. Regardless, government and health care providers must immediately implement strategies to ensure equity, such as using sexual orientation and gender identity measures in surveillance data and include equity-focused initiatives [42].

Study strengths and limitations

Our study strengths and limitations should be considered. Firstly, online surveys decrease the response rate, comprise a convenience sample, and only include participants with internet access. Therefore, the most vulnerable population was not included. However, considering the unavailability of nationally representative datasets and the difficulty to design a nationally representative study with the sexual and gender minorities, this study might contribute to understand the sexual and gender minorities' higher COVID-19 vulnerability. Secondly, the lack of programmatic vulnerability [2] in the COVID-19 vulnerability operationalization and the statistical approach hindered a straight vulnerability overview as a syndemic model. Therefore, further analyses must consider different approaches. Thirdly, the cross-sectional design limits the establishment of causal chain, but vulnerabilities are usually bidirectional. Finally, having a private health care was used to classify a lower COVID-19 vulnerability, despite during periods of increased COVID-19 cases in Brazil, such as in July-August, at the beginning of our data collection, both private and public health care systems lacked hospital beds. Regarding the strengths of our study, we used anonymous data of the participants, which is considered the best form to increase adherence of this population. Moreover, this is the first study in Brazil with broad coverage of participants from the five geographical regions of Brazil and includes questions on a wide range of health dimensions. We used post-stratification regarding Brazilian regions to strengthen sample representativeness.

Conclusion

Our outcomes emphasize structural factors associated with the highest COVID-19 vulnerability among sexual and gender minorities, which suggests overlapping vulnerabilities, as described by a syndemic of a mutually caused epidemic. This model guides health care providers and governments' strategies to deal with the pandemic, which includes a joint approach to the common epidemic that affects sexual and gender minorities. They include broad multi-sectorial approach to decrease inequalities, promoting sexual and gender minorities' friendly environments, supporting social and economic vulnerable individuals, increasing primary health care and emergency access, and better understand care and psychosocial care network in the public health care system.

Contributors

A. O. Macedo Neto contributed to the study conception and design, data interpretation, writing, and review. S. A. G. Silva and G. P. Gonçalves contributed to the study conception and design, writing, and review. J. L. Torres contributed to the study conception and design, data analysis, acquisition, and interpretation, writing, and review. All the authors approved the final version of the manuscript and agreed to be accountable for all aspects of the study.

Additional informations

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Conflict of interest

All the authors declare no conflict of interest.

