

The contribution of two Brazilian multi-center studies to the assessment of HIV and HCV infection and prevention strategies among injecting drug users: the AjUDE-Brasil I and II Projects

Contribuição de dois estudos multicêntricos brasileiros para o conhecimento da infecção pelo HIV e hepatite C e das estratégias de prevenção entre usuários de drogas injetáveis: Projetos AjUDE-Brasil I e II

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Abstract

This study assessed 1,144 Brazilian injecting drug users (IDUs) recruited on the street through outreach syringe exchange programs by two multi-center cross-sectional studies: 287 IDUs were recruited during the AjUDE-Brasil I Project and 857 during the AjUDE-Brasil II Project. IDU characteristics related to drug use and sexual behavior, and legal and health conditions for the two studies were compared, using decision tree and logistic regression for each individual study, with HIV infection as the outcome. Fifty-two percent of IDUs were HIV-infected in AjUDE I versus 36.5% in AjUDE II. In both studies, HIV infection was independently associated with: mean background HIV prevalence for each site (OR = 2.17; 10.66), HCV seropositive status (OR = 19.79; 15.48), and men who reported ever having sex with other men (OR = 2.10; 2.09). Incarceration (OR = 1.41) and 8 or more years of injecting drug (OR = 2.13) were also associated with HIV in AjUDE II. The high HIV infection rates and high prevalence of both parenteral and sexual risk behaviors in the context of syringe-exchange programs are of great concern and demand thorough surveillance and renewed prevention strategies.

Intravenous Drug Abuse; HIV; Hepatitis C Virus; Sexual Behavior; Male Homosexuality

Introduction

In various countries, injecting drug users (IDUs) play a relevant role in the spread of HIV and other sexually transmitted and blood-borne pathogens ¹. Although on a substantially reduced scale as compared to the explosive spread in certain settings such as Thailand and Eastern Europe ^{1,2}, in Brazil IDUs made a major contribution to the spread of HIV/AIDS, especially from the late 1980s to the mid-1990s.

Since Brazil is a continental-sized country with major social and regional heterogeneities and an HIV/AIDS epidemic which is actually a mosaic of regional sub-epidemics, especially among IDUs ^{1,3,4}, multi-center studies are both necessary and difficult to perform.

The purpose of the AjUDE-Brasil I and II studies was precisely to assess the infection rates for HIV and other sexually transmitted and blood-borne pathogens and the risk behaviors of IDUs in different drug injecting scenes and the respective intervention programs at two distinct moments. Although representative data are not available for the country as a whole, there is no doubt that progress has been made in using standardized recruiting methods, antibody testing in the field using finger stick blood samples stored on filter paper, and interviews with a large contingent of individuals in different regional contexts, thus moving towards a broader and scientifically more consistent por-

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trait of the dynamics of HIV/AIDS and other sexually transmitted and blood-borne pathogens among Brazilian IDUs.

The current article summarizes the findings of two Brazilian multi-center studies known as the AjUDE-Brasil I and AjUDE-Brasil II Projects, conducted in 1998 and 2000-2001. The basic concern here is to introduce the topic, discussed in detail in other articles in this thematic issue of *Cadernos de Saúde Pública/Reports of Public Health*, and to discuss broader questions related to a wide pool of participants in both studies, including 1,144 IDUs who were interviewed and tested for HIV and other pathogens.

Methods

The data were obtained from IDUs who were recruited and interviewed within the multi-center AjUDE-Brasil I and II studies. Methods and procedures used in the two studies have been described in various publications^{5,6,7,8,9,10,11,12}. They will be summarized to introduce the analyses conducted herein and the respective findings, as well as to provide an overview of the two studies, which provide the material for several articles in this same thematic issue.

AjUDE-Brasil I and II respectively were two cross-sectional studies conducted in five Brazilian cities in 1998 (São Paulo, Sorocaba, and São José do Rio Preto in the State of São Paulo; Itajaí in Santa Catarina; and Porto Alegre in Rio Grande do Sul) and six in 2000-2001 (Salvador in the State of Bahia; São José do Rio Preto in São Paulo; Florianópolis and Itajaí in Santa Catarina; and Porto Alegre and Gravataí in Rio Grande do Sul). The objective was to describe the IDUs profile in the context of syringe-exchange programs (SEP) in various Brazilian cities¹².

Non-institutionalized IDUs were recruited by "outreach workers" (health agents acting in the respective communities) by adapting the so-called "targeted sampling" technique¹³. Face-to-face interviews were conducted by previously trained staff, using a structured questionnaire including the subjects' socio-demographic information, drug use, sexual behavior, legal status, and health conditions, in addition to their knowledge on blood-borne infections (and risks associated with unsafe sexual practices)¹².

In addition to the interview, blood samples were taken by finger stick and stored on filter paper for subsequent diagnosis, using ELISA (enzyme-linked immunosorbent assay) for HIV, hepatitis C virus (HCV), hepatitis B virus (by detection of the antigen, HBsAg), human T-

lymphotropic viruses I and II (HTLV-I/II), and syphilis (VDRL).

