

# Epidemiology of HIV and AIDS in the state of Rio Grande do Sul, Brazil, 1980-2015\*

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**Gerson Fernando Mendes Pereira**<sup>1</sup> –  [orcid.org/0000-0001-8886-1662](https://orcid.org/0000-0001-8886-1662)

**Helena Eri Shimizu**<sup>2</sup>

**Ximena Pamela Bermudez**<sup>2</sup>

**Edgar Merchan Hamann**<sup>2</sup>

<sup>1</sup>Ministério da Saúde, Secretaria de Vigilância em Saúde, Brasília, DF, Brasil

<sup>2</sup>Universidade de Brasília, Departamento de Saúde Coletiva, Brasília, DF, Brasil

## Abstract

**Objective:** to describe the HIV/AIDS epidemic in the state of Rio Grande do Sul and the metropolitan region of Porto Alegre (MRPA), Brazil, in the period 1980-2015. **Methods:** this was a descriptive study using data from Ministry of Health information systems. **Results:** 83.313 AIDS cases were recorded in the state; during the periods 1980-1990, 1991-2000 and 2001-2015, the detection rates in the state were 1.1, 17.2 and 40.3/100,000 inhab., respectively, and in the MRPA the detection rates were 2.4, 33.6 and 66.9/100,000 inhabitants, while mortality rates were 0.5, 8.5 and 12.6/100,000 inhab. in the state, and 1.3, 17.3 and 21.7/100,000 inhab. in the MRPA; in 2001-2015, the detection rate of HIV+ pregnant women per 1.000 live births in the state was 8.1 and 13.7 in the MRPA, while injecting drug users in the state (8.2%) and in the MRPA (8.9%) also stood out. **Conclusion:** the epidemic is generalized in the MRPA and with greater magnitude in relation to the state.

**Keywords:** HIV Infection; Acquired Immune Deficiency Syndrome; Epidemics; Brazil; Epidemiology, Descriptive.

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## Correspondence:

**Gerson Fernando Mendes Pereira** – Ministério da Saúde, Secretaria de Vigilância em Saúde, Departamento de Vigilância, Prevenção e Controle das Infecções Sexualmente Transmissíveis, do HIV/Aids e das Hepatites Virais, SRTVN, Quadra 701, Lote D, Edifício PO 700, 5º andar, Brasília, DF, Brazil. CEP: 70719-040  
E-mail: [gerson.pereira@aids.gov.br](mailto:gerson.pereira@aids.gov.br)

## Introduction

According to Joint United Nations Program on HIV/AIDS (UNAIDS) estimates for 2015, worldwide there are 38.8 million people living with HIV, and 2.1 million of them accounted for new infections that year. In addition, also in 2015, a total of 17 million people were estimated to be receiving treatment and 1.1 million died from the disease. It is estimated that around 50% of people living with HIV need treatment and many are unaware of their HIV status.<sup>1</sup>

In Brazil, HIV infection prevalence estimates for parturient women for the period 2004 to 2006 indicate that prevalence is 0.4% in females.<sup>2,3</sup> Among young males in the 17-20 age range, HIV prevalence was estimated at 0.12% in 2007.<sup>4</sup> Studies conducted in 2008-2009 estimated prevalence of 4.9% among injecting drug users (IDUs),<sup>5</sup> 12.1% among men who have sex with men<sup>6</sup> and 5.8% among women sex workers.<sup>7</sup>

*As of June 2016, 842,710 AIDS cases had been recorded since 1980. Between 2005 and 2015 41,100 new cases were recorded each year on average.*

According to World Health Organization (WHO) criteria,<sup>8</sup> the HIV epidemic in Brazil is a concentrated one: prevalence rates among key populations (IDUs, men who have sex with men and women sex workers) are higher than in the general population aged 15 to 49; in 2004, HIV infection prevalence was 0.42%: 0.31% among females and 0.52% among males.<sup>2</sup> A generalized epidemic, in turn, is characterized as one that is firmly established in the general population, with prevalence of infection above 1% in pregnant women.<sup>8</sup>

As of June 2016, 842,710 AIDS cases had been recorded since 1980.<sup>9</sup> Between 2005 and 2015 41,100 new cases were recorded each year on average. In the period from 2005 to 2015, the detection rate in the country as a whole remained stable, with an annual average of 20.7/100,000 inhab. In the Southern region, this rate was also stable, with an annual average of 31.6/100,000 inhab. The North, Northeast and Midwest regions showed a significant trend of growth. The Southeast region had a decreasing trend, with detection rates of 25.2 and 18.0 new cases/100,000 inhab. in 2005 and 2015, respectively.<sup>9</sup>

