

## Injecting drug users who are (un)aware of their HIV serostatus: findings from the multi-center study AjUDE-Brasil II

Usuários de drogas injetáveis que (des)conhecem seu status sorológico para a infecção pelo HIV: achados do Projeto AjUDE-Brasil II

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### Abstract

*This study aimed to characterize the profiles of injecting drug users (IDUs) who were unaware of their HIV serostatus, given the importance of this information for prevention strategies, especially in this vulnerable population, key to the HIV/AIDS dynamic. As part of a cross-sectional multi-city survey, IDUs were interviewed and HIV-tested by the ELISA technique. IDUs were categorized according to knowledge of their own HIV status as either aware or unaware. Means, averages, and proportions were compared between the groups using bi- and multivariate analyses. Of 857 IDUs interviewed, 34.2% were unaware of their HIV serostatus. Those who were unaware were more likely: to have been recruited at sites where the HIV prevalence rate was considered medium (> 10 to 50%; odds ratio = 8.0) or high (> 50%; 4.0); to be illiterate (OR = 4.54); to have no prior HIV test (OR = 2.22); to be male (OR = 1.81); and to have been enrolled more recently in syringe-exchange programs (OR = 1.69). HIV prevention programs should target both individuals at risk and HIV-positive individuals. Programs to expand access to HIV testing are pivotal and should be tailored to specific contexts and populations.*

*AIDS Serodiagnosis; Intravenous Substance Abuse; Acquired Immunodeficiency Syndrome; HIV*

### Introduction

Public health strategies have been developed to increase awareness of HIV serostatus among individuals and populations for the control of the HIV/AIDS epidemic. Knowledge of one's serostatus, expressed as early diagnosis of HIV infection, can allow adequate access to treatment, ensuring better response to therapy and quality of life among persons with HIV as well as reduction in AIDS mortality <sup>1</sup>. In addition, it is believed that such awareness is associated with lower frequency of practices that expose individuals to the risk of being (re)infected and of transmitting the virus <sup>2,3,4,5,6</sup>. Testing, counseling, and returning the test results thus has an effect on the epidemic's dynamics by reducing the frequency of risk interactions and HIV transmission <sup>2,3,4</sup>.

Statistics indicate 40 million individuals infected worldwide <sup>7</sup>, with 600 thousand infected in Brazil <sup>8</sup>. Of these, an estimated 67% are unaware of their HIV serostatus <sup>8</sup>.

Based on this scenario and studies emphasizing the advantages of serostatus awareness, since the late 1980s the Brazilian Ministry of Health has invested in the creation of Anonymous Testing Centers (ATCs) or Centers for Serological Support and Orientation, characterized by free access, voluntary participation, and confidentiality, offering HIV testing along with pre- and post-test counseling <sup>2</sup>. In addi-

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tion to the availability of these centers, campaigns like *Fique Sabendo!* (Know it!) have also been developed. This campaign was launched in 2003 and aims to raise the Brazilian population's awareness concerning the importance of HIV testing, with the goal of a 150% increase in the number of tests performed in the country by 2006<sup>8</sup>.

The epidemiological profile of HIV/AIDS infection in Brazil is known to be differentiated, varying according to the period analyzed, exposure categories, and regional characteristics. Among the exposure categories, the most relevant is "heterosexual", followed by "injecting drug user" (IDUs), accounting for 19.1% of the AIDS cases diagnosed as of 2004<sup>9</sup>.

However, the proportional participation of IDUs varies substantially between regions, corresponding to some 60% of the AIDS cases reported in the South of the country<sup>7,10,11</sup>. IDUs play an even more relevant role in the HIV/AIDS dynamics when considering the risk of transmission from infected IDUs to their sex partners and offspring<sup>11</sup>. Thus, injecting drug use behaviors such as initiation of use, sharing of injecting materials, and type of drug used have contributed to the spread of HIV and maintenance of the epidemic in Brazil<sup>12</sup>.

The present study aims to characterize the profile of Brazilian IDUs who are unaware (versus aware) of their HIV serostatus, using data from the AjUDE-Brasil II Project. This line of analysis was allowed by the range of information included in the project and is especially relevant because of the lack of quantitative analyses on the choice to test for HIV infection in specific populations in the country. The resulting information can support public policies for testing and counseling, fostering awareness-raising strategies and contributing to greater effectiveness in the interventions to control the HIV/AIDS epidemic in Brazil.

## Methods

The AjUDE-Brasil II Project was designed to assess the effectiveness of harm reduction strategies and establish the baseline situation of IDUs participating in syringe-exchange projects (SEP). This was a cross-sectional, multi-center study obtaining information on aspects related to this population. Participating IDUs were accessed by the SEP in six Brazilian cities (Porto Alegre and Gravataí in the State of Rio Grande do Sul, São José do Rio Preto in São Paulo, Itajaí and Florianópolis in Santa Catarina, and Salvador in Bahia) in 2000-2001. Selection of these

SEP was based on level of structuring and time in operation, on the epidemiological profile of the HIV/AIDS epidemic, and the pattern and forms of drug consumption in the different sites.

The project included face-a-face interviews conducted by previously trained health agents, using a standardized structured questionnaire, focusing on socio-demographic aspects, living conditions, drug use, risk practices, sexual behavior, knowledge on blood-borne infections/diseases and utilization of health services, including HIV testing<sup>13</sup>.

In addition, blood sample was taken on filter paper for diagnosis by ELISA (enzyme-linked immunosorbent assay) of HIV and other blood-borne and/or sexually transmitted infections, according to the methodology described in the document systematizing the AjUDE-Brasil I procedures<sup>13</sup>.

In all stages of the study, procedures were performed to guarantee the data quality and reliability<sup>13</sup>.

## Study sample

IDUs 18 years of age or older and with a history of injecting use in the five years prior to the interview were accessed and recruited by outreach workers in each site. A total of 857 IDUs participated in the study, and no refusals were recorded.

