IMPACTO CIENTÍFICO
EDITORA

HIV INFECTION STATUS IN PARANÁ AND MARINGÁ: A QUANTITATIVE AND COMPARATIVE APPROACH BETWEEN 2012 AND 2023

STATUS DA INFECÇÃO PELO HIV NO PARANÁ E EM MARINGÁ: UMA ABORDAGEM QUANTITATIVA E COMPARATIVA ENTRE 2012 E 2023

ESTADO DE LA INFECCIÓN POR HIV EN PARANÁ Y MARINGÁ: UN ENFOQUE CUANTITATIVO Y COMPARATIVO ENTRE 2012 Y 2023

10.56238/edimpacto2025.036-001

Júlia Fernandes Silva[1], Maria Fernanda de Souza Santos Nocette[2], Maria Gabriela Andrade Ferrér[3], Vitor Guilherme Santin dos Santos[4], Rosemarie Dias Fernandes da Silva[5]

ABSTRACT

Introduction: HIV infections remain a significant public health tchallenge, requiring continuous monitoring to assess the effectiveness of screening and treatment strategies.

Objective: This study comparatively analyzed the status of HIV infection in the state of Paraná and the city of Maringá between 2012 and 2023.

Methodology: This is a descriptive study with a quantitative approach, based on secondary data from SINAN and SIM. Variables such as year of diagnosis, sex, education level, race/color, exposure category, and number of deaths were analyzed, in addition to incidence, mortality, and case fatality rates, calculated from population data from the IBGE (Brazilian Institute of Geography and Statistics).

Results: The results indicated a downward trend in HIV incidence in Brazil and Paraná, while Maringá showed an increase in the number of reported cases. The infection was more prevalent in men (76.3%), predominantly between 35 and 59 years old, with a higher proportion of cases among heterosexuals. The mortality rate in Paraná was slightly higher than that of Maringá, which may be related to greater testing coverage and earlier initiation of antiretroviral therapy (ART) in the municipality.

Conclusion: The increase in notifications in Maringá highlights the need to intensify preventive strategies and expand access to early diagnosis and appropriate treatment. Public policies that promote adherence to ART and reduce morbidity and mortality are essential for confronting the epidemic and promoting the health of people living with HIV.

[1] Medical Student. Universidade Cesumar. Lattes: http://lattes.cnpq.br/1902333138400173
[2]Medical Student. Universidade Cesumar. Lattes: http://lattes.cnpq.br/4164616169829588
[3]Medical Student. Universidade Cesumar. Lattes: http://lattes.cnpq.br/0898600961844322
[4]Medical Student. Universidade Cesumar. Lattes: http://lattes.cnpq.br/9845186012946388
[5]Master. Universidade Cesumar. Lattes: http://lattes.cnpq.br/3791565444188784

Keywords: HIV Infections. Epidemiology. Public Health.

RESUMO

Introdução: As infecções por HIV permanecem um desafio significativo para a saúde pública, exigindo monitoramento contínuo para avaliar a efetividade das estratégias de rastreamento e tratamento.

Objetivo: Este estudo analisou de forma comparativa o status da infecção pelo HIV no estado do Paraná e no município de Maringá, entre 2012 e 2023.

Metodologia: Trata-se de um estudo descritivo, com abordagem quantitativa, baseado em dados secundários do SINAN e do SIM. Foram analisadas variáveis como ano de diagnóstico, sexo, escolaridade, raça/cor, categoria de exposição e número de óbitos, além das taxas de incidência, mortalidade e letalidade, calculadas a partir dos dados populacionais do IBGE.

Resultados: Os resultados indicaram uma tendência de redução da incidência de HIV no Brasil e no Paraná, enquanto Maringá apresentou um aumento no número de casos notificados. A infecção foi mais prevalente em homens (76,3%), predominantemente entre 35 e 59 anos, com maior proporção de casos entre heterossexuais. A taxa de mortalidade no Paraná foi discretamente superior à de Maringá, o que pode estar relacionado a uma maior cobertura de testagem e início precoce da terapia antirretroviral (TARV) no município.

Conclusão: O aumento das notificações em Maringá evidencia a necessidade de intensificar estratégias preventivas e ampliar o acesso ao diagnóstico precoce e ao tratamento adequado. Políticas públicas que favoreçam a adesão à TARV e a redução da morbimortalidade são fundamentais para o enfrentamento da epidemia e para a promoção da saúde das pessoas vivendo com HIV.

Palavras-chave: Infecções por HIV. Epidemiologia. Saúde Pública

RESUMEN

Introducción: Las infecciones por VIH siguen siendo un importante problema de salud pública, que requiere un seguimiento continuo para evaluar la eficacia de las estrategias de detección y tratamiento.

Objetivo: Este estudio analizó comparativamente la situación de la infección por VIH en el estado de Paraná y el municipio de Maringá, entre 2012 y 2023.

Metodología: Se trata de un estudio descriptivo, con enfoque cuantitativo, basado en datos secundarios del SINAN y SIM. Se analizaron variables como año de diagnóstico, sexo, escolaridad, raza/color, categoría de exposición y número de muertes, además de las tasas de incidencia, mortalidad y letalidad, calculadas a partir de datos poblacionales del IBGE.

