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HIV infection and related risk behaviors in a community of recyclable waste collectors of Santos, Brazil

Infecção por HIV e comportamentos de risco relacionados em coletores de lixo de Santos, Brasil

ABSTRACT

OBJECTIVE: To estimate the seroprevalence of HIV, hepatitis B and C and syphilis and to describe risk behaviors associated to their transmission among recyclable waste collectors.

METHODS: A seroepidemiological survey was carried out in the city of Santos, Southeastern Brazil, in 2005. A total of 315 individuals were enrolled in the survey, of which 253 subjects underwent serological testing HIV, hepatitis B and C and syphilis. Statistical analysis consisted of univariate and bivariate analyses (cross-tabulation and odds ratio) and multivariate analysis (by logistic regression), relating HIV infection with established risk behaviors and seropositivity.

RESULTS: Overall seroprevalences were: HIV, 8.9%; hepatitis B, 34.4%; hepatitis C, 12.4%; and syphilis, 18.4%. Subjects were characterized by a predominance of males with low educational and economic levels, subjected to parenteral and sexual exposures to HIV and other sexually transmitted infections. Multivariate analysis results indicated that risk factors for both sexually and parenterally related exposure were significantly associated with HIV in this community.

CONCLUSIONS: Seroprevalences found in the study were approximately 10 to 12 times higher than the national average. These communities are socially marginalized and generally not recognized by national programs as potentially endangered populations.

DESCRIPTORS: Solid Waste Segregators. HIV. Hepatitis B virus. Hepacivirus. Syphilis. Risk Factors. Seroepidemiologic Studies.

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RESUMO

OBJETIVO: Estimar a soroprevalência de HIV, Hepatites B e C e sífilis e descrever os comportamentos de risco associados à sua transmissão entre coletores autônomos de lixo.

MÉTODOS: Um inquérito soropidemiológico foi conduzido na cidade de Santos (SP), em 2005. Um total de 315 indivíduos foi incluído no estudo, dos quais 253 submeteram-se a testes sorológicos para HIV, Hepatites B e C e sífilis. A análise estatística consistiu de análises uni e bivariadas (tabulação cruzada e *odds ratio*) e análise multivariada (por regressão logística), relacionando a infecção por HIV com os fatores de risco estabelecidos e soropositividade.

RESULTADOS: As soroprevalências totais foram: HIV, 8,9%; Hepatite B, 34,4%; Hepatite C, 12,4%; e sífilis, 18,4%. A amostra foi caracterizada por predominância de indivíduos do sexo masculino, com baixos níveis econômicos e educacionais e sujeitos a exposição parenteral e sexual ao HIV e outras doenças sexualmente transmissíveis. Os resultados da análise multivariada indicaram que fatores de risco ligados tanto à exposição sexual quanto à parenteral estão significativamente associados ao HIV nesta comunidade.

CONCLUSÕES: As soroprevalências encontradas no estudo foram aproximadamente 10 a 12 vezes maiores que a média nacional. Estas comunidades são socialmente marginalizadas e geralmente não reconhecidas pelos programas nacionais como populações de risco potencial.

DESCRITORES: Catadores. HIV. Vírus da Hepatite B. Hepacivirus. Sífilis. Fatores de Risco. Estudos Soropidemiológicos.

INTRODUCTION

Since the 1970's, recycling of waste material has acquired an economic and environmental importance and has become a strategic approach for several industries in the production chain (Masui et al¹⁵ 2000).

As the Brazilian economic crisis aggravated in the 1980's, in the view of not having an established policy for industrial and residential waste management, thousands of people started to collect waste from the streets and disposal areas and sell it for recycling mills.^a In Brazil, it is estimated that the number of recyclable waste collectors increased from 150,000 in 1999 to 500,000 in 2004.^b

There is a well-known strong association between garbage, work and social exclusion (Berthier¹ 2003), which makes this group of informal waste collectors highly vulnerable to a series of risk factors associated to poor health care, as well as to unfavorable social and cultural and environmental factors.

An important aspect that makes this group particularly vulnerable is the fact that most preventative policies

related to sexually transmitted infections (STIs) are aimed to groups and populations with higher exposure and does not include those marginal groups living on the streets such as waste collectors.

Therefore, the vulnerability of disadvantaged waste collectors to illicit drugs, unprotected sex, and consequently to HIV infection and other STIs should be investigated and taken into account before planning any intervention targeting this specific risk group.

