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Risk Factors for Human Immunodeficiency Virus Infection among Brazilian Blood Donors; a Multicenter Case-Control Study Using Audio Computer-Assisted Structured-Interviews

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Abstract

Background—Although risk factors for HIV infection are known, it is important for blood centers to understand local epidemiology and disease transmission patterns. Current risk factors for HIV infection in blood donors in Brazil were assessed.

Methods—A case-control study was conducted at large public blood centers located in four major cities between April 2009 – March 2011. Cases were persons whose donations were confirmed positive by enzyme immunoassays followed by Western Blot confirmation. Audio computer-assisted structured-interviews (ACASI) were completed by all cases and controls. Multivariable logistic regression was used to estimate adjusted odds ratios (AORs) and associated 95% confidence intervals (CIs).

Results—There were 341 cases, including 47 with recently-acquired infection, and 791 controls. Disclosed risk factors for both females and males were sex with an HIV-positive person (adjusted odds ratio (AOR) 11.3, 95% CI [4.1, 31.7]) and being an IVDU or sexual partner of an IVDU (AOR 4.65 [1.8, 11.7]). For female blood donors, additional risk factors were having male sex partners who also are MSM (AOR 13.5 [3.1, 59.8]), and having unprotected sex with multiple sexual partners (AOR 5.19 [2.1, 12.9]). The primary risk factor for male blood donors was MSM activity (AOR 21.6 [8.8, 52.9]). Behaviors associated with recently-acquired HIV were being a MSM or sex partner of MSM (13.82, [4.7, 40.3]), and IVDU (11.47, [3.0, 43.2]).

Conclusion—Risk factors in blood donors parallel those in the general population in Brazil. Identified risk factors suggest that donor compliance with selection procedures at the participating blood centers is inadequate.

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Keywords

HIV; blood donors; Brazil; risk factors; risk reporting/disclosure; medical informatics

INTRODUCTION

Risk factors for HIV infection in the general population of Brazil have been evaluated in several studies [1–5]. Sexual transmission is the cause of the majority of HIV/AIDS cases in Brazil, with almost half of infections attributable to unprotected sex among men who have sex with other men (MSM). Other identified risk factors for HIV infection include intravenous drug use (IVDU) and vertical transmission [6]. Blood centers may provide a unique opportunity to contribute to the understanding of risk factors for infection because persons who present to donate reflect a diverse cross-section of the general population. In addition, blood centers can inadvertently contribute to the overall burden of HIV infection in society if transfusion-transmission occurs. Historically, transfusion-transmission of HIV infection has occurred in many countries including Brazil [7]. Universal testing of donated blood has substantially reduced the absolute and residual risk of disease transmission by blood [8]. All donated blood in Brazil was tested for HIV antibodies (and antigens if fourth generation tests were in use at individual blood centers) at the time of this study. In a previous publication we reported the HIV prevalence at the REDS-II Brazil centers; 92.2 per 10,000 donations in first time donors, with an incidence of 38 per 100,000 person-years in first time donors, 22.5 in repeat donors, and 27.5 overall [9]. The estimated residual risk of HIV transfusion-transmission is 11.3 per 1,000,000 donations (95% CI, 8.4–14.2) [9]. Nucleic Acid Testing (NAT) can further reduce the risk of transfusion-transmitted HIV; for example, in the USA the residual risk in donated blood has been reduced from 2 per 1,000,000 [10] to 0.67 per 1,000,000 [11], meaning a small residual risk persists [12]. NAT for HIV (in a duplex mini-pool assay that includes HCV) has been implemented in the largest cities and is poised to be scaled-up throughout the country and is expected to lead to a lower (6.8 per 1,000,000 donations), but still elevated residual risk compared to countries in Europe and North America.

Multicenter studies of HIV risk factors in Brazilian blood donors have not been reported. A previous study to investigate risk factors for HIV-positive donors in São Paulo was conducted using face-to-face interviews [13]. For the assessment of socially sensitive or stigmatizing behaviors face-to-face interviews could be a source of bias. We therefore conducted a case-control study using an audio computer-assisted structured interview (ACASI) to assess HIV risk factors among blood donors in four large Brazilian blood centers.

