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Analysis of donor deferral at three blood centers in Brazil

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Abstract

Background—The safety of the blood supply is ensured through several procedures from donor selection to testing of donated units. Examination of the donor deferrals at different centers provides insights into the role that deferrals play in transfusion safety.

Methods—A cross-sectional descriptive study of prospective allogeneic blood donors at three large blood centers located in São Paulo, Belo Horizonte and Recife, Brazil from August 2007 to December 2009 was conducted. Deferrals were grouped into similar categories across the centers, and within each center frequencies out of all presentations were determined.

Results—Of 963,519 prospective blood donors at the three centers, 746,653 (77.5%) were accepted and 216,866 (22.5%) were deferred. Belo Horizonte had the highest overall deferral proportion of 27%, followed by Recife (23%) and Sao Paulo (19%). Females were more likely to be deferred than males (30% versus 18%, respectively). The three most common deferral reasons were low hematocrit/hemoglobin (Ht/Hb), medical diagnoses and higher-risk behavior.

Conclusion—The types and frequencies of deferral vary substantially among the three blood centers. Factors that may explain the differences include demographic characteristics, the order in which health history and vital signs are taken, the staff training, an the way deferrals are coded by the centers among other policies. The results indicate that blood donor deferral in Brazil has regional aspects that should be considered when national policies are developed.

Keywords

blood donation; deferred donors; deferral reasons

Introduction

Blood donor eligibility policies are designed to protect both the donor and the recipient[1,2]Donors with risk identified during the health questionnaire may be deferred. Donor deferral is initiated either by the blood center based on information disclosed by prospective donors or by the donor through self-deferral. Both types of deferral occur

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because of the belief that a donor's behavior, exposures, or history may represent an increased risk to safety of the blood supply or the donor.

The risk of transfusion safety threats varies by donation history (first-time *vs.* repeat) and type of donation (community *vs.* replacement). Repeat and community donors are reputed to be safer donors[3-6]. Eligibility criteria also vary across countries[6-8] due to differences in TTI prevalence, comorbidities related to racial/ethnicity population groups[7], and other contextual factors. In Brazil little is known about donor deferral, including the characteristics, rates, and regional variability of the deferrals between blood centers. The goals of this analysis were to describe the deferrals and compare the donor deferral proportions and approaches to deferral at three public blood centers in Brazil.

Materials and Methods

The NHLBI-funded REDS-II International Component study in Brazil started in 2007, and is comprised of three major public blood banks. Two of them are in the Southeast (Fundação Pro-Sangue, São Paulo [FPS São Paulo] and Fundação Hemominas [Hemominas], Belo Horizonte, Minas Gerais) while the third is in the Northeast (Fundação Hemope [Hemope], Recife, Pernambuco). São Paulo is the largest city in South America with a population of nearly 11 million[9]. The blood bank Fundação Pro-Sangue/Hemocentro São Paulo (FPS São Paulo) is one of the largest blood banks in State of São Paulo, processing 120,000 units of blood annually. Fundação Hemominas collects about 50,000 units of blood in the metropolitan area of Belo Horizonte and it is responsible for 92% of the blood collected in State of the Minas Gerais (MG). Fundação Hemope is the only public blood center in the State of Pernambuco (PE). This facility collects approximately 75,000 blood units per year, covering approximately 98% of the blood needs of the area. There are considerable regional differences between the Southeastern and Northeastern areas of Brazil[10]. For instance, the current economic development of the South and Northeast regions of Brazil is strongly influenced by historical factors. Each region was colonized by individuals of different backgrounds and cultures. The South and Southeast of the country has been the industrial and economic engine of the entire country and was colonized by a variety of groups and races providing for the current economic diversification and better quality of life, while the Northeast has primarily been agrarian[11].The northeast has the lowest Human Development Index (HDI) compared to the South and Southeast regions of Brazil[11,12]. In addition, education has been listed as one of the main cause of the socioeconomic differences that exist between the Northeast and Southeast[12] Differences in blood donor profiles and behavior have been also described[13].

Overall study design

We conducted a cross-sectional descriptive study of prospective donors aged 18-65 years presenting for allogeneic blood donation, between August 1, 2007 and December 31, 2009. Analyses were focused on deferrals based on vital signs and the donor health interview. This study does not address those who self-deferred and the strategy for the analysis was to create common categories that have led to us combine temporary and permanent deferrals. Data originated from information that is routinely collected in the course of blood donation.