Rio Grande do Sul state stands out in the Southern region. From January 1982 to June 2016 the state recorded 84,852 AIDS cases, accounting for 50.1% of accumulated cases in the region and 10.1% in Brazil.<sup>9</sup> Taking the time series since 2005, the state is among the three Federative Units with the highest detection rates.<sup>9</sup> In 2015 the AIDS case detection rate in Rio Grande do Sul was 74.0/100,000 inhab.; since 2001 the state has had the highest AIDS mortality rates in Brazil.<sup>9</sup>

In 2014, UNAIDS reported that HIV prevalence among women was 2% in Rio Grande do Sul,<sup>10</sup> in 2004, the prevalence of HIV infection among women in the country as a whole was much lower: 0.4%.<sup>2</sup> According to WHO parameters, the epidemic in Rio Grande do Sul is generalized.

Studies on the HIV/AIDS epidemic in the state of Rio Grande do Sul, their results and conclusions are useful for informing the debate on the pattern of the epidemic in that state and in its sole metropolitan region, known as Grande Porto Alegre, as well as reflecting on the strategies adopted to cope with the disease.

The objective of this paper is to describe the HIV/AIDS epidemic in the state of Rio Grande do Sul and the metropolitan region of Porto Alegre (MRPA), Brazil, in the period from 1980 to 2015.

## Methods

This was a descriptive study based on secondary data on AIDS cases reported between 1980 and 2015 in the state of Rio Grande do Sul.

In 2010, Rio Grande do Sul had a territorial area of 281,731.45km<sup>2</sup> and had a population of 10,693,929 inhabitants. The metropolitan region of Porto Alegre covered 34 municipalities with 4,031,688 inhabitants occupying an area of 10,340.00 km<sup>2</sup>.<sup>11</sup>

The sources of secondary data used were: (i) Notifiable Diseases Information System (SINAN); (ii) Mortality Information System (SIM); (iii) Laboratory Tests Control System (SISCEL); and (iv) Medication Logistics Control System (SICLOM).

The databases were linked with the objective of identifying the greatest number of cases, thus reducing possible underreporting and/or delay in data recording on the systems. The following were included for the probabilistic linkage of the data: (i) the number of AIDS cases reported on SINAN between 1980 and 2015, (ii) deaths recorded on SIM and classified with

'AIDS' as their underlying cause, codes B20 to B24 of the International Statistical Classification of Diseases and Related Health Problems (ICD), between 1999 and 2015, and (iii) AIDS cases with laboratory tests held on SISCEL and who met the following criteria defining:

- adults with CD4+ T lymphocyte counts below 350 cells/mm<sup>3</sup> and detectable viral load;
- children with CD4+ T lymphocyte counts lower than expected for their current age and two viral load counts greater than 10,000 copies/mL;
- adults with CD4+ T lymphocyte counts below 350 cells/mm<sup>3</sup> and use of medication recorded on SICLOM; or
- children with CD4+ T lymphocyte count lower than expected for their current age and use of medication recorded on SICLOM.<sup>16</sup>

SICLOM records were used to confirm AIDS cases with laboratory tests recorded on SISCEL who met the defining criteria; a detailed description of the methodology has been published previously.<sup>12</sup>

Database linkage only took into account recorded AIDS cases, since the inclusion of HIV infection on the list of notifiable diseases started in 2014 and HIV infection in pregnant women was included with effect from the year 2000.

The Windows version SINAN databases of cases reported until 2006 are frozen and unified. With regard to the NET version databases for cases notified from 2007 onwards, first of all duplicated cases were removed, based on the comparison of the following fields: patient's name, patient's mother's name and patient's date of birth. The child and adult databases were then linked to each other with the aim of identifying children who might have been notified on the adult database. The method for excluding duplicated cases from SINAN (NET version) was based on the criteria of case definition and date of diagnosis. Thus, duplicated records were excluded according to criteria hierarchy (Adapted CDC, Rio-Caracas, Death criterion, HIV-positive and discarded cases);<sup>12</sup> in the event of duplicated cases within the same definition criterion, the first date of diagnosis was selected.

