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ORIGINAL ARTICLE

Factors associated with human immunodeficiency virus infection among adults in southern Brazil

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ABSTRACT

Objective: to analyze the association between demographic categories and types of exposure. **Methods:** an analytical cross-sectional study was conducted using data provided by the Paraná State Health Department, from 2010 to 2020. Absolute and relative frequencies were used for the descriptive analysis. Prevalence ratios and their respective 95% confidence intervals were calculated using Poisson regression with robust variance adjustment (significance level of 0.05). **Results:** most cases were male, of white race, and aged between 18 and 39 years old. In small municipalities, schooling up to eight years prevailed, while in medium and large municipalities, schooling of nine years or more predominated. Associations were found between male gender, the age range of 18 to 39 years old, and categories of exposure to injectable drugs (PR 1.38; CI 95% 1.21 – 1.58) and heterosexual orientation (PR 1.49; CI 95% 1.49 – 1.50). In the group with up to 8 years of schooling, there was an association with injectable drugs (PR 2.65; CI 95% 2.29 – 3.06), transfusion (PR 1.69; CI 95% 1.20 – 2.38), and men who have sex with men (PR 1.18; CI 95% 1.18 – 1.19). **Conclusion:** the use of injectable drugs and heterosexual orientation were exposure categories associated with the male gender and the age range of 18 to 39 years old. Men who have sex with men, cases of transfusion transmission, and users of injectable drugs were associated with up to 8 years of schooling.

Descritores: HIV; Acquired Immunodeficiency Syndrome; Health Risk Behaviors; Epidemiology.

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INTRODUCTION

Since the early 1980s, the identification of the human immunodeficiency virus (HIV) and the acquired immunodeficiency syndrome (AIDS) have been considered global public health problems, and involving various social actors, affecting individuals without social, economic, racial, cultural, or political distinction[1].

The Joint United Nations Programme on HIV/AIDS (UNAIDS) estimates that in 2020 around 37.7 million people were living with HIV (PLHIV) in the world, with 1.5 million new infections and 680,000 deaths from AIDS-related diseases[2].

In Brazil, from 2007 to June 2021, 381,793 cases of HIV infection were reported. Of these, 266,360 were male (69.8%) and 115,333 were female (30.2%), with a predominance of individuals in the 20-34 age group (201,968/52.9%), with complete secondary education (82,085/21.5%), and who self-declared as black (197,386/51.7%)[3].

In Paraná (PR), between 2007 and 2015, 8,553 cases of HIV were reported, with a predominance of males in the 20-29 age group, followed by people in the 30-39 age group, and those with incomplete primary education. It should be noted that the State Health Department (SESA) did not disclose the exact numbers of cases and percentages for demographic characteristics[4].

It is known that transmission occurs mainly among people who adopt risky behaviors, such as having multiple partners, having sex without a condom, sharing contaminated needles and syringes, and from mother to child during pregnancy, childbirth, and breastfeeding, when the appropriate preventive measures are not taken[5,6].

In this context, it is important to carry out a situational diagnosis of HIV cases in young adults and adults, to contribute to the development of interventions aimed at improving care for the diagnosis, treatment, and prevention of the disease. The aim of this study was therefore to analyze the association between demographic categories and types of exposure to HIV.

METHOD

This analytical cross-sectional study was based on secondary data from the HIV forms of the National Information System for Notifiable Diseases (SINAN), provided by SESA-PR in June 2020, in the form of an Excel spreadsheet.

The sample consisted of all notified and confirmed cases of PLHIV who met the inclusion criteria: being between 18 and 59 years old at the time of diagnosis, and having their case notified in the state of Paraná between January 1, 2010 and December 31, 2020. Cases with incomplete and/or duplicate information were excluded.

The reporting municipalities were categorized according to the Brazilian Institute of Geography and Statistics (IBGE) as small (up to 50,000 inhabitants or a population of less than 20,000 with a population density > 80 inhabitants per square kilometer), medium (50,000 to 100,000 inhabitants or

20,000 to 50,000 inhabitants with a population density > 80 inhabitants per square kilometer) and large (over 100,000 inhabitants)[7].

Paraná is divided into 399 municipalities, 302 of which took part in this study. Of these, 258 (85.4%) are small, 26 (8.6%) are medium, and 18 (6.0%) are large, according to the categories established by the IBGE.