The current study adopted the calculation referring to the detection power for the sample calculation from the source project<sup>13</sup>. Based on testing the hypothesis of comparing proportions and an alpha error of 5%, we observed a power of 90%<sup>14</sup>.

The premise was that 56.6% of IDUs were unaware of their serostatus based on data obtained during the AjUDE-Brasil I Project, defining serostatus unawareness as infected IDUs who had never had an HIV test or had never returned for the test results<sup>13</sup>.

## Variables

Knowledge of HIV serostatus was defined as the outcome, with the IDUs classified in two groups. The first consisted of IDUs who were unaware of their serostatus, including: (a) HIV-positive IDUs, based on findings from field testing and who either reported during the interview that they were unaware of their serostatus or claimed to be HIV-negative and (b) HIV-negative IDUs who reported not knowing their serostatus or claimed to be HIV-positive. The other IDUs, i.e., those who were consistently aware of their serostatus in accordance with

the empirical test findings, were defined as those who were actually aware of their HIV status.

Among the covariables was “*local HIV background prevalence among IDUs*”, a socio-demographic variable obtained from classification of the SEP where the participants were recruited, in terms of overall HIV prevalence, based on criteria set by the World Health Organization<sup>15</sup>. A “*low seroprevalence site*” was defined as one where the mean prevalence was less than 10%, which in this case included only one SEP, where the overall HIV prevalence among IDUs was 6.4%. Four SEP, with background HIV prevalence varying from 30.9 to 38.3%, were grouped as “*medium prevalence sites*”, and finally one SEP where 64.3% of the IDUs were HIV-positive was classified as a “*high prevalence site*”.

Health services utilization was analyzed according to the following variables: (1) “*lifetime treatment seeking at health services*”; (2) “*utilization of SEP*”, referring to IDUs who reported using or having used the services in such projects; (3) “*time using SEP*”, related to the time elapsed between the first contact with the SEP and the last recorded contact or the time of the interview (in the case of actively engaged IDUs); (4) “*interest in having an HIV test*”, as indicated by the question “*Have you ever considered having an HIV test?*” and; (5) “*prior HIV test*”, as reported by the IDUs.

Analysis of knowledge about infections was based on the questions: “*Do you know of any blood-transmitted disease or infection?*”, “*Do you know ways of preventing HIV infection?*”, among others.

Analysis of drug use considered information from the six months prior to the interview, and needle/syringe sharing was defined as self-reported lending or borrowing of previously used injecting equipment (active or receptive sharing).

Sexual relations were characterized according to the nature of the partnership, either occasional or regular. Male condom use was defined as consistent when the interviewee reported using condoms in all sexual relations in the six months prior to the interview.

### **Analysis**

The study analyzed frequency distributions, central tendency and dispersion, comparison of means and proportions using respectively the Student's *t* and chi-squared tests.

The association between the outcome and the covariables was explored, allowing the se-

lection of variables ( $p \leq 0.25$ ) to construct the multivariate model. Odds ratios (OR) were used to measure the associations and respective 95% confidence intervals (95%CI).

The relevance of each variable included in the multivariate model was verified by the Wald statistic, having removed those that did not contribute significantly. Adjustment of the final model was verified by the Hosmer and Lemeshow test. The final model contained variables with statistical significance ( $p \leq 0.05$ ) and biological plausibility<sup>16</sup>. Based on the estimators obtained by logistic regression, the probability of the event's occurrence was calculated<sup>16</sup>. The analyses were performed using Microsoft Excel, version 2000, and SPSS, version 11.5.

### **Ethical issues**

The IDUs participating in AjUDE-Brasil II signed a free informed consent form in accordance with Ministry of Health Ruling 196/96. The project was approved by the Research Ethics Committee of the Universidade Federal de Minas Gerais (case ETIC168/99).