The probabilistic linkage between all the databases was performed taking the patient's name, the patient's mother's name and the patient's date of birth as comparison fields, and the phonetic codes for the patient's first and last names and the patient's sex as blocking keys, combined in different modes in three

fully automated steps using RecLink III software.<sup>13,14</sup> In order to perform linkage pairing between the SINAN platforms (Windows and NET), the information gathered from SINAN Windows only considered cases falling into the definition criterion. The information about the records that do not meet this criterion were retrieved from SINAN NET. Duplicated records were removed from the SIM database using the same comparison fields used for the SINAN database.

The SISCEL and SICLOM databases enable the creation of the database of patients who access public health services to have CD4+ T or viral load counts or to get medication. Duplicated records were removed from this database using the same comparison fields as those used for the SINAN and SIM systems. The resulting database was then linked with the SIM database. The pairing of records found by linking the SIM and SISCEL/SICLOM databases prioritized the SISCEL/SICLOM information for those records that met the definition criterion. In the case of paired records that did not meet the criterion, the information was retrieved from the SIM system. The unified SISCEL/SICLOM and SIM records were linked to the SINAN records (combined Windows and NET versions) to identify probable SINAN underreporting from SINAN and add it to the AIDS database. The pairing of records through this linkage prioritized SINAN information only for cases that met the definition criterion. When cases did not meet this criterion, the information was obtained from SISCEL/SICLOM; and finally, if they did still not meet the criterion using SISCEL/SICLOM, the information was retrieved from the death records (SIM). The unified SISCEL/SICLOM and SIM records that were not paired with the SINAN system were included on the AIDS database when they met the following criteria: CD4+ T lower than expected for the age range, with detectable viral load; or medication dispensation; or death from AIDS as per the SIM system. Cases that did not meet these criteria were excluded from the database. Similarly, AIDS cases reported on SINAN and classified according to the discarded or HIV-positive or left blank criterion were excluded from the database if they were not paired with the SIM system or with the SISCEL/SICLOM record database. In addition, cases paired with the record database were eliminated if they did not meet one of the following criteria: CD4+ T lower than expected for the age range with detectable

viral load; or medication dispensation. With regard to cases not reported on SINAN but included on the AIDS database because they came from the SIM, SISCEL and SICLOM systems, the variable 'diagnosis date' variable was created, based on date of death (SIM) and date of first CD4+ T test (SISCEL), according to when the record was input to the database.

The cases obtained from the database resulting from the linkage between the SINAN, SISCEL/SICLOM and SIM system databases were used to calculate the following indicators for the periods 1980-1990, 1991-2000 and 2001-2015:

- AIDS case detection rates, according to sex and age, calculated using registered cases as the numerator and the specific populations at the study sites as the denominator, for each period.
- Sex ratios, calculated by dividing the total number of male AIDS cases by the total number of female cases, for each period.
- HIV detection rate in pregnant women, calculated by dividing the number of cases of HIV+ pregnant women registered by the number of live births, for each period.
- AIDS detection rates in children under 5 years old, calculated by dividing the number of AIDS cases in children under 5 years by the total population in the same age range, for each period.
- Proportion of AIDS cases according to exposure category, calculated by dividing the total number of AIDS cases by specific exposure category (heterosexual, homosexual, bisexual, IDUs, blood transfusion, accident at work, vertical transmission, ignored/blank), divided by the total number of AIDS cases, in percentages, for the periods 1980-1990, 1991-2000 and 2001-2015.
- Gross AIDS mortality rate, calculated by dividing the number of deaths due to AIDS (underlying cause), by place and period, by the total population in the same place and period.

When calculating the rates for the period 1980-2012, we used the Brazilian Institute of Geography and Statistics (IBGE) population estimates, calculated based on demographic censuses (1980, 1991, 2000 and 2010), population count (1996) and intercensal projections (1981 to 2012); for the years 2013, 2014 and 2015 we used IBGE population estimates, calculated by the study sponsored by the Brazilian Interagency Health Information Network (RIPSA).

The study project was submitted to the STD/AIDS Reference and Training Center Research Ethics Committee and was approved as per Protocol No 1,449,357, dated 14 March 2016.

## Results

83,313 AIDS cases were included in the study, recorded in the state of Rio Grande do Sul from 1980 to 2015: 63,567 of them originated from SINAN, 6,081 from SIM and 13,665 from SISCEL/SICLOM (Figure 1). AIDS detection rates per 100,000 inhabitants increased from 1.1 (1,051) case in the period from 1980 to 1990 to 40.3 (65,497) cases from 2001 to 2015 (Table 1).

