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Knowledge of HIV testing and attitudes towards blood donation at three blood centres in Brazil

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Abstract

Background—Reducing risk of HIV window period transmission requires understanding of donor knowledge and attitudes related to HIV and risk factors.

Study Design and Methods—We conducted a survey of 7635 presenting blood donors at three Brazilian blood centres from 15 October through 20 November 2009. Participants completed a questionnaire on HIV knowledge and attitudes about blood donation. Six questions about blood testing and HIV were evaluated using maximum likelihood chi-square and logistic regression. Test seeking was classified in non-overlapping categories according to answers to one direct and two indirect questions.

Results—Overall, respondents were male (64%) repeat donors (67%) between 18 and 49 years old (91%). Nearly 60% believed blood centres use better HIV tests than other places; however, 42% were unaware of the HIV window period. Approximately 50% believed it was appropriate to donate to be tested for HIV, but 67% said it was not acceptable to donate with risk factors even if blood is tested. Logistic regression found that less education, Hemope-Recife blood centre, replacement, potential and self-disclosed test-seeking were associated with less HIV knowledge.

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Conflict of interest

The authors declare no conflict of interests.

Conclusion—HIV knowledge related to blood safety remains low among Brazilian blood donors. A subset finds it appropriate to be tested at blood centres and may be unaware of the HIV window period. These donations may impose a significant risk to the safety of the blood supply. Decreasing test-seeking and changing beliefs about the appropriateness of individuals with behavioural risk factors donating blood could reduce the risk of transfusing an infectious unit.

Keywords

blood donation; HIV knowledge; test-seeking

Introduction

The World Health Organization (WHO) blood transfusion safety programme provides policy guidance and technical assistance to countries worldwide to achieve equitable access to safe blood and blood products and their safe and rational use [1]. The European Council and the American Association of Blood Banks (AABB) guidelines recommend blood banks to use questionnaires to identify and defer potential blood donors with clinical histories or behaviours associated with transfusion-transmitted infections (TTIs) [2, 3].

Screening questionnaire responses depend on donor knowledge of and attitude towards TTI risk and testing attributes such as socio-economic status and education, and a trusting relationship between interviewer and candidate. Potential donors should have a certain level of knowledge concerning the blood donation process, TTIs and the impact of blood transfusion on a recipient's life prior to donation.

However, these factors may not be sufficient to avoid blood donation from at-risk individuals – those who may hide important information related to TTIs in order to donate blood, mainly to get their blood tested [4–6]. Others might underestimate the relevance of the donor screening questionnaire by not revealing important information (e.g. drug use and sexual risk behaviour) or they might misinterpret questions [7–9]. On the other hand, knowledge of HIV transmission, risk perception, and attitudes and practices of individuals and groups related to risk behaviour are essential elements in defining individual HIV vulnerability [10].

The value of responses to behavioural screening questions depends on donor knowledge of and attitudes towards TTI risks and donation testing. The few studies that have addressed these issues indicated a lack of donor knowledge and a number of misconceptions [7–9]. Assessing these factors, especially in high prevalence countries such as Brazil where transfusion-transmission risks remain, despite nucleic acid testing (NAT), 10-fold higher than current estimates in the USA or Europe [11, 12], may prove useful to estimate a donor population's vulnerability to giving window period donations. We therefore conducted a study to evaluate knowledge, beliefs, attitudes and practices related to HIV testing among blood donor candidates in three large blood centres in Brazil.

Materials and methods

Study population

This is a secondary analysis of a cross-sectional study that was conducted in 7635 blood donors at three Brazilian blood centres from 15 October 2009 through 20 November 2009. The centres included Fundação Pró-Sangue (FPS-São Paulo) in São Paulo State, Fundação Hemominas in Belo Horizonte (Hemominas-Belo Horizonte), Minas Gerais State and Fundação HEMOPE in Recife (Hemope-Recife), Pernambuco State, participating in the National Heart, Lung and Blood Institute's REDS-II International Brazil component. This study was approved by the Brazilian National Ethical Committee and human subject's protections committees in the USA at each of the USA-based participating institutions. All donor candidates aged 18–65 years who presented to donate blood during the study period were invited to participate. Participants were informed that results of the study questionnaire were anonymous. Signed informed consent was obtained, and subjects completed a self-administered paper questionnaire about their motivations and attitudes concerning blood donation and knowledge of HIV testing while awaiting the medical screening. Subjects included replacement donors (i.e. persons providing a donation when a friend or family member needs blood) and community volunteer donors. Both approved and deferred donors were included in the study. Predonation materials (such as an educational pamphlet) are given to donors routinely at these blood centres.

