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Temporal trend in the incidence of AIDS in people aged 50 and over in Brazil*

Tendência temporal da incidência da AIDS em pessoas com 50 anos ou mais no Brasil

Tendencia temporal de la incidencia del sida en personas de 50 años y más en Brasil

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Abstract: **Objective**: to analyze the temporal trend of the incidence of Acquired Immunodeficiency Syndrome (AIDS) in people aged 50 years or more in Brazil and its regions. **Method**: a mixed ecological study of reported cases of AIDS in people aged 50 years or more between 2007 and 2017, in Brazil and regions. Data were extracted from the National System of Diseases and Notification and analyzed using the Prais-Winsten method. **Results**: the temporal trend of the incidence of AIDS in people aged 50 years or more was stable in Brazil and the Southeast, South, and Midwest regions (annual percentage variation: 10.7; 4.9; 8.4 and 12.2, respectively); in the North and Northeast regions, it was increasing (annual percentage variation: 16.6 and 20.6, respectively). **Conclusion**: the incidence of AIDS in Brazil and the Southeast, South and Midwest regions were stable, as well as an increase in the incidence of the disease in the North and Northeast regions, in the population studied.
Descriptors: Acquired Immunodeficiency Syndrome; Ecological Studies; Middle-aged; Aged; Disease Notification

Resumo: **Objetivo:** analisar a tendência temporal da incidência da Síndrome da Imunodeficiência Adquirida (AIDS) em pessoas com 50 anos ou mais no Brasil e suas regiões. **Método:** estudo ecológico misto dos casos

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notificados de AIDS em pessoas de 50 anos ou mais entre 2007 e 2017, no Brasil e regiões. Os dados foram extraídos do Sistema Nacional de Agravos e Notificação e analisados pelo método *Prais-Winsten*. **Resultados:** a tendência temporal da incidência de AIDS em pessoas com 50 anos ou mais foi estável no Brasil e nas regiões Sudeste, Sul e Centro-Oeste (variação percentual anual: 10,7; 4,9; 8,4 e 12,2, respectivamente); nas regiões Norte e Nordeste, foi crescente (variação percentual anual: 16,6 e 20,6, respectivamente). **Conclusão:** houve estabilidade da incidência de AIDS no Brasil e nas regiões Sudeste, Sul e Centro-Oeste, como também aumento da incidência da doença nas regiões Norte e Nordeste, na população estudada.
Descritores: Síndrome de Imunodeficiência Adquirida; Estudos Ecológicos; Pessoa de Meia-idade; Idoso; Notificação de Doenças

Resumen: Objetivo: analizar la tendencia temporal de la incidencia del Síndrome de Inmunodeficiencia Adquirida (SIDA) en personas de 50 años o más en Brasil y sus regiones**. Método:** estudio ecológico mixto de casos notificados de sida en personas de 50 años o más entre 2007 y 2017, en Brasil y regiones. Los datos fueron extraídos del Sistema Nacional de Enfermedades y Notificación y se analizaron mediante el método Prais-Winsten. **Resultados:** la tendencia temporal de la incidencia de SIDA en personas de 50 años o más fue estable en Brasil y en las regiones Sudeste, Sur y Centro-Oeste (variación porcentual anual: 10,7; 4,9; 8,4 y 12,2, respectivamente); y en las regiones Norte y Nordeste aumentó (variación porcentual anual: 16,6 y 20,6, respectivamente). **Conclusión:** hubo estabilidad en la incidencia de sida en Brasil y en las regiones Sudeste, Sur y Centro-Oeste, así como un aumento en la incidencia de la enfermedad en las regiones Norte y Nordeste, en la población estudiada.
Descriptores: Síndrome de Inmunodeficiencia Adquirida; Estudios Ecológicos; Persona de Mediana Edad; Anciano; Notificación de Enfermedades

Introduction

The Acquired Immunodeficiency Syndrome (AIDS) caused by the Human Immunodeficiency Virus (HIV), even after almost 40 years of its appearance, is considered a public health problem. By the end of 2018, about 44 million people were living with HIV worldwide and 1.1 million deaths from AIDS-related causes had occurred.[1] In Brazil, 43,941 new cases of HIV and 37,161 of AIDS were reported in 2018.[2] In that same year, the AIDS detection rate in the general population was 17.8/100,000 inhabitants.[2]