All phases of the project included procedures to guarantee data quality and study reliability. Further details on the methodology and procedures are in a previous publication¹².

The current analysis includes 287 IDUs from the first study (1998) and 857 from the second (2000-2001), initially compared for their socio-demographic and behavioral characteristics.

Later, using HIV serology as the outcome, the IDUs were compared for their socio-demographic characteristics and specific covariates, including: (1) local background HIV prevalence based on categorization of the programs where the interviewees were recruited using overall HIV seroprevalence for the set of IDUs recruited through each of the projects, according to World Health Organization criteria¹⁴ for second-generation epidemiological surveillance (i.e., seeking to integrate serological and behavioral data); (2) living conditions, considering housing, (un)employment, and reported conviction or incarceration; (3) drug use, i.e., the circumstances in first use, type of drugs consumed and route, duration, and frequency of use, and sharing of needles and syringes; (4) sexual behavior, analyzing the types of sexual partnerships (hetero and homosexual), in addition to consistent condom use, namely in all sexual relations in the previous six months.

Also included were the serological results for HIV, HTLV I/II, HBsAg, HCV, and syphilis (VDRL). As of the first study, the technology for ELISA diagnosis on filter paper only existed for HIV, HCV, and HTLV. Tests were introduced later for HBsAg and VDRL.

Descriptive analysis used frequency distributions, measurements of central tendency, and dispersion. Comparison of proportions used the chi-square test, measuring the strength of association by means of odds ratios (OR) and their respective 95% confidence intervals (95%CI).

To provide an overview of the data, the initial findings from the univariate and bivariate analyses were presented for a broad set of variables, with the subsequent construction of multivariate models using logistic regression and decision trees.

The final multivariate logistic regression model, built with an exclusively discriminatory purpose, was established through the selection of explanatory variables ($p \leq 0.25$). The relevance of each variable included in the model was analyzed by the Wald statistic, excluding variables that failed to contribute significantly to the discrimination of the dichotomous outcome. Adjustment of the final model was con-

sidered adequate using the likelihood ratio test, by comparing it to the other constructed models. The final model was built using variables with statistical significance ($p \leq 0.05$), biological plausibility, and epidemiological relevance¹⁵.

Multivariate analysis was also used, using a decision tree approach by means of the exhaustive CHAID algorithm (chi-squared automatic interaction detector), aimed at comparing characteristics of HIV-positive versus HIV-negative IDUs. This method consisted of successive splitting the data set so as to make it increasingly homogeneous in relation to the outcome¹⁶.

The study used the programs Microsoft Excel version 2000 (Microsoft Corp., USA); SPSS, version 11.5 and Answertree 3.0 (SPSS Inc., Chicago, USA).

Both studies complied with prevailing ethical principles. All participants signed a free and informed consent form, and both study protocols were approved in full by the SEP from each site and the Institutional Review Board of the Universidade Federal de Minas Gerais (ETIC no. 056/98, in March 1998 for AjUDE-Brasil I and ETIC no. 168/99 in January 2000 for AjUDE-Brasil II).

Results

Table 1 shows the characteristics of IDUs in the two studies. Of the 1,144 IDUs, 287 (25.1%) were interviewed in 1998 and 857 (74.9%) in 2000-2001. As for distribution by gender and skin color, in both studies the proportion of female IDUs was 17% and some 50% of respondents were non-white. Mean age varied little between the two studies. However, in the second study there was a variation among the recruiting sites, with a site in Salvador, Bahia, showing IDUs with a mean age of 25.7 ± 6.5 years, significantly less ($p \leq 0.05$) than the overall mean for AjUDE-Brasil II (28.5 ± 8.2 years). The two studies showed similar results for mean schooling.

Subjects' socioeconomic status was precarious in the first study, with some 30% homeless and up to 82% unemployed in AjUDE-Brasil I, an adverse situation that was partially meliorated in the second study. On the other hand, the proportion of IDUs who reported a lifetime history of arrest or incarceration increased from 70% in the first study to 80% in the second ($p < 0.01$).

Concerning prevalence rates for HIV, HBV, HCV, HTLV-I/II, and syphilis, there was a significant drop in HIV prevalence from the first

to the second study. However, when the analysis excludes the Salvador site, with a particularly low seroprevalence rate in the second study (6.4%), the reduction loses statistical significance ($p > 0.05$). For HCV, there was a significant increase in seroprevalence (from 52.4 to 61.5%) between the first and second studies. Meanwhile, for HTLV-I/II this increase only becomes significant (from 21.3% to 29.4%) when the data from the Salvador site are excluded. Hepatitis B and syphilis were only studied in the AjUDE-Brasil II Project, with estimated prevalence rates of 2.3% and 0.4%, respectively.

In AjUDE-Brasil I none of the subjects came from sites with low background HIV seroprevalence, since 61% were from medium-prevalence settings, i.e., with aggregate prevalence rates between 10% and 50%, while the remaining 39% were from high-prevalence sites ($\geq 50\%$). In AjUDE-Brasil II, 23.7% of the subjects were from sites with low background HIV prevalence ($< 10\%$), 46.6% from medium-prevalence sites, and 29.8% from high-prevalence sites.