Sample size

The sample size was calculated using (1) estimated percentage of test seekers (7.5–10.1%) [6], (2) two-tailed 0.05 significance level and 80% power and (3) expected proportions of 2/3 community donors and 1/3 replacement donors. Allowing for a moderate amount of missing data (e.g. missing lab results, incomplete questionnaires), we planned to approach 3000 candidates to donation in each centre, with the goal of enrolling 2500 per centre. Questionnaires were distributed consecutively until the total required in each centre (3000) was reached.

Study measures

The motivation questionnaire survey contained questions on demographics, previous blood donation, HIV testing and knowledge, motivation factors for blood donation and social capital. Survey questions were structured from published instruments and were pretested with prospective donors to ensure the appropriateness of the content [13, 14]. For the purpose of this analysis, six questions about blood testing and HIV were evaluated. To assess beliefs about blood bank procedures, donors were asked: 'Do you believe that the blood centre uses better HIV tests than are available at other places?' To assess attitudes regarding blood donation to obtain HIV test results two questions were used: 'Do you think it is OK to donate blood in order to be tested for the AIDS virus?' and 'Is it OK to donate blood if you have engaged in risk behaviours for HIV or AIDS because the blood centre tests all blood and throws away any infected blood?' The awareness of HIV window period was assessed by: 'Is it OK to donate blood even if you engage in risk behaviours for HIV or AIDS as long as you have a negative HIV test?' and 'Does the blood test for HIV identifies everyone who is infected with the virus?' Finally the affirmative statement – 'The blood

centre is the only place I know of offering tests'. – was designed to assess whether donors were aware of other health services/locations to get tested. The first five questions were answered 'Yes', 'No' or 'Don't Know'. For the sixth question, the participants answered using a Likert scale to indicate how much they agreed with the statement: 'Totally Agree', 'Agree', 'Disagree' or 'Totally Disagree'. These four categories were grouped as 'Yes' for 'Totally Agree' or 'Agree' and 'No' for 'Disagree' or 'Totally Disagree'.

Self-disclosed test seekers were classified as those who answered 'Totally Agree' or 'Agree' to the statement: 'I donated blood so I could be tested for HIV'. Potential test seekers answered 'Totally Agree' or 'Agree' to two statements: 'I think that blood donation is a good, fast and anonymous way to get my blood tested', and 'I like to donate blood to get my blood test results'. Non-test seekers were those who did not match the above criteria.

Completed questionnaires were scanned into an electronic database using TELEFORM (Cardiff, Vista, CA, USA) software. The following questionnaire data were incorporated from the REDS-II Brazil Donation and Deferral Database by Westat (REDS-II International Data Coordinating Center): demographics, donor/donation characteristics (community/replacement, first-time/repeat) and routine blood donation laboratory screening results for HIV, Chagas disease, HTLV-1/2, hepatitis B and C and syphilis.

Statistical analyses

Data distribution by blood centre was evaluated using the likelihood ratio chi-square statistic to test for common distribution over all three centres. Variables included gender, age group, education, income, marital status, employment status, donor presentation type (community/replacement/deferral), donation status (first time/repeat), serological screening result and level of test seeking, which have been consistently demonstrated as having an important predictive value in studies in Brazil [6, 15–18]. These variables, as well as blood centre location, were maintained as independent predictors in separate multivariable logistic regression models to compare 'Yes' vs. 'No', 'Don't Know'/'Missing' answers for the six questions. The missing data, 'don't know' were compiled with the 'No' answers for comparison with the 'Yes' answers. SAS/STAT version 9.2 (SAS Institute Inc., Cary, NC, USA) was used for all analyses.

Results

During the study period, there were 16 275 presentations for whole-blood donation at the centres. Of those, 12 804 (78.7%) and 3471 (21.3%) were accepted and deferred donors, respectively. Of all presentations, 6745 (41.4%) occurred at Hemope-Recife, followed by 5595 (34.4%) at FPS-São Paulo and 3935 (24.2%) at Hemominas-Belo Horizonte. A total of 9000 questionnaires were distributed and 7635 (84.8%) were completed.