Between the periods 1980-1990 and 1991-2000, the AIDS case detection rate increased 15.6 times, and from 1991-2000 to 2001-2015 it increased 2.3 times. The highest detection rates were identified in the 30-39 age range, with an increase in the study period from 2.4 to 39.1 and 90.5/100,000 in 1980-1990, 1991-2000 and 2001-2015, respectively (Table 1).

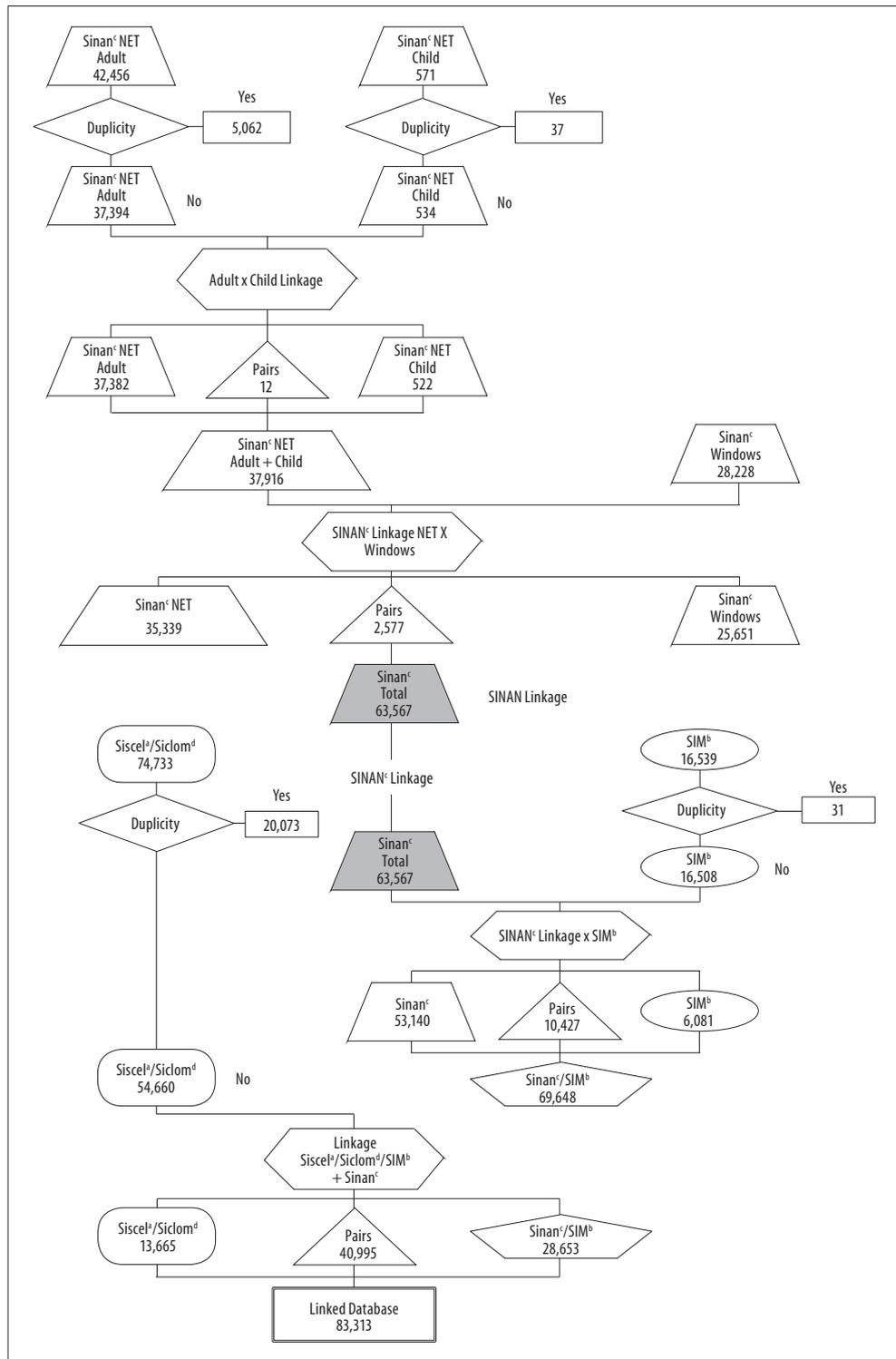
Of the total number of cases registered in the state between 1980 and 2015, 59.3% were male and 40.6% were female. Between 1980 and 1990, of the 1,051 cases diagnosed in Rio Grande do Sul, 89.1% were male. This percentage decreased to 69.0% in 1991-2000 and reached 56.4% in 2001-2015, showing that although there is a predominance of AIDS cases in men, there is a clear increase of cases in women (Table 1).