### **Results**

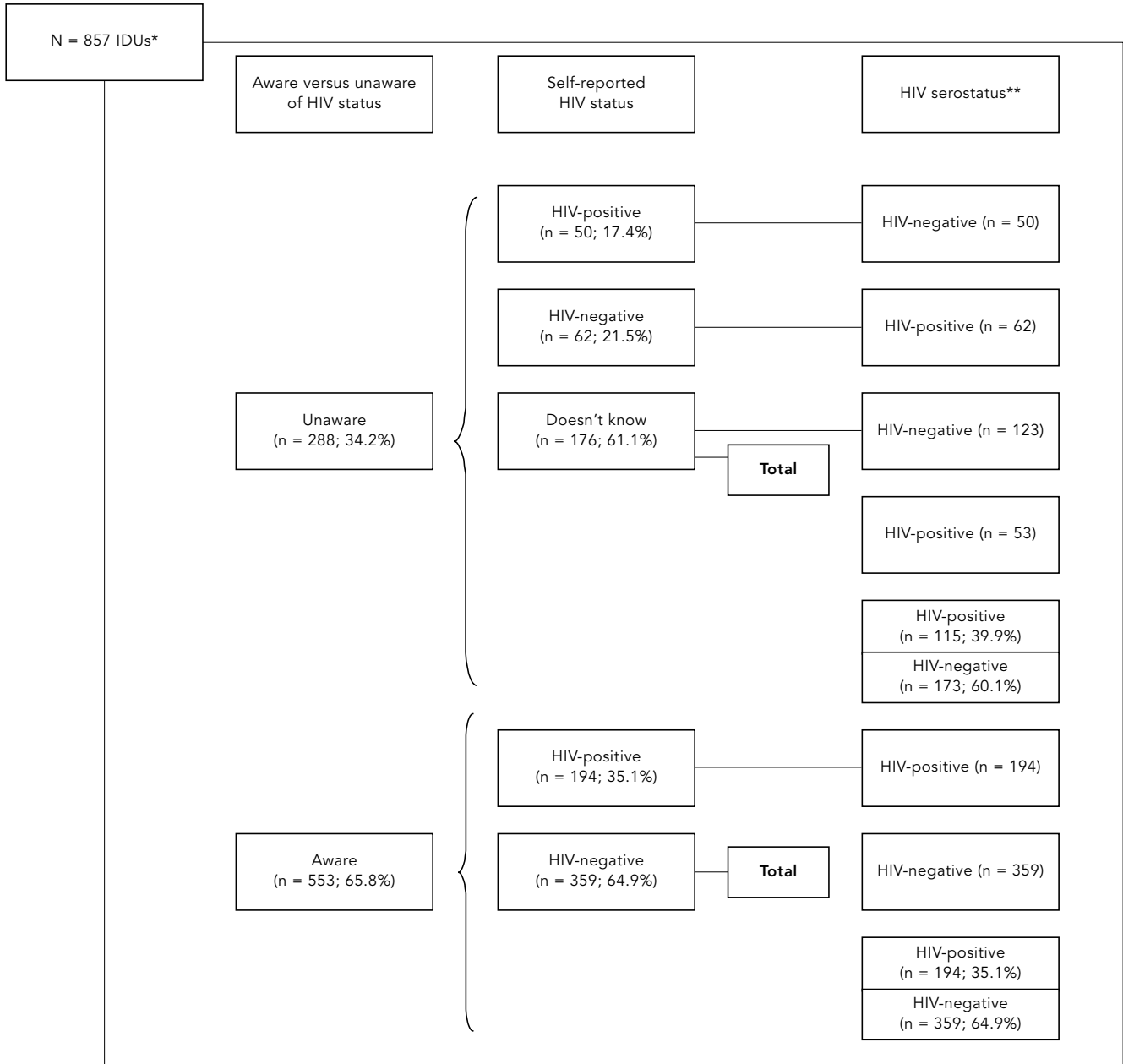
Of the 857 interviewees, 34.2% were unaware of their HIV serostatus (according to the classification adopted by this study), of whom 39.9% were HIV-positive. The overall HIV prevalence was 36.5%, but only 28.9% reported being HIV-positive. The IDUs were predominantly male (82.9%), with a mean age of  $28.5 \pm 8.2$  years. The majority of the IDUs reported having used SEP services some time in life, with a mean utilization of  $11.6 \pm 14.5$  months (median = 5.9 months). Some three-fourths of the interviewees had considered having an HIV test, but only 47.8% had actually been tested. Among the IDUs who had been tested previously, 20% had not returned for the results (Figure 1, Table 1).

Stratifying the IDUs by recruitment site (Table 1) shows that lack of awareness of one's serostatus varied from 14.9 to 46.1% and was higher in sites with medium background HIV prevalence. In all the sites there was a lower proportion of IDUs who reported being HIV-positive as compared to the actual proportion of infected IDUs (as defined by the field testing results).

There were a high proportion of males, with no significant gender difference between sites. However, there was a significant age difference, with younger participants recruited predominantly from low-prevalence sites (median = 24.5 years). As for utilization of SEP services,

Figure 1

Classification of IDUs according to knowledge of HIV status. AjUDE-Brasil II Project, 2000-2001.



\* Totals may vary due to missing/inchoate answers;  
 \*\* Defined by two ELISA tests on eluted blood (filter paper).

Table 1

Profile of injecting drug users according to selected characteristics. AJUDE-Brasil II Project, 2000-2001.

Characteristics	Total (n = 857)	Local HIV prevalence among IDUs			p value
		Low (n = 203)	Medium (n = 399)	High (n = 255)	
<b>HIV serostatus (n [%])</b>					
Unaware of HIV status	288 [34.2]	30 [14.9]	179 [46.1]	79 [31.5]	< 0.01
HIV-positive status (self-reported)	244 [28.9]	11 [5.4]	112 [28.9]	121 [48.0]	< 0.01
HIV-positive status (ELISA)	311 [36.5]	13 [6.4]	136 [34.1]	162 [64.3]	< 0.01
<b>Gender (n [%])</b>					
Male	709 [82.9]	176 [86.7]	327 [82.4]	206 [80.8]	0.23
<b>Age (years)</b>					
Mean ± SD	28.5±8.2	25.7±6.5	28.0±8.2	31.4±8.6	< 0.01
Median	27.0	24.5	27.0	30.0	
<b>Use of SEP</b>					
Lifetime use (n [%])	600 [70.3]	135 [66.8]	300 [75.8]	165 [64.7]	0.005
Time used (months)					
Mean ± SD	11.6±14.5	12.7±16.2	10.4±11.5	12.6±17.0	0.084
Median	5.9	5.9	6.7	3.0	
<b>Lifetime HIV testing</b>					
Considered having test (n [%])	646 [75.6]	137 [67.5]	286 [71.7]	223 [88.1]	< 0.01
Had test (n [%])	407 [47.8]	58 [28.7]	189 [47.6]	160 [63.2]	< 0.01
Times tested					
Mean ± SD	1.1+1.9	1.6+0.9	2.6+2.4	2.6+2.2	0.003
Median	0.0	1.0	2.0	2.0	
Returned for result (n [%])	317 [85.2]	31 [54.4]	147 [86.5]	139 [95.9]	< 0.01

the IDUs from medium prevalence sites reported using these services more frequently (75.8%), however they had used them for less time (mean = 10.4±11.5 months).

As for HIV testing, in contexts with low background prevalence, a significant difference was observed when comparing IDUs who reported having considered an HIV test (67.5%) with IDUs who had actually had the test (28.7%). HIV testing was more frequent in high-prevalence sites (63.2%), and a higher proportion also returned to obtain the results (93.8%).

Comparing IDUs stratified according to awareness of HIV serostatus, Table 2 shows that IDUs recruited by SEP from sites with a background HIV prevalence greater than 10% had two to four times higher likelihood of not knowing their serostatus as compared to the other IDUs. Lack of awareness of serostatus by IDUs was also significantly higher among male IDUs (OR = 1.7; 95%CI: 1.1-2.6), whites (OR = 1.4; 95%CI: 1.1-1.9), and those who reported some religion (OR = 1.5; 95%CI: 1.0-2.1).