Respondent demographic characteristics are shown in Table 1. Of 7635 respondents, 2673 (35.0%) were enrolled at FPS-São Paulo, 2547 (33.4%) at Hemominas-Belo Horizonte, and 2415 (31.6%) at Hemope-Recife. The majority were male (64.5%), high school educated (56.8%) and 18–39 years old (73.2%; median = 31 years). More than two-thirds were employed with 62.9% earning a monthly income between \$251 and \$1500 (US).

Respondent demographics varied across centres for all variables ($P < 0.0001$). Hemope-Recife participants were characterized by a higher proportion of males, 'married' or 'living together', and lower educational and income levels compared with Hemominas-Belo Horizonte and FPS-São Paulo. FPS-São Paulo participants had higher income and educational levels and were older compared with Hemope-Recife and Hemominas-Belo Horizonte.

Table 2 shows respondent donor characteristics by blood centre. Approximately two-thirds were repeat donors and 40.5% were replacement donors (family- or friend-related). The highest proportion of first-time donors was observed at Hemominas-Belo Horizonte (36%), while FPS-Sao Paulo had the highest percentage of repeat donors (68.8%). A higher proportion of replacement donors were observed at Hemope-Recife (71.5%), while the majority of community blood donors were from FPS-Sao Paulo (86.9%). Of the respondents, 1444 (18.9%) were deferred after medical screening with the highest percentage observed at Hemominas-Belo Horizonte (22.4%) followed by Hemope-Recife (19.7%) and FPS-São Paulo (14.9%).

Among approved donors, 224 participants (3.6%) were reactive for one or more of the routine screening markers (Chagas disease, HIV-1/2, HTLV-1/2, hepatitis B and C, and syphilis) including nine (0.1%) participants who were HIV-1/2 EIA repeat reactive on two tests, which correlates strongly with confirmed infection. Participants at Hemope-Recife had the highest proportion of positive screening markers at 6.7% compared with 2.5% at Hemominas-Belo Horizonte and 2.0% at FPS-São Paulo.

Overall, 37.7% of participants expressed test-seeking behaviour. Of those, 29.6% were classified as potential test seekers and 8.1% as self-disclosed test seekers. The highest percentages of test-seeking behaviour (potential and self-disclosed) were observed at Hemope-Recife (42.2% and 15.7%), followed by Hemominas-Belo Horizonte (25.3% and 4.5%) and FPS-São Paulo (22.5% and 4.6%).

The characteristics of the study participants shown in Tables 1 and 2 were similar to those of all presenting donors with the exception of centre (since the sample design was to enrol a roughly equal number of participants at each centre rather than enrolling proportional to the number of presenting donors at each centre). Table 3 shows participant responses to HIV knowledge and attitude questions by blood centre, while Table 4 presents the adjusted odds rate for the six questions investigated.

Response to question about beliefs that blood centres use better HIV tests

In response to the question: 'Do you believe that the blood centres use better HIV tests than are available at other places?' 59% of respondents agreed and nearly 30% did not know (Table 3). Of note, this question received the highest 'Yes' response among the three blood centres compared with the other five questions. The majority of 'Yes' responses were observed among participants at Hemope-Recife (66.3%), followed by 57.8% at Hemominas-Belo Horizonte and 53.6% at FPS-São Paulo. In an adjusted logistic model, the 'Yes' response was significantly associated with Hemope-Recife (AOR = 1.4) older age (AOR 1.2), potential test seeker (AOR = 1.6) and self-disclosed test seeker (AOR = 1.6).

Participants with higher educational level (AOR = 0.7) and monthly income (AOR = 0.7), and first-time donors (AOR = 0.8), were less likely to believe that blood centres use better HIV tests (Table 4).

Response to questions about test-seeking behaviour and HIV/AIDS risk factors

In response to ‘Do you think it is OK to donate blood in order to be tested for the AIDS virus?’ 46.1% of respondents answered ‘Yes’, the majority of them from Hemope-Recife (Table 3). Regression analysis found that those who felt it was OK to be tested were more likely to be Hemope-Recife (AOR = 2.0), 40 years of age and older (AOR = 1.5), first-time donors (AOR = 1.3), replacement (AOR = 1.4), potential test seeking (AOR = 4.8) and self-disclosed test seeking (AOR = 11.5; Table 4).