Between 2001 and 2015, 17,262 HIV-positive pregnant women were diagnosed, with a detection rate of 8.1/1,000 live births (Table 1).

Between 1980 and 2015, 2,020 AIDS cases were diagnosed in children under 5 years old. The HIV/AIDS detection rates in these children were 0.3/100,000 inhab. in 1980-1990, 8.5/100,000 inhab. in 1991-2000 and 10.6/100,000 inhab. in 2001-2015 (Table 1).

Between 1980 and 2015, 29,285 deaths in the state were registered on the SIM system having 'AIDS' as their underlying cause. The mortality rate in 1980-1990 was 0.5/100,000 inhab., 8.5/100,000 inhab. in 1991-2000 and 12.6/100,000 inhab. in 2001-2015 (Table 1), representing a 17-fold increase between the first two periods and an increase of 1.5 between the second and the third periods.

There was an increase in AIDS case detection rates in all age groups. However, they were concentrated in the



- a) SISCCEL: Laboratory Tests Control System.
- b) SIM: Mortality Information System.
- c) SINAN: Notifiable Diseases Information System.
- d) SICLOM: Medication Logistics Control System.

**Figure 1 – Database linkage flow diagram, Rio Grande do Sul, Brazil, 1980-2015**

**Table 1 – Characterization of AIDS cases, detection rates and mortality rates, Rio Grande do Sul, Brazil, 1980-2015**

| Rio Grande do Sul                                       | 1980-1990 |      | 1991-2000 |      | 2001-2015 |      | Total  |
|---|-----------|------|-----------|------|-----------|------|--------|
|   | N         | rate | N         | rate | N         | rate | N      |
| <b>General detection (rate per 100,000 inhab.)</b>      | 1,051     | 1.1  | 16,765    | 17.2 | 65,497    | 40.3 | 83,313 |
| <b>Sex (rate per 100,000 inhab.)</b>                    |           |      |           |      |           |      |        |
| Male  | 937       | 2.0  | 11,550    | 24.1 | 36,945    | 46.9 | 49,432 |
| Female  | 114       | 0.2  | 5,215     | 10.4 | 28,530    | 34.6 | 33,859 |
| Sex ratio   | –         | 8.2  | –         | 2.2  | –         | 1.3  | –      |
| <b>Age Group (rate per 100,000 inhab.)</b>              |           |      |           |      |           |      |        |
| <15   | 48        | 0.2  | 888       | 3.2  | 2,260     | 5.9  | 3,196  |
| 15-29   | 400       | 1.5  | 5,642     | 22.5 | 15,843    | 39.2 | 21,885 |
| 30-39   | 355       | 2.4  | 6,127     | 39.1 | 21,752    | 90.5 | 28,234 |
| 40-49   | 178       | 1.7  | 2,764     | 23.0 | 15,315    | 68.0 | 18,257 |
| ≥50   | 70        | 0.4  | 1,343     | 7.7  | 10,312    | 27.5 | 11,725 |
| <b>Pregnant HIV+ women (rate per 1,000 live births)</b> | –         | –    | –         | –    | 17,262    | 8.1  | 17,262 |
| <b>Detection in children (rate per 100,000 inhab.)</b>  | 29        | 0.3  | 747       | 8.5  | 1,244     | 10.6 | 2,020  |
| <b>Mortality (rate per 100,000 inhab.)</b>              | 536       | 0.5  | 8,269     | 8.5  | 20,480    | 12.6 | 29,285 |

Source: Ministry of Health, Health Surveillance Secretariat, Department of Surveillance, Prevention and Control of Sexually Transmitted Infections, HIV/AIDS and Viral Hepatitis.