As for drug use, there was a difference of one year in relation to mean age at initiation of injecting use by subjects, corresponding to 17.7 ± 4.7 years in AjUDE-Brasil I and 18.7 ± 5.1 years in AjUDE-Brasil II ($p < 0.01$). There was also a significant reduction in the duration of injecting drug use (from 11.6 ± 7.6 years in AjUDE-Brasil I to 9.8 ± 7.7 years in AjUDE-Brasil II). The mean time between first use (by any route) and first injecting drug use was 4.09 ± 4.28 years for AjUDE-Brasil II. Cocaine, the most frequently used drug at initiation, was also the most frequently reported drug in the six months prior to the interview, with some 77% in both studies. There was a significant reduction in crack use, from 55% in the first study to 47% in the second. Frequency of lifetime sharing syringes or needles increased significantly ($p > 0.05$), from 38.6% to 52.3%, as did the number of injections (cutoff point: "more than three times per session") on the days when the interviewees injected. Tobacco and alcohol were widely consumed in both studies.

As for sexual behavior, there was a presumed increase in the prevalence of sexually transmitted diseases (STDs) in the six months prior to the interview, as assessed by reports of genital lesions or discharge, from 13% in the first study to 18% in the second. Inconsistent condom use, defined for the purposes of this study as non-use or use in less than half of sexual relations with the opposite sex in the six months prior to the interview, did not differ in the two studies, generally with a high prevalence (some 60%) of less-than-adequate use. A total of 32%

Table 1

Characteristics of subjects in the AjUDE-Brasil I and AjUDE-Brasil II Projects, 1998-2001: socio-demographic conditions, serological results, drug use, sexual behaviors, use of syringe-exchange programs (SEP) and other health services, Brazil, 1998 and 2000-2001.

Characteristics (%)	AjUDE-Brasil I (n = 287)	AjUDE-Brasil II (n = 857)	p value
Socio-demographic			
Female gender	17.5	17.1	0.87
Non-white	50.0	53.2	0.35
Mean age in years (\pm SD)	29.2 \pm 7.9	28.5 \pm 8.2	0.21
City (State)			
Porto Alegre (Rio Grande do Sul)	47.7	29.8	< 0.01
Gravataí (Rio Grande do Sul)	–	13.4	–
São José do Rio Preto (São Paulo)	16.0	14.9	0.65
São Paulo (São Paulo)	5.6	–	–
Sorocaba (São Paulo)	13.2	–	–
Itajaí (Santa Catarina)	17.4	11.3	< 0.01
Florianópolis (Santa Catarina)	–	6.9	–
Salvador (Bahia)	–	23.7	–
Homelessness*	28.4	20.6	< 0.01
Unemployment*	81.8	75.4	0.03
Incarceration (lifetime)	70.1	80.2	< 0.01
Mean schooling in years (\pm SD)	5.5 \pm 2.5	5.3 \pm 2.6	0.33
Positive serology			
Acquired immunodeficiency virus (HIV)	52.3	45.8	0.06
Hepatitis C virus (HCV)	52.4	64.0	0.01
Human T-lymphotropic viruses (HTLV I/II)	17.7	23.6	0.03
Hepatitis B virus (HbsAg)	–	2.3	–
Syphilis (VDRL)	–	0.4	–
Background HIV seroprevalence			
Low (< 10%)	–	23.7	–
Medium (10-50%)	61.0	46.6	< 0.01
High (\geq 50%)	39.0	29.8	< 0.01
Drug use			
Mean age at first injecting drug use (\pm SD)	17.7 \pm 4.7	18.7 \pm 5.1	< 0.01
Mean duration of injecting drug use (\pm SD)	11.6 \pm 7.6	9.8 \pm 7.7	< 0.01
Cocaine injecting**	77.6	76.4	0.67
Frequency of drug injections*** (> 3 times/day)	12.7***	50.6	< 0.01
Sharing of needles and syringes# (lifetime)	38.6	52.3	< 0.01
Crack**	55.1	46.8	0.01
Alcohol**	89.2	90.1	0.65
Cigarette smoking**	84.8	81.3	0.18
Sexual behavior			
Sexually transmitted infections**	13.1	18.3	0.04
Condom use (never or < half of the time) with opposite sex**	57.9	61.0	0.42
Men who report sex with men (lifetime)	32.3	26.9	0.12
Sex for drugs**	8.7	7.6	0.59
Use of SEP and health services			
Use of SEP services (lifetime)	62.0	70.3	0.01
Syringes, needles, and other material from SEP	62.9	69.2	0.08
Drug-related treatment*	23.2	63.4	< 0.01
Health treatment*	42.0	69.3	< 0.01
Intention to test for HIV	71.9	75.6	0.22
Tested for HIV (lifetime)	61.4	63.3	0.61

* Variables refer to the 12 months prior to the interview in AjUDE-Brasil I and six months in AjUDE-Brasil II;

** Variables refer to the six months prior to the interview;

*** In the AjUDE-Brasil I Project, only frequency of cocaine injecting was considered;

Defined as giving used syringes/needles for another IDUs to use.

and 26.9% of male interviewees, respectively, in AjUDE-Brasil I and II, reported any sexual relations with men, with a non-significant difference ($p = 0.12$) between the two studies.