Regarding the question: ‘Is it OK to donate blood if you have engaged in risk behaviours for HIV or AIDS because the blood centre tests all blood and throws away any infected blood?’ 21.5% of the respondents agreed (‘Yes’). In Recife, the proportion of Yes response was almost twice of those from Belo Horizonte and São Paulo (Table 3). In adjusted logistic regression analysis, those who answered ‘Yes’ were more likely to be Hemope-Recife (AOR = 1.6,) participants, male (AOR = 1.2), replacement donors (AOR = 1.4), potential test seekers (AOR = 2.7) and self-disclosed test seekers (AOR = 4.0; Table 4).

Responses to HIV window period questions

Concerning window period knowledge (‘Does the blood test for HIV identify everyone who is infected with the virus?’), 42.4% of participants were unable to acknowledge the HIV window period (‘Yes’) and 37.6% did not know (Table 3). Furthermore, participants from Hemope-Recife were more likely to answer ‘Yes’. In logistic regression analysis, ‘Yes’ was more likely among Hemope-Recife participants (AOR = 1.3), those with lower educational (AOR = 1.3), self-disclosed test seekers (AOR = 2.5) and potential test seekers (AOR = 1.8). Students and those with the highest income level were less likely to believe the tests for HIV to identify all infected donors, AOR = 0.8 and 0.8, respectively (Table 4).

‘Is it OK to donate blood even if you engage in risk behaviours for HIV or AIDS as long as you have a negative HIV test?’ 28.0% of the participants responded ‘Yes’ (Table 3). After adjusted logistic regression, those more likely to give a ‘Yes’ response were from Hemope-Recife (AOR = 1.5), male (AOR = 1.2), replacement donors (AOR = 1.3), potential test seekers (AOR = 2.1) and self-disclosed test seekers (AOR = 3.0). Older participants and those with lower education were less likely to answer ‘Yes’ (AOR = 0.6 and 0.8, respectively; Table 4).

Response to places offering tests

‘The blood centre is the only place I know of offering tests’. 26.3% of the respondents were poorly informed about places to get tested. The higher proportion of individuals who agree with this statement was observed in Recife (Table 3). In logistic regression analysis, those less informed were associated with Hemope-Recife (AOR = 1.5) and Hemominas-Belo Horizonte (AOR = 1.3), older age (AOR = 1.6), lower education and monthly income levels (AOR = 1.5), retired (AOR = 1.6), self-disclosed test seeker (AOR = 8.1) and potential test

seeker (AOR = 3.7) (Table 4). Participants with higher educational (AOR = 0.6) and higher monthly income levels (AOR = 0.6) were less likely to agree that blood centres were the only places offering tests.

Discussion

Our results highlight that knowledge of HIV testing and attitudes towards donating if one has behavioural risk factors remain modest among Brazilian blood donors and are lower than in similar studies conducted in the USA [13, 19]. Lower levels of HIV knowledge were observed among self-disclosed test seekers and potential test seekers in accordance with previous studies in Brazil [6, 14].

HIV testing knowledge and beliefs regarding risk behaviour varied according to demographic and geographical differences showing that regional and socioeconomic differences are relevant and affect the accuracy of HIV knowledge [13, 20, 21]. Hemope-Recife participants had the highest misunderstanding related to accuracy of HIV tests, window period and donation attitudes compared with prospective donors at Hemominas-Belo Horizonte and FPS-São Paulo. This result likely reflects the historical socioeconomic and health disparities in the north and north-east (Recife) compared with the south-east (Belo Horizonte and São Paulo). Despite the advances in the Brazilian public health system (the National Health System), many discrepancies still exist regarding access to healthcare services and distribution of healthcare professionals [22]. A large percentage of healthcare facilities and physicians are located in the south and south-east regions of Brazil where the economic power of the country is concentrated [22].

In our study, lower levels of HIV testing knowledge, beliefs and attitudes tended to be associated with males, older age (40 years and older), replacement donors, first-time blood donors and those with lower education and income levels, similar to other studies [13, 20, 21]. As expected, higher education and income levels tended to be positively associated with HIV knowledge, and this effect remained after adjustment for potential confounding factors [13, 19, 20, 23]. Older age was associated with lower HIV testing knowledge in accordance with other studies [23, 24]. This finding may indicate that younger individuals are better informed about HIV risk, perhaps due to the increased level of schooling seen in the economically active population for the last 15 years in Brazil [25].