15 to 39 years age group (60% of the total). Detection rates according to age range suffered increases over the period studied. Particularly noteworthy is the 30 to 39 age group with an increase in the rate from 2.4/100,000 inhab. in the period 1980-1990 to 90.5/100,000 inhab. in the period 2000-2015. There was also a significant increase in the detection rate in the 40 to 49 years age range, which increased from 1.7/100,000 inhab. in 1980-1990 to 68/100,000 inhab. in 2000-2015 (Table 1). Regarding AIDS case distribution according to exposure category, the exposure profile was found to change over the course of time: in the first study period (1980-1990), the highest proportion of cases occurred among homosexuals and bisexuals, while in the second period (1991-2000) it was predominant among heterosexuals and IDUs and maintained this profile in the last period (2001-2015) (Table 2).

From 1980 to 2015, 53,468 AIDS cases were diagnosed in the metropolitan region of Porto Alegre, accounting for 64.0% of all cases recorded in the state of Rio Grande do Sul in the period (Table 3). In the periods mentioned above, on average the AIDS case detection rate in the metropolitan region was more than 1.5 times that of the state.

Of the total number of metropolitan region cases, 60.3% were male. The sex ratio, which was 9.4:1 in 1980-1990, rose to 2.3:1 in 1991-2000 and reached

1.3:1 in 2001-2015 (Table 3). The metropolitan region sex ratio pattern follows that of the state: in the period from 2001 to 2015, both the state and the metropolitan region have a sex ratio of 1.3:1 (Tables 1 and 3).

From 2001 to 2015, 11,870 pregnant women were diagnosed with HIV in the metropolitan region, corresponding to 68.7% of the total detected in the state of Rio Grande do Sul (Table 3). The detection rate in the metropolitan region was 13.7/1,000 live births, almost twice the detection rate for the state in the same period (Tables 3 and 1).

Between 1980 and 2015, 1,335 AIDS cases were diagnosed in children under 5 years old in the metropolitan region (66.1% of the total for the state in the same period); when comparing the state's specific rates for this age range, detection rates in the metropolitan region were 1.5 times higher, in all periods studied (Tables 3 and 1).

From 1980 to 2015, 19,736 AIDS deaths in the metropolitan region were recorded on the SIM system, equivalent to 67.0% of the total number of AIDS deaths recorded in the state. In the period 1980-1990, the mortality rate was 1.3/100,000 inhab., increasing to 21.7/100,000 inhab. in the period 2001-2015 (Table 1). The metropolitan region mortality rate over the period studied was twice that of the state (Tables 3 and 1).

**Table 2 – Characterization of AIDS cases, according to detection and mortality rates, Rio Grande do Sul, Brazil, 1980-2015**

| Exposure Category                  | 1980-1990 |      | 1991-2000 |      | 2001-2015 |      | Total  |      |
|------------------------------------|-----------|------|-----------|------|-----------|------|--------|------|
|                                    | N         | %    | N         | %    | N         | %    | N      | %    |
| Homosexual                         | 372       | 35.4 | 1,881     | 11.2 | 3,988     | 6.1  | 6,241  | 7.5  |
| Bisexual                           | 223       | 21.2 | 1,259     | 7.5  | 1,571     | 2.4  | 3,053  | 3.7  |
| Heterosexual                       | 136       | 12.9 | 6,254     | 37.3 | 29,870    | 45.6 | 36,260 | 43.5 |
| Injecting drug users               | 169       | 16.1 | 3,913     | 23.3 | 5,357     | 8.2  | 9,439  | 11.3 |
| Hemophiliac                        | 30        | 2.9  | 52        | 0.3  | 12        | 0.0  | 94     | 0.1  |
| Accidents with biological material | –         | –    | 45        | 0.3  | 13        | 0.0  | 58     | 0.1  |
| Blood transfusion                  | –         | –    | –         | –    | 3         | 0.0  | 3      | 0.0  |
| Vertical transmission              | 15        | 1.4  | 725       | 4.3  | 1,412     | 2.2  | 2,152  | 2.6  |
| Unknown                            | 106       | 10.1 | 2,636     | 15.8 | 23,271    | 35.5 | 26,013 | 31.2 |

Source: Ministry of Health, Health Surveillance Secretariat, Department of Surveillance, Prevention and Control of Sexually Transmitted Infections, HIV/AIDS and Viral Hepatitis.