MATERIAL AND METHODS

This study is part of the NHLBI REDS-II International (Brazil) program. The study was conducted from April 2009 to March 2011, and included Fundação Pró-Sangue in São Paulo, Fundação Hemominas in Belo Horizonte and Fundação Hemorio in Rio de Janeiro, all in the Southeastern and most densely populated part of Brazil, and Fundação Hemope in Recife in Northeastern Brazil.

Blood samples from each donation were screened at each center with two different enzyme immunoassays (EIAs) tests (third or fourth generation) performed in parallel. Per standard procedures, if the two EIAs were reactive or discordant, a Western Blot was performed. Samples reactive on both EIAs were sent to Blood Systems Research Institute (San Francisco, CA) to classify the infection as recent (i.e., incident) or longstanding using the standardized testing algorithm for recent HIV seroconversion (STARHS), which is based on

a sensitive or less-sensitive enzyme immunoassay (less sensitive- or “detuned” EIA) [14]. Recently acquired infection is defined as HIV infection that was acquired within the preceding six months as determined by the detuned testing.

In Brazil donors are asked to return to the blood center for notification of donation testing results at which time additional samples are collected for new EIA and/or WB testing. Cases were persons who returned for counseling about donation testing results and were confirmed positive by the Western Blot on the follow up sample. Cases were enrolled in the study and completed the risk factor interview at the time of return to the blood center for notification and counseling. Potential controls were recruited for this study following donation. We randomly selected (prior to study start-up) the days/shifts to conduct control recruitment and randomly assigned a number (0–9) for each selected shift. This number was used to select which donors to approach – the recruiters would only approach donors whose identification numbers ended in the randomly assigned 0–9 number. Research staff would continue recruiting in a given shift until they enrolled two controls. After donating blood, the control donors answered the ACASI questionnaire. Controls had to test negative for all infections for which donations are currently screened in Brazil.

The risk factor questionnaire used is based on the HIV risk interviews developed by the US CDC [15, 16] but was modified to reflect potential risk behaviors in Brazil. The questionnaire was pilot tested in each of the REDS-II Brazil blood centers and revisions were made to enhance the clarity of the content. Formal cognitive debriefing studies of the meaning and content of each question were not conducted. The questionnaire included the following domains: sociodemographic factors, previous blood donation and HIV testing, incentives and motivations to donate, sexual history, sexual partners’ risks, a social matrix used to obtain detailed information on sexual behaviors and the participant’s last five sexual partners before blood donation, alcohol and drug use, medical history, other potential risk factors (tattoo, body piercing, acupuncture), and work place exposure. The ACASI (QDS Software, Nova Research Co, Bethesda, MD) was conducted using desktop computers at each blood center and included audio and on-screen text with a limited number of graphics but no pictures. Respondents were provided two options for recording responses, by touch screen or by keyboard/mouse. Except where noted we focused on lifetime behavioral exposures as indicators of the risk of infection. For the purpose of defining disclosed risk factor variables for analysis responses of “don’t know” and item refusals were grouped with the subjects who reported “no.” The potential risks we investigated and how they were defined are described in a Supplemental Digital Appendix. A script of the entire ACASI instrument is available in Portuguese or English from the authors upon request.

To assess differences in cases that participated to all potential cases, we compared the study cases to HIV-positive donors in the overall REDS-II Brazil donation database on demographic and donation characteristics, calculating proportions and using likelihood ratio chi-square p-values. These comparisons exclude cases from the Rio de Janeiro center because Rio de Janeiro did not provide the overall donation database that would have allowed us to determine whether the case participants are representative of all HIV-positive donors in Rio de Janeiro. We did assess differences between study cases at Rio de Janeiro and the other three centers.

Stepwise multivariable logistic regression was used to estimate odds ratios (ORs) for disclosed HIV risk factors and associated 95% confidence intervals (CIs). Candidate predictor variables were entered into the statistical model if $p \geq 0.2$ and retained if $p < 0.05$. Because we thought that some sexual behavior factors would show differential risk by gender, we nested some behaviors and sexual orientation within gender to obtain separate odds ratios. Predictor variables with $p < 0.05$ were considered significant. All statistical

analyses were performed using SAS version 9.2 (SAS Institute Inc., Cary, NC). The study was reviewed and approved by Ethical Committees in Brazil and Institutional Review Boards in the United States.