The variables were categorized as sex (female and male), age (18 to 39 years old and 40 to 59 years old), race/color (non-white and white), schooling (no schooling, ≤ 8 years of schooling, > 9 years of schooling) and, as an outcome, exposure category (men who have sex with men (MSM), heterosexual and bisexual, injectable drug use, and transfusion). It should be noted that the non-white race/color variable includes self-declared black, yellow, brown, and indigenous people.

The descriptive analysis used absolute and relative frequencies. In the bivariate analysis, prevalence ratios (PR) and their respective 95% confidence intervals (95%CI) were calculated using Poisson regression with robust variance adjustment. Multicollinearity was verified to check for correlation between the predictor variables. Adjustment models were used, such as the omnibus test and the model effects test.

All the analyses were carried out using the IBM Software Statistical Package for the Social Sciences (SPSS) version 20.0® for Windows, adopting a significance level of $p<0.05$.

This study was submitted to and approved by a human research ethics committee, under CAAE: 006.03718.6.0000.5231 and opinion number 4.063.442.

RESULTS

In the studied period, 46,488 cases of HIV were notified, and 7,285 cases were excluded, so the sample totaled 39,203 cases.

Table 1 shows the demographic characteristics and exposure categories, segmented according to municipality size. Regarding the profile of PLHIV, there was a predominance of men (27,106/69.1%), aged between 18 and 39 years old (27,087/69.1%), self-declared as white (27,388/69.9%), with up to eight years of schooling or more (18,042/46.0%), and heterosexual exposure (22,158/56.5%). There was a significant predominance of cases in large municipalities (31,266/79.8%).

Table 2 shows the data on the association between the sex and exposure categories. This analysis revealed a statistically significant association, with a higher incidence in men, injectable drug users, and heterosexual exposure.

Table 3 shows the data on the association between the age group variable and the exposure categories. There was a statistically significant association in the 18-39 age group with injectable drugs and heterosexual exposure.

Table 1 – Demographic characteristics and exposure categories segregated according to municipality size in the state of Paraná, Brazil (2010 to 2020). Londrina, PR, Brazil, 2023.

Variables	Municipalities							
	Small		Medium		Large		Total	
	n	%	n	%	n	%	n	%
Sex*								
Male	2,137	7.9	2,720	10.1	22,201	82.0	27,058	100.0
Female	1,416	11.8	1,599	13.2	9,065	75.0	12,080	100.0
Race**								
White	2,312	8.5	2,903	10.6	22,125	80.9	27,340	100.0
Non-white	1,205	11.9	1,315	13.0	7,618	75.1	10,138	100.0
Age group***								
18 to 39 years old	2,277	8.4	2,833	10.5	21,931	81.1	27,041	100.0
40 to 59 years old	1,276	10.5	1,486	12.3	9,335	77.2	12,097	100.0
Schooling****								
No schooling	86	22.2	71	18.3	231	59.5	388	100.0
≤ 8 years	1,387	12.1	1,364	11.9	8,741	76.0	11,492	100.0
> 9 years	1,032	5.7	1,685	9.4	15,297	84.9	18,014	100.0
Exposure categories*****								
MSM	493	4.5	915	8.3	9,571	87.2	10,979	100.0
Heterosexual	1,816	8.2	2,417	10.9	17,894	80.9	22,127	100.0
Bisexual	155	7.6	196	9.5	1,701	82.9	2,052	100.0
Injectable drug users	142	12.0	117	10.0	920	78.0	1,179	100.0
Transfusion	33	17.6	34	18.0	121	64.4	188	100.0

*65 cases not informed as for sex; **1,660 cases not informed/ignored as for race/color; *** 65 cases not informed as for age group; ****9,244 cases not informed/ignored as for schooling; *****each volunteer could select several options.

Table 2 - Associations between sex and exposure categories of confirmed HIV cases in the state of Paraná, Brazil (2010 - 2020). Londrina, PR, Brazil.

SEX	TOTAL (n)	n (%*) EXPOSED	EXPOSURE CATEGORIES	
			PR** (IC 95)	p-value***
			INJECTABLE DRUGS	
Male	24,366	888 (3.6)	1.38 (1.21 – 1.58)	<0.001
Female	11,126	292 (2.6)	1	
			TRANSFUSION	
Male	24,953	87 (0.3)	0.44 (0.31 - 0.62)	<0.001
Female	11,308	101 (0.9)	1	
			MSM	
Male	24,154	10,992 (45.5)	-	
Female	-	-	-	
			HETEROSEXUAL	
Male	24,303	11,079 (45.6)	1.49 (1.49 – 1.50)	<0.001
Female	11,425	11,079 (97.0)	1	
			BISEXUAL	
Male	24,303	1,957 (8.1)	0.96 (0.96 – 0.96)	<0.001
Female	11,425	93. (0.8)	1	

*Percentages do not add up to 100% because each volunteer could select several options; ** Prevalence ratio; ***p-value relating to Poisson regression with robust variance.