Since 2002 waste collection has been regulated by the Brazilian Occupational Classification and defined as the act of "collecting, selecting and selling recyclable waste material as paper, cardboard, and glass, as well as ferrous and non-ferrous metals and other recyclable materials". This job is carried out by autonomous workers organized or not in cooperatives who work at different time schedules. Previous studies pointed to high insalubrity and morbidity associated to this occupation (Hsu et al¹¹ 2005). In 1990 the city of Santos carried out a survey on the activities of informal waste collectors and a database was created on this specific community.^c

^a Anais do IV Seminário de Metodologia para Projetos de Extensão [Internet]; 2001 ago 29-31; São Carlos, Brasil; 2001 [cited 2008 jul 15]. Available from: <http://www.itoi.ufrj.br/sempe/t7p47.htm>

^b Compromisso Empresarial para a Reciclagem [Internet]. São Paulo; 1992 [cited 2008 jul 15]. Available from: <http://www.cempre.org.br>

^c Santos MCS. Uma atividade informal e sua expressão no processo produtivo: análise histórico-social dos carrinheiros de Santos [Master's dissertation]. São Paulo: Pontifícia Universidade Católica de São Paulo; 1992.

In July 2005, a second survey on waste collectors was conducted in the city of Santos. All the city waste collectors (estimated to be around 400 individuals) were required by law to register and sociodemographic and economic information was collected. This survey was used to develop a study on occupational health and prevalence and risk factors for HIV, hepatitis B virus (HBV), hepatitis C virus (HCV) and syphilis in this group. The findings on occupational health will be published elsewhere.

Studies on other disadvantaged populations in Brazil have already been carried out, exploring the occurrence of HIV, Hepatitis B and C and syphilis among male inmates and the identification of parenteral transmission inside Brazilian prisons (Rozman et al¹⁶ 1998, Massad et al¹⁴ 1999, Burattini et al³ 2000, Burattini et al⁴ 2005); the prevalence and risk factors of HIV and related transmitted infections among intravenous drug users (Carvalho et al⁵ 1996, Massad et al¹³ 1994); the relationship between HIV and HPV infection and the risk for genital neoplasia and high grade lesions among females sex-workers (Gonçalves et al¹⁰ 1999, Gonçalves et al⁸ 2003, Gonçalves et al⁹ 2003); the risk for HIV and sexual vulnerability of female Brazilian inmates (Strazza et al¹⁹ 2004, Strazza et al²⁰ 2007); the interaction between HIV and HTLV I-II among male prisoners (Segurado et al¹⁸ 1995); and, finally, HIV and associated infections prevalence and risk behaviors among a disadvantaged youth population (Zanetta et al²³ 1999). This is the first study on HIV seroprevalence and associated risks addressing this specific group in Brazil.

The aim of the present study was to estimate the seroprevalence of HIV, hepatitis B and C and syphilis, and to describe risk behaviors associated to their transmission among those engaged in informal recyclable waste collection.

METHODS

A non-anonymous cross-sectional seroepidemiological survey was carried out in the city of Santos, southeastern Brazil, during June 2005. All informal recyclable waste collectors were invited to take part in the study when attending the municipal call for their annual registration.

Confidentiality was assured and all participants answered a specific questionnaire including questions about sexual behavior, commercial sex work, sexual practices and use of illicit drugs, knowledge of HIV and STI transmission and prevention, blood infections due to work-related injuries, besides sociodemographic information and alcohol consumption. Of 315 individuals enrolled in the survey, 253 agreed to undergo serological testing for HIV, hepatitis B and C and syphilis. The serological test results were individually delivered to subjects.

All interviews were conducted by undergraduate students of Universidade Católica de Santos who were specifically trained for this research. The variables analyzed are detailed in Table 3. Blood samples were obtained by venipuncture using a Vacutainer[®] system. Sera were extracted by centrifugation at 3000 rpm and stored at -20°C.

The following serological tests were performed with commercial kits from Abbott Laboratories (hepatitis B: total anti-HBc-AxSym[®]CORE, HBsAg-AxSym[®]HBsAg (V2), anti-HBs-AxSym[®]AUSAB), Roche Diagnostics (anti-HIV-Cobas[®]Core anti-HIV 1+2+O EIA and anti-HCV-Cobas[®]Core anti-HCV EIA), and Dade Behring Inc. (anti-syphilis- Enzygnost[®]Syphilis and VDRL cardiolipin-antigen). Confirmatory testing for HIV was performed with Cambridge Biotech HIV-1 Western Blot kit by REM Ltd. HIV infection was defined according to the Brazilian Ministry of Health algorithm.^a Any positive results in the serological tests for HBV, HCV and syphilis were considered an indication of previous exposure (infection) to those agents.