RESULTS

From April 2009 to March 2011, out of 720 potential cases, 32% in São Paulo, Belo Horizonte and Recife were enrolled. We did not have Rio de Janeiro data for all donations during this period to allow us to determine enrollment proportions at that center. Out of 564 potential cases contacted for participation in the study, 341 (60%) completed all studies procedures, and 791 controls met eligibility criteria and completed all study procedures. There were no significant differences between the study cases and HIV-positive donors in the donation database on available characteristics (Table 1). Comparing participating cases between Rio de Janeiro and the other centers, the results show that the donors from Rio de Janeiro were more likely to be community donors. There were no other significant differences between Rio de Janeiro and the other centers.

The demographic and donation characteristics and the disclosed behaviors by case-control status are reported (Tables 2 and 3). More cases were enrolled in Recife and Rio de Janeiro than in Belo Horizonte and São Paulo. By design the number of controls from each participating site was similar. Cases were more likely to be first time donors, male, younger, single, and to define their sexual orientation as bisexual or gay/homosexual.

The disclosed risk factors that were found to be most significantly associated with HIV infection were lifetime sex with an HIV-positive person (adjusted odds ratio (AOR) 11.3, 95% CI [4.1, 31.7]) and ever being an IVDU or sexual partner of an IVDU (AOR 4.65 [1.8, 11.7]). The overall multivariable model nested some behaviors and sexual orientation within gender to obtain separate odds ratios. For males, ever MSM (AOR 21.6 [8.8, 52.9]) and unprotected sex (with a sex worker or 2 unknown heterosexual partners (AOR 1.82 [1.1, 3.0])) were associated with HIV infection (Table 4). For females, ever being a sex partner of MSM (AOR 13.5 [3.1, 59.8]) and unprotected sex (with a sex worker or 2 unknown heterosexual partners (AOR 5.19 [2.1, 12.9])) were associated with HIV infection. Reporting bisexual orientation was associated with HIV infection for men (AOR 7.18 [2.3, 22.2]) but not for women (AOR 4.12 [0.6, 30.1]). It is noteworthy that the odds of infection for MSM in Rio de Janeiro alone, where MSM is a permanent deferral criterion, were greater than in the other centers (AOR 39.01 [5.5, 277.1] vs. AOR 26.31 [8.9, 78.0]), but confidence intervals overlapped due to the small number of cases. Other factors that were found to be significantly associated with HIV infection included first time donor status, potential job exposure, surgery and endoscopy in the last 12 months, marital status other than married, and elementary education or less. The type of blood donor (community or replacement) was forced into the model and showed no difference in risk for HIV infection.

Overall, 24 (7%) cases did not disclose any potential behavioral risk factor on the ACASI. However, from the multivariable analysis several of the factors that we inquired about were not significantly associated with being a case, including risks such as acupuncture, recent tattoos or piercings. Using the statistically significant behavioral risk factors we found in this study (Table 4) and re-analyzing risk disclosure, 23% of cases did not disclose any of these behavioral risk factors associated with HIV.

Of the 341 HIV-positives donors, 47 were determined to have recently-acquired HIV infection. Due to the smaller sample size, we were unable to run a nested model for gender (Table 5). The strongest disclosed risk factors were MSM or sex partner of MSM (AOR 13.82 [4.7, 40.3]), IVDU or sex partner of IVDU (AOR 11.47 [3.0, 43.2]), reporting being

bisexual (AOR 8.26 [1.7, 40.3]), potential job exposure (AOR 4.64 [1.8, 12.3]), and reporting being single, never married (AOR 4.29 [1.8, 10.5]).

DISCUSSION

We conducted a case-control study using ACASI that included over 340 HIV-positive and nearly 800 HIV-negative blood donors in four large cities in Brazil. We found MSM activity was the sexual behavior most strongly associated with being an HIV-positive blood donor followed by reporting having HIV-positive sexual partners. As expected, risk factors for male and female donors were different. Interestingly, after adjusting for other variables in the model for men, reporting bisexuality was associated with being HIV-positive whereas reporting homosexuality was not. For women, being a sex partner of an MSM and unprotected sex with multiple or unknown partners were the main factors associated with HIV infection. IVDU was also associated with HIV infection and was more strongly associated with recently-acquired HIV. Our data point to a need to improve blood donors' compliance with pre-donation screening, since many cases, and even a measurable proportion of controls disclosed deferrable risk behaviors on the post-donation ACASI.