Since the emergence of HIV and AIDS, the epidemiological profile of people who acquire and live with HIV has changed. In the beginning, it was common in young people, homosexuals, residents of large cities, and people with higher socioeconomic status. In the 1990s, it gradually reached smaller cities and other population segments, starting to be diagnosed also in people with low socioeconomic status, heterosexuals, and women. In the following decades, there was

an increase in the incidence of both the virus and the disease in homosexuals and men and older people, such as those aged 50 or over.[3-4]

The average annual record of new AIDS cases since 2013 in Brazil has been 40,000, in which about 20% were people aged 50 or over.[2] For this population and their families, the burden of HIV/AIDS is significant because of the different physical, psychological, and social changes such as increased chances of opportunistic infections, hospitalizations, functional limitations, stress, depression, discrimination, and social isolation.[4] One hypothesis for this increase in cases is the extension of the life of these individuals combined with unprotected sexual practices or the fact that the use of Antiretroviral Therapy (ART) has enabled the aging of people living with HIV (PLHIV).[4-5]

This gradual increase in PLHIV in the world and Brazil has developed several types of studies on HIV and AIDS in the adult population, including several studies aimed at investigating the time distribution of incidence, prevalence, and/or mortality.[6-9] However, few studies on the temporal trend of HIV or AIDS in people aged 50 years and over were found in the literature. In China, there was a significant increase in the incidence of HIV and AIDS in this population between 2004 and 2014.[10] In Botswana, in the time series from 2004 to 2013, an increasing trend of HIV prevalence in people aged 50 or over was found.[11]

Most research aimed at estimating AIDS trends in people aged 50 years and over in Brazil used states or municipalities as the unit of analysis. In all of them, we observed an increase in the incidence of the disease in this population.[12-16] Studies with cases of individuals in this age group, with nationally consolidated data, are scarce. One of them evaluated the temporal trend of AIDS in Brazil in the period 1980 — 2008 in people over 50 years old but compared with other ages.[17] Another had a similar objective and level of disaggregation, however, it used mortality as an indicator and the period was from 2000 to 2011.[8]

When considering the change in the epidemiological profile of AIDS over the years, the extension of the population's sexual life, the aging of PLHIV, the burden of HIV, and the scarcity of temporal trend studies on the incidence of AIDS in people aged 50 years and over, the research question is: what is the trend of AIDS in people aged 50 or over in Brazil and its regions? To answer this question, the objective was to analyze the temporal trend of the incidence of AIDS in people aged 50 years or more in Brazil and its regions.

Method

This is a mixed ecological study of the incidence rates of AIDS in people aged 50 years or more in Brazil and its geographic regions, from 2007 to 2017.

We carried out the study with data from the National System of Diseases and Notification (SINAN - *Sistema Nacional de Agravos e Notificação*), which gathers information on all cases of compulsory notification diseases and is available at the Information Technology Department of the Unified Health System (DATASUS - *Departamento de Informática do Sistema Único de Saúde*). Population data were obtained through the projection of the population of Federation Units by gender and age groups: 2000 to 2030 by the Brazilian Institute of Geography and Statistics (IBGE).[18] The population consisted of all notified cases of AIDS in people of 50 years or more. This age group was chosen considering the rapid process of population aging that has taken place in Brazil in recent years and the changing age distribution of the HIV epidemic in the world.[4]

We collected information in October 2019. We included all cases of AIDS in people aged 50 years or more notified in the analyzed period. Notification in SINAN follows the criteria for defining AIDS in CDC-adapted adults and/or Rio de Janeiro/Caracas, established by the Ministry of Health (MH). The study period was chosen considering the availability of complete information in the database used.

Data were generated in a Comma Separated Values (CSV) file considering the following variables of interest: gender (male, female), skin color/race (white, black, Asian, brown, indigenous, ignored), education level (illiterate, 1st to 4th incomplete grade, complete 4th grade, incomplete 5th to 8th grade, complete elementary school, incomplete high school, complete high school, incomplete higher education, complete higher education), age group (50-59, 60-69, 70-79, 80 and over), category of exposure (homosexual, bisexual, heterosexual, injecting drug user, hemophiliac, transfusion, biological accident and ignored) and year (2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016 and 2017).

Then, we exported and organized the data in a Microsoft Office Excel spreadsheet. The characteristics of AIDS cases in people aged 50 years or more were analyzed according to Brazil and region of notification through absolute and relative frequency.