Measures

Blood transfusions and donations are regulated by the Federal Government of Brazil and by the Blood Coordination Office (BCO) in the Ministry of Health, which is responsible for general policies for the entire country. Specific requirements are defined for donor recruitment, deferral criteria, laboratory tests, proper handling and component preparation procedures. Blood centers may apply donor acceptability criteria that are more stringent than

required by the BCO. Of note, since 80's remunerated blood donation is forbidden in Brazil[14]. Each blood donor is interviewed face-to-face and asked questions which cover common content as required by the BCO, including HIV risk-related behaviors and risk factors for other transfusion-transmissible infections. Responses are entered at the time they are provided into the data management software system of each blood center.

According to the Brazilian guidelines for blood donor selection potential blood donors must be in a good general health without evidence of transfusion-transmitted diseases[1]. Nevertheless, there are some differences regarding the donor screening procedures and policies across the three blood centers. For example, on the donor health questionnaire (DHQ), the HIV risk questions are administered by physicians at Hemope and Hemominas, and by nurses (under physician supervision) at FPS São Paulo. The DHQ is electronically performed at FPS São Paulo and at Hemope but not at Hemominas. The deferral status of each potential donor is recorded as temporary or permanent. In case of temporary deferral, the number of deferral days is electronically pre-defined for that event at Hemope and at FPS São Paulo blood centers, but not for Hemominas, where the deferred period is entered manually. The donor's data can be electronically reviewed so that if the individual presents during the deferred period she/he will not be allowed to donate.

In Brazil it is also mandatory to have the vital signs checked prior to the blood donation[1]. At FPS São Paulo and Hemope the vital signs (blood pressure/pulse) and anemia (hematocrit/hemoglobin) testing are performed in the waiting room by a trained technician, whereas at Hemominas the blood pressure and pulse are taken by the physician during the donor health screening interview and the anemia test is performed by a trained technician in a private area. Of note, the three blood center use the same deferral criteria for age, weight and pulse; however slightly different deferral criteria was observed for blood pressure, and hematocrit or hemoglobin (see Appendix Table 1). The donor hemoglobin or hematocrit is assessed using a capillary fingerstick sample. At FPS São Paulo and at Hemominas the parameter for anemia is measured by hematocrit using micro-centrifuge, while at Hemope, anemia is measured by the hemoglobin level using a commercial instrument (Hemocue). Weight and height are self-reported at the three blood centers.

An important operational distinction is that two of the REDS-II Brazil centers (FPS São Paulo and Hemope) use detailed codes to record specific deferrable behaviors, while Hemominas (Belo Horizonte) uses a smaller number of summary codes that are applied particularly for deferrable behaviors reported by the donor.

For our analysis, summary categories of different types of deferrals were developed using previously reported classifications for the United States REDS-II study[15] modified to reflect deferrals used in Brazil (See Appendix Table 2). The deferral codes of each blood center were grouped into 11 categories: low hemoglobin/hematocrit; blood pressure/pulse; medical diagnoses, high-risk behavior; unwell/cold/temperature; medication, other infectious exposures; "couldn't wait or changed mind"; vaccination; weight; and other deferrals. Of note, the medical diagnoses categories encompassed deferrals related to gastroenterology, neurologic, pulmonary, cardiac, endocrinology, renal or urologic, among other diseases. Psychiatric conditions such as mental disorders, schizophrenia, psychoses and also dental treatments are included in the medical deferral category. Surgical procedures were classified in the "other" deferral category. The higher-risk behavior category encompassed deferrals related to: HIV exposure, sexually transmitted infection (STD) exposure, high risk sexual partners, having multiple heterosexual partners and men who have sex with men (MSM). Importantly, behaviors that lead to deferral at one center may not be deferrals at another center. For example, the allowed number of heterosexual sex partners in the previous year is 1 for Hemominas but is 3 for Hemope and is 6 FPS São Paulo.

Analysis

Data were electronically transferred to the in-country database coordinating center at the University of Sao Paulo, and were merged into a new dataset with personal identifiers removed before being sent to the US data coordinating center for analysis. The donation and deferral data were analyzed to determine the demographic characteristics for accepted and deferred donor visits by blood center. Frequency analyses were conducted using SAS version 9.2, Cary, North Carolina.

Results

During the study period, there were a total of 963,519 presentations for allogeneic blood donation at the three centers (Table 1). Of those, 746,653 (77.5% of presentations) were accepted for donation and 216,866 (22.5%) were deferred. Forty-one percent of all presentations occurred at FPS São Paulo (SP), followed by 34% at Hemope in Recife (PE), and 24% at Hemominas in Belo Horizonte (MG).