HIV test seeking, meaning persons donate in order to obtain HIV test results, has been reported to occur in nearly 9% of blood donors in São Paulo [17] and may be a reason for low compliance with behavioral risk disclosure among the studied population. Although in larger cities of Brazil, Voluntary Counseling and Testing Centers (VCTs) offer free HIV testing, historically, blood centers were the first public institutions to perform HIV testing. Blood centers have a public image of efficiency and reliability, and they are not associated with negative stigma. Thus presenting to donate may provide a route that appears to be a more socially acceptable pathway for HIV testing. Moreover, test-seekers may erroneously think that tests performed in blood centers are more accurate than those performed at VCTs, and may also believe that donation testing fully mitigates transfusion-transmission risk. The adoption of NAT screening of blood donations in Brazil which will permit identification of infection earlier following exposure in addition to serological screening could lead to the unintended consequence of increased test-seeking at blood centers in Brazil.

Male-male sex and being a partner of a MSM were strongly associated with prevalent and recent HIV infection. These findings are consistent with previous research. In a previous study HIV-positive donors were 26 times more likely to report MSM [13]. The current study was designed to collect more information on sexual behaviors and sexual identity and is able to define sexual behavior risks in more specific risk categories. The controversial topic of accepting MSM as blood donors is an area where opinions diverge. The United States and Canada have an indefinite deferral for MSM since 1977. Some other countries, as New Zealand, have a 5-year deferral for MSM. The current Brazilian policy, as well as the policies in Japan, Argentina, Australia, Sweden, Hungary and United Kingdom (except in Northern Ireland) establish that MSM are eligible to donate blood if they have not had a male sexual partner in the past 12 months [18]. However, individual blood centers in Brazil are allowed to define more restrictive medical policies. In Rio de Janeiro MSM activity is an indefinite deferral. For the other three blood centers the deferral is currently one year duration from last MSM contact. We did not see a substantive difference in odds ratios for HIV in MSM between Rio de Janeiro and the other centers, suggesting that indefinite deferral of MSM is not more effective than a one year deferral in reducing the likelihood that HIV-positive MSM will attempt to donate.

The risk factors identified in this study raise challenging public health issues. In the second decade of the HIV epidemic, the increase in HIV infection in women was attributed to the "bisexual bridge" [19]. Awareness and disclosure of HIV serostatus to sexual partners by

heterosexual and bisexual men is still a matter of trust with a high potential for stigma. Two thirds of women surveyed agreed that it was not easy to tell their sexual partner they do not want to have sex without condoms [20]. Population-based studies in Brazil found that 36.6% of young women reported condom use at last intercourse and those who did were more concerned with preventing sexual transmitted infections than pregnancy [21]. Bisexual orientation seems to play an important role in the epidemiology of HIV among donors and further studies are needed to evaluate its role in the spread of HIV within the Brazilian social context.

Brazil is very well-known for its HIV/AIDS control program, including access to antiretroviral therapy. Condom promotion has been a backbone of prevention efforts in the country, mainly among young people and women in particular [21]. Besides campaigns alerting people to use condoms, in 2011 the Brazilian Ministry of Health provided almost half a billion condoms to States and municipalities for free distribution. In 2012, 20 million female condoms were distributed at an equivalent cost of about \$14 million [22]. These data suggest condoms are available, but the prevalence of unprotected sex we found among male and female donors call attention to the need to reinforce condom use and improved approaches for negotiation of condom use for women. Furthermore, the results of this study highlight the need to develop effective HIV risk reduction campaigns that cut across self-defined sexual orientation categories and instead focus broadly on the importance of condom use in all sexually active persons in Brazil.