As for work status and schooling, recently unemployed IDUs and those who had never taking technical or occupational training showed increased odds of not knowing their HIV serostatus (OR = 1.5; 95%CI: 1.1-2.2; OR = 1.5; 95%CI: 1.1-2.0, respectively). IDUs with less schooling showed higher odds of not knowing their serostatus, as shown by comparing those with no schooling and those who had finished at least the eighth grade (OR = 3.8; 95%CI: 1.6-9.3).

Lack of use of SEP and health services as well as shorter use of SEP services were associated both with unawareness of serostatus and lack of HIV testing. As expected, unawareness of serostatus was more common among IDUs who had never considered being tested (OR = 1.5; 95%CI: 1.1-2.1) or had never actually been tested (OR = 2.3; 95%CI: 1.7-3.1). Identification of aspects related to infection and/or blood-borne diseases, such as knowing ways to prevent HIV transmission, proved to be a protective factor against unawareness of serostatus

Table 2

Bivariate analysis of aspects associated with unawareness of one's HIV serostatus. AJUDE-Brasil II Project, 2000-2001.

Variables	N	Unaware* (%)	OR	95%CI
<b>Socio-demographic</b>				
Local HIV prevalence among IDUs				
Low (< 10%)	202	14.9	1.00	
Medium (10-50%)	388	46.1	4.91	3.18-7.60
High (>50%)	251	31.5	2.63	1.65-4.22
Male gender	698	36.0	1.70	1.13-2.57
White skin color	388	38.4	1.41	1.06-1.88
Having a religion	639	36.0	1.47	1.03-2.09
Unemployed**	620	36.5	1.52	1.07-2.16
Having completed a technical course	343	36.9	1.47	1.08-2.00
Schooling				
None	29	51.7	3.81	1.55-9.34
≤ 4 <sup>th</sup> grade	246	41.1	2.48	1.39-4.43
5 <sup>th</sup> to 8 <sup>th</sup> grade	441	31.3	1.62	0.93-2.84
> 8 <sup>th</sup> grade	82	22.0	1.00	
<b>Use of SEP and health services</b>				
Never used SEP	247	38.5	1.32	0.97-1.79
Time of SEP use*** ≤ 5.9 months	399	38.8	1.53	1.14-2.05
Never had health treatment	215	50.2	2.54	1.84-3.49
HIV testing				
Never considered testing	201	41.3	1.49	1.08-2.07
Never tested	433	43.2	2.29	1.70-3.07
HIV + and doesn't treat	153	28.8	3.23	1.53-6.80
<b>Knowledge</b>				
About blood-borne infections	716	33.1	0.74	0.50-1.10
About HIV/AIDS	777	32.9	0.53	0.31-0.89
Knows some HIV carrier	609	36.3	1.45	1.04-2.04
<b>Drug use</b>				
IDU < 3 years	185	38.4	1.29	0.92-1.81
Smoking**	678	36.7	1.87	1.27-2.86
Obtains needles from friend**	161	39.1	1.28	0.90-1.82
Shares needles**	161	42.2	1.52	1.06-2.17
Cleaning of needles/syringes**	296	39.5	1.41	1.05-1.89
<b>Regular sex partners**,#</b>				
Not reported	189	38.6	3.78	1.07-13.27
Partners use drugs	103	37.9	1.37	0.88-2.17
100% condom use	134	22.4	0.50	0.32-0.79
<b>Occasional sex partners**,#</b>				
Sex for drugs	58	37.9	1.85	0.87-2.78
100% condom use	186	18.3	0.30	0.19-0.48

\* IDUs classified in this study as those who were unaware of their HIV serostatus;

\*\* Data refer to the six months prior to the interview;

\*\*\* Cutoff based on median time using SEP services;

# Sexual relations with partners of the opposite sex.

(OR = 0.5; 95%CI: 0.3-0.9). On the other hand, IDUs who were unaware of their serostatus were more likely to have persons with HIV in their social networks (OR = 1.5; 95%CI: 1.1-2.0).

The groups were different as to risk behaviors for infection/disease in relation to sharing needles/syringes (OR = 1.5; 95%CI: 1.1-2.2) and inadequate cleaning of injecting equipment for subsequent use (OR = 1.4; 95%CI: 1.1-1.9). As for sexual behaviors, not having relations with regular partners of the opposite sex was associated with increased odds of not knowing one's serostatus (OR = 3.8; 95%CI: 1.1-13.3). Inversely, there was an association between consistent condom use in all sexual relations with persons of the opposite sex in the last six months and more accurate knowledge of serostatus, and the association was shown for sexual relations both with regular partners (OR = 0.5; 95%CI: 0.3-0.8) and occasional ones (OR = 0.3; 95%CI: 0.2-0.5).

Table 3 presents the results of the multivariate analysis. The variables that best explain unawareness of HIV serostatus were: "site where IDU was recruited"; "gender"; "schooling"; "time using SEP services", and "lifetime HIV testing".

Comparing individuals from sites with low background HIV prevalence and those recruited from medium prevalence sites, the latter were more likely not to know their serostatus (OR = 8.0; 95%CI: 4.8-13.3). The odds were also increased, but to a lesser degree, among individuals from high-prevalence sites as compared to the reference category (OR = 4.0; 95%CI: 2.3-7.0).

In addition, unawareness of serostatus showed increased odds in male IDUs (OR = 1.8; 95%CI: 1.1-2.9), those who had been in contact with an SEP for less time (OR = 1.7; 95%CI: 1.2-2.4), and those who had never been tested for HIV (OR = 2.2; 95%CI: 1.6-3.2). As for schooling, there was a dose-response gradient in the association with unawareness of serostatus: IDUs who had never studied showed higher odds of not knowing (OR = 4.5; 95%CI: 1.6-12.7), with progressively weaker associations for those who had studied up to the fourth grade (OR = 2.5; 95%CI: 1.3-4.9) and those had studied from the fourth to eighth grades (OR = 1.7; 95%CI: 0.9-3.1), as compared to those with more than eight years of schooling.