Statistical analysis consisted of univariate and bivariate analyses (cross-tabulation and odds ratio) using EpiInfo version 6, and multivariate analysis (by logistic regression) using SPSS, version 15.0, relating HIV infection with established risk behaviors and HBV, HCV and syphilis seropositivity.

All participants who agreed to participate in the study signed an informed consent form, and then individual interviews and blood testing were carried out. The study protocol was approved by the Research Ethics Committees of *Universidade de São Paulo* and *Universidade Católica de Santos* Medical Schools.

RESULTS

The sample comprised 315 informal recyclable waste collectors, 271 (86%) males and 44 (14%) females. Data from 315 individuals of the sample were used to describe demographic characteristics. This choice was because most of these characteristics were not included in the HIV risk analysis (Table 3). The HIV risk analysis included only data from 253 subjects who agreed to undergo testing. Of them, 251 were tested for HIV and 250 for hepatitis B, C and syphilis.

Mean age was 42.4 years old, without any significant differences between males and females. There was a predominance of the age group 30 to 50 years and 25.7% were over 50. Mean formal education was 4.36 years and 10% were illiterate. Only 16.8% had complete elementary schooling (four years of education). As for alcohol consumption, 108 (42.6%) reported not drinking, 77 (30.5%) reported drinking 1-3 times per month and 68 (26.6%) reported drinking daily. As

^a Ministério da Saúde. Portaria GM no 59, de 28 de Janeiro de 2003. Dispõe sobre a sub-rede de laboratórios do Programa Nacional de DST e Aids. Diário Oficial União. 30 jan 2003.

for housing, 17.5% reported living in waste deposits, 17.5% lived on the streets, and 57.5% either rented or owned their residence.

Those who reported working five years or more as waste collectors were 46.6% and the mean length they worked in this activity was 6.52 years. Only 15.8% worked as waste collectors for less than one year. Eighty-four percent earned up to US\$ 300.00 per month, with an average income rate of US\$ 200.00 per month, but 46% earned less than the monthly minimum wage, equivalent to US\$ 150.00.

As for risk of blood infection, 35% reported previous work-related injuries such as cuts, contractures and contusion of arms and legs. These are probably due to no use of protection equipment since 77.2% reported never using gloves and 53% worked without any foot protection, wearing plain sandals only.

With respect to sexual behavior, 43.3% of the subjects had their first sexual intercourse before the age of 15. In the year previous to the survey, 52% reported never using condoms during sex, 8% reported using condoms only sometimes and only 30% reported always using condoms. As for the distribution of the number of sexual partners during their lifetime, Table 1 shows an even distribution in four intervals with their respective HIV prevalence. It can also be noted a trend towards an increasing risk of HIV infection with the number of sexual partners in life, although not significant at the 5% level. In the risk analysis, these data were aggregated into two categories and having had more than 20 sexual partners was set as a cut off value because it represented an increased risk of HIV infection (Table 3).

Table 1. Distribution of the number of sexual partners in lifetime according to HIV status* among recyclable waste collectors. Santos, Southeastern Brazil, 2005.

Number of sexual partners in lifetime	HIV status	
	Negative (%)	Positive (%)
0-3	53 (24.8)	4 (7.0)
4-8	45 (21.1)	6 (11.8)
9-20	53 (24.8)	2 (3.6)
>20	42 (19.6)	9 (17.6)
Total	193 (90.2)	21 (8.9)

* Of 37 subjects who did not report the number of sexual partners in their lifetime, only one was HIV-positive
Chi-square trend = 6.63 p = 0.085

Table 2. Seroprevalence of the infections analyzed among recyclable waste collectors. Santos, Southeastern Brazil, 2005.

Infection	N	Seroprevalence	95% CI
HIV	251	8.9%	5.39;12.41
HBC	250	34.4%	28.55;40.25
HCV	250	12.4%	8.34;16.46
Syphilis	250	18.4%	13.63;23.17

Overall seroprevalences for the infections analyzed are summarized in Table 2. Among the 22 HIV-positive subjects, 14 (63.6%) were not aware of their HIV status before the study.