References

1. Ministério da Saúde. Portaria nº 2.836, de 1º de dezembro de 2011. Institui, no âmbito do Sistema Único de Saúde (SUS), a Política Nacional de Saúde Integral de Lésbicas, Gays, Bissexuais, Travestis e Transexuais (Política Nacional de Saúde Integral LGBT). Diário Oficial da União 2011; 2 dez.
2. Ayres JRCM, França Junior I, Calazans GJ, Saletti Filho HC. O conceito de vulnerabilidade e as práticas de saúde: novas perspectivas e desafios. In: Czeresnia D, Freitas CM, organizadores. Promoção da saúde: conceitos, reflexões, tendências. Rio de Janeiro: Editora Fiocruz; 2003. p. 117-39.
3. Bambra C, Riordan R, Ford J, Matthews F. The COVID-19 pandemic and health inequalities. J Epidemiol Community Health 2020; 71:964-8.
4. Bispo Júnior JP, Santos DB. COVID-19 como sindemia: modelo teórico e fundamentos para a abordagem abrangente em saúde. Cad Saúde Pública 2021; 37:e00119021.
5. Borrillo D. Homofobia: história e crítica de um preconceito. Belo Horizonte: Autêntica; 2010,
6. Meyer IH. Prejudice, social stress, and mental health in lesbian, gay, and bisexual populations: conceptual issues and research evidence. Psychol Bull 2003; 129:674-97.
7. Han BH, Duncan DT, Arcila-Mesa M, Palamar JJ. Co-occurring mental illness, drug use, and medical multimorbidity among lesbian, gay, and bisexual middle-aged and older adults in the United States: a nationally representative study. BMC Public Health 2020; 20:1123.
8. McCabe SE, Hughes TL, Matthews AK, Lee JGL, West BT, Boyd CJ, et al. Sexual orientation discrimination and tobacco use disparities in the United States. Nicotine Tob Res 2019; 21:523-32.
9. Caceres BA, Markovic N, Edmondson D, Hughes TL. Sexual identity, adverse life experiences, and cardiovascular health in women. J Cardiovasc Nurs 2019; 34:380-9.
10. Cochran SD, Björkenstam C, Mays VM. Sexual orientation and all-cause mortality among US adults aged 18 to 59 years, 2001-2011. Am J Public Health 2016; 106:918-20.
11. Gibb JK, DuBois LZ, Williams S, McKerracher L, Juster RP, Fields J. Sexual and gender minority health vulnerabilities during the COVID-19 health crisis. Am J Hum Biol 2020; 32:e23499.
12. Magno L, Silva LAV, Guimarães MDC, Veras MASM, Deus LFA, Leal AF, et al. Discrimination based on sexual orientation against MSM in Brazil: a latent class analysis. Rev Bras Epidemiol 2019; 22 Suppl 1:e190003.
13. Pinto IV, Andrade SSA, Rodrigues LL, Santos MAS, Marinho MMA, Benício LA, et al. Profile of notification of violence against lesbian, gay, bisexual, transvestite and transsexual people recorded in the National Information System on Notifiable Diseases, Brazil, 2015-2017. Rev Bras Epidemiol 2020; 23 Suppl 1:e200006.
14. Xue J, Chen J, Chen C, Hu R, Zhu T. The hidden pandemic of family violence during COVID-19: unsupervised learning of tweets. J Med Internet Res 2020; 22:e24361.
15. Gonzales G, Loret de Mola E, Gavulic KA, McKay T, Purcell C. Mental health needs among lesbian, gay, bisexual, and transgender college students during the COVID-19 pandemic. J Adolesc Health 2020; 65:645-8.
16. Salerno JP, Devadas J, Pease M, Nketia B, Fish JN. Sexual and gender minority stress amid the COVID-19 pandemic: implications for LGBTQ young persons' mental health and well-being. Public Health Rep 2020; 135:721-7.