An unexpected finding was the association of job exposure with recent HIV infection among cases. One out of seven cases reported a potential job exposure as the source of HIV infection. Healthcare workers (HCWs) frequently face the risk of occupational infection from blood borne pathogens following exposure to blood and other body fluids. However, available evidences suggest that healthcare-acquired HIV infections are not as frequent as reported here. Rapparrini conducted a systematic review to identify cases of occupationally acquired HIV infection among Brazilian HCWs [23]. After searching 219 references, she identified only four documented occupational HIV infection cases. Three of the 4 HCWs had treated patients with probable high viral loads and low CD4 counts. It is possible that even using ACASI, some donors such as HCWs, did not feel comfortable to disclose personal risk behaviors. Similarly, weak but significant associations with HIV infection and history of surgery or endoscopy in the last 12 months must be interpreted with caution. More detailed studies are necessary to establish if endoscopy and other medical procedures are really risk factors for HIV infection in Brazil or an effect-cause association, meaning that persons with HIV-infection may be more likely to access health care services thus leading to the association we observed.

There are limitations to our study. From a public health perspective the most important limitation is that the relative distribution of risk behaviors for HIV infection identified in blood donors is not expected to accurately reflect the proportion of risk behaviors that are associated with HIV infection in the general population. The primary reason for this is because of the donor eligibility and selection procedures that blood centers use mean that the donor population is not representative of the general population. However, this study highlights that blood centers may be identifying a range of risk factors that may not be captured in setting such as VCTs, and may have identified rare but potentially relevant risk factor in the Brazilian context. A potential limitation is that we were only able to assess or control for factors which we measured using ACASI or had access to from the REDS-II Brazil donation database. It is possible that residual confounding as a result of unmeasured factors is present.

The assessment of HIV risk factors was based on self-report and differential misclassification of exposure, often referred to as “recall bias” is possible. HIV-positive donors were invited to participate after knowing their serologic status. In contrast, on-site controls had just donated blood when invited to participate and did not know the results from donation testing at the time of completing the interview. Thus, HIV-positive donors had more time to evaluate their own risks and perhaps would be more willing to both remember and disclose them.

All participants had been accepted as donors based on face-to-face interviews and denied risk factors that, if disclosed, could lead to deferral. A strength of our study is the use of ACASI [24]. In blood banks ACASI may play an important role leading to increased sensitivity of predonation medical interviews and encouraging personal risk disclosure [25, 26]. The use of ACASI led to the reporting of behavioral risks in both cases and controls. In the control donors, over 10% reported risk behaviors that were not disclosed in face-to-face interviews. Our results suggest an important need to enhance educational efforts in Brazil in order to reduce the risk of transmission of HIV, and to re-assess whether face-to-face interviews to determine blood donor eligibility are the most appropriate procedure for eliciting risk disclosure.

This study has public health and governmental policy implications, not only regarding blood safety, but also as an indicator of current HIV risk factors in the general Brazilian population, as we brought to light some unanticipated risks, such as endoscopy and medical procedures in the last 12 months, and self-defined sexual orientation of bisexuality for males. There is a clear need to understand why higher risk populations are donating blood and how blood centers might be better able to steer people to VCTs instead. Addressing these issues is more likely to reduce transfusion threats more than restrictive donor deferral policies will, because donors are not currently disclosing risks, especially those that can be perceived as being more stigmatizing [27, 28]. In addition, blood banks also need to create an environment of trust and transparency to increase donors’ compliance and guarantee the success of the “layers of safety” concept that underpins blood safety. The risk factors we identified in this study suggest that there are many routes whereby HIV continues to be transmitted in Brazil. Information about modes of HIV transmission and non-transmission still need to be better developed and communicated [29] not only among blood donors, but to the Brazilian population as a whole.

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Abbreviations

ACASI	Audio computer-assisted structured-interview
HCV	hepatitis C virus
HIV	human immunodeficiency virus
HCWs	Health Care Workers
MSM	Men who have sex with other men
NAT	Nucleic Acid Technology
VCT	Voluntary Counseling and Testing Centers

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Table 1

Case demographics and comparison of cases in donation database and those enrolled in the HIV risk factor study by center.