We calculated annual AIDS incidence coefficients per 100,000 population. Subsequently, we performed the direct standardization of age-adjusted incidence coefficients, using the Brazilian population as a reference based on inter-census projections (2000 – 2030) available in DATASUS, to cancel out the effect of the unequal demographic distribution of the population.

Trend analysis was performed for all Brazil and geographic regions using the generalized linear regression model using the Prais-Winsten method. The dependent variable was the logarithm of the coefficients and the independent variable was the years of the time series. The annual percentage change (APC) was calculated by the formula $-1+10b = \Delta$, and for the confidence interval (CI) $\Delta CI95\% = -1+10(b \pm t^{*}se)$ where "b" corresponds to the rate of annual growth. The values of "b" and standard error (se) were extracted from the regression analysis and the value of "t" provided by the Student's t distribution table.

The increasing, decreasing, or stable trend was expressed as APC, with the respective CI (95%). We considered stable (if $p>0.05$), decreasing (if $p<0.05$ and negative regression coefficient),

and increasing (if $p<0.05$ and positive regression coefficient). For trend analysis, we used the Stata software, version 12.0.

Although the study was carried out with secondary data, all ethical precepts established in Resolution 466/2012 of the National Health Council were followed.

Results

From 2007 to 2017, 49,188 cases of AIDS were reported in Brazil in people aged 50 years and over. The largest number of cases was registered in the age group between 50 and 59 years old (35.599; 72.4%), in males (30.619; 62.2%), in the white race/skin color (23.480; 47.7%), with incomplete school from 5th to 8th grade (8.142; 22.5%) and in the category of heterosexual exposure (32.678; 66.4%) (Table 1).

As for the distribution of AIDS cases in the population studied according to Brazilian regions, the largest number of cases was registered in the Southeast region (20.898; 42.5%), followed by the South region (13.230; 26.9%). Male cases were predominant in the North (66.1%), Northeast (66.2%), Southeast (62.3%), and Midwest (61.2%) regions. Brown race/skin color was more frequent in the North (74.2%), Northeast (65.5%), and Midwest (48.7%) regions. In the Southeast (49.7%) and South (77%) regions, white race/skin color was predominant. Incomplete 5th to 8th grade of school was more frequent in the North (22.4%), Southeast (20.5%), South (28%), and Midwest (22.4%) regions. In the Northeast region (19.8%), incomplete 1st to 4th grade schooling was more frequent. The age group from 50 to 59 years old and the heterosexual exposure category represented most of the cases in all Brazilian regions (Table 1).

Table 1 - Distribution of notified AIDS cases among people aged 50 and over in Brazil and its regions according to sociodemographic variables. Brazil, 2007–2017.