The univariate analysis with HIV infection as the independent variable is summarized in Table 3.

The variables "number of sexual partners in lifetime", "number of sex worker partners" and "HCV" were significantly associated with HIV infection in the bivariate analysis. Table 4 shows the final logistic regression analysis including the variables that were significantly associated with HIV infection in the bivariate analysis as well as age and gender, as in Table 3.

Only the variables "number of sexual partners in lifetime" and "HCV" remained significantly associated with HIV infection.

DISCUSSION

The present study follows the path of a long line of research investigating HIV transmission dynamics in socially vulnerable communities of Brazil (Burattini et al³ 2000, Burattini et al⁴ 2005, Carvalho et al⁵ 1996, Gonçalves et al⁸ 2003, Gonçalves et al⁹ 2003, Gonçalves et al¹⁰ 1999, Massad et al¹³ 1994, Massad et al¹⁴ 1999, Rozman et al¹⁶ 1998, Rozman et al¹⁷ 2007, Segurado et al¹⁸ 1995, Strazza et al¹⁹ 2004, Strazza et al²⁰ 2007, Zanetta et al²³ 1999). They all have in common high prevalences of HIV, HCV, HBV, syphilis, or other related infections with preponderance of sexually or parenterally transmitted infections depending on specific demographic and sociological characteristics of the groups studied.

The group here studied was characterized by a predominance of males with low educational and economic levels, subjected to parenteral and sexual exposures to HIV infection and other STIs. Fifty percent of the subjects reported having had more than 10 sexual partners in lifetime (with 25% reporting more than 20 partners) and 10% reported intravenous drug use, though this is an illicit practice in Brazil.

Seroprevalences of HIV (8.9%), HCV (12.4%), HBV (34.4%) and syphilis (18.4%) were approximately 10 to 12 times higher than the national average (Fonseca et al⁶ 2002, Fonseca et al⁷ 2003, Ministério da Saúde² 2005, Szwarcwald et al^{21,22} 2000). Projecting these figures to an estimated 500,000 waste collectors nationwide, there would be approximately 45,000 HIV-positive individuals, of which about 28,000 would not be aware of their HIV status. However, it should be taken into consideration significant regional heterogeneities in HIV seroprevalences, which limit the validity of these projections. The study seroprevalence findings could constitute an increase of around 10% in the cohort of HIV-positive individuals followed by the Brazilian

Table 3. Univariate risk analysis for HIV infection among recyclable waste collectors. Santos, Southeastern Brazil, 2005.

Variable	Negative*	Positive*	OR (95% CI)
Age group (years)			
16–30	38	5	1.0
31–40	66	6	1.73 (0.33;8.99)
41–50	76	12	3.00 (0.64;14.10)
>50	46	2	0.83 (0.11;6.14)
Gender			
Male	193	20	1.0
Female	33	2	0.58 (0.09;2.81)
Anal sex			
No	172	18	1.0
Yes	31	2	0.62 (0.09;3.01)
Homosexual exposure			
No	196	20	1.0
Yes	12	1	0.82 (0.0;6.73)
IVDU			
No	220	22	1.0
Yes	4	0	0.0 (0.0;16.87)
Number of sexual partners in lifetime			
0–20	151	12	1.0
>20	42	9	2.70 (1.06;7.52)
Number of sexual partners in the previous year			
0–1	127	16	1.0
>1	66	4	0.48 (0.13;3.42)
Number of sex worker partners in lifetime			
0–9	135	7	1.0
10 +	27	8	5.11 (1.56;16.87)
Condom use			
Never	95	11	1.0
Sometimes/ always	120	11	0.79 (0.30;2.08)
Crack use			
No	175	15	1.0
Yes	30	4	1.56 (0.40;5.55)
Oral sex			
No	152	15	1.0
Yes	54	5	0.94 (0.28;2.96)
Needle accident			
No	197	20	1.0
Yes	15	2	1.31(0.0;6.79)
HCV			
Negative	201	15	1.0
Positive	24	7	3.91 (1.28;11.69)
HBV			
Negative	149	14	1.0
Positive	76	8	1.12 (0.41;3.03)
Syphilis			
Negative	186	17	1.0
Positive	40	5	1.37 (0.41;4.30)

The total number of subjects varies according to the number of respondents for each question.