Nearly 50% of the respondents admitted that it was OK to donate blood to get tested; however, less than one-quarter felt that it was OK to donate if one had HIV behavioural risk factors. This may indicate that a large proportion of the donors who are coming in for testing do not engage in HIV risk behaviours; however, a subset of them, with risk behaviour, might not recognize the possible harm to recipients from persons who donate with HIV risk behaviours, as seen in a US study [19].

It is concerning that 59% of the participants in our study believe that the HIV tests at the blood centre are more accurate than those performed elsewhere and 42% believe that the HIV test identifies everyone who is infected with the virus. These evident that misconceptions may lead individuals to underestimate the threat that a person with HIV risk

may pose to the blood supply, as well as suggest that people may already be using the blood centres as a testing place and others may use it in the future if they need to check their HIV status. Our results are also concerning because the residual risk of HIV transfusion-transmission in Brazil is high, estimated at 11.3 per 10⁶ donations, although it could be reduced to 4.2 per 10⁶ donations by use of individual donation NAT [18].

The overall prevalence of self-disclosed test-seeking was 8.1%, similar to findings in previous studies in Brazil [17]. However, the prevalence was threefold higher in Hemope-Recife compared with Hemominas-Belo Horizonte and FPS-São Paulo. This corroborates the fact that social discrepancies coupled with lack of health care and fewer volunteer testing centres (VCTs) may drive more individuals in the Northeast region to donate in order to obtain test results as a way to check their health status. Furthermore, individuals with lower socio-economic status and test-seekers overall were more likely to believe that blood centres were the only places offering tests. In addition, dissatisfaction with past testing and counselling, including public HIV testing programs, motivates some persons to test at blood banks in Brazil [26]. Potential test seeking and self-disclosed test seeking were associated with lower HIV knowledge compared with non-test seeking for all six analysed questions. As expected, this association was strongest in self-disclosed test seekers who answered 'Yes' to the question 'Do you think it is OK to donate blood in order to be tested for the AIDS virus?' These results indicate that test-seeking donors have a strong desire to obtain their HIV test through the blood bank. In addition, test seekers mistakenly believed that tests performed in blood centres are more accurate than those performed elsewhere. The association of these two beliefs might lead to a potential threat to the blood supply considering that previous studies in Brazil have shown that test seekers have higher prevalence of Herpes simplex 2 virus than non-test seekers, suggesting that test seekers also engage more frequently in risk behaviours [17, 27]. Our results confirm that test seekers and replacement blood donors are more poorly informed about the HIV window period and other places where testing is available [6]. Efforts to improve HIV knowledge among replacement blood is necessary as they represent more than one-third of the blood donor population in Brazil and may become an important source of community blood donors in further donations.

Brazilian blood donors believe that the blood centres use better HIV tests than those available at other places, similar to findings in Canada [5]. These results reinforce international studies showing that blood centres' attribute of having 'excellence in services' may lead to a 'magnet' effect, attracting persons interested in checking their sero-logic test results [5, 28].

Our study has some limitations. First, we focused on blood donors and were not able to assess HIV knowledge and attitudes among the general population, which might have provided evidence for effective selection of safer and more knowledgeable persons among presenting donors. Second, the candidates were recruited to complete a self-administered paper questionnaire survey prior to the donor screening process while in the waiting area, not in a private space, and hence may not have had enough time or privacy to interpret and give thorough and truthful answers regarding HIV risk factor awareness and availability and performance of tests. Given more time or a more private questionnaire, such as ACASI, the