Resultados: Los resultados indicaron una tendencia descendente en la incidencia del VIH en Brasil y Paraná, mientras que Maringá mostró un aumento en el número de casos notificados. La infección fue más prevalente en hombres (76,3%), predominantemente entre 35 y 59 años, con mayor proporción de casos entre heterosexuales. La tasa de mortalidad en Paraná fue ligeramente superior a la de Maringá, lo que puede estar relacionado con una

mayor cobertura de pruebas y el inicio temprano de la terapia antirretroviral (TAR) en el municipio.

Conclusión: El aumento de las notificaciones en Maringá destaca la necesidad de intensificar las estrategias preventivas y ampliar el acceso al diagnóstico precoz y al tratamiento adecuado. Las políticas públicas que promueven la adherencia al TAR y reducen la morbilidad y la mortalidad son fundamentales para enfrentar la epidemia y promover la salud de las personas que viven con el VIH.

Palabras clave: Infecciones por VIH. Epidemiología. Salud Pública.

1 INTRODUCTION

Acquired Immunodeficiency Syndrome (AIDS) is a chronic disease characterized by a systemic viral infection caused by the Human Immunodeficiency Retrovirus (HIV), which promotes lymphocyte depletion and consequent decrease in cellular immunity. It is estimated that by the end of 2019, 38 million people were already living with HIV in the world, while in Brazil, this statistic is around 1,088,500 million (1–4).

Regarding the diagnosis, due to the long latency period, everyone with an active sexual life should be tested for the HIV virus while still in Primary Health Care (PHC) and if the person is living with HIV (PLHIV), the service maintains comprehensive care to prevent the progression of the disease and immediately start Antiretroviral Therapy (ART) (5,6).

Prevention of HIV infection involves a group of biomedical (exposure reduction), behavioral (approach to exposed groups) and structural (reduction of factors that enhance the vulnerabilities of exposed people) strategies (7).

Every person living or living with HIV has the right to continue his or her civil, professional, sexual and emotional life, and no action may restrict his or her full rights to citizenship. In order to achieve this premise, the Unified Health System (SUS) has well-established prevention, diagnosis, and treatment strategies; and for these to be applied effectively, it is necessary to know the epidemiological context of each place (7–9).

In view of the importance of screening and early diagnosis of the infection and thus improving the quality of life and reducing mortality related to the virus, outlining the local epidemiological outline, seeking to evaluate the real impact of the screening strategies recommended by the Ministry of Health, in addition to identifying the predominant aspects in the population, are essential factors for the control of the HIV epidemic in the state of Paraná, especially in the city of Maringá, from 2012 to 2023.

2 METHODOLOGY

This is a descriptive study, with a quantitative approach based on secondary data from the Notifiable Diseases Information System (SINAN), which is inserted in the health information (TABNET), Epidemiological and Morbidity information in the Department of Informatics of the Unified Health System (DATASUS).

The study was composed of the secondary files of individuals who were notified as having the HIV and/or AIDS virus in the period from 2012 to 2023, in the state of Paraná and in the city of Maringá. In addition to the identification of deaths, in the same place and period mentioned above, in the Mortality Information System (SIM).

The variables used were: year of diagnosis, sex, education, race/color, exposure category and, subsequently, number of deaths.

The Incidence Rate (TI) was calculated based on the number of new cases registered and the population residing in the same place and period (Maringá and Paraná), in the years considered (10).

The Mortality Rate (MD) was calculated based on the number of deaths recorded by the International Codes of Diseases (ICD) related to HIV infection, namely: B20 (HIV disease, resulting in infectious and parasitic diseases), B21 (HIV disease resulting in malignancies), B22 (HIV disease resulting in other specified diseases), B23 (HIV disease resulting in other diseases) and B24 (HIV disease unspecified) (11).

For the TM, the division was made for each 100 thousand inhabitants, in the population residing in a given geographic space (Maringá and Paraná), in the years considered (10).

To elucidate the resident population used in both rates mentioned above, the demographic census provided by the Brazilian Institute of Geography and Statistics (IBGE) was applied and completed in 2024 (12).

The Case Fatality Rate (TL) was used to measure the severity of the disease caused by the HIV virus, calculated by dividing the number of deaths from a given disease by the number of cases of the same disease (10), both data found respectively in SIM and SINAN.

To code the variables described above, electronic spreadsheets were used in *Microsoft Office Excel* 2016 Software. For the final result of the analyses, only 2 decimal places after the decimal point were considered.

As a limitation to the analysis of the data in this study, the data collected regarding the education of patients in the state of Paraná totaled 11,837 and not 22,299 patients as presented in the tables referring to the other variables analyzed in the study, being only a discrepancy or error in the registration in the DATASUS system, the same happens with the data from Maringá.