The majority of prospective donors were male 634,565 (66%). (Table 1). The highest proportion of male donor candidates was observed at Hemope (76%), followed by Hemominas (60%) and FPS São Paulo (55%). For both male and female presentations, 74% were in the age group of 21 to 40 years of age, 64% were repeat donors, 42% had attained a high school level education, and 40% defined their self-reported skin color as mixed, 36% as white, and 10% as black.

Across the three centers, the highest deferral proportions were observed at Hemominas (27%) followed by Hemope (23%) and FPS São Paulo (19%). Deferred donors tended to be female (30% deferred compared to 18% for males), have mixed and black skin color (39% deferred compared to 17% for white skin color), and were more likely to be first time donors (33% *vs* 17%). The deferral proportions were very similar across age groups, except for the age group <21 years old, where 91,595 candidates (31% of presentations) were deferred, representing a much higher proportion than for older ages.

The three most common deferral reasons among blood donor candidates were different at the three hemocenters. Low hematocrit/hemoglobin was the major deferral at Hemope (957 and 391 per 10,000 presentations, for first-time and repeat donors, respectively), medical diagnoses at FPS Sao Paulo (610 and 385 per 10,000 presentations) and higher risk behaviors at Hemominas (1,543 and 402 per 10,000 presentations) (Table 2). Of note, higher risk behavior was one of the three most common deferral reasons at each of the blood centers.

Medical diagnosis deferrals varied across the blood centers (See Appendix Table 3). Gastroenterological diseases were the most common reasons for medical deferral at Hemope (28.3%), whereas at Hemominas 23.9% of the deferrals where related to cardiac diseases. At FPS São Paulo 32% of the medical diagnoses deferrals was classified as “other” which means that the deferral reason did not fit in any of the medical deferral categories used at that center.

Blood pressure/pulse deferrals rates represented the fourth most prevalent deferral reason across the three blood centers with proportions of 382, 305 and 231 per 10,000 presentations for first-time and 268,185 and 163 per 10,000 presentations for repeat donors at Hemope, Hemominas and at FPS São Paulo, respectively.

The deferral proportions for couldn’t wait or changed mind varied across the three centers, with the highest proportion observed at Hemominas (276 and 203 per 10,000 first-time and

repeat presentations) and the lowest at FPS São Paulo (88 and 56 per 10,000 first-time and repeat presentations).

The demographic characteristics of the low hemoglobin/hematocrit deferrals for the three blood centers are described in Table 3. Overall 4.2% of the presenting donors at the three blood centers were disqualified due to low hematocrit/hemoglobin. These constituted 18.7% of all deferrals. Deferrals for low hemoglobin/ hematocrit were much more likely to be females (1,088 *vs.* 75 for males per 10,000 presentations) and first-time donors (572 *vs.* 338 for repeat per 10,000 presentations). The highest deferral proportion for low hemoglobin was observed at Hemope, 585 per 10,000 presentations, followed by 392 per 10,000 presentations at FPS São Paulo and 239 per 10,000 presentations at Hemominas.

Table 3 also shows the demographics characteristics for higher-risk behavior deferrals. Deferrals for higher-risk behaviors were more likely in males (452 per 10,000 presentations), younger age groups [< 21 years (851 per 10,000 presentations) and 21-30 years (482 per 10,000 presentations)] and in first-time donors (724 per 10,000 presentations). The highest deferral rates for higher-risk behavior was observed at Hemominas (854 per 10,000 presentations) followed by Hemope (243 per 10,000 presentations) and FPS São Paulo (194 per 10,000 presentations).

Females were also deferred for medical diagnoses more often than males (461 *vs.* 349 per 10,000 presentations, respectively). The highest proportion of deferral for medical diagnoses were observed in the age group >51 years old (580 per 10,000 presentations), first-time donors (556 *vs.* 297 per 10,000 presentations) and at FPS São Paulo (462 per 10,000 presentations).

Discussion

This study illustrates the challenge of comparing donor deferral data within, let alone between countries. Moreover this analysis helps to show the remarkable differences in deferral across blood centers in Brazil and represents an important first step in understanding the epidemiology of deferred donors in Brazil, and finally adds an epidemiological perspective to donor deferral in Latin America.

The proportion of presenting donors who were deferred was 23% in our study, which is similar to 21.6%, reported in a previous study in Minas Gerais State in Brazil[4] and 22% in Jamaica[16]. However, studies conducted in other countries have shown lower proportions of donor deferral, such as 12.8%, 15.6% in the US[17,18], 14.4% in Singapore[19], 10.8% in France[20], between 5.8 and 16.4% in India[21-24]and 17.7% in Nigeria[25], with higher proportion observed in Trinidad and Tobago (35.6%)[26].