Calculating the probability of the logistic regression estimators shows that IDUs recruited from medium background HIV prevalence sites, males, those who had never studied, those with less contact with an SEP, and those who reported never having been tested for HIV showed a 0.53 probability of not knowing their HIV status. Meanwhile, IDUs from low background HIV prevalence sites, females, those

Table 3

Multivariate logistic regression using unawareness of HIV serostatus as the response variable.

Variables	Crude OR (95%CI)	Adjusted OR (95%CI)
<b>Local HIV prevalence in IDUs</b>		
Low	1.00	1.00
High	2.63 (1.65-4.22)	4.04 (2.32-7.03)
Medium	4.91 (3.18-7.60)	8.00 (4.81-13.28)
<b>Gender</b>		
Female	1.00	1.00
Male	1.70 (1.13-2.57)	1.81 (1.13-2.90)
<b>Time of SEP use</b>		
> 5.9 months	1.00	1.00
< 5.9 months	1.53 (1.14-2.05)	1.69 (1.20-2.38)
<b>Lifetime HIV testing</b>		
Yes	1.00	1.00
No	2.29 (1.70-3.07)	2.22 (1.55-3.16)
<b>Schooling</b>		
None	3.81 (1.55-9.34)	4.54 (1.62-12.71)
≤ 4 <sup>th</sup> grade	2.48 (1.39-4.43)	2.50 (1.29-4.85)
5 <sup>th</sup> to 8 <sup>th</sup> grade	1.62 (0.93-2.84)	1.66 (0.88-3.12)
> 8 <sup>th</sup> grade	1.00	1.00

who had finished at least the eighth grade, those using a harm reduction program for more than 5.9 months, and those who had been tested for HIV showed only a 0.005 probability of not knowing their serostatus (Figure 2).

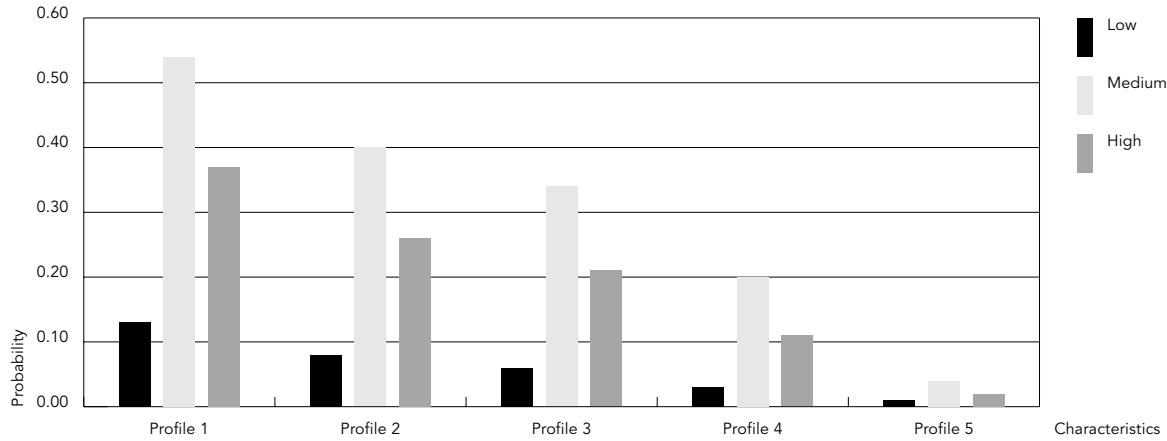
## Discussion

This study showed that a significant proportion of IDUs are unaware of their HIV status. Among these, during the survey some 40% were diagnosed as HIV-positive, highlighting the major spread of the virus in the study population as a consequence of different risk attitudes and behaviors, including lack of care for one's own health. In addition to lack of HIV testing, unawareness of serostatus was associated with the characteristics of IDUs recruiting sites, low schooling, less contact with harm reduction programs, and male gender.

Unawareness of serostatus was observed with a quite variable frequency, with a heavy contextual influence in addition to individual variations, which the study also explored. Few studies have approached this issue, thus hin-

Figure 2

Probability of not knowing HIV status, stratified by low, medium, and high background HIV prevalence among IDUs.



Profile 1: Male IDU, no schooling, has used SEP for  $\leq 5.9$  months, and never tested.  
 Profile 2: Male IDU, no schooling, has used SEP for  $> 5.9$  months, and never tested.  
 Profile 3: Male IDU, no schooling, has used SEP for  $\leq 5.9$  months, and already tested.  
 Profile 4: Male IDU, studied  $> 8^{\text{th}}$  grade, has used SEP for  $\leq 5.9$  months, and never tested.  
 Profile 5: Female IDU, studied  $> 8^{\text{th}}$  grade, has used SEP for  $> 5.9$  months, and already tested.

dering comparisons. However, a recent study in San Francisco, California, from 1997 to 1999 showed similar proportions of unawareness of serostatus (43.7%), although using a different definition for the outcome, namely IDUs who had not HIV-tested or who did not inform the results of their HIV tests during the interview<sup>17</sup>.

Some comparisons can be made using estimated proportions of individuals who are unaware of their HIV serostatus, considering different contexts. For example, in Brazil an estimated 66.7% of HIV-infected individuals are unaware of their condition<sup>8</sup>, which is a higher proportion than in the current study. In the United States, unawareness of serostatus (approximately 25%) appears to be much less frequent as compared to either the overall Brazilian estimate or the findings from the current study<sup>18</sup>. The differences in these proportions between the two countries and the population studied here may be related to the HIV prevalence in the resident populations and the peculiar characteristics of IDUs, among other factors.

The milieu to which the individual belongs, expressed here in simplified form by HIV seroprevalence among one's peers, can influence attitudes, habits, and beliefs. According to data from the Behavioral Risk Factor Surveillance System (BRFSS), individuals living in neighborhoods where HIV is more prevalent tend to be

tested more frequently<sup>19</sup>, probably since they are more familiar with issues related to both the infection and the clinical syndrome<sup>20</sup>.