There was a significant increase in the use of SEP services, from 62% in 1998 to 79.3% in 2000-2001, and in obtaining injecting material from SEP, although the difference did not reach statistical significance for the latter variable. The demand for drug-related and other health treatment also increased significantly, from 23.2% to 63.4% and from 42% to 69.3% ($p < 0.01$), respectively. The same did not occur with either intention-to-test or actually having an HIV test, since both remained at similar levels from the first to the second studies.

Table 2 shows the results for the bivariate analyses of the selected variables with HIV serology as the outcome. Men and women in the first study showed similar HIV prevalence rates, as opposed to higher rates in women in AjUDE-Brasil II, although the latter did not reach statistical significance (OR = 1.15; 95%CI: 0.74-1.62).

AjUDE-Brasil I showed a higher risk of HIV infection in whites (OR = 1.67; 95%CI: 1.04-2.68), those > 28 years of age (OR = 2.21; 95%CI: 1.37-3.56), and those from sites with high background HIV prevalence (OR = 3.05; 95%CI: 1.84-5.06), with the proviso that there is an evident violation of independence of observations between this co-variable and the outcome, since each individual is both himself or herself and an integral part of the local pool of infected individuals. Similar findings were observed in AjUDE-Brasil II: white subjects (OR = 2.11; 95%CI: 1.58-2.80), those > 27 years of age (OR = 3.46; 95%CI: 2.58-4.64), and those from medium-prevalence (OR = 7.52; 95%CI: 4.13-13.68) or high HIV prevalence sites (OR = 26.16; 95%CI: 14.10-48.56) were more likely to be HIV infected as compared to the other subjects.

Social variables (unemployment and incarceration) were significantly associated with the outcome in both studies, while homelessness in the six months prior to the interview was only associated with HIV infection in the second study (OR = 2.00; 95%CI: 1.42-2.81).

An interesting association was observed between background HIV seroprevalence and odds of HIV infection, once again calling attention the structural dependence between the two, creating a dose-response gradient with OR varying from 3 to 15 in study I and from 7 to 26 in study II. HCV-infected individuals also showed higher odds of HIV infection (thus becoming co-infected), with high crude odds ratios and confidence intervals that did not include unity

in both studies (AjUDE-Brasil I: OR = 15.27; 95%CI: 8.49-27.48 and AjUDE-Brasil II: OR = 15.87; 95%CI: 10.07-25.04).

As for drug use, "duration of injecting drug use greater than the median for each study" (ten years for the first and eight for the second), "more than three injections per session", and "lifetime sharing of syringes and needles" were significantly associated with HIV infection in both studies. Some variables described in the literature were associated with the outcome in the first study and others in the second, particularly crack and tobacco, which were only associated with HIV infection in the second.

As for sexual exposures, in both studies IDUs who reported signs suggestive of STDs and those who reported any lifetime same-sex relations showed higher odds of being HIV-positive as compared to the others. Inconsistent condom use (as defined in the present study) and a report of sex for drugs were only significantly associated with HIV infection in the first study.

Marker variables for use of SEP and other health services were significantly associated with HIV infection in the second study, including: "obtaining injecting materials from SEP"; "seeking health treatment", and "HIV test", the latter for both intention-to-test and actually having been tested.

The multivariate analyses using the logistic model and decision-tree classificatory method showed consistent and similar results for comparisons within and between the studies. Positive HCV serology was an important predictor of HIV infection due to the magnitude of the estimates in the logistic models and since it was the first classificatory variable in the decision trees generated for each study separately (Table 3 and Figures 1 and 2). The second most relevant covariate was background HIV seroprevalence at the site where the subject was recruited. That is, in the presence of HCV infection and medium or high local background HIV prevalence, the odds of being HIV infected varied from 9 to 15 in the first study and from 2 to 31 in the second.

As for the results of the logistic models, men who reported sex with other men were significantly ($p < 0.05$) associated with HIV infection only in AjUDE-Brasil II, as was duration of injecting drug use, with this latter variable also present in a classificatory node in the decision tree for this same study.

As for the classificatory models, in AjUDE-Brasil I the IDUs who reported sexual relations with other men were from high background HIV prevalence sites and had negative HCV serolo-

Table 2

Socio-demographic characteristics, drug use, sexual behaviors, and use of syringe-exchange programs (SEP) and health services and their association with positive HIV serology, AjUDE-Brasil I and AjUDE-Brasil II Projects, Brazil, 1998 and 2000-2001.