participants may have provided different responses. In addition, the study questionnaire in TELEFORM format might have given the participants a sense of lack of anonymity, resulting in socially desirable responses. For instance, some potential test seekers may have donated for an HIV test; however, they might have denied it in the clinical screening and also in the study questionnaire. Finally, the difference in the participation rates across the three blood centres can be explained by the sampling process as it was not proportional to the number of blood donor candidates at each centre. Historically, Hemominas-Belo Horizonte [29] has higher deferral rates compared with the other two blood centres, thus the emphasis on the over-enrolment. The sample size was calculated from different scenarios and was statistically powered for detecting differences across the blood centres. In summary, although our study was targeted to those presenting for blood donation, our results contradict the general perception that Brazilians have a sufficiently high level of HIV information, similar to a previous study [10], and suggest that strategies need to be pursued to enhance the safety of the blood supply in Brazil. Currently, direct provision of pamphlets to enhance potential blood donors' knowledge regarding sensitivity of screening tests and the residual infectious window period has not encouraged potential high-risk donors to self-defer or acknowledge their risk behaviour, as evidenced by our results and corroborating studies [30, 31]. Additionally, to avoid test-seeking behaviour at the blood centres, a stronger benchmark for the quality of testing and services at the VCT needs to be created. A marketing campaign targeting the general population must emphasize that VCTs are centres of excellence in providing reliable, accurate and free test results for hepatitis B and C, HIV and syphilis. Improving and expanding voluntary HIV counselling and testing centres in Brazil, especially in settings with low social development and lack of health service infrastructure, are imperative.

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Table 1Respondent demographic characteristics by blood centre location^a

Demographic characteristics	Recife <i>n</i> (%)	Belo Horizonte <i>n</i> (%)	São Paulo <i>n</i> (%)	Total participants <i>n</i> (%)	All presenting donors <i>n</i> (%)
Gender					
Female	570 (23.6)	1062 (41.7)	1079 (40.4)	2711 (35.5)	5487 (33.7)
Male	1845 (76.4)	1485 (58.3)	1594 (59.6)	4924 (64.5)	10 788 (66.3)
Age (in years) ^b					
18–25	675 (28.0)	798 (31.3)	610 (22.8)	2083 (27.3)	4121 (25.3)
26–30	495 (20.5)	541 (21.2)	487 (18.2)	1523 (20.0)	3040 (18.7)
31–39	601 (24.9)	631 (24.8)	744 (27.8)	1976 (25.9)	4333 (26.6)
40+	644 (26.7)	577 (22.7)	832 (31.1)	2053 (26.9)	4778 (29.4)
Educational level					
Less than elementary	244 (10.1)	268 (10.5)	225 (8.4)	737 (9.7)	1880 (11.6)
Elementary school	513 (21.2)	445 (17.5)	300 (11.2)	1258 (16.5)	
High school	1401 (58.0)	1467 (57.6)	1468 (54.9)	4336 (56.8)	10892 (66.9)
College or more	233 (9.7)	363 (14.3)	491 (18.4)	1087 (14.2)	2026 (12.4)
Missing	24 (1.0)	4 (0.2)	189 (7.1)	217 (2.9)	1477 (9.1)
Monthly income ^c					
<R\$ 500 (US\$ 250)	375 (15.5)	168 (6.6)	87 (3.3)	630 (8.3)	n.a.
R\$ 501–1000 (US\$ 251–500)	885 (36.7)	742 (29.1)	638 (23.9)	2265 (29.6)	
R\$ 1001–3000 (US\$ 501–1500)	665 (27.5)	894 (35.1)	985 (36.9)	2544 (33.3)	
>R\$ 3001 (>US\$ 1500)	262 (10.9)	414 (16.3)	520 (19.3)	1196 (15.7)	
Missing	228 (9.4)	329 (12.9)	443 (16.6)	1000 (13.1)	
Marital status					
Single, never married	910 (37.7)	1037 (40.7)	953 (35.7)	2900 (38.0)	n.a.
Living together/married	1335 (55.3)	1199 (47.1)	1236 (46.2)	3770 (49.4)	
Separated/Divorced/Widowed	137 (5.7)	133 (5.2)	208 (7.8)	478 (6.3)	
Missing	33 (1.4)	178 (7.0)	276 (10.3)	487 (6.4)	
Employment status					
Employed/Self-employed	1798 (74.5)	1874 (73.6)	1870 (70.0)	5542 (72.6)	n.a.
Retired	44 (1.8)	46 (1.8)	62 (2.3)	152 (2.0)	
Student	229 (9.5)	207 (8.1)	161 (6.0)	597 (7.8)	
Unemployed	311 (12.9)	242 (9.5)	294 (11.0)	847 (11.1)	
Missing	33 (1.4)	178 (7.0)	286 (10.7)	497 (6.5)	
Total participants	2415 (31.6)	2547 (33.4)	2673 (35.0)	7635 (100.0)	
Total presenting donors	6745 (41.4)	3935 (24.2)	5595 (34.4)		16 275 (100.0)

n.a., not ascertained.