Variables	Brazil	North	Northeast	Southeast	South	Midwest
	% (n)	% (n)	% (n)	% (n)	% (n)	% (n)
Gender						
Total	49.188	3.129	8.501	20.898	13.230	3.430
Male	62.2 (30.619)	66.1 (2.067)	66.2 (5.631)	62.3 (13.013)	59.0 (7.808)	61.2 (2.100)
Female	37.8 (18.569)	33.9 (1.062)	33.8 (2.870)	37.7 (7.885)	41.0 (5.422)	38.8 (1.330)
Age group						
Total	49.188	3.129	8.501	20.898	13.230	3.430
50-59	72.4 (35.599)	73.6 (2.304)	72.3 (6.147)	72.7 (15.193)	71.9 (9.510)	71.3 (2.445)
60-69	22.4 (11.035)	20.8 (651)	22.6 (1.918)	22.2 (4.634)	23.2 (3.075)	22.1 (757)
70-79	4.5 (2.214)	4.5 (141)	4.2 (359)	4.5 (936)	4.4 (578)	5.8 (200)
80 and more	0.7 (340)	1.1 (33)	0.9 (77)	0.6 (135)	0.5 (67)	0.8 (28)
Race/skin color						
Total	49.188	3129	8.501	20.898	13.230	3.430
White	47.7 (23.480)	13.5 (421)	15.8 (1.342)	49.7 (10.381)	77.0 (10.182)	33.6 (1.154)
Black	10.2 (5.040)	5.2 (164)	10.3 (875)	12.3 (2.562)	8.8 (1.169)	7.9 (270)
Asian	0.5 (236)	0.4 (14)	0.3 (25)	0.5 (114)	0.4 (49)	1.0 (34)
Brown	33.6 (16.520)	74.2 (2.321)	65.5 (5.565)	27.0 (5.650)	9.9 (1.313)	48.7 (1.671)
Indigenous	0.3 (124)	0.9 (29)	0.2 (18)	0.1 (27)	0.2 (23)	0.8 (27)
Ignored	7.7 (3.788)	5.8 (180)	8.0 (676)	10.4 (2.164)	3.7 (494)	8.0 (274)
Education level						
Total	36.132	2.249	6.020	14.461	10.938	2.464
Illiterate	6.6 (2.374)	10.7 (240)	14.2 (856)	4.5 (650)	3.9 (426)	8.2 (202)
Incomplete 1st to 4th grade	16.8 (6.061)	20.4 (458)	19.8 (1.191)	15.6 (2.261)	15.2 (1.660)	19.9 (491)
Complete 4th grade	11.6 (4.186)	10.7 (240)	9.5 (572)	12.0 (1.741)	12.8 (1.399)	9.5 (234)
Incomplete 5th to 8th grade	22.5 (8.142)	22.4 (504)	17.7 (1.064)	20.5 (2.960)	28.0 (3.061)	22.4 (553)
Complete Elementary school	12.9 (4.661)	8.0 (181)	10.4 (624)	14.5 (2.104)	13.6 (1.490)	10.6 (262)
Incomplete high school	5.7 (2.044)	4.6 (103)	4.5 (272)	5.9 (848)	6.1 (669)	6.2 (152)
Complete high school	14.3 (5.172)	14.9 (335)	15.8 (949)	15.5 (2.239)	12.3 (1.350)	12.1 (299)
Incomplete higher education	1.9 (676)	1.8 (40)	1.4 (86)	2.0 (292)	1.9 (209)	2.0 (49)
Complete	7.8 (2.816)	6.6 (148)	6.7 (406)	9.4 (1.366)	6.2 (674)	9.0 (222)

higher education						
Exposure category						
Total	49.219	3.133	8.488	20.912	13.252	3.434
Homosexual	7.7 (3.811)	7.0 (218)	8.8 (743)	9.1 (1.901)	5.6 (744)	6.0 (205)
Bisexual	4.1 (2.029)	4.1 (130)	4.6 (387)	4.7 (990)	3.1 (405)	3.4 (117)
Heterosexual	66.4 (32.678)	75.8 (2.374)	63.1 (5.354)	60.4 (12.622)	74.0 (9.812)	73.3 (2.516)
IDU*	1.9 (938)	0.8 (26)	0.9 (76)	2.1 (445)	2.7 (359)	0.9 (32)
Hemophilic	0.0 (11)	0.1 (2)	0.1 (5)	0.0 (3)	0.0 (1)	0.0 (0)
Transfusion	0.1 (25)	0.0 (0)	0.0 (0)	0.1 (14)	0.1 (9)	0.1 (2)
Biological accident	0.0 (3)	0.0 (0)	0.0 (0)	0.0 (1)	0.0 (2)	0.0 (0)
ignored	19.8 (9.724)	12.2 (383)	22.7 (1.923)	23.6 (4.936)	14.5 (1.920)	16.3 (562)

Source: Notifiable Diseases Information System (SINAN/AIDS). SUS Informatics Department.
*IDU: injecting drug users

When we analyzed the AIDS incidence coefficients together, they showed stability with an average coefficient of 10.9/100.000 inhabitants. When analyzed by region, we observed a growing trend in the North and Northeast regions and stability in the other regions of the country (Table 2).

Table 2 - Number and percentage of notified AIDS cases, average coefficient per 100,000 population, and trend of AIDS incidence rates in people aged 50 and over by region. Brazil, 2007–2017

Region	Cases		Average coefficient†	APC*	CI95%§	Interpretation
	N	%				
North	3.129	6.4	11.9	16.6	4.2; 30.5	Growing
North East	8.501	17.3	7.9	20.6	5.1; 38.3	Growing
Southeast	20.898	42.5	9.9	4.9	-5.3; 16.2	Stable
South	13.230	26.8	17.8	8.4	-7.1; 26.5	Stable
Midwest	3.430	7.0	11.2	12.2	-5.3; 33.0	Stable
Brazil	49.188	100.0	10.9	10.7	-3.1; 26.4	Stable

† Standardized coefficients for the Brazilian population. * Annual percentage change.§ APC Confidence Interval.