**Table 3 – Characterization of AIDS cases, detection rates and mortality rates, metropolitan region of Porto Alegre, Rio Grande do Sul, 1980-2015**

| Metropolitan region of Porto Alegre                     | 1980-1990 |      | 1991-2000 |      | 2001-2015 |       | Total  |
|---|-----------|------|-----------|------|-----------|-------|--------|
|   | N         | rate | N         | rate | N         | rate  | N      |
| <b>General detection (rate per 100,000 inhab.)</b>      | 828       | 2.4  | 11,933    | 33.6 | 40,707    | 66.9  | 53,468 |
| <b>Sex (rate per 100,000 inhab.)</b>                    |           |      |           |      |           |       |        |
| Male  | 748       | 4.5  | 8,331     | 48.5 | 23,155    | 79.0  | 32,234 |
| Female  | 80        | 0.4  | 3,602     | 19.5 | 17,537    | 55.6  | 21,219 |
| Sex ratio   | –         | 9.4  | –         | 2.3  | –         | 1.3   | –      |
| <b>Age Group , in years(rate per 100,000 inhab.)</b>    |           |      |           |      |           |       |        |
| <15   | 38        | 0.4  | 637       | 6.4  | 1,394     | 9.5   | 2,069  |
| 15-29   | 299       | 3.2  | 3,758     | 40.2 | 9,171     | 58.1  | 13,228 |
| 30-39   | 282       | 5.1  | 4,487     | 76.1 | 13,789    | 147.0 | 18,558 |
| 40-49   | 151       | 4.0  | 2,065     | 46.6 | 9,828     | 116.6 | 12,044 |
| ≥50   | 58        | 1.1  | 985       | 16.9 | 6,513     | 49.6  | 7,556  |
| <b>Pregnant HIV+ women (rate per 1,000 live births)</b> | –         | –    | –         | –    | 11,870    | 13.7  | 11,870 |
| <b>Detection in children (rate per 100,000 inhab.)</b>  | 24        | 0.7  | 544       | 16.9 | 767       | 16.6  | 1,335  |
| <b>Mortality (per 100,000 inhab.)</b>                   | 435       | 1.3  | 6,087     | 17.3 | 13,214    | 21.7  | 19,736 |

Source: Ministry of Health, Health Surveillance Secretariat, Department of Surveillance, Prevention and Control of Sexually Transmitted Infections, HIV/AIDS and Viral Hepatitis.

In the metropolitan region of Porto Alegre, AIDS cases were concentrated in the 15 to 49 years age group (81.9%). There was an increase in detection rates in the 30 to 39 years and 40 to 49 years age ranges, increasing from 5.1/100,000 inhab. and 4.0/100,000 inhab., in the period 1980-1990, to 147/100,000 inhab. and 116/100,000 inhab. in the period 2001-2015 (Table 3).

Regarding the distribution of cases according to the risk of HIV infection, the same pattern found in the state

was found in the metropolitan region, with a decrease in the percentage of cases whose exposure category was homosexual or bisexual sexual intercourse, and an increase among heterosexuals. However, we found a significant percentage of cases whose exposure category was recorded as 'unknown': in Grande Porto Alegre, this proportion jumped from 9.4% (1980-1990) to 34.5% (2001-2015), while in the state it grew similarly from 10.1% (1980-1990) to 35.5% (2001-2015) (Tables 4 and 2).

## Discussion

There was an increase in the AIDS detection rate in the state of Rio Grande do Sul and the metropolitan region of Porto Alegre in the period from 1980 to 2015. We observed an increase of cases in females and in children younger than 5 years old, as well as high rate of case detection in pregnant women. In addition, mortality due to AIDS in the state, especially in the metropolitan region, has remained at high levels, reaching rates two times higher than those of Brazil as a whole, despite the introduction of antiretroviral therapy in the mid 1990s. The high proportion of AIDS cases among injecting drug users is also a differentiating characteristic of the epidemic in Rio Grande do Sul, when compared to that of other Brazilian states.<sup>9</sup>

A cross-sectional study, carried out in Porto Alegre between August 2001 and October 2002 with 298 pregnant women submitted to rapid HIV testing, found positivity in 5.3% of cases.<sup>15</sup> Another study, conducted by the Municipal Health Department of Porto Alegre in the same year with parturient women, found 2% prevalence in pregnant women and 5.2% vertical transmission,<sup>16</sup> while studies conducted in Brazil indicate 0.4% prevalence in this population group.<sup>17</sup> According to WHO, prevalence rates above 1% in pregnant women characterize a generalized epidemic.<sup>8</sup> Another characteristic of AIDS in Rio Grande do Sul is the high prevalence of HIV subtype C among those infected. Several studies have characterized aspects related to HIV subtypes in the context of the