17. Pedrosa AL, Bitencourt L, Fróes ACF, Cazumbá MLB, Campos RGB, Brito SBCS, et al. Emotional, behavioral, and psychological impact of the COVID-19 pandemic. Front Psychol 2020; 11:566212.
18. Kneale D, Bécares L. Discrimination as a predictor of poor mental health among LGBTQ+ people during the COVID-19 pandemic: cross-sectional analysis of the online Queerantine Study. BMJ Open 2021; 11:e049405.
19. #VoteLGBT. Diagnóstico LGBT+ na pandemia: desafios da comunidade LGBT+ no contexto de isolamento social em enfrentamento à pandemia de coronavírus. https://static1.squarespace.com/static/5b310b91af2096e89a5bc1f5/t/5ef78351fb8ae15cc0e0b5a3 (accessed on 06/Mar/2022).
20. Nassif-Pires L, Carvalho L, Rawet E. Public policy brief, no. 153. New York: Levy Economics Institute; 2020.
21. Sales A, Andrade A, Friche A, Moreira B, Coelho D, Sales D, et al. InfoCOVID OSUBH. Informe 11. https://www.medicina.ufmg.br/coronavirus/wp-content/uploads/sites/91/2021/01/InfoCOVID11-22-01-2021.pdf (accessed on 06/Mar/2022).
22. Instituto Pólis. Raça e COVID no município de São Paulo. https://polis.org.br/estudos/raca-e-covid-no-msp/ (accessed on 06/Mar/2022).
23. Torres T, Hoagland B, Bezerra D, Garner A, Jalil E, Coelho L, et al. Impact of COVID-19 pandemic on sexual minority populations in Brazil: an analysis of social/racial disparities in maintaining social distancing and a description of sexual behavior. AIDS Behav 2020; 25:73-84.
24. Wordometer. Coronavirus: Brazil. https://www.worldometers.info/coronavirus/country/brazil/ (accessed on 06/Mar/2022).
25. Torres JL, Gonçalves GP, Pinho AA, Souza MHN. The *Brazilian LGBT+ Health Survey*: methodology and descriptive results. Cad Saúde Pública 2021; 37:e00069521.
26. Szwarcwald CL, Souza Júnior PRB, Damacena GN, Malta DC, Barros MBA, Romero DE, et al. *ConVid – Behavior Survey* by the Internet during the COVID-19 pandemic in Brazil: conception and application methodology. Cad Saúde Pública 2021; 37:e00268320.
27. Braga LHR, Menezes CS, Martins IV, Silva JDP, Torres JL. Factors associated with lifestyle deterioration during the COVID-19 pandemic among Brazilian lesbians, gays, bisexuals, transsexuals, transvestites and related identities: a cross-sectional study. Epidemiol Serv Saúde 2022; 31:e2021752.
28. Albuquerque GSC, Silva MJ. Sobre a saúde, os determinantes da saúde e a determinação social da saúde. Saúde Debate 2014; 38:953-65.
29. Garbois JA, Sodré F, Dalbello-Araujo M. Da noção de determinação social à de determinantes sociais da saúde. Saúde Debate 2017; 41:63-76.
30. Butler JP. Problemas de gênero: feminismo e subversão da identidade. Rio de Janeiro: Civilização Brasileira; 2003.
31. Cardoso B. A implementação do auxílio emergencial como medida excepcional de proteção social. Rev Admin Pública 2020; 54:1052-63.
32. Sears B, Conron KJ, Flores AR. The impact of the fall 2020 COVID-19 surge on LGBT adults in the US. https://williamsinstitute.law.ucla.edu/publications/covid-surge-lgbt/ (accessed on 06/Mar/2022).
33. Rocon PC, Sodré F, Zamboni J, Rodrigues A, Roseiro MCFB. O que esperam pessoas trans do sistema único de saúde? Interface (Botucatu) 2018; 22:42-53.
34. Souza M, Pinho A, Graever L, Pereira AR, Santana AMS, Pesqueno Junior CJP, et al. Access of the LGBTQI+ population from the perspective of community health agents, Brazil. Eur J Public Health 2020; 30 Suppl 5:ckaa166.770.
35. Lefevor GT, Boyd-Rogers CC, Sprague BM, Janis RA. Health disparities between genderqueer, transgender, and cisgender individuals: an extension of minority stress theory. J Couns Psychol 2019; 66:385-95.
36. Badgett M, Choi S, Wilson B. LGBT poverty in the United States: a study of differences between sexual orientation and gender identity groups. https://williamsinstitute.law.ucla.edu/wp-content/uploads/National-LGBT-Poverty-Oct-2019.pdf (accessed on 06/Mar/2022).
37. Pilecco FB, Leite L, Góes EF, Diele-Viegas LM, Aquino EML. Addressing racial inequalities in a pandemic: data limitations and a call for critical analyses. Lancet Glob Health 2020; 8:E1461-2.
38. Baqui P, Bica I, Marra V, Ercole A, van der Schaar M. Ethnic and regional variations in hospital mortality from COVID-19 in Brazil: a cross-sectional observational study. Lancet Glob Health 2020; 8:E1018-26.
39. Poteat T, Millett GA, Nelson LRE, Beyrer C. Understanding COVID-19 risks and vulnerabilities among black communities in America: the lethal force of syndemics. Ann Epidemiol 2020; 47:1-3.
40. Ruprecht MM, Wang X, Johnson AK, Xu J, Felt D, Ihenacho S, et al. Evidence of social and structural COVID-19 disparities by sexual orientation, gender identity, and race/ethnicity in an urban environment. J Urban Health 2021; 98:27-40.
41. Ko NY, Lu WH, Chen YL, Li DJ, Chang YP, Wang PW, et al. Cognitive, affective, and behavioral constructs of COVID-19 health beliefs: a comparison between sexual minority and heterosexual individuals in Taiwan. Int J Environ Res Public Health 2020; 17:4282.
42. Phillips G, Felt D, Ruprecht MM, Wang X, Xu J, Pérez-Bill E, et al. Addressing the disproportionate impacts of the COVID-19 pandemic on sexual and gender minority populations in the United States: actions toward equity. LGBT Health 2020; 7:279-82.