Figure 1 shows the increase in AIDS incidence coefficients between 2007 and 2017 in the North and Northeast regions, and the stability of the AIDS incidence coefficients in Brazil and the Southeast, South, and Midwest regions.

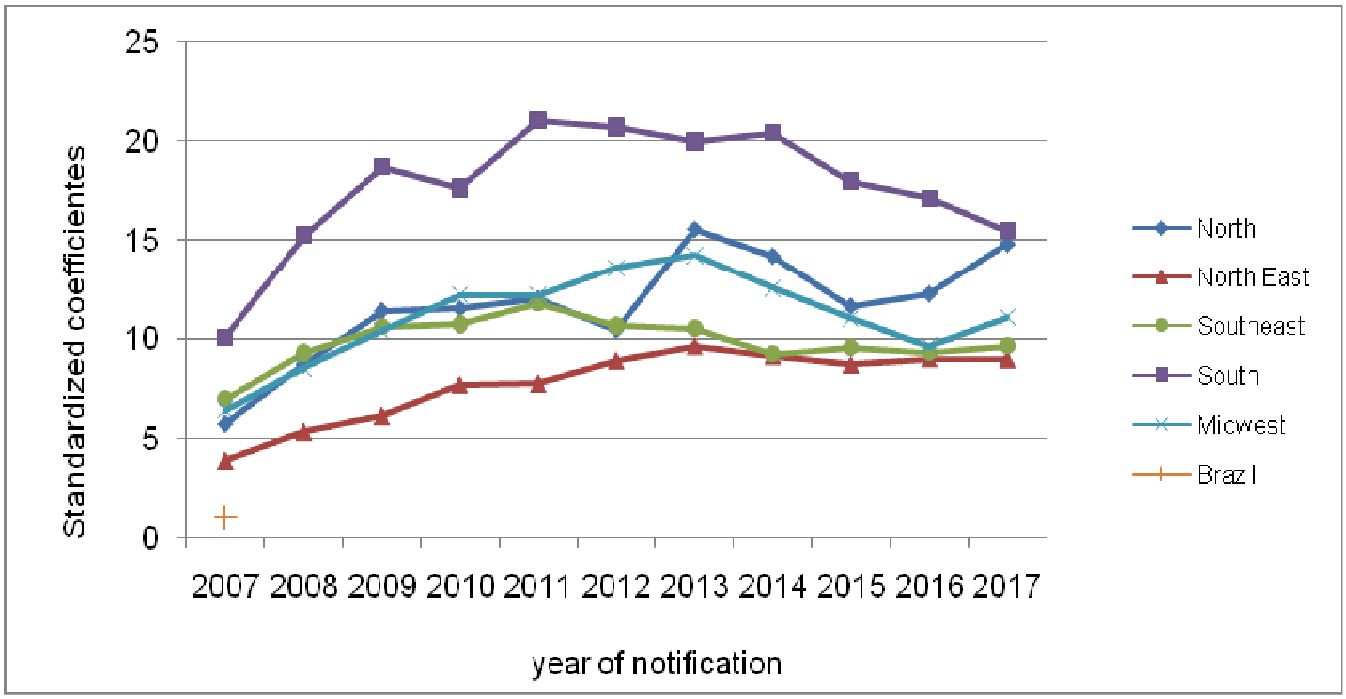

Figure 1 - Time series of AIDS incidence coefficients according to Brazilian regions. Brazil, 2007–2017.
‖ Standardized coefficients for the population of Brazil.

Discussion

The main finding of this study was the stable trend of AIDS incidence coefficients in people aged 50 years and over in Brazil. The stability trend found is maybe related to advances in health services and public policies in the diagnosis, treatment, and monitoring of HIV/AIDS, especially the introduction of ART.[19] This contributed to the control of the infection, reduced mortality, and increased life expectancy, making AIDS a chronic disease.[4]

Also, this trend may have been influenced by the decrease in the AIDS detection rate in the general population. In 2012, the rate was 21.4/100.000 inhabitants and went to 17.8/100.000 inhabitants in 2018, representing a decrease of 16.8%.[2]

The analysis of temporal trends of AIDS incidence coefficients by region in this study showed different patterns. In the literature, there were no studies that analyzed the temporal trend of AIDS in people aged 50 years or more on a regional basis, which makes it difficult to compare results. However, studies carried out in states in the Northeast[12-13,15] and the North[16] show that there has been an increase in AIDS cases in adults aged 50 years and over.