The current study highlighted both the different proportions of serostatus awareness and differences in aspects related to HIV testing according to each specific context, with higher proportions of testing in high-prevalence neighborhoods.

International studies in different vulnerable populations have shown higher testing proportions than in the current study, thus highlighting the importance of expanding testing, counseling, and returning test results in the Brazilian context. In a study in Baltimore with 558 IDUs in 1999-2000, 84% reported previous HIV testing<sup>21</sup>. According to the HIV Testing Survey (HITS) in 1995-1996 (HITS-I) and 1998-1999 (HITS-II), more than 75% of the subjects had already been tested<sup>3</sup>.

In addition, individual characteristics of the study population can influence HIV testing, with an obvious impact on the serostatus unawareness rate.

Individuals with little schooling show higher odds of not being properly informed about issues related to HIV infection and AIDS and thus have an insufficient perception of the objective risks to which they are exposed<sup>22,23</sup> or express a fatalistic view, i.e., that nothing can



be done to avoid HIV infection or AIDS<sup>24</sup>. This limited knowledge along with fatalism and denial<sup>25</sup> can be expressed as less preoccupation with one's serostatus<sup>20</sup>.

This study showed an association (with a dose-response gradient) between low schooling and serostatus unawareness. Individuals with less schooling had higher odds of not knowing their HIV serological status. These findings are similar to those of Tobin et al.<sup>21</sup>, who show an association between low schooling and lack of HIV testing among North American IDUs.

Unawareness of one's HIV status can be even more relevant in populations with low schooling, since a substantial proportion of this population is not tested, and when they do have the HIV test they fail to return to pick up the result<sup>26</sup>. Sullivan et al.<sup>26</sup> identified IDUs as those who return the least frequently to pick up their results (27%), as compared to other groups who are at particular risk for HIV infection. In the current study, approximately 20% of the IDUs who had been tested for HIV failed to return for the result, a figure that is probably underestimated, since it was measured indirectly by the questionnaire.

The reasons for "*failure to return*" for one's HIV test results have been discussed by various authors. Two important factors are fear of finding out that they are infected and discrimination associated with seropositive status<sup>23,27</sup>. Thus, the association shown by the current study between high local background HIV prevalence and higher individual probability of having been tested does not allow one to generalize, i.e., sites heavily affected by the epidemic are not necessarily associated with higher serostatus awareness. For example, in Africa, where HIV/AIDS prevalence is the highest in the world, individuals tend not to want to know their serostatus, because they believe that HIV-positive status is associated with social stigma and somber prospects as to the availability of appropriate treatment, thus contributing to the high proportion of individuals who are unaware of their serostatus in various African communities<sup>28</sup>. The recent expansion of anti-retroviral treatment appears to have contributed to a reduction in stigma in some contexts, although the findings are still not conclusive<sup>29</sup>.

Analyzing the issue from an additional perspective, IDUs can display differentiated behaviors within the context of harm reduction programs. An example is the association between less use of SEP services and higher odds of not knowing one's HIV serostatus. This finding could highlight harm reduction activities as

a vehicle for greater dissemination of information on infection/clinical evolution of HIV infection, as well as greater visibility and referral of IDUs to anonymous testing centers. In this sense, SEP utilization could encourage HIV-tested IDUs to return for their test results, thus favoring an increase in the proportion of individuals who are actually aware of their HIV status<sup>21</sup>.

Some variables that are amenable to differentiated intervention were also associated with serostatus unawareness, such as gender. Some specificities of the testing, counseling, and return for test results process are known to be frequently associated with socio-demographic and cultural characteristics. For example, studies have shown that individuals with incorrect information on HIV/AIDS, in addition to having low schooling, are mostly young<sup>30,31</sup> and male<sup>22,31</sup>. Thus, as observed in this study and the literature, women are generally more informed and are tested more frequently as compared to men, and thus have higher odds of knowing their HIV serostatus.

Risk practices for HIV infection<sup>3,22,23,27,32,33</sup> and recognition of increased risk<sup>22</sup> can increase the odds of individuals knowing their serological status. In this sense, another analysis in the AJUDE Project showed a higher frequency of risk behaviors among female IDUs, in relation to initiation in drug injecting and to sexual practices<sup>34</sup>, which on the other hand could favor HIV testing. In addition, women generally have higher odds of knowing their HIV status, due to specific programs for diagnosis during prenatal care and childbirth<sup>1,33</sup>.

Some other findings should not be overlooked. In relation to consistent condom use, an apparently inverse association was observed. As discussed above, individuals with more frequent risk practices tend to be tested more frequently and probably tend more to know their HIV status. However, the interviewees who reported consistent condom use, that is, apparently at reduced risk for infection, were more likely to know their serostatus. Still, since this was a cross-sectional study, this finding may express behavior changes subsequent to testing. An alternative interpretation would be that certain lifestyles and health precautions could be mediating both findings (condom use and testing). However, only an in-depth investigation in this area would be capable of elucidating this possibility<sup>35</sup>.

The study's cross-sectional design limits the interpretation of some findings, principally those related to a possible reverse causality. In addition, use of data collected for other purposes limits the important specific analyses in

the characterization of HIV serostatus unawareness, for example, reasons leading to lack of concern over one's serostatus, not testing, and not returning for test results.

The study may have committed a bias by using non-random samples, with the possibility of a survival bias, recruiting IDUs in better health and consequently underestimating the true HIV seroprevalance in the study population. A recall bias may have occurred with a resulting underestimation in the data due to overvaluing of exposures, as well as an information bias in view of interviewee's conditions in the SEP context, which could favor "desirable" responses.

In addition, comparisons were limited by the lack of publications on unawareness of HIV infection status in keeping with this study's design and the reduced number of quantitative studies on HIV testing in IDUs.