Resumo

Grupos minoritários são mais propensos a fortalecer suas vulnerabilidades pessoais e sociais, aumentando a vulnerabilidade à COVID-19 durante a pandemia. Este estudo objetivou identificar fatores associados à maior vulnerabilidade à COVID-19 entre as minorias sexuais e de gênero no Brasil. Trata-se de um estudo transversal realizado com 826 entrevistados do Inquérito Nacional de Saúde LGBT+*, realizado online de agosto a novembro de 2020. A vulnerabilidade à COVID-19 pautou-se em um índice de vulnerabilidade anterior criado por uma instituição LGBT+, compreendendo três dimensões (renda, exposição à COVID-19, e saúde). O resultado foi o quartil de maior pontuação. A análise estatística foi baseada em modelos de regressão logística. Vulnerabilidade à COVID-19 foi maior em heterossexuais e outras sexualidades menores (OR = 2,34; IC95%: 1,01-9,20,* vs. *homossexual), homens cisgênero (OR = 3,52; IC95%: 1,35-4,44,* vs. *mulheres cisgênero), e aqueles com 50 anos ou mais (OR = 3,74; IC95%: 1,24-11,25,* vs. *18-29 anos). Verificou-se associação negativa entre ter pós-graduação (OR = 0,06; IC95%: 0,02-0,22,* vs. *até o Ensino Médio), ter cor de pele branca (OR = 0,44; IC95%: 0,23-0,83) e usar máscara adequada (OR = 0,31; IC95%: 0,13-0,76). Exceto pelo uso adequado da máscara, fatores associados à maior vulnerabilidade à COVID-19 são determinantes estruturais e sugerem vulnerabilidades que se sobrepõem, como descrito pelo modelo sindêmico. Ele orienta estratégias para lidar com a pandemia, que engloba uma abordagem conjunta da epidemia comum que afeta as minorias sexuais e de gênero, ampliando a abordagem intersetorial para diminuir as desigualdades.*

Minorias Sexuais e de Gênero; Infecções por Coronavirus; Índice de Vulnerabilidade Social

Resumen

Los grupos minoritarios son los más propensos a intensificar sus vulnerabilidades individuales y sociales, lo que aumenta la vulnerabilidad al COVID-19 durante la pandemia. Este estudio tuvo como objetivo identificar los factores asociados con mayor vulnerabilidad al COVID-19 entre las minorías sexuales y de género en Brasil. Se trata de un estudio transversal, realizado con 826 personas que respondieron la Encuesta Brasileña sobre la Salud LGBT+*, aplicada en línea entre agosto y noviembre de 2020. La vulnerabilidad al COVID-19 se basó en un índice de vulnerabilidad anterior creado por una institución LGBT+, el cual comprende tres dimensiones (renta, exposición al COVID-19 y salud). El resultado fue el cuartil de mayor puntuación. El análisis estadístico se basó en modelos de regresión logística. La vulnerabilidad al COVID-19 fue mayor en heterosexuales y otras sexualidades menores (OR = 2,34; IC95%: 1,01-9,20, vs. homosexual), hombres cisgénero (OR = 3,52; IC95%: 1,35-4,44, vs. mujeres cisgénero), y los de 50 años o más (OR = 3,74; IC95%: 1,24-11,25, vs. 18-29 años). Hubo una asociación negativa entre tener un título de posgrado (OR = 0,06; IC95%: 0,02-0,22, vs. hasta la secundaria), tener color de piel blanca (OR = 0,44; IC95%: 0,23-0,83) y usar mascarilla adecuadamente (OR = 0,31; IC95%: 0,13-0,76). Excepto por el uso adecuado de mascarilla, los factores asociados con una mayor vulnerabilidad al COVID-19 son determinantes estructurales y apuntan vulnerabilidades superpuestas, tal como lo describe el modelo sindémico. Este orienta estrategias para enfrentar la pandemia, que constan de un enfoque conjunto de la epidemia común que afecta a las minorías sexuales y de género, ampliando el enfoque intersectorial para reducir las desigualdades.*

Minorías Sexuales y de Género; Infecciones por Coronavirus; Índice de Vulnerabilidad Social

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