Characteristic	Cases in Donation Database			Cases Enrolled in HIV Risk Factor Study from São Paulo, Recife, and Belo Horizonte			Likelihood Ratio Chi-Square p-value	Rio de Janeiro Cases Enrolled in HIV Risk Factor Study		Likelihood Ratio Chi-Square p-value
	n	%		N	%			n	%	
Total	720	100%		233	100%			108	100%	
Blood Donation Center										
Recife	322	45%		110	47%					
Belo Horizonte	147	20%		51	22%	0.54				
São Paulo	251	35%		72	31%					
Donor Status										
First Time	400	56%		117	51%			63	58%	0.21
Repeat	320	44%		112	49%	0.24		45	42%	
Donation Type										
Community	435	60%		125	57%			83	77%	
Replacement	263	37%		88	40%	0.62		18	17%	<0.0001
Other/Missing	22	3%		6	3%			7	7%	
Gender										
Male	606	84%		196	84%			86	80%	0.31
Female	114	16%		37	16%	0.99		22	20%	
Age										
18-25	190	26%		67	29%			31	29%	
26-30	169	24%		53	23%	0.90		24	22%	0.41
31-39	220	31%		67	29%			24	22%	
40+	140	20%		46	20%			29	27%	
Education										
< High School	180	34%		82	33%			41	38%	0.60
High School	358	67%		150	65%	0.61		66	62%	

NOTE: Totals may not sum to 720, 233 and 108 due to missing data for individual items.

Table 2

Demographics of blood donors by case-control status

Characteristic	Case		Control	
	n	%	n	%
Total	341	100%	791	100%
Blood Donation Center				
Recife	110	32%	194	25%
Belo Horizonte	51	15%	194	25%
São Paulo	72	21%	195	25%
Rio de Janeiro	108	32%	208	26%
Donor Status				
First Time	183	54%	201	25%
Repeat	158	46%	590	75%
<i>Donation Type</i>				
Community	208	61%	466	59%
Replacement	106	31%	249	31%
Other/Missing	27	8%	76	10%
<i>Gender</i>				
Male	282	83%	556	70%
Female	59	17%	235	30%
<i>Age</i>				
18–25	98	29%	189	24%
26–30	77	23%	130	16%
31–39	91	27%	235	30%
40+	75	22%	237	30%
<i>Education</i>				
Elementary School	123	36%	206	26%
> Elementary School	216	63%	582	74%
Refused/Don't Know	2	1%	3	0%
Marital Status				
Single, never married*	196	57%	299	38%
Living together, not married	62	18%	119	15%
Married	51	15%	326	41%
Separated/Divorced/Widowed	32	9%	47	6%
Sexual Orientation				
Straight/Heterosexual	206	60%	713	90%
Bisexual	57	17%	8	1%
Gay/Homosexual	68	20%	31	4%
Refused/Don't Know	10	3%	39	5%

* One respondent who answered “don't know” was included in the single, never married category.

Table 3

Disclosed behaviors using ACASI by case-control status.

Disclosed behaviours and exposure intervals	Case		Control	
	n	%	n	%
Total	341	100%	791	100%
<i>Potential Job Exposure, ever</i>	50	15%	33	4%
<i>Body Piercing, ever</i>	63	18%	96	12%
<i>Tattoos, ever</i>	74	22%	106	13%
<i>Acupuncture, ever</i>	26	8%	47	6%
<i>Manicure or Shave in salon/barber shop, ever</i>	201	59%	371	47%
<i>Medical procedures in the last 12 months</i>	116	34%	152	19%
<i>Surgery in the last 12 months</i>	103	30%	126	16%
<i>Endoscopy in the last 12 months</i>	36	11%	40	5%
<i>IVDU or sexual partner of IVDU, ever</i>	30	9%	10	1%
<i>Blood Transfusion/Sex partner with blood transfusion, ever</i>	35	10%	42	5%
<i>Inmate, ever</i>	8	2%	6	1%
<i>Sex with inmate, ever</i>	19	6%	13	2%
<i>MSM</i>	118	35%	15	2%
<i>MSM, unprotected sex last 12 months</i>	23	7%	6	1%
<i>Sexual partner of MSM, ever</i>	142	42%	13	2%
<i>Sex with person with potential job exposure, ever</i>	31	9%	41	5%
<i>Sex with HIV+ person, ever</i>	49	14%	7	1%
<i>2 or more heterosexual partners, protected sex, last 12 months</i>	18	5%	28	4%
<i>Sex with sex worker, protected sex, last 12 months</i>	6	2%	3	0%
<i>Sex with unknown person, protected sex, last 12 months</i>	23	7%	15	2%
<i>Sex with sex worker/unknown or 2 heterosexual partners, unprotected sex, last 12 months</i>	100	29%	94	12%

Table 4

Disclosed risk factors and demographic characteristics predicting case status. Overall and gender-specific adjusted odds ratios (95% CI) and p-values from logistic regression modeling, conditioned on donation center, Number of cases 341, number of controls 791.