In addition to the statistical analysis already described, the Clinical Protocols and Therapeutic Guidelines (PCDT) for Comprehensive Care for People with Sexually Transmitted Infections and for HIV were searched. The protocols were systematized according to the indications for screening for HIV infection, for future analysis of the relationship between the indications of the protocol and the repercussion on HIV indicators in both locations analyzed.

3 RESULTS AND DISCUSSION

Although there is a 2024 PCDT, it only deals with co-infections and opportunistic infections, so it was exposed only during the discussion, and was not included in the figure on screening guidelines (Table 1).

Table 1

Clinical Protocols and Therapeutic Guidelines (PCDT) for Comprehensive Care for People with Sexually Transmitted Infections and for HIV

		PCDT	
TITLE	**YEAR**	**SCREENING FOR HIV?**	**ORIENTATION**
Clinical Protocol and Therapeutic Guidelines for the Management of HIV Infection in Adults	2013	**No**	----------
Clinical Protocol and Therapeutic Guidelines (PCDT): Comprehensive Care for People with Sexually Transmitted Infections	2015	**Yes**	When available, HIV screening should be done in people with another STI already diagnosed and key populations (gays, MSM, sex workers, transvestites/transsexuals, and people who use drugs)
Technical Manual for the Diagnosis of HIV Infection in Adults and Children	2018	**Yes**	Testing for HIV and other STIs should be offered during routine evaluations, even in the absence of symptoms, to all those with an active sexual life, especially after risk exposure. The frequency of the tests is personalized according to subgroups such as: age, sexual activity, use of PrEP and PeP medications, and risk exposures (people deprived of liberty, victims of violence, sex workers, carriers of other infections, alcohol or drug users).
Clinical Protocol and Therapeutic Guidelines for Comprehensive Care of People with Sexually Transmitted Infections (STIs)	2019	**Yes**	
Clinical Protocol and Therapeutic Guidelines for Comprehensive Care of People with Sexually Transmitted Infections (STIs)	2020	**Yes**	
Clinical Protocol and Therapeutic Guidelines for the Prevention of Vertical Transmission of HIV, Syphilis and Viral Hepatitis	2022	**Yes**	

Source: The authors.

Screening for HIV infection was institutionalized in 2013 and inserted into the Clinical Protocol and Therapeutic Guidelines (PCDT) for Comprehensive Care for People with Sexually Transmitted Infections in 2015, which recommended testing in specific populations (gays, men who have sex with men, sex workers, transvestites/transsexuals, and people who

use drugs) and in 2018 was indicated by a diagnostic manual, specific for HIV infection, the testing of the entire population with a sexual life (6,13).

The evolution in the screening models was illustrated in Table 1 and shows that as new protocols became available, testing became more comprehensive, which suggests, at first, greater registration of cases and improvement in the management of infection, but the PCDT, despite being a document of federal application, has different levels of adherence around the country.

For a more effective control of the HIV and AIDS epidemic in Brazil, in addition to PCDTs, epidemiological surveillance of cases of HIV and AIDS infection was implemented, with the inclusion of these conditions in the List of Notifiable Diseases. Thus, data regarding suspected and confirmed cases of infection are stored in SINAN, which is responsible for analyzing the incidence and prevalence of PLHIV individuals in the three governmental spheres, as well as the clinical profile of notified patients (14).

The following table presents data on the number of cases and the incidence rate (IT) per 100 thousand inhabitants related to HIV at three geographic scales - Maringá, Paraná and Brazil - between the years 2012 and 2023. These data allow us to compare the temporal evolution of infections at the local, state, and national levels, evidencing possible regional differences and trends over the analyzed period. TI is a relevant indicator to assess the proportional impact in each locality, considering population differences, while the absolute number of cases offers an overview of the magnitude of the number of infections in each area (10).

In the national scenario, between 2012 and 2023, the number of cases of HIV infection decreased by 14.18%. The state of Paraná followed this trend, registering a reduction of 20.4%, with reported cases going from 1,260 to 1,003. However, the municipality of Maringá went in the opposite direction, showing an increase of 16.98% in cases in the same period, with notifications rising from 106 to 124, as shown in Table 2 (15).

This analysis raises questions about the reasons for the increase in notifications at the local level, suggesting the possibility of underreporting at the regional and national levels, the lack of knowledge of the diagnosis on the part of infected patients, or even a greater effectiveness of the municipality's notification system.

Table 2

Number of HIV cases and incidence rate in Maringá, Paraná and Brazil, 2012-2023, by year and in the period.