IVDU: intravenous drug user

Ministry of Health HIV/AIDS/STD program (Ministério da Saúde² 2005) meaning a significant additional burden to the program, and further investigations are required nationwide.

In addition, if 43% of HIV-positive subjects studied (Table 1) reported more than 20 sexual partners in lifetime, this would mean about 12,000 HIV-positive and very promiscuous (more than 5 sexual partners) individuals spreading the infection to their communities. Moreover, the fact that HCV infection was the main risk factor associated to HIV is a strong indicator that this community is heavily involved with injecting drug use (Burattini et al³ 2000, Burattini et al⁴ 2005, Carvalho et al⁵ 1996, Massad et al¹⁴ 1999, Rozman et al¹⁷ 1998), although none of HIV-positive subjects reported IV drug use, which would imply in additional risk to their communities. However, as shown before (Burattini et al³ 2000, Burattini et al⁴ 2005, Massad et al¹⁴ 1999, Rozman et al¹⁷ 1998) low report of intravenous drug use could be expected and HCV status is a good surrogate of this use.

The study sample size allowed to make the above estimates with a relative precision (Lwanga & Lemeshow¹² 1991) of approximately 65%, which reinforces the need of the National Program on HIV/AIDS to dedicate special attention to this particular community regarding their potential role as an underestimate source for spreading the risk of infection.

In conclusion, it should be stressed out that socially vulnerable communities as the one here described are relatively common in middle-income/developing countries. These communities have systematically shown high prevalences of HIV and related infections (Burattini et al³ 2000, Carvalho et al⁵ 1996, Gonçalves et al⁸ 2003, Gonçalves et al⁹ 2003, Rozman et al¹⁶ 1998, Rozman et al¹⁷ 2007, Segurado et al¹⁸ 1995, Strazza et al¹⁹ 2004, Zanetta et al²³ 1999). They are marginalized communities with virtually no voice and are generally overlooked by national public health policies and programs as potentially high-risk populations. Therefore, similar seroprevalence studies addressing unassisted communities are still a relevant instrument for social change.

Table 4. Final multivariate risk analysis of HIV infection among recyclable waste collectors. Santos, Southeastern Brazil, 2005.

Variable	Negative	Positive (%)	OR (95% CI)
Number of sexual partners in lifetime			
0-20	124	12 (8.8)	1.0
>20	32	9 (21.9)	2.91 (1.02;8.24)
HCV			
Negative	142	14 (8.9)	1.0
Positive	15	6 (28.6)	4.06 (1.18;13.62)