Despite these limitations, the study produced relevant findings on knowledge of HIV serological status in the IDUs population. This question permeates the testing process and is associated with other equally relevant factors, like the context to which the individual belongs, expressed here by background HIV prevalence in each local context. IDUs with similar

characteristics displayed distinct probabilities of not knowing their HIV status, according to the areas where they were recruited. Preventive strategies should thus take the contextual dimension into account, formulating culturally appropriate interventions.

One can thus suppose that preventive campaigns will contribute to knowledge of serological status among IDUs, as long as they focus on information concerning the infection and disease and encourage testing. Such findings could also be used by anonymous testing centers, reinforcing the importance of pre-test counseling to reduce the rate of non-return for test results.

The findings also emphasize the importance of maintaining harm reduction programs and the need to focus in more detail on the issues approached here, such as testing and counseling, as well as referral and counter-referral between harm reduction programs and anonymous testing centers.

This study allowed developing a differentiated approach to the issue of HIV serostatus unawareness, not limited to prior HIV testing. Further research in this area is needed, given the relevance of such issues for controlling the HIV epidemic.

## Resumo

*Este estudo busca caracterizar o perfil de usuários de drogas injetáveis (UDIs) que desconhecem seu status sorológico para a infecção pelo HIV, em virtude da importância desta população na dinâmica da epidemia de HIV/AIDS e do conhecimento da sorologia como estratégia preventiva. Foram analisadas informações do Projeto AjUDE-Brasil II, estudo seccional multicêntrico, obtidas mediante questionário e teste sorológico para diagnóstico do HIV (ELISA). Os UDIs foram agrupados em: (1) UDIs que desconheciam seu sorostatus para a infecção pelo HIV e (2) UDIs que o conheciam. Foram realizadas comparações de médias, medianas e proporções, análises bivariadas e multivariadas. Dos 857 UDIs, 34,2% desconheciam sua sorologia. Estes apresentaram, significativamente, uma maior chance de terem sido recrutados de locais onde a prevalência do HIV era considerada média (OR = 8,0) e alta (OR = 4,0); de serem do sexo masculino (OR = 1,8); de frequentarem há menos tempo os programas de redução de danos (OR = 1,7), de nunca terem realizado o teste anti-HIV (OR = 2,2) e de nunca terem estudado (OR = 4,5). Estratégias preventivas devem ser elaboradas visando aos diferentes fatores associados ao desconhecimento do status sorológico, principalmente levando em consideração o contexto em que o UDIs está inserido.*

*Sorodiagnóstico da AIDS; Uso Indevido de Drogas Parenterais; Síndrome de Imunodeficiência Adquirida; HIV*

## Contributors

A. D. Ferreira participated in all stages of the study, including the design, data analysis and interpretation, literature review, and drafting of the manuscript. W. T. Caiaffa, principal investigator of the AjUDE-Brasil Project, participated in all areas of the project and was responsible for the original idea, supervision of the analyzed data, and revision of the manuscript. F. I. Bastos participated in all phases of the study and was responsible for reviewing the manuscript, playing a key role in updating the bibliographic references. S. A. Mingoti assisted in the statistical analyses and calculations and is responsible for the statistical component of the AjUDE-Brasil II Project. The AjUDE-Brasil II Project was conducted in 2000-2001 by an extensive team, listed below.

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## References

1. Nacher M, El Guedj M, Vaz T, Nasser V, Randrianjohany A, Alvarez F, et al. Risk factors for late HIV diagnosis in French Guiana. *AIDS* 2005; 19:727-38.
2. Ferreira MP, Silva CM, Gomes MC, Silva SM. Testagem sorológica para o HIV e a importância dos Centros de Testagem e Aconselhamento (CTA) – resultados de uma pesquisa no município do Rio de Janeiro. *Ciênc Saúde Coletiva* 2001; 6:481-90.
3. Kellerman SE, Lehman JS, Lansky A, Stevens MR, Hecht FM, Bindman AB, et al. HIV testing within at-risk populations in the United States and the reasons for seeking or avoiding HIV testing. *J Acquir Immune Defic Syndr* 2002; 31:202-10.
4. Wright RJ, Stringer JSA. Rapid testing strategies for HIV-1 serodiagnosis in high-prevalence African settings. *Am J Prev Med* 2004; 27:42-8.
5. Medley A, Garcia-Moreno C, McGill S, Maman S. Rates, barriers and outcomes of HIV serostatus disclosure among women in developing countries: implications for prevention of mother-to-child transmission programmes. *Bull World Health Organ* 2004; 82:299-307.
6. Wilson SR, Brown NL, Chin V, Levin D, Kao Y, Hu P. Condom use by women recently diagnosed with a sexually transmitted infection. *Sex Transm Dis* 2004; 31:740-7.
7. Joint United Nations Programme on HIV/AIDS/World Health Organization. *AIDS epidemic update: December 2004*. [http://www.unaids.org/wad2004/EPI\\_1204\\_pdf\\_en/Chapter0-1\\_intro\\_en.pdf](http://www.unaids.org/wad2004/EPI_1204_pdf_en/Chapter0-1_intro_en.pdf) (accessed on 15/Jan/2005).
8. Ministério da Saúde. Programa Nacional DST/AIDS: Fique Sabendo, 2003. <http://www.aids.gov.br/fiquesabendo/noticias1.asp?not=145> (accessed on 30/Nov/2003).
9. Ministério da Saúde. *Boletim Epidemiológico AIDS e DST 2004; ano I, n. 1*. <http://www.aids.gov.br/final/dados/BOLETIM2.pdf> (accessed on 02/Dec/2004).
10. Andrade TM, Dourado MI, Farias AH, Castroeu BG. Redução de danos e redução da prevalência de infecção pelo HIV entre usuários de drogas injetáveis em Salvador-Bahia. In: Teixeira PR, organizador. *A contribuição dos estudos multicêntricos frente à epidemia de HIV/AIDS entre usuários de drogas injetáveis no Brasil: 10 anos de pesquisa e redução de danos*. Brasília: Ministério da Saúde; 2001. p. 95-114. (Série Avaliação, 8).
11. Caiaffa WT, Bastos FI, Proietti FA, Reis ACM, Mingoiti SA, Gandolfi D, et al. Practices surrounding syringe acquisition and disposal: effects of Syringe Exchange Programmes from different Brazilian regions-the AJUDE-Brasil II Project. *Int J Drug Policy* 2003; 14:365-71.
12. Hacker MA, Friedman SR, Telles PR, Teixeira SL, Bongertz V, Morgado MG, et al. The role of “long-term” and “new” injectors in a declining HIV/AIDS epidemic in Rio de Janeiro, Brazil. *Subst Use Misuse* 2005; 40:99-123.
13. Caiaffa WT. Projeto AJUDE-Brasil. Avaliação epidemiológica dos usuários de drogas injetáveis dos projetos de redução de danos apoiados pela CN-DST/AIDS. Série Avaliação 6. 2001. <http://www.aids.gov.br> (accessed on 20/Sep/2003).
14. Lwanga SK, Lemeshow S. *Sample size determination in health studies: a practical manual*. Geneva: World Health Organization; 1991.
15. World Health Organization/Joint United Nations Programme on HIV/AIDS. *Second generation HIV surveillance: the next decade*. Geneva: World Health Organization/Joint United Nations Programme on HIV/AIDS; 2000.
16. Hosmer DW, Lemeshow S. *Applied logistic regression*. New York: John Wiley & Sons; 1989.
17. Shafer KP, Hahn JA, Lum PJ, Ochoa K, Graves A, Moss A. Prevalence and correlates of HIV infection among injection drug users in San Francisco. *J Acquir Immune Defic Syndr* 2002; 31:422-31.