^a*P*-value < 0.0001 for all characteristics.^bMissing value excluded.^cBrazilian minimum wage = US\$ 250.

Table 2Respondent donor characteristics by blood centre location^a

Donor characteristics	Recife <i>n</i> (%)	Belo Horizonte <i>n</i> (%)	São Paulo <i>n</i> (%)	Total participants <i>n</i> (%)	All presenting donors <i>n</i> (%)
Prospective donor status					
Approved	1939 (80.3)	1977 (77.6)	2275 (85.1)	6191 (81.1)	12804 (78.7)
Deferred	476 (19.7)	570 (22.4)	398 (14.9)	1444 (18.9)	3471 (21.3)
Donation history ^b					
First time	612 (31.6)	712 (36.0)	709 (31.2)	2033 (32.8)	4020 (31.4)
Repeat	1327 (68.4)	1265 (64.0)	1566 (68.8)	4158 (67.2)	8784 (68.6)
Donor presentation type ^b					
Community	552 (28.5)	1152 (58.3)	1977 (86.9)	3681 (59.5)	7809 (61.0)
Replacement	1387 (71.5)	825 (41.7)	298 (13.1)	2510 (40.5)	4993 (39.0)
Screening result (including HIV) ^b					
Negative	1810 (93.3)	1927 (97.5)	2230 (98.0)	5967 (96.4)	12441 (97.2)
Positive	129 (6.7)	50 (2.5)	45 (2.0)	224 (3.6)	363 (2.8)
Screening HIV result ^{b,c}					
Negative	1936 (99.8)	1977 (100.0)	2269 (99.7)	6182 (99.9)	12788 (99.9)
Positive	3 (0.2)	0 (0.0)	6 (0.3)	9 (0.1)	16 (0.1)
Level of test seeking					
Non-test seeker	1017 (42.1)	1789 (70.2)	1949 (72.9)	4755 (62.3)	n.a.
Potential test seeker	1019 (42.2)	643 (25.3)	601 (22.5)	2263 (29.6)	
Self-disclosed test seeker	379 (15.7)	115 (4.5)	123 (4.6)	617 (8.1)	
Total	2415 (31.6)	2547 (33.4)	2673 (35.0)	7635 (100.0)	

n.a., not ascertained among presenting donors.

^a *P*-value < 0.0001 for all characteristics, except screening HIV result.^b Among approved donors.^c Fishers exact test due to cells with expected frequencies <5, *P* = 0.05.

Table 3Knowledge of HIV testing and attitudes questions by blood centre^a

Question	Recife <i>n</i> (%)	Belo Horizonte <i>n</i> (%)	São Paulo <i>n</i> (%)	Total <i>n</i> (%)
Beliefs				
Do you believe that the blood centre uses better HIV tests than are available at other places?				
Yes	1601 (66.3)	1471 (57.8)	1434 (53.6)	4506 (59.0)
No	164 (6.8)	235 (9.2)	296 (11.1)	695 (9.1)
DK	639 (26.5)	811 (31.8)	809 (30.3)	2259 (29.6)
Missing	11 (0.5)	30 (1.2)	134 (5.0)	175 (2.3)
HIV attitudes				
Do you think it is OK to donate blood in order to be tested for the AIDS virus?				
Yes	1570 (65.0)	1030 (40.4)	917 (34.3)	3517 (46.1)
No	142 (28.7)	1306 (51.3)	1473 (55.1)	3472 (45.5)
DK	693 (5.9)	166 (6.5)	142 (5.3)	450 (5.9)
Missing	10 (5.1)	45 (1.8)	141 (5.3)	196 (2.6)
Is it OK to donate blood if you have engaged in risk behaviours for HIV or AIDS because the blood centre tests all blood and throws away any infected blood?				
Yes	818 (33.9)	411 (16.1)	411 (15.4)	1640 (21.5)
No	1310 (54.2)	1912 (75.1)	1926 (72.0)	5148 (67.4)
DK	272 (11.3)	188 (7.4)	194 (7.3)	654 (8.6)
Missing	15 (0.6)	36 (1.4)	142 (5.3)	193 (2.5)
HIV window				
Does the blood test for HIV identify everyone who is infected with the virus?				
Yes	1241 (51.4)	976 (38.3)	1019 (38.1)	3236 (42.4)
No	364 (15.1)	485 (19.0)	474 (17.7)	1323 (17.3)
DK	795 (32.9)	1040 (40.8)	1037 (38.8)	2872 (37.6)
Missing	15 (0.6)	46 (1.8)	143 (5.4)	204 (2.7)
Is it OK to donate blood even if you engage in risk behaviours for HIV or AIDS as long as you have a negative HIV test?				
Yes	947 (39.2)	609 (23.9)	582 (21.8)	2138 (28.0)
No	1141 (47.3)	1595 (62.6)	1647 (61.6)	4383 (57.4)
DK	300 (12.4)	267 (10.5)	282 (10.6)	849 (11.1)
Missing	27 (1.1)	76 (3.0)	162 (6.1)	265 (3.5)
Place where to get tested				
The blood centre is the only place I know of offering tests				
Yes (Totally agree/agree)	934 (38.7)	586 (23.0)	487 (18.2)	2007 (26.3)
No (Totally disagree/disagree)	1105 (45.8)	1471 (57.8)	1556 (58.2)	4132 (54.1)
DK	365 (15.1)	402 (15.8)	364 (13.6)	1131 (14.8)
Missing	11 (0.5)	88 (3.5)	266 (10.0)	365 (4.8)
Total	2415 (31.6)	2547 (33.4)	2673 (35.0)	7635 (100.0)