Table 3 - Associations between age group and exposure categories of confirmed HIV cases in the state of Paraná, Brazil (2010 - 2020). Londrina, PR, Brazil, 2023.

AGE GROUP	TOTAL (n)	n (%*) EXPOSED	EXPOSURE CATEGORIES	
			PR** (CI 95)	p-value***
			INJECTABLE DRUGS	
18 - 39 years old	24,678	837 (3.4)	1.34 (1.14 – 1.57)	< 0.001
40 - 59 years old	10,814	313 (2.9)	1	
			TRANSFUSION	
18 - 39 years old	25,211	106 (0.4)	0.59 (0.42 – 0.83)	0.003
40 - 59 years old	11,050	82 (0.7)	1	
			MSM	
18 - 39 years old	17,703	9,709 (54.8)	0.88 (0.88 – 0.89)	< 0.001
40 - 59 years old	6,451	1,283 (19.9)	1	
			HETEROSEXUAL	
18 - 39 years old	24,911	13,272 (53.3)	1.18 (1.17 – 1.19)	< 0.001
40 - 59 years old	10,817	8,886 (82.2)	1	
			BISEXUAL	
18 - 39 years old	24,911	1,567 (6.3)	0.99 (0.98 – 0.99)	< 0.001
40 - 59 years old	10,817	483 (4.5)	1	

* Percentages do not add up to 100% because each volunteer could select several options; ** Prevalence ratio; *** p-value relating to Poisson regression with robust variance.

Table 4 shows the data on the association between the schooling variable and the exposure categories. An association was observed between schooling of up to eight years and the following variables: injectable drugs, transfusion, and MSM.

Table 4 - Associations between schooling and exposure categories of confirmed HIV cases in the state of Paraná, Brazil (2010 - 2020). Londrina, PR, Brazil, 2023.

SCHOOLING	TOTAL (n)	n (%) * EXPOSED	EXPOSURE CATEGORIES	
			PR** (CI 95)	p-value***
			INJECTABLE DRUGS	
≤ 8 years	10,661	481 (4.5)	2.65 (2.29 – 3.06)	< 0.001
> 9 years	17,029	305 (1.8)	1	
			TRANSFUSION	
≤ 8 years	10,890	76 (0.7)	1.69 (1.20 – 2.38)	0.002
> 9 years	17,211	64 (0.4)	1	
			MSM	
≤ 8 years	10,790	5,853 (54.2)	1.18 (1.18 – 1.19)	< 0.001
> 9 years	16,941	11,622 (68.6)	1	
			HETEROSEXUAL	
≤ 8 years	10,847	8,818 (81.3)	0.79 (0.78 – 0.79)	< 0.001
> 9 years	16,973	7,760 (45.7)	1	
			BISEXUAL	
≤ 8 years	10,847	456 (4.2)	0.99 (0.99 – 0.99)	0.003
> 9 years	16,973	1,224 (7.2)	1	

* Percentages do not add up to 100% because each volunteer could select several options; ** Prevalence ratio; *** p-value relating to Poisson regression with robust variance.

DISCUSSION

This study aimed to analyze the association between demographic characteristics and exposure categories. When examining the demographic characteristics according to the size of the municipalities, there was a predominance of men (27,106/69.1%), who were white (27,388/69.9%), and aged between 18 and 39 years old (27,087/69.1%). Men generally show risk behaviors, such as having multiple partners, not using condoms, and, in the case of young people and adults, being in a period of high productivity, which can make it difficult to take time off work and lead to less healthy habits[5,6].

Regarding schooling, in the medium-sized and large municipalities, there was a predominance of more than nine years of schooling (1,685/9.4% and 15,297/84.9%, respectively), while in the small municipalities, the majority had lower levels of schooling (1,387/12.1%). This suggests that this disparity can be attributed to different social, economic, and territorial characteristics. In the smaller municipalities, rural areas with family farming activities prevail, and investments are concentrated on rural development. In contrast, in urban areas, investments are directed towards infrastructure, such as transportation and telecommunications, and the establishment of health and education institutions[8].

It is assumed that in small municipalities, HIV infection occurs more frequently among individuals with low levels of schooling, possibly due to a lack of information and limited access to means of prevention(9). These conditions increase exposure to risk behaviors, making these individuals more vulnerable to infection, as evidenced in other studies[10,11].