Characteristics	AjUDE-Brasil I OR (95%CI)	AjUDE-Brasil II OR (95%CI)
Socio-demographic		
Female	1.00 (0.54-1.86)	1.15 (0.74-1.62)
White	1.67(1.04-2.68)	2.11 (1.58-2.80)
Age (> median)*	2.21 (1.37-3.56)	3.46 (2.58-4.64)
Schooling (> 5 years)	1.25 (0.94-1.68)	0.85 (0.53-1.35)
Homeless**	1.48 (0.88-2.51)	2.00 (1.42-2.81)
Unemployed**	2.16 (1.28-3.65)	1.66 (1.12-2.47)
Incarceration (lifetime)	1.81 (1.11-2.95)	3.04 (2.23-4.12)
Seroprevalence		
Background HIV		
Low	–	1.00
Medium	1.00	7.52 (4.13-13.68)
High	3.05 (1.84-5.06)	26.16 (14.10-48.56)
Hepatitis C virus (HCV) positive	15.27 (8.49-27.48)	15.87 (10.07-25.04)
Drug use		
Age at first injecting drug use (> 17 years)	1.89 (1.18-3.05)	1.15 (0.86-1.51)
Duration of injecting use (> median)***	2.19 (1.36-3.52)	3.98 (2.96-5.37)
Frequency of injections (> 3 times/day)	6.09 (2.02-18.39)	1.52 (1.10-2.08)
Sharing of syringes or needles# (lifetime)	5.06 (2.97-8.62)	2.59 (1.93-3.47)
Absence of crack use##	1.28 (0.80-2.05)	2.03 (1.52-2.71)
Alcohol##	0.41 (0.18-0.92)	0.83 (0.53-1.32)
Cigarette smoking##	0.75 (0.39-1.45)	1.52 (1.11-2.08)
Sexual behavior		
Sexually transmitted infections##	2.42 (1.15-5.12)	1.62 (1.13-2.32)
Condom use (never or < half of the time) with opposite sex##	1.02 (0.61-1.68)	0.58 (0.40-0.84)
Men who report sex with men (lifetime)	2.49 (1.40-4.43)	2.09 (1.43-3.06)
Sex for drugs##	2.94 (1.11-7.78)	1.72 (0.97-3.06)
Use of SEP and health services		
Use of SEP services (lifetime)	1.22 (0.74-2.01)	1.52 (1.11-2.08)
Syringes, needles, and other material from SEP##	1.23 (0.72-2.10)	1.47 (1.04-2.09)
Drug-related treatment###	1.01 (0.27-3.71)	0.97 (0.31-3.05)
Health treatment###	2.41 (0.79-7.30)	7.28 (2.47-21.46)
Intention to test for HIV	0.76 (0.45-1.29)	3.31 (2.25-4.86)
Tested for HIV (lifetime)	1.59 (0.98-2.56)	4.40 (3.05-6.35)

* Median age was 28 years in AjUDE-Brasil I and 27 years in AjUDE-Brasil II;

** Variables refer to the 12 months prior to the interview in AjUDE-Brasil I and six months in AjUDE-Brasil II;

*** Median duration of injecting drug use was 10 years in AjUDE-Brasil I and eight years in AjUDE-Brasil II;

Defined as giving syringes/needles for another IDUs to use;

Variables refer to the six months prior to the interview;

Variables refer to the 12 months prior to the interview in AjUDE-Brasil I and lifetime in AjUDE-Brasil II.

gy (Figure 1). Meanwhile, in AjUDE-Brasil II, subjects reporting more than eight years of injecting drug use and from medium background HIV prevalence sites also belonged to the HCV-positive group (Figure 2).

Discussion

The current study allowed a comparison of non-institutionalized IDUs recruited at two points in time in different areas of Brazil. From the point of view of transmission of HIV and other sexually-transmitted and blood-borne pathogens, the study suggests the persistence of particularly vulnerable situations. This vulnerability is characterized by high-risk exposures associated with inadequate drug use, unsafe sexual practices, and social conditions of poverty, unemployment, marginalization, and criminalization (incarceration), in addition to the still-limited utilization of health services, especially HIV testing. The study also indicates the presence of IDUs subgroups with additionally risky behaviors for HIV and other pathogens and whose profile and practices can purportedly contribute to the maintenance of the epidemic in this population group, despite the successful implementation of harm reduction strategies aimed at curbing unsafe drug use and unprotected sexual practices.

Other relevant findings relate to the diversity of infection rates for the different pathogens both within and between the target sites, suggesting varied dynamics and maturity in the HIV/AIDS epidemic in each specific setting and population. Prominent findings were HCV infection/co-infection, at least as prevalent as HIV in this population according to the current study. The study also draws attention to the favorable (albeit still limited) role of SEP, which have apparently expanded the reach and diversity of their actions, not to mention the probable indirect role of these programs, fostering health services utilization, especially among IDUs living with HIV/AIDS and particularly for testing and the demand for health care.

HCV, HIV, and HIV/HCV co-infection share common routes for transmission and spread in the IDU population. The presence of "facilitating" conditions favors the spread of both infections, emphasizing the efficiency of blood-borne transmission of both viruses and the risk interactions in the setting of social networks that share injecting equipment^{17,18}. The main risk factors for HCV infection in this group appear to be related to the characteristics of initiation into drug injecting, including age at initi-

Table 3

Multivariate analysis by logistic regression of factors associated with HIV infection according to the AjUDE-Brasil I and II Projects, Brazil, 1998 and 2000-2001.