YEAR	LOCAL	CASES	THEE

			100,000
2012	Maringá	106	29,68
	Paraná	1.260	12,06
	Brazil	42.823	22,44
2013	Maringá	121	33,88
	Paraná	1.443	13,81
	Brazil	43.666	22,89
2014	Maringá	149	41,72
	Paraná	1.496	14,32
	Brazil	42.421	22,23
2015	Maringá	120	33,60
	Paraná	1.544	14,78
	Brazil	41.323	21,66
2016	Maringá	127	35,56
	Paraná	1.239	11,86
	Brazil	39.696	20,80
2017	Maringá	135	37,80
	Paraná	1.311	12,55
	Brazil	38.893	20,38
2018	Maringá	156	43,68
	Paraná	1.260	12,06
	Brazil	38.501	20,18
2019	Maringá	144	40,32
	Paraná	1.236	11,83
	Brazil	38.288	20,07
2020	Maringá	139	38,92
	Paraná	960	9,19
	Brazil	30.562	16,02
2021	Maringá	135	37,80
	Paraná	998	9,55
	Brazil	35.424	18,57
2022	Maringá	124	34,72
	Paraná	1.003	9,60
	Brazil	36.753	19,26
2023	Maringá	51	12,44
	Paraná	405	3,54
	Brazil	7197	3,38
2012-2023	Maringá	1.507	367,86
	Paraná	14.155	123,68
	Brazil	435.547	204,88

Source: (15).

In 2023, Paraná was ranked as the 9th state with the highest HIV incidence rate in Brazil, with 3.54 cases per 100 thousand inhabitants, behind Roraima (13.04), Rio de Janeiro (9.44), Rondônia (7.46), Amazonas (6.24) and Santa Catarina (5.96), the rate in Paraná is considerably lower. This rate is above the national average, corresponding to 3.38/100 thousand inhabitants (15).

An analysis published in 2024, carried out from 2007 to 2022, indicates a significant increase in HIV IT in Paraná, with an average growth of 2.14% per month between 2007 and 2014. In the state context, an analysis of the 21 municipalities with more than 100 thousand inhabitants places Pinhais at the top, with the highest IT, 9.45/100 thousand inhabitants, followed by Maringá (9.28), Cambé (7.29) (16).

It is necessary to reflect not only the absolute increase in cases, but also the social and economic dynamics that impact the spread of the virus.

The variations in incidence among the municipalities of the state highlight the role of metropolitan areas, which are more vulnerable to the epidemic. Factors such as intense urbanization, high population density, and economic inequalities in these regions contribute to greater exposure and transmission of HIV.

Although initial data may suggest a more severe scenario, the high incidence of cases can be attributed, in part, to greater access to health services, better educational level, and a higher proportion of young people, factors that favor early detection of HIV; in addition to the lower underreporting in the municipality. On the other hand, this reality contrasts with that of municipalities with less infrastructure, where underreporting can hide the true dimension of the epidemic.

In these locations, unfavorable socioeconomic conditions, such as low income, limited access to health and education, migration, and precarious housing, aggravate the context.

Much of the available health information has remained outdated since 2010 and the dependence on private sources to the detriment of official data compromises the transparency and effectiveness of public policies. This gap makes it difficult to plan and implement effective strategies to tackle not only HIV but other pathologies as well.

From the analysis of the epidemiological profile of the patients, as illustrated in Table 3, it is observed that HIV infection affects all age groups, although there is a predominance in the age group of 35 to 59 years, followed by that of 25 to 34 years, both at the local level, in the city of Maringá, and at the state level. This pattern is corroborated by previous work, indicating that, despite fluctuations over the years, the highest proportion of cases diagnosed between 1980 and 2019 occurred among patients aged 30 to 59 years (17).

Table 3

Epidemiological profile of PLHIV in the municipality of Maringá and in the state of Paraná between 2012 and 2023

VARIABLE	LOCAL			
	Paraná		Maringá	
	n 22.299	%	n 1.506	%
Age group				
< 12 years	157	0,70%	4	0,26%
13-24 years	2.484	11,14%	244	16,20%
25-34 years	6.028	27,03%	473	31,40%
35-59 years old	11.321	50,77%	703	46,68%
> 60 years old	1.477	6,62%	82	5,44%
Gender				
Male	15.028	67,39%	1.149	76,30%
Female	7.268	32,60%	357	23,70%
Blank	3	0,01%	-	-
Race/color				
White	9.938	44,57%	1.079	71,65%
Black	913	4,10%	123	8,17%
Yellow	111	0,50%	9	0,60%
Brown	2.817	12,63%	274	18,20%
Indigenous	27	0,12%	1	0,07%
Ignored	8.493	38,09%	20	1,33%
Schooling				
Illiterate	183	0,82%	16	1,06%
Incomplete elementary school	3.222	14,45%	385	27,37%
Complete elementary school	2.166	9,71%	204	13,55%
Incomplete high school	1.226	5,50%	143	9,50%
Complete high school	2.765	12,40%	332	22,05%
Incomplete higher education	773	3,47%	129	8,56%
Complete higher education	1.433	6,43%	202	13,41%
Not applicable	69	0,31%	3	0,20%
Exhibition Category				
Gay	3.256	14,60%	513	34,06%
Bisexual	727	3,26%	102	6,77%

Heterosexual	8.402	37,68%	805	53,45%
UDI	413	1,85%	14	0,93%
Hemophiliac	2	0,01%	-	-
Transfusion	4	0,02%	-	-
Vertical Transmission	146	0,65%	10	0,66%
Ignored	9.349	41,92%	62	4,12%

Source: (15)

In addition, even with the changes that have occurred over time and the expansion of access to health services, data from 2013 to 2015 reinforce the constancy of this pattern, patients aged 30 to 59 years - although a higher infection rate was observed among young adults aged 30 to 34 years (18).