^a *P*-value < 0.0001 for all questions.

Table 4

Factors associated with HIV knowledge from multivariable analysis showing the odds of agreement with the knowledge assessment questions*

Question	1. Blood banks use better HIV tests?	2. Ok to donate to be tested?	3. Ok to donate even with risk behaviour because infected blood is thrown away	4. HIV test identifies everyone who is infected?	5. Ok to donate if risk behaviour as long as test is negative?	6. Only place I know?
Blood centre						
Belo Horizonte						1.3 (1.1–1.5)
Recife	1.4 (1.2–1.6)	2.0 (1.7–2.3)	1.6 (1.4–1.9)	1.3 (1.2–1.5)	1.5 (1.3–1.8)	1.5 (1.3–1.8)
Male donors			1.2 (1.1–1.4)		1.2 (1.1–1.4)	
Older age						
31–39 years	1.2 (1.1–1.4)					
>40 years	1.4 (1.2–1.6)	1.5 (1.2–1.8)			0.6 (0.5–0.7)	1.6 (1.3–1.9)
Higher education						
College or more	0.7 (0.6–0.9)					0.6 (0.5–0.8)
Lower education						
Less than elementary school				1.3 (1.1–1.5)		1.7 (1.4–2.1)
Elementary school					0.8 (0.7–0.9)	1.5 (1.3–1.8)
Lower income						
Less than US\$ 250						1.8 (1.5–2.3)
Between US\$ 251–500						1.5 (1.3–1.7)
Higher income						
More than US\$ 1501	0.7 (0.6–0.8)			0.8 (0.7–0.9)		0.6 (0.4–0.7)
Employment status						
Retired						1.6 (1.1–2.3)
Students				0.8 (0.6–0.9)		
Unemployed						
First-time donor	0.8 (0.7–0.9)	1.3 (1.2–1.5)				
Replacement donor		1.4 (1.2–1.6)	1.4 (1.2–1.6)		1.3 (1.2–1.5)	
Test seeker						
Potential	1.6 (1.5–1.8)	4.8 (4.3–5.4)	2.7 (2.4–3.1)	1.8 (1.6–2.0)	2.1 (1.9–2.4)	3.7 (3.2–4.2)
Self-disclosed	1.6 (1.3–2.1)	11.5 (9.0–14.7)	4.0 (3.3–4.9)	2.5 (2.1–3.0)	3.0 (2.5–3.5)	8.1 (6.7–9.9)

* A separate multivariable model for each question was developed. Variables considered for inclusion were: gender, age group, education, income marital and employment status, donor type, donation status, serologic screening result, level of test-seeking and blood center location. Only values statistically significant were retained in each model. OR, Odds ratio; 95% CI, 95% Confidence Interval. Reference groups (OR = 1): FPS-São Paulo, female, 18–25 years old, high school, income between US\$ 51–1500, employed, living together/married, repeat donor, community donor and non-test seeker.