In relation to injectable drug use, the prevalence was 1.38 times higher among males, 1.34 and 2.65 times higher among individuals aged between 18 and 39 years old and those with up to eight years of schooling, respectively. These results are similar to those found in a national survey carried out by the Oswaldo Cruz Foundation[12].

This data highlights the importance of innovative approaches for this population, through more effective health actions focused on the prevention, promotion, treatment, and reintegration of these individuals into society[12-15].

In response to this need, the National Health Plan established priorities and targets for the period from 2020 to 2023, with guidelines that emphasize health actions related to drug use[16]. With the aim of reducing harm, the Ministry of Health suggests distributing disposable syringes and needles free of charge, along with preventive actions that emphasize the importance of not sharing sharp objects[17].

Regarding the heterosexual exposure category, there was a statistically significant association, with a higher prevalence in males (PR 1.49; 95% CI 1.49 - 1.50) and in the 18-39 age group (PR 1.18; 95% CI 1.17 - 1.19), compared to females and the 40-59 age group, respectively.

In this context, men between the ages of 18 and 39 are considered to be economically active, less likely to seek health services, and more prone to risk behaviors, such as having multiple partners, unprotected sex, and the use of chemical substances, which are common behaviors among men and young people[18].

It is important to note that, in some situations, women are responsible for diagnosing their partners due to the tests carried out during prenatal care, routine consultations, and, sometimes, the worsening of symptoms[10].

It is therefore crucial to formulate and implement effective public policies aimed at men's health. The Ministry of Health established the National Policy for Comprehensive Men's Health Care and the Men's NP to encourage the active participation of this group in health promotion, prevention, and treatment of sexually transmitted infections (STIs)[19]. One possible approach involves offering rapid tests and consultations in the workplace, and partnerships with higher education institutions to provide lectures and guidance[5].

Concerning the statistically significant association between schooling up to 8 years and exposure categories, an association was found with transfusion (PR 1.69; 95% CI 1.20 - 2.38) and men who have sex with men (PR 1.18; 95% CI 1.18 - 1.19) compared to schooling over 8 years.

Social inequality is reflected when it comes to vulnerable populations such as MSM, homosexuals, and bisexuals, and low schooling emerges as an aggravating factor in the spread of HIV[20]. In addition, a higher level of education can facilitate the search for information, favoring prevention and reducing the risk of infection[21].

The difficulty in negotiating condom use with partners, the trust placed in them to forgo condoms (as in stable relationships), social stigma and lack of awareness of the risk of STIs, lack of humanization in health services, and homophobia are all factors that contribute to the spread of the virus[22].

As for the transfusion category, there is a lack of articles on the subject. However, one possible explanation is that some people seek out blood donation services to be tested for HIV or because they are unaware of their serological status, which represents a risk to the system when there is inadequate testing for PLHIV[23].

It is important to note that the spread of the epidemic and its impact vary between populations, and identifying these differences is crucial to planning policies and programs that serve the groups most vulnerable to HIV.

The results of this study are relevant and robust. However, the failure to fill in some variables on the SINAN forms made it difficult to obtain data, representing a limitation of the study. It is therefore essential to promote the training of health professionals and higher education students in the health field on how to properly fill in the notification forms, guaranteeing the quality of the data and enabling a diagnostic analysis of the population's health situation through the information system.

Caution should be taken when generalizing the results to other scenarios. However, this study may offer significant contributions to public health in the state of Paraná, particularly in the planning and implementation of strategies to reorganize health services, as well as raising awareness among professionals about this specific population.

CONCLUSION

The results of this study made it possible to characterize the epidemiological profile of people living with HIV, aged between 18 and 59, in relation to the different sizes of the municipalities that make up the health regions of the state of Paraná from 2010 to 2020.

This study highlights the predominant demographic characteristics of PLHIV, mainly men aged between 18 and 39, self-declared as white, with more than nine years of schooling, and with sexual transmission as the main route of exposure.

Significant results were found for injectable drug use among males, individuals aged 18 to 39, and those with eight years or less of schooling. In addition, significance was observed for heterosexual relationships in this same age group. There was also a statistical association between less than or equal to eight years of schooling and men who have sex with men, as well as exposure via blood transfusion.

These results provide crucial information for HIV surveillance in the state of Paraná. They serve as a subsidy for health managers and professionals, helping to develop more targeted and strategic health policies. The aim is to improve health care and control of the epidemic.

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