AIDS epidemic in the state. The high frequency of polymorphs, identified in subtypes B and C samples analyzed in Porto Alegre, may have relevance regarding viral replication capacity, with clear implications for virus transmission and disease mortality.<sup>18</sup>

High mortality due to AIDS in Rio Grande do Sul and the metropolitan region can be attributed – albeit partially – to AIDS/tuberculosis co-infection: a study conducted in the year 2000 indicated a co-infection proportion of 47%.<sup>19,20</sup> Late access to diagnosis and treatment of HIV infection and the inequalities existing in the provision of treatment services are also relevant factors for mortality from the disease.<sup>21,22</sup> The mortality rate for the metropolitan region of Porto Alegre, in the period studied, was two times greater than that of the state of Rio Grande do Sul, and almost four times greater than that of Brazil.<sup>9</sup>

A study conducted in 2005 in two Testing and Counseling Centers in Porto Alegre found 15% HIV prevalence, of which 10% reported the use of injectable drugs.<sup>23</sup> IDUs have special importance in the HIV epidemic, acting as a "bridge" population in the spread of the disease to other populations.<sup>24</sup> Whereas in 2015 the proportion of IDUs was 2.6% for Brazil as a whole, it reached 8.2% in Rio Grande do Sul and 8.9% in the metropolitan region of Porto Alegre.<sup>9</sup>

Taking the state of Rio Grande do Sul as a whole, the proportion of cases with unknown exposure category increased from 10.1% in the first study period to 35.5% in the last period, thus hindering evaluation of exposure profile, especially in the last period.

**Table 4 – Characterization of AIDS cases in the metropolitan region according to exposure category, metropolitan region of Porto Alegre, Rio Grande do Sul, 1980-2015**

| Exposure Category                   | 1980-1990 |      | 1991-2000 |      | 2001-2015 |      | Total  |      |
|-------------------------------------|-----------|------|-----------|------|-----------|------|--------|------|
|                                     | N         | %    | N         | %    | N         | %    | N      | %    |
| Homosexual                          | 307       | 37.1 | 1,429     | 12.0 | 2,732     | 6.7  | 4,468  | 8.4  |
| Bisexual                            | 187       | 22.6 | 928       | 7.8  | 1,026     | 2.5  | 2,141  | 4.0  |
| Heterosexual                        | 96        | 11.6 | 4,218     | 35.3 | 18,376    | 45.2 | 22,690 | 42.4 |
| Injecting drug users                | 118       | 14.3 | 2,791     | 23.4 | 3,633     | 8.9  | 6,542  | 12.2 |
| Hemophilic                          | 27        | 3.3  | 33        | 0.3  | 7         | 0.0  | 67     | 0.1  |
| Accidents with biological material. | –         | –    | 28        | 0.2  | 8         | 0.0  | 36     | 0.1  |
| Blood transfusion                   | –         | –    | –         | –    | 3         | 0.0  | 3      | 0.0  |
| Vertical transmission               | 14        | 1.7  | 524       | 4.4  | 909       | 2.2  | 1,447  | 2.7  |
| Unknown                             | 79        | 9.4  | 1,982     | 16.6 | 14,013    | 34.5 | 16,074 | 30.1 |

Source: Ministry of Health, Health Surveillance Secretariat, Department of Surveillance, Prevention and Control of Sexually Transmitted Infections, HIV/AIDS and Viral Hepatitis.

With respect to the management of actions to prevent and control sexually transmitted infections (IST) and AIDS, state investment has been seen to be low.<sup>25,26</sup> Added to this, weakening of the state and municipal STI and HIV/AIDS control programs, low Primary Health Care and Family Health Care coverage, centralization of care in large hospitals and delay in the implementation of programmatic actions, such as rapid testing and the centralization of the Tuberculosis Control Program, among other examples, may explain late diagnosis in close to 40% of cases.<sup>25,26</sup>

We suggest that health service organization include decentralized combined prevention strategies, involving timely testing, immediate initiation of treatment, pre- and post-exposure prophylaxis and promotion of continuous condom use. We emphasize that there is a need for more detailed studies, both quantitative and qualitative, with the aim of gaining a better understanding of the dynamics of the epidemic in the state and in its metropolitan region.

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