On the other hand, a global increase in the number of infected people between 2007 and 2017 is pointed out, highlighting that the most affected age group was 20 to 29 years old. This growth raises the question about the effectiveness of health education strategies for young people, suggesting a possible failure to educate this audience, which could be contributing to the increase in infections (8).

Regarding the gender of the patients, the present study identified a predominance of male cases, both in Maringá and Paraná. However, there is a growing trend of infection also among women, which configures a process of feminization of the disease. This phenomenon can be identified by the variation in infection rates over the years, showing a significant increase in cases among women.

However, women are still not a priority in public policies, which focus mainly on preventing vertical transmission, aimed only at pregnant women. This results in limited access to diagnosis and treatment for many women, which contributes to the neglect and greater vulnerability of this population (19).

Regarding color/race, in Paraná, there is a predominance of cases among white people (45%), followed by brown (12%) and black (4%). However, the large number of cases that ignore this information in their records (8,014 in Paraná), hinders the detailed and reliable analysis of this variable. In Maringá, although the number of ignored cases is lower, the racial distribution follows the same pattern: white (71%), brown (18%) and black (12%).

Regarding education, both infected men and women have low educational levels, with most cases among those with incomplete primary education, complete secondary education and complete primary education - in descending order. These data indicate that the disease more frequently affects individuals in situations of social vulnerability, with lack of access to information and health services (17).

The most predominant exposure category was heterosexual patients, on average, with 38% in Paraná and 53% in Maringá. This reflects a change in the exposure profile, since HIV was initially stigmatized as a disease associated with homosexual relationships. The category of homosexual exposure also presented significant rates, with 14% in Paraná and 34% in Maringá. This change reinforces the growing number of infected women.

On the other hand, transmission by blood transfusion represents a derisory percentage, only 0.020% of cases in Paraná, while there were no records of this form of transmission in Maringá, reflecting the efficacy and safety of the processes of donation and selection of blood components.

The expansion of prenatal testing has allowed the diagnosis and treatment of pregnant women, aiming to prevent vertical transmission, although, even with these advances, there were still 156 cases of vertical transmission between the years and locations studied.

Regarding morbidity and mortality, as illustrated in Table 4, HIV is responsible for a series of complications that are classified in ICDs B20 to B24, previously described in the methodology. These complications are evidenced from the Mortality and Lethality Rates as a result of this infection (6).

Table 4

HIV mortality rate and case fatality rate, according to ICD-10 classification, in the municipality of Maringá and in the state of Paraná, 2012-2023, by year and in the period

YEAR	LOCAL	CID										GENERAL	
		B20		B21		B22		B23 B24					
		TM	TL	TM	TL	TM	TL	TM	TL	TM	TL	TM	TL
		100,000	%	100,000	%	100,000	%	100,000	%	100,000	%	100,000	%
2012	Maringá	4,20	0,14	-	-	0,56	0,01	-	-	1,12	0,03	5,88	0,19
	Paraná	3,81	0,31	0,12	0,01	0,84	0,07	0,07	0	1,17	0,09	6,03	0,50
2013	Maringá	3,64	0,12	-	-	0,84	0,02	-	-	0,84	0,02	5,32	0,18
	Paraná	4,23	0,30	0,25	0,01	0,87	0,06	0	0	0,84	0,06	6,20	0,44
2014	Maringá	3,92	0,13	0,28	0	0,84	0,02	-	-	0,84	0,02	5,88	0,19
	Paraná	4,20	0,30	0,21	0,01	0,61	0,04	0,08	0	0,98	0,06	6,09	0,42
2015	Maringá	4,20	0,14	0,28	0	0,28	0	-	-	0,84	0,02	5,60	0,19
	Paraná	3,96	0,26	0,15	0,01	0,67	0,04	0,04	0	0,82	0,05	5,65	0,38
2016	Maringá	2,52	0,08	0,28	0	0,56	0,01	-	-	0,56	0,01	3,92	0,13
	Paraná	3,73	0,31	0,22	0,01	0,65	0,05	0,08	0	0,76	0,06	5,45	0,46
2017	Maringá	5,04	0,17	0,28	0	0,56	0,01	-	-	0,56	0,01	6,44	0,20
	Paraná	3,74	0,30	0,26	0,02	0,68	0,05	0,05	0	0,72	0,05	5,48	0,43
2018	Maringá	2,80	0,09	0,28	0	0,84	0,02	-	-	1,40	0,04	5,32	0,18
	Paraná	3,61	0,30	0,14	0,01	0,55	0,04	0,04	0	0,87	0,07	5,23	0,43
2019	Maringá	2,24	0,07	-	-	0,56	0,02	-	-	1,40	0,04	4,20	0,14