Effect	AOR	95% CI	p-value
Both genders			
<i>Behavioral Factors (reference = No)</i>			
Sex with HIV+ partner	11.3	(4.1,31.7)	<.0001
IVDU or Sex Partner of IVDU	4.65	(1.8,11.7)	0.001
First time donor	4.22	(2.8,6.3)	<.0001
Potential Job Exposure	3.18	(1.7,6.0)	0.0004
Surgery last 12 months	2.07	(1.3,3.2)	0.001
Endoscopy last 12 months	2.06	(1.0,4.1)	0.04
<i>Marital Status (reference = Married)</i>			
Separated/Divorced/Widowed	3.66	(1.8,7.4)	0.0003
Single, never married/Don't know ¹	2.85	(1.8,4.5)	<.0001
Living together, not married	2.8	(1.6,4.8)	0.0002
<i>Education (reference =>Elementary)</i>			
Elementary education	2.54	(1.7,3.8)	<.0001
Don't know/Refused education	0.67	(0.1,8.5)	0.76
<i>Donation Type (reference = Community donor)²</i>			
Other donation type	1.65	(0.8,3.3)	0.15
Replacement donor	1.06	(0.7,1.7)	0.8
Males			
<i>Behavioral Factors (reference = No)</i>			
MSM	21.6	(8.8,52.9)	<.0001
Sex with sex worker/unknown or 2 heterosexual partners, unprotected sex	1.82	(1.1,3.0)	0.02
<i>Sexual Orientation (reference = Straight/Heterosexual)</i>			
Bisexual	7.18	(2.3,22.2)	0.0006
Gay/Homosexual	1.71	(0.7,4.2)	0.24
Don't know/Refused sexual orientation	0.35	(0.1,1.2)	0.09
Females			
<i>Behavioral Factors (reference = No)</i>			
Sex Partner of MSM	13.5	(3.1,59.8)	0.001
Sex with sex worker/unknown or 2 heterosexual partners, unprotected sex	5.19	(2.1,12.9)	0.0004
<i>Sexual Orientation (reference = Straight/Heterosexual)</i>			
Bisexual	4.12	(0.6,30.1)	0.16
Gay/Homosexual	1.08	(0.2,6.5)	0.94
Don't know/Refused sexual orientation	1.88	(0.6,5.7)	0.27

¹One subject responded "don't know" to marital status. He was included in the "Single" category

²Donation type was forced into model

NOTE: 79 (23.2%) of cases have no behavioral risk factors that are statistically significant in the model.

Table 5

Disclosed risk factors and demographic characteristics predicting recent infection.¹ Adjusted odds ratios (95% CI) and p-values from logistic regression modeling, conditioned on donation center Number of cases 47, number of controls 731.

Effect	AOR	95% CI	p-value
<i>Behavioral Factors (reference = No)</i>			
MSM or Sex Partner of MSM	13.82	(4.7,40.3)	<.0001
IVDU or Sex Partner of IVDU	11.47	(3.0,43.2)	0.0003
Potential Job Exposure	4.64	(1.8,12.3)	0.002
<i>Sexual Orientation (reference = Straight/Heterosexual)</i>			
Bisexual	8.26	(1.7,40.3)	0.009
Gay/Homosexual	1.66	(0.4,6.2)	0.45
Don't know/Refused sexual orientation	1.66	(0.3,8.0)	0.53
<i>Gender (reference=female)</i>			
	1.68	(0.7,4.0)	0.24
<i>Marital Status (reference = Married)</i>			
Single, never married/Don't know ²	4.29	(1.8,10.5)	0.001
Living together, not married	1.39	(0.4,5.2)	0.63
Separated/Divorced/Widowed	1.65	(0.3,9.8)	0.59
<i>Donation Type (reference = Community donor)³</i>			
Replacement donor	1.99	(0.8,4.8)	0.13
Other donation type	0.41	(0.1,2.6)	0.34
<i>Donor Status (reference = Repeat)³</i>			
First time donor	0.71	(0.3,1.7)	0.42

¹Recent infection determined by detuned EIA application

²One subject responded "don't know" to marital status. He was included in the "Single" category

³Donation type and donor status were forced into model