Study characteristics	Adjusted OR*	95%CI*
AjUDE-Brasil I**		
High background HIV prevalence (> 50%)	2.16	0.98-4.75
Positive HCV serology	9.78	9.73-40.19
Men who report sex with other men (lifetime)	2.09	0.93-4.71
AjUDE-Brasil II***		
Background HIV prevalence		
Medium (10-50%)	10.66	4.51-25.16
High (> 50%)	31.69	13.13-76.49
Incarceration (lifetime)	1.40	0.88-2.24
Positive HCV serology	15.47	8.29-28.87
Duration of injecting drug use (≥ 8 years)	2.12	1.34-3.37
Men who report sex with other men (lifetime)	2.09	1.27-3.46

* Odds ratios (OR) and 95% confidence intervals (95%CI) adjusted for the set of variables in each model;

** Model in AjUDE-Brasil I: -2 log likelihood = 204.58. Reference variables were medium background HIV prevalence (10-50%), negative HCV serology, men who denied sex with other men;

*** Model in AjUDE-Brasil II: -2 log likelihood = 475.684. Reference variables were low background HIV prevalence (< 10%), negative HCV serology, no history of incarceration, duration of injecting drug use less than eight years, and men who denied sex with other men.

ation, duration and frequency, type of drug injected, and sharing of injecting equipment, expressed here as "giving or receiving syringes and needles", aspects discussed in the work by Zocrato et al.¹⁰. Sexual transmission of HCV, although controversial, has been documented by growing evidence in male populations, especially those living with HIV/AIDS and who report unprotected sex with other men^{9,11,17}. Suffice it to recall that some 30% of our sample reported a history of sex with other men, and that Ferreira et al.¹¹ may not have identified such an association due to this infection's high prevalence in their study population and the undeniably preponderant role of parenteral transmission in this population.

Differences in HIV prevalence between sites and between studies may reflect specific dynamics of various local sub-epidemics, suggesting relevant differences related to the exposure to and transmission of HIV and other pathogens. Beyond the behaviors adopted by individuals and their social networks, the greater or lesser emphasis placed by prevention programs on specific practices could be associated with the maintenance of this scenario. One should also consider determining where and when such risk interactions occur

Figure 1

Decision tree using the CHAID algorithm (chi-squared automatic interaction detector) referring to AjUDE-Brasil I.