	Paraná	3,13	0,26	0,21	0,01	0,34	0,03	0,06	0	0,76	0,06	4,51	0,38
2020	Maringá	2,52	0,08	0,56	0,02	0,56	0,02	-	-	0,84	0,03	4,48	0,15
	Paraná	3,03	0,33	0,20	0,02	0,50	0,05	0,05	0	0,66	0,07	4,46	0,48
2021	Maringá	3,92	0,13	0,28	0	0,28	0	-	-	1,12	0,03	5,60	0,19
	Paraná	4,11	0,43	0,19	0,02	0,47	0,05	0,05	0	1,37	0,14	6,22	0,65
2022	Maringá	4,48	0,15	0,28	0	0,84	0,03	-	-	1,12	0,03	6,72	0,22
	Paraná	3,52	0,36	0,25	0,02	0,49	0,05	0,04	0	1,01	0,10	5,34	0,55
2023	Maringá	2,19	0,17	0,48	0,03	0,48	0,03	-	-	0,48	0,03	3,66	0,29
	Paraná	3,25	0,92	0,15	0,04	0,41	0,11	0,08	0,02	0,75	0,21	4,66	1,31
2012-2023	Maringá	41,67	1,47	3,00	0,05	7,20	0,19	-	-	11,20	0,31	63,02	2,25
	Paraná	44,32	4,38	2,35	0,19	7,08	0,64	0,64	0,02	10,71	1,02	66,32	6,43

Source: (12,15)

The HIV epidemic in Brazil has a heterogeneous distribution, with significant differences between the different regions of the country. In the states of the North and Northeast regions, such as Acre, Pará, Amapá, Maranhão, Rio Grande do Norte, Pernambuco, Piauí and Paraíba, there has been an increase in the number of deaths from the infection in the last ten years. In contrast, the other regions showed greater stability in mortality rates (20–22).

When comparing the municipality of Maringá with the state of Paraná, it is verified that the overall mortality rate associated with HIV over the last 11 years is similar, with the state presenting a slightly higher rate, and even so, it was not maintained throughout all years.

In addition, a relationship between the reduction in mortality and the expansion of screening strategies is suggested, in 2015, when screening was limited to certain populations, the mortality rate was 5.60 (Maringá) and 5.65 (Paraná), and in 2019, after the establishment of testing for all with an active sexual life, the rate declined to 4.20 (Maringá) and 4.51 (Paraná); increasing again in 2021 and 2022; a fact probably associated with the COVID-19 pandemic.

When analyzing the causes of death, it is observed that, both in Maringá and Paraná, secondary infections are the main causes of deaths.

Co-infection between tuberculosis (TB) and HIV is particularly prevalent, since PLHIV individuals are 30 times more likely to develop HIV infection. *Mycobacterium tuberculosis* and the probability of progression to the active form of the disease increases by 10% each year (23,24). In addition to tuberculosis, it is also common to be co-infected with other sexually transmitted infections, such as syphilis, as well as less frequent infections, such as those caused by fungi of the genus *Cryptococcus* (8,25).

In a study carried out in the west of Pará, a prevalence of tuberculosis was identified, especially toxoplasmosis, and concluded that with opportunistic infections, the development

of other infections such as syphilis and Human Papillomavirus (HPV) in the patients analyzed was followed in 25% of patients (26).

The close relationship between these infections reinforces the importance of early diagnosis and treatment, which can not only prevent or minimize the occurrence of co-infections, but is also crucial to reduce the worsening mortality rate due to infectious and parasitic diseases secondary to HIV. In this context, the need for comprehensive health care is highlighted, which includes the control of viral load and the rapid initiation of pharmacological treatment (23,27).

In this context, it is plausible that the fact that Maringá has a slightly lower mortality and lethality rate due to ICD B20 (HIV disease) than Paraná is related to the greater HIV screening in the municipality, which results in the rapid initiation of therapy.

This early diagnosis is also directly linked to the reduction of deaths resulting from the evolution of the infection to Acquired Human Immunodeficiency Syndrome (AIDS). In Maringá, effective screening and early initiation of antiretroviral therapy (ART) are pointed out as factors that contribute to the lower mortality rate, reflecting the importance of viral load control for treatment success.

ART, with first-line and easy-to-manage drug regimens, has been shown to be effective in improving treatment adherence, prolonging patient survival, and reducing the chances of HIV transmission. Brazil, a pioneer in the universal distribution of this class of drugs, remains a world reference in the implementation of this strategy, despite some difficulties related to treatment adherence (28,29).

To be considered effective, ART needs adherence to more than 95%, and is not a reality for many patients with the infection, this is due to a set of factors beyond the use of medication, since the connection with social and individual vulnerabilities can compromise access to health services (30).

The stigma related to the AIDS epidemic derived from homophobia, social rejection of the use of some drugs and sex workers; it made it necessary to create laws and protocols directly linked to medical confidentiality around diagnosis; but in PHC, with the decentralization of care, there is ambivalence between the expansion of care and the breach of medical confidentiality, which can drive many users away from the service (30,31).

In addition, the analysis of the lethality rate, which considers the number of deaths in relation to the total number of carriers of the infection, is essential for a more in-depth understanding of the severity of the epidemic. In this study, it was observed that Paraná had a higher lethality rate than Maringá throughout the period analyzed, with a difference of more than three times between the two locations.