18. Cohen MS, Hosseenipour MC. HIV transmission: epidemiology, biology, and prevention. In: 9th Conference on Retroviruses and Opportunistic Infections; 2002. <http://www.medscape.com/viewarticle/430380> (accessed on 05/Sep/2005).
19. Centers for Disease Control and Prevention. HIV testing – United States, 2001. *MMWR Morb Mortal Wkly Rep* 2003; 52:540-5.
20. Zafar T, Brahmabhatt H, Imam G, Hassan S, Strathdee SA. HIV knowledge and risk behaviors among Pakistani and Afghani drug users in Quetta, Pakistan. *J Acquir Immune Defic Syndr* 2003; 32:394-8.
21. Tobin KE, Tang AM, Gilbert SH, Laktin CA. Correlates of HIV antibody testing among a sample of injection drug users: the role of social and contextual factors. *AIDS Behav* 2004; 8:303-10.
22. Riess TH, Kim C, Downing M. Motives for HIV testing among drug users: an analysis of gender differences. *AIDS Educ Prev* 2001; 13:509-23.
23. Spielberg F, Branson BM, Goldbaum GM, Lockhart D, Kurth A, Celum CL, et al. Overcoming barriers to HIV testing: preferences for new strategies among clients of Needle Exchange, a Sexually Transmitted Disease Clinic, and Sex Venues for Men Who Have Sex with Men. *J Acquir Immune Defic Syndr* 2003; 32:318-27.
24. Ramirez JR, Crano WD, Ousit R, Burgoon M, Alvaro EM, Grandpre J. Effects of fatalism and family communication on HIV/AIDS awareness variations in Native American and Anglo parents and children. *AIDS Educ Prev* 2002; 14:29-40.
25. Hopkins SG, Gelfand SE, Buskin SE, Kent JB, Kahle EM, Barkan SE. HIV testing behaviors and attitudes after adoption of name-to-code HIV case surveillance in Washington State. *J Public Health Manag Pract* 2005; 11:25-8.
26. Sullivan PS, Lansky A, Drake A. Failure to return for HIV test results among persons at high risk for HIV infection. *J Acquir Immune Defic Syndr* 2004; 35:511-8.
27. Downing M, Knight K, Riess TH, Vernon K, Mulia N, Ferreboeuf M, et al. Drug users talk about HIV testing: motivating and deterring factors. *AIDS Care* 2001; 13:561-77.
28. Lau C, Muula AS. HIV/AIDS in Sub-Saharan Africa. *Croat Med J* 2004; 45:402-14.
29. World Health Organization. "3 by 5" progress report. December 2004 / WHO and UNAIDS. <http://www.who.int/3by5/en/ProgressReportfinal.pdf> (accessed on 20/Aug/2005).
30. Szwarwald CL, Júnior AB, Pascom AR, Júnior PR. Pesquisa de conhecimento, atitudes e práticas na população brasileira de 15 a 54 anos, 2004. *Boletim Epidemiológico AIDS e DST* 2004; ano XVIII, n 1.
31. Tapia-Aguirre V, Arillo-Santillán E, Allen B, Angeles-Llerenas A, Cruz-Valdéz A, Lazcano-Ponce E. Associations among condom use, sexual behavior, and knowledge about HIV/AIDS. A study of 13,293 public school students. *Arch Med Res* 2004; 35:334-43.
32. Spielberg F, Kurth A, Gorbach PM, Golbaum G. Moving from apprehension to action: HIV counseling and testing preferences in three at-risk populations. *AIDS Educ Prev* 2001; 13:524-40.
33. McGarrigle CA, Mercer CH, Fenton KA, Copas AJ, Wellings K, Erens B, et al. Investigating the relationship between HIV testing and risk behavior in Britain: National Survey of Sexual Attitudes and Lifestyles 2000. *AIDS* 2005; 19:77-84.
34. Cintra AMO, Caiaffa WT, Mingoti SA; Projeto AJUDE-Brasil. Characteristics of male and female injecting drug users of the AJUDE-Brasil II Project. *Cad Saúde Pública* 2006; 22:791-802.
35. Des Jarlais DC. Intoxications, intentions, and disease preventions. *Sex Transm Dis* 1997; 24:320-1.

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