In Paraíba, a growing trend of incidence around 232% was identified in just over 10 years. While in the general population, there was little variation, with a growth of 5%.[13] In Ceará, we also found an increasing trend, especially in people aged 60 to 69 years.[12] In the North region, a study conducted in the state of Rondônia found an increase of 440% in the incidence of HIV/AIDS in people aged 50 and over, in the period 2000 to 2011.[16] The increase observed in the trend in these regions may be due to improved access to health services and reporting systems, investigation and processing the data over the years, which may have contributed to showing cases that were previously unreported.[20-21]

Although the South region and the Midwest and Southeast regions presented a stable temporal trend in the analyzed period, its average coefficient was higher, indicating that this region has a higher incidence of the disease. This result is maybe related to the region's human development index (HDI), which may favor greater access to health and diagnostic services. Evidence points to high rates of AIDS in places with better living conditions and the South region has the best rates in the country in terms of health, education, and income.[6,22]

Regarding the characteristics of the population studied, there is a predominance of cases in the age group of 50 to 59 years. This finding is because these people may have become infected in earlier age groups, did not undergo diagnostic tests for HIV, and/or had a late

diagnosis of the infection.[23-24] This result indicates that, for these individuals, aging will come with all the consequences of living with a chronic condition that entails several physical, psychological and social changes.[4] Also, aging with AIDS brings a significant increase in costs to health services due to the increased chances of these people developing multi-morbidities, opportunistic infections and need specialized care, medications, and hospitalizations.[4,25-26]

As in this study, other previous ones corroborate that heterosexual transmission was predominant in people aged 50 years or more.[14-15,17,27] The predominance of HIV transmission through sex in the analyzed cases is an expected finding, as it follows a pattern of behavior and ratifies sexual transmission as predominant in Brazil.[2] This result also reinforces that middle-aged and elderly people have maintained an active sexual life associated with unprotected sex and should be included in HIV prevention actions.[5,28]

Another interesting result found in this research and which shows the dynamics of the HIV epidemic is that initially, it was prevalent in men, then there was a period of feminization of the infection and, recently, the infection is predominant in males.[3] The disease probably returned to grow in men because, in general, they are more resistant to taking care of their health and less likely to seek health services for prevention.[29]

The predominance of cases with low education, a variable that represents the socioeconomic status of the population, is a result similar to the study carried out in the state of Paraíba[13] and another one developed in Botswana with people aged 50 years or more with HIV.[11] This is maybe because Brazil and Botswana are developing countries, whose populations have low socioeconomic levels. Furthermore, this portion of the population comes from a period in which access to school was incipient.[30] The level of education can directly influence the practice of self-care, knowledge about the disease, and understanding of the treatment.[6]

Although this study allows us to know the temporal distribution of AIDS in people aged 50 years and over, it has some limitations. As it is a disease that presents signs and symptoms

that are confused with changes in the aging process, there may be underreporting and late diagnosis. Another limitation is the use of a secondary database, with information limited to notification forms, which does not allow researchers to control aspects related to the completeness of the data. Therefore, we recommend that health services carry out continuing education on notification of injuries filling out notifications, typing, and recording information.

Other studies should be developed with the theme, regarding aging with HIV, the exercise of sexuality, and prevention of Sexually Transmitted Infections (STIs) and AIDS in middle-aged and elderly people. We recommend analyzing the distribution of HIV over time in this portion of the population since the infection became an aggravation of compulsory notification throughout the national territory only in 2014.

Conclusion

The results of this study showed stability in the incidence of AIDS in Brazil and the Southeast, South, and Midwest regions, as well as an increase in the incidence of AIDS in this population in the North and Northeast regions. We also found that the age group from 50 to 59 years old, male, incomplete elementary school, white race/skin color, and heterosexual transmission was the profile with the highest frequency in the analyzed cases.

These findings indicate that AIDS in older people is relevant in the epidemiological context, pointing to the need to include this group in prevention and care actions carried out by health services throughout the country. Also, it contributed to the organization of care and management of HIV in the PLHIV Health Care Network, such as those in the age groups listed in the study. We recommend that there is a reconfiguration of professional practices within the scope of the sexuality of people who are aging and the implementation of health education actions on safe sexual practice and vulnerability to STI/AIDS for this specific group.

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