Finally, these data suggest that the discrepancy in the timing of screening and early diagnosis can directly influence lethality, since the delay in the start of treatment is associated with an increase in viral load and, consequently, with an increase in mortality and a higher occurrence of secondary infections and other disorders (23,28).

4 FINAL CONSIDERATIONS

The epidemiological analysis of HIV infection between 2012 and 2023 showed distinct patterns between Maringá, Paraná, and Brazil. While the national and state incidence showed a downward trend, Maringá recorded an increase in notifications, which may indicate greater effectiveness in screening and less underreporting, but also reinforces the need to expand preventive actions.

The predominance of infection in heterosexual adult men reflects changes in the epidemiological profile of the disease, previously associated mostly with social minorities (sex workers and men who have sex with men). In addition, the data reinforce the importance of early diagnosis and timely access to ART, factors that directly influence the lethality and quality of life of people living with HIV.
Despite advances in infection control, challenges persist, especially in relation to treatment adherence and equity in access to health services. More effective and comprehensive strategies, including health education and stigma reduction, are essential to improve the response to the epidemic in Paraná and Brazil.

REFERENCES

Batista, R. M., Andrade, S. D. S., & Souza, T. F. M. P. (2021). Prevalência de casos de HIV/AIDS nos últimos 10 anos no Brasil. Research, Society and Development, 10(14), e336101422149. https://doi.org/10.33448/rsd-v10i14.22149

Cunta Gonçalves, B., De Araujo Lima, N., Gawlinski Franchi, M., Poubel Batista, A., Albano Alves, M. L., Ferreira Dos Santos, R., et al. (2022). Fatores que influenciam a adesão da terapia antirretroviral (TARV). RECIMA21 - Revista Científica Multidisciplinar, 3(4), e341341. https://doi.org/10.47820/recima21.v3i4.1341

Cunha, A. P. D., Cruz, M. M. D., & Pedroso, M. (2022). Análise da tendência da mortalidade por HIV/AIDS segundo características sociodemográficas no Brasil, 2000 a 2018. Ciência & Saúde Coletiva, 27(3), 895–908. https://doi.org/10.1590/1413-81232022273.00432021

Damião, J. D. J., Agostini, R., Maksud, I., Filgueiras, S., Rocha, F., Maia, A. C., et al. (2022). Cuidando de pessoas vivendo com HIV/AIDS na Atenção Primária à Saúde: Nova agenda de enfrentamento de vulnerabilidades? Saúde em Debate, 46(132), 163–174. https://doi.org/10.1590/0103-1104202213211

Departamento de HIV, Aids, Tuberculose, Hepatites Virais e Infecções Sexualmente Transmissíveis. (n.d.). Direitos das PVHA. Retrieved March 10, 2025, from https://www.gov.br/aids/pt-br/assuntos/hiv-aids/direitos-das-pvha

Fama, M. M. D. O., Pimenta, A. T. G., Dourado, É. S., & Azevedo, L. N. (2020). Coinfecção HIV-Sífilis nos pacientes acompanhados em um serviço de atenção especializado de João Pessoa-PB. Brazilian Journal of Health Review, 3(4), 7398–7413. https://doi.org/10.34119/bjhrv3n4-014

Leite, D. S. (2020). A AIDS no Brasil: Mudanças no perfil da epidemia e perspectivas. Brazilian Journal of Development, 6(8), 57382–57395. https://doi.org/10.34117/bjdv6n8-228

Lourenço, G. O., Amazonas, M. C. L. D. A., & Lima, R. D. M. D. (2018). Nem santa, nem puta, apenas mulher: A feminização do HIV/AIDS e a experiência de soropositividade. Sexualidad, Salud y Sociedad, (30), 262–281. https://doi.org/10.1590/1984-6487.sess.2018.30.13.a

Macedo, L. F., Bastos, T. D. R., Deprá, J. V. S., Feio, L. P. P., Braga, T. L. G. P., & Paes, A. L. V. (2021). Levantamento epidemiológico e fatores associados à coinfecção tuberculose/HIV no Brasil. Revista Eletrônica Acervo Saúde, 13(1), e5360. https://doi.org/10.25248/reas.e5360.2021

Malta, M. C., Gomes, L. H. A., & Pol-Fachin, L. (2022). Perfil e prevalência da coinfecção de tuberculose e HIV/AIDS no estado de Alagoas no período de 2017 a 2021. Brazilian Journal of Development, 8(6), 47945–47951. https://doi.org/10.34117/bjdv8n6-341

Maranhão, T. A., Alencar, C. H., Ribeiro, L. M., Sousa, G. J. B., de Abreu, W. C., & Pereira, M. L. D. (2020). Padrão espaço-temporal da mortalidade por AIDS. Revista de Enfermagem UFPE on line, 14, e244407. https://doi.org/10.5205/1981-8963.2020.241981

Melo, M. C. D., Almeida, V. C. D., & Donalísio, M. R. (2021). Tendência da incidência de HIV-AIDS segundo diferentes critérios diagnósticos em Campinas-SP, Brasil de 1980 a 2016. Ciência & Saúde Coletiva, 26(1), 297–307. https://doi.org/10.15448/1980-6108.2021.1.38938

Ministério da Saúde. (2015). Protocolo Clínico e Diretrizes Terapêuticas para Atenção Integral às Pessoas com Infecções Sexualmente Transmissíveis – IST. Brasília, Brazil: Ministério da Saúde.