REFERENCES

1. Berthier HC. Garbage, work and society. *Resour Conservat Recycl.* 2003;39(3):193-21. DOI: 10.1016/S0921-3449(03)00027-2
2. Boletim Epidemiológico AIDS/DST. Brasília, DF: Ministério da Saúde; 2005;1(1).
3. Burattini MN, Massad E, Rozman M, Azevedo RS, Carvalho HB. Correlation between HIV and HCV in Brazilian prisoners: evidence for parenteral transmission inside prison. *Rev Saude Publica.* 2000;34(5):431-6. DOI: 10.1590/S0034-89102000000500001
4. Burattini MN, Strazza L, Paoliello AA, Carvalho HB, Azevedo RS, Coutinho FAB, et al. The change from intravenous to crack cocaine and its impact on reducing HIV incidence in Brazilian prisons. *Int J STD AIDS.* 2005;16(12):836-7. DOI: 10.1258/09564620574988136
5. Carvalho HB, Mesquita FC, Massad E, Bueno RC, Lopez GT, Ruiz MA, et al. HIV and Infection of similar transmission patterns in a drug injectors community of Santos, Brazil. *J Acquir Immune Defic Syndr Hum Retrovirol.* 1996;12(1):84-92.
6. Fonseca MGP, Szwarcwald CL, Bastos FI. Análise sociodemográfica da epidemia de Aids no Brasil, 1989-1997. *Rev Saude Publica.* 2002;36(6):678-85. DOI: 10.1590/S0034-89102002000700004
7. Fonseca MGP, Travassos C, Bastos FI, Silva NV, Szwarcwald CL. Distribuição social da AIDS no Brasil, segundo participação no mercado de trabalho, ocupação e status sócio-econômico dos casos de 1987-1998. *Cad Saude Publica.* 2003;19(5):1351-63. DOI: 10.1590/S0102-311X2003000500013
8. Gonçalves MAG, Burattini MN, Donadi EA, Massad E. Risk factors associated with genital warts in HIV-positive Brazilian women. *Tumori.* 2003;89(1):9-15.
9. Gonçalves MAG, Burattini MN, Donadi EA, Massad E. Anogenital warts contribution to the risk of squamous intraepithelial lesions among HIV-positive women of São Paulo, Brazil. *Int J STD AIDS.* 2003;14(5):309-13. DOI: 10.1258/095646203321605503
10. Gonçalves MAG, Massad E, Burattini MN, Villa LL. Relationship Between Human Papillomavirus (HPV) genotyping and genital neoplasia in HIV-Positive Patients of Santos city, São Paulo. Brazil. *Int J STD AIDS.* 1999;10(12):803-7. DOI: 10.1258/0956462991913583
11. Hsu E, Kuo CM. Recycling rates of waste home appliances in Taiwan. *Waste Manag.* 2005;25(1):53-65. DOI: 10.1016/j.wasman.2004.07.003
12. Lwanga SK, Lemeshow S. Sample Size Determination in Health Studies-A Practical Manual. Geneva: World Health Organization; 1991.
13. Massad E, Coutinho FAB, Yang HM, Carvalho HB, Mesquita F, Burattini MN. The basic reproduction ratio of HIV among intravenous drug users. *Math Biosci.* 1994;123(2):227-47. DOI: 10.1016/0025-5564(94)90013-2
14. Massad E, Rozman M, Azevedo RS, Silveira ASB, Takey K, Yamamoto YI, et al. Seroprevalence of HIV, HCV and syphilis in Brazilian prisoners: preponderance of parenteral transmission. *Eur J Epidemiol.* 1999;15(5):439-45. DOI: 10.1023/A:1007523027876
15. Masui T, Morit T, Kyogoku J. Analysis of recycling activities using multi-sectoral economic model with material flow. *Eur J Oper Res.* 2000;122(2):405-15. DOI: 10.1016/S0377-2217(99)00242-8
16. Rozman MA, Massad E, Silveira ASB, Azevedo-Neto RS, Takey K, Yamamoto YI, et al. HIV/AIDS in a Brazilian prison. *Int J STD AIDS.* 1998;9(3):183-184. DOI: 10.1258/0956462981921855
17. Rozman MA, Alves IS, Porto MA, Gomes PO, Ribeiro NM, Nogueira LAA, et al. HIV and related infections in a sample of recyclable waste collectors of Brazil. *Int J STD AIDS.* 2007;18(9):653-4. DOI: 10.1258/095646207781568574
18. Segurado AAC, Sumita LM, Rozmann M, Massad E, Souza VAUF, Panutti CS. HTLV-I and HTLV-II infections in inmates of São Paulo-State-Prison, São Paulo, Brazil. *J Acquir Immune Defic Syndr Hum Retrovirol.* 1995;10(2):200.
19. Strazza L, Azevedo RS, Carvalho HB, Massad E. The vulnerability of Brazilian female prisoners to HIV infection. *Braz J Med Biol Res.* 2004;37(5):771-6. DOI: 10.1590/S0100-879X2004000500020
20. Strazza L, Massad E, Azevedo RS, Carvalho HB. Estudo de comportamento associado à infecção pelo HIV e HCV em detentas de um presídio de São Paulo, Brasil. *Cad Saude Publica.* 2007;23(1):197-205. DOI: 10.1590/S0102-311X2007000100021
21. Szwarcwald CL, Bastos FI, Esteves MAP, Andrade CL. A disseminação da epidemia de AIDS no Brasil, no período de 1987-1996: uma análise espacial. *Cad Saude Publica.* 2000;16(Supl 1):7-19. DOI: 10.1590/S0102-311X2000000700002
22. Szwarcwald CL, Castilho EA. Estimativa do número de pessoas de 15 a 49 anos infectadas pelo HIV, Brasil, 1998. *Cad Saude Publica.* 2000;16(Supl 1):135-41. DOI: 10.1590/S0102-311X2000000700012
23. Zanetta DM, Strazza L, Azevedo RS, Carvalho HB, Massad E, Menezes RX, et al. HIV infection and related risk behaviors in a disadvantaged youth institution of São Paulo, Brazil. *Int J STD AIDS.* 1999;10(2):98-104. DOI: 10.1258/0956462991913718