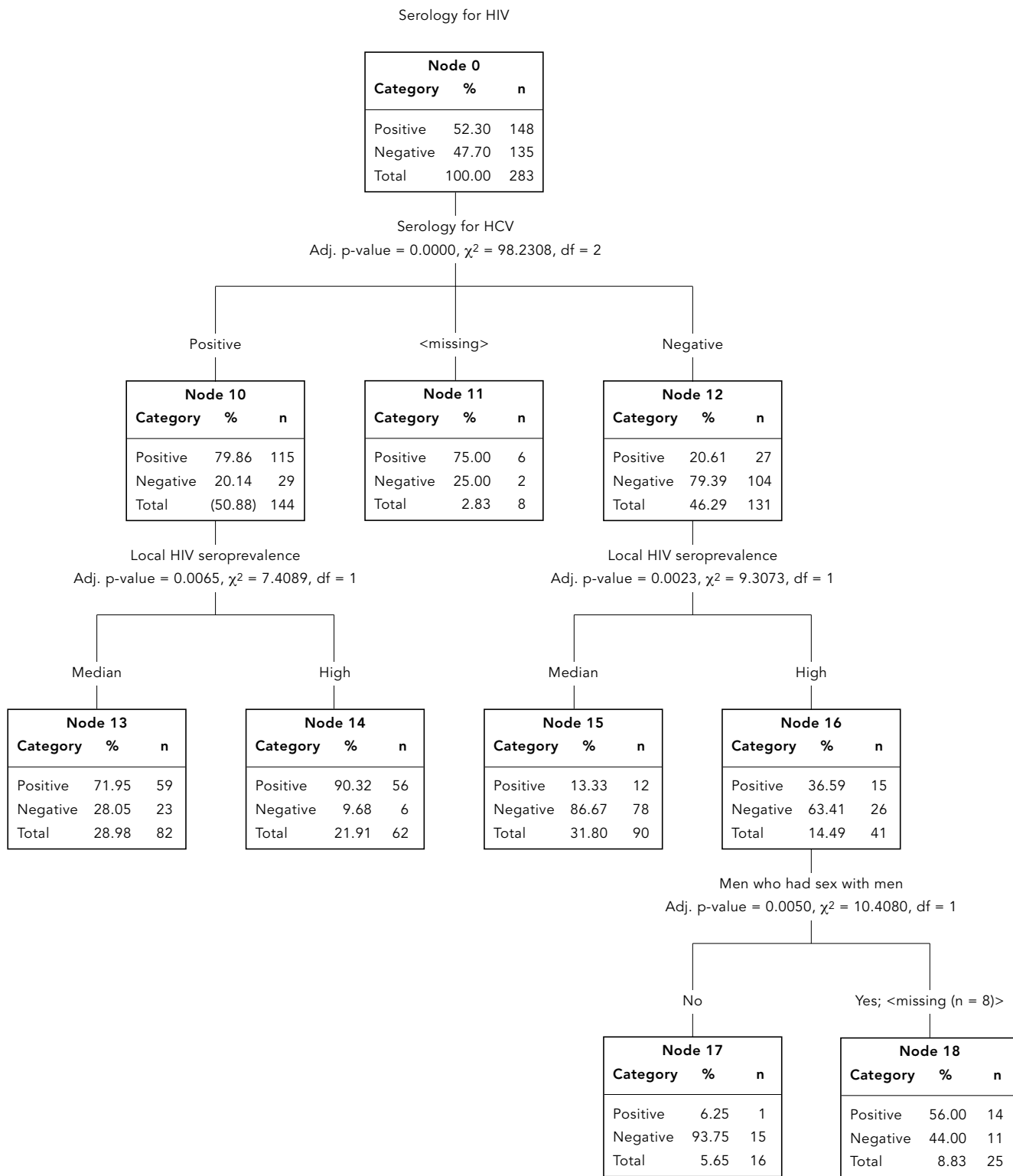
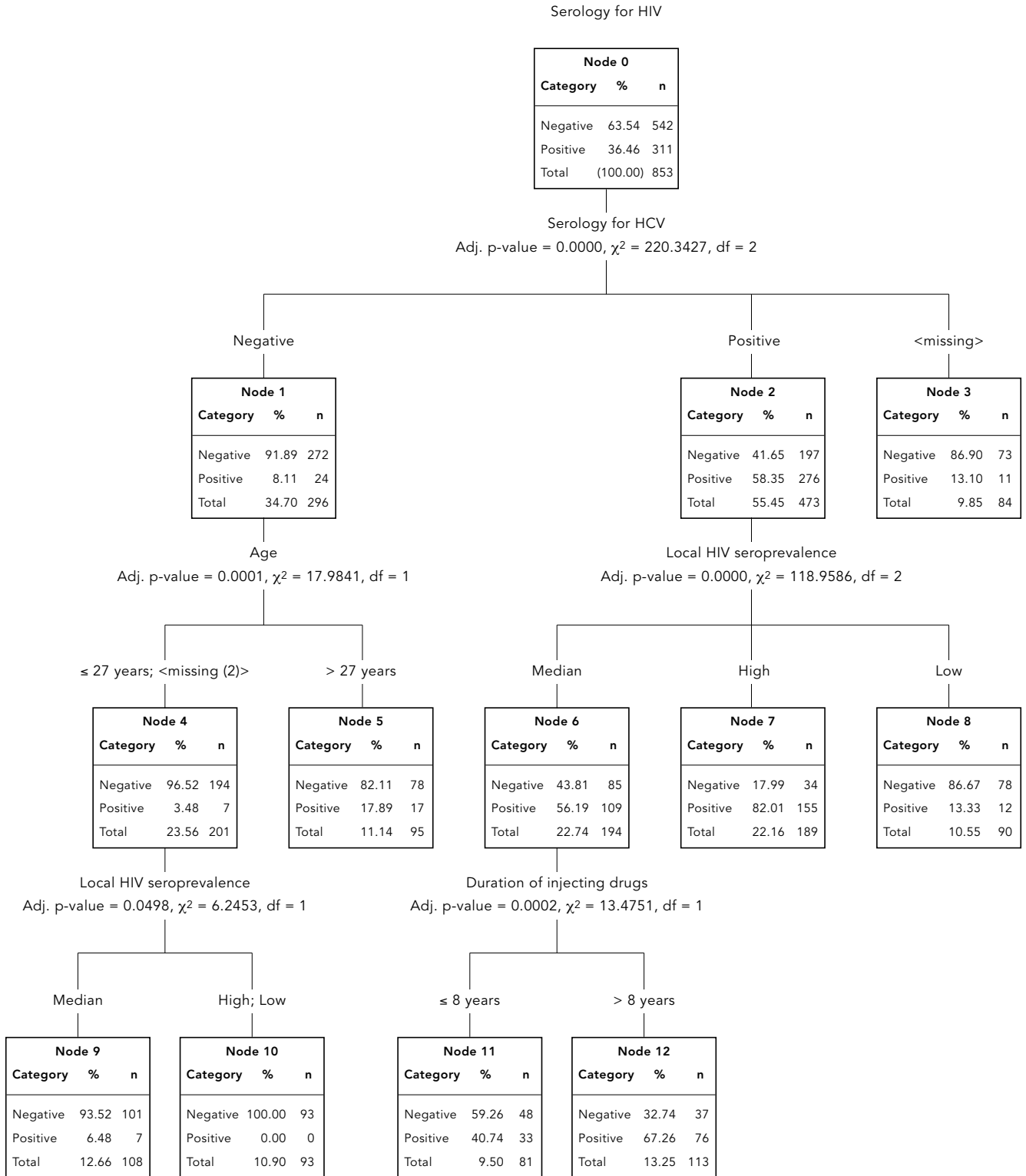


Figure 2

Decision tree using the CHAID algorithm (chi-squared automatic interaction detector) referring to AjUDE-Brasil II.



and the nature and dynamics of social interaction networks¹⁸. Despite the limitations of the analyses due to the structural dependence mentioned above, the marker used here, background HIV prevalence in the respective site, suggests that in high HIV prevalence settings IDUs are more likely to become infected, consistent with recent studies on the theory of social risk networks^{3,18,19}. This line of analysis considers the complex interaction between individual and supra-individual behaviors and practices and should inform future studies on IDUs and other especially vulnerable populations for HIV/AIDS, as summarized so well in a recent study by Martina Morris²⁰.