Ministério da Saúde. (2018). Protocolo Clínico e Diretrizes Terapêuticas para Manejo da Infecção pelo HIV em Adultos. Brasília, Brazil: Ministério da Saúde.

Ministério da Saúde. (2020). Protocolo Clínico e Diretrizes Terapêuticas para Atenção Integral às Pessoas com Infecções Sexualmente Transmissíveis – IST. Brasília, Brazil: Ministério da Saúde.

Ministério da Saúde. (2023). Protocolo Clínico e Diretrizes Terapêuticas para Atenção Integral às Pessoas com Infecções Sexualmente Transmissíveis – IST. Brasília, Brazil: Ministério da Saúde.

Ministro do Estado da Saúde. (1986). Portaria no 542, de 22 de dezembro de 1986. Brasília, Brazil: Ministério da Saúde.

Montanha, R. M., Gioia, T. B., Ramos, A. C. V., Ferreira, N. M. D. A., Torres, M. A. F., Pimenta, R. A., et al. (2024). HIV and AIDS in the state of Paraná, Brazil, 2007-2022: Trends and spatiotemporal distribution. Revista Brasileira de Epidemiologia, 27, e240015. https://doi.org/10.1590/1980-549720240015

Obeagu, E. I., & Onuoha, E. C. (2023). Tuberculosis among HIV patients: A review of prevalence and associated factors. International Journal of Advanced Research in Biological Sciences, 10(9), 128–134. https://doi.org/10.22192/ijarbs.2023.10.09.014

Pan American Health Organization. (2008). Indicadores básicos para a saúde no Brasil: Conceitos e aplicações (2nd ed.). Brasília, Brazil: Pan American Health Organization.

Pan American Health Organization. (n.d.). HIV/AIDS. Retrieved March 9, 2025, from https://www.paho.org/pt/topicos/hivaids

Pereira, G. F. M., Pimenta, M. C., Giozza, S. P., Caruso, A. R., Bastos, F. I., & Guimarães, M. D. C. (2019). HIV/AIDS, STIs and viral hepatitis in Brazil: Epidemiological trends. Revista Brasileira de Epidemiologia, 22(Suppl. 1), e190001. https://doi.org/10.1590/1980-549720190001.supl.1

Pinto Neto, L. F. D. S., Perini, F. D. B., Aragón, M. G., Freitas, M. A., & Miranda, A. E. (2021). Protocolo Brasileiro para Infecções Sexualmente Transmissíveis 2020: Infecção pelo HIV em adolescentes e adultos. Epidemiologia e Serviços de Saúde, 30(spe1), e2020588. https://doi.org/10.1590/s1679-4974202100013.esp1

Sciarotta, D., Melo, E. A., Damião, J. D. J., Filgueiras, S. L., Gouvêa, M. V., Baptista, J. G. B., et al. (2021). O “segredo” sobre o diagnóstico de HIV/AIDS na Atenção Primária à Saúde. Interface - Comunicação, Saúde, Educação, 25, e200878. https://doi.org/10.1590/interface.200878

Silva, D. G. D., Lima, R. C. C., Oliveira, F. G. D., Otero, S. G., Natário, R. M., Pereira, L. T. T., et al. (2021). Perfil epidemiológico de pacientes internados por HIV/AIDS no Brasil: Revisão integrativa da literatura. Research, Society and Development, 10(9), e19410917976. https://doi.org/10.33448/rsd-v10i9.17976

TabNet Win32 2.4: Casos de AIDS identificados no Brasil. (n.d.). Retrieved March 10, 2025, from http://www2.aids.gov.br/cgi/tabcgi.exe?tabnet/br.def

Tavares, M. D. P. M., Souza, R. F. D., Tavares, A. D. P. M., Vilela, M. F. D. C., Souza, V. F. D., Fontana, A. P., et al. (2021). Perfil epidemiológico da AIDS e infecção por HIV no Brasil: Revisão bibliográfica. Brazilian Journal of Health Review, 4(1), 786–790. https://doi.org/10.34119/bjhrv4n1-068

UNAIDS Brasil. (2022). Estatísticas. Retrieved March 9, 2025, from https://unaids.org.br/estatisticas/

Veronesi, R., & Focaccia, R. (2020). Tratado de infectologia (6th ed.). São Paulo, Brazil: Atheneu.

B20-B24 Doença pelo vírus da imunodeficiência humana [HIV]. (n.d.). Retrieved March 10, 2025, from http://www2.datasus.gov.br/cid10/V2008/WebHelp/b20_b24.htm

Panorama do Censo 2022. (n.d.). Retrieved March 10, 2025, from https://censo2022.ibge.gov.br/panorama/