The current study's findings suggest the existence of IDUs subgroups at additional risk that should be the object of preventive interventions designed on the basis of detailed knowledge of their specificities. Some of these subgroups would consist of younger individuals and men involved in sexual partnerships with other men, usually involving unsafe sex. These sub-groups would compose a profile of IDUs with risk behaviors that would allegedly contribute to the maintenance of foci for the spread of HIV in settings where the frequency of equipment sharing is relatively low, expressed as low infection rates for HCV (whose transmission is predominantly parenteral).

Despite the existence of subgroups at particular risk and the persistent transmission of pathogens in various settings, we should emphasize the beneficial effects of exposure to harm reduction projects for IDUs. These actions are now more effective in reaching IDUs networks with high background HIV prevalence, thus establishing secondary and tertiary health interventions. In the medium term, emphasis should be placed on primary prevention. An example of the impact of SEP is a study on the sources of syringes at initiation into injecting practice and in the six months prior to the interview. More than 50% of IDUs with a

longer injecting career reported having initially acquired their syringes at pharmacies, compared to 69% of syringes acquired through SEP in the six months prior to the interview²¹.

The IDUs population using SEP services also displays a profile of high vulnerability and social marginalization, as represented by a large portion of subjects experiencing difficulties with employment and housing, in addition to a high proportion of lifetime incarceration⁹.

All the information presented here should be interpreted with caution, since during an epidemic situation the relationships between prevalence and incidence rates vary according to the epidemic's degree of maturity and the complex interaction between individual-level and context-level determinants in the spread of infectious diseases.

Cross-sectional studies contribute undeniably to the systematization of information on practices, behaviors, and attitudes, as well as to the measurement of seroprevalence for various pathogens. However, in terms of tracing trends in the epidemic over time, such studies are quite susceptible to numerous inherent biases²², including those pertaining to selection, survival, and information. Limitations as to the generalization of these studies should also be appreciated. According to Mingoti & Caiaffa⁶, there are no limitations to this study in relation to possible self-correlation due to the presence of the same individuals in both cross-sectional studies, since few individuals were recruited by both.

Despite these limitations, the trends in the dynamic of HIV infection and other sexually transmitted and blood-borne pathogens among IDUs begin to be identified for particularly vulnerable groups, suggesting that surveillance and prevention strategies should be designed for specific population groups, considering social risk network theories and the new scenario of relatively low HIV prevalence but persistently high HCV prevalence.

Resumo

O estudo analisa dados referentes a 1.144 usuários de drogas injetáveis (UDIs) brasileiros, recrutados por dois estudos transversais multicêntricos: 287 do Projeto AjUDE-Brasil I e 857 do AjUDE-Brasil II. Procedeu-se análise comparativa de características relacionadas ao uso de drogas, comportamento sexual, situação jurídica e de saúde. Construíram-se modelos multivariados, por meio das árvores de decisão e regressão logística, para cada estudo, utilizando a infecção pelo HIV como variável-resposta. Cerca de 52% dos UDIs estavam infectados pelo HIV no AjUDE I e 36,5%, no AjUDE II. Em ambos os estudos a infecção pelo HIV se mostrou independentemente associada à soroprevalência média de fundo para o HIV (OR = 2,17; 10,66), soropositividade para o vírus da hepatite C (OR = 19,79; 15,48) e relato de sexo de homem-com-outro-homem (OR = 2,10; 2,09). No âmbito do AjUDE II, história de encarceramento (OR = 1,41) e oito ou mais anos de uso injetável (OR = 2,13) se mostraram também associados à infecção pelo HIV. Elevadas taxas de infecção pelo HIV entre UDIs relacionadas a comportamentos de risco injetável e sexual reforçam a necessidade de vigilância epidemiológica e prevenção.

Uso Indevido de Drogas Parenterais; HIV; Vírus da Hepatite C; Comportamento Sexual; Homossexualidade Masculina

Contributors

W. T. Caiaffa designed the research and drafted the article. F. I. Bastos participated in all phases of the research and in drafting the article. L. L. Freitas reviewed the literature, organized the database for this analysis, and participated in drafting the article. S. A. Mingoti accompanied the handling of the database and the statistical analyses. F. A. Proietti and A. B. Carneiro-Proietti were consultants to the serological surveys in both studies. D. Gandolfi and D. Doneda participated in all phases of both studies, mainly their design.

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