As expected, the deferral rates varied across the blood centers and according to the type of donors, as well as gender and age group. Overall deferred candidates tend to be females and first time donors, which is similar to the US[18], India[24], Norway[27], and Saudi Arabia[28]. The deferral reasons also varied across the 3 blood centers reflecting differences in the donor populations and eligibility criteria used, as shown by other authors[4,29]. For instance, low hemoglobin/hematocrit was the most common reason for deferral in the donor population in Recife, a region with relatively low social economic status. The majority of donors with low hemoglobin/hematocrit were females as reported in most studies[4,18,23,26,30-32]. This finding highlights that efforts may be needed to address iron depletion and anemia in prospective blood donors in the Northeast of Brazil. The diagnosis of anemia in blood donors may be an indicator of significant undiagnosed disease,[33] and the blood centers could be used as a community health resource to monitor for clinically significant anemia.

This study highlights the important influence of local blood center policies on donor eligibility. While Pernambuco is situated in the Northeast of Brazil, with higher levels of poverty, the blood centers in Sao Paulo and Minas Gerais, both in the Southeast part of the country, present similar general demographic structure and standard of living[9-12]. Nevertheless, the types and proportions of deferrals at Hemominas and FPS São Paulo are quite different. In Belo Horizonte (where Hemominas is located), the most common deferral reason was higher-risk behavior in both first time and repeat donors. One explanation for this finding is related to differences in the DHQ content across the three blood centers. For instance, the DHQ in use at Hemominas has only 15 questions to assess deferrals for higher risk behavior, while at FPS São Paulo and Hemope, respectively 23 and 24 specific and focused questions are included (Appendix Table 3). Interestingly, Belo Horizonte has the highest overall deferral and risk behavior deferral rates; given that this center does not have lower TTI rates in accepted donors than the other two blood centers, we believe this indicates non-specificity of the 15 questions. Higher risk behavior was one of the 3 most common deferral reasons across the three Brazilian blood centers and those blood donors tend to be first-time, young, and male, similar to studies in the US[18], Trinidad and Tobago[26], and Turkey[30,34]. This result is particularly relevant taking into account that this age group (<21 to 30 years old) represented 47% of all the donor presentations at the centers. Anecdotally, waiting times for donation in Brazil can be long. High rates of "deferral" for "could not wait, changed mind" at Hemominas and Hemope suggest that blood centers might be losing a significant number of potential blood donors due to waiting times. To our knowledge there is no data on waiting time and loss of blood donors in Brazil. This result may lead to a further study to explore whether the reason those donors who did not ultimately donate blood was primarily due to a self-deferral decision or prolonged waiting time. This study has several limitations, mostly due to differences in the blood donation policies, operational procedures and how the blood donor data were captured across the centers. First, we were not able to distinguish permanent from temporary for all types of deferrals or the donation type: (community versus replacement). Replacement blood donors have been reported to present higher risk than community donors[35], although recent studies in Brazil[36,37], West Africa[38] have not observed this difference among the two types of donors. Moreover, a previous study in Sao Paulo and the REDS-II Brazil study have demonstrated that HIV prevalence and incidence are higher among volunteer community compared to replacement donors[37,39]. Second, although we could not distinguish between permanent and temporary deferrals, we tried to compensate this limitation by classifying the deferral reasons into 11 categories. Also, while temporary deferrals allow for a prospective donor to present again, it has been established in several studies that a larger proportion of temporarily deferred donors do not return donate[15,40]. However, there were other challenges, for instance, blood pressure/pulse deferral proportions represented the fourth most prevalent deferral reason across the three blood centers, and we were unable to establish whether those deferrals were related to systolic or diastolic pressure or to high or low pulse. Descriptive studies focusing on epidemiology of donor deferrals can provide indicators of the health status of the population, and also can serve as an important tool for planning strategies for blood donor recruitment in order to improve blood availability while retaining safer blood donors. Our study highlights that blood donor suitability criteria are associated with donor demographics and lead to distinct regional deferral patterns. Furthermore, blood donor candidate populations are useful to address broader scientific and public health questions. For instance, our data on low hemoglobin/hematocrit at Hemope may suggest the need for public health strategies to address the high prevalence of anemia particularly in the Northeast of Brazil. On the blood center side, one important strategy would be providing better education to blood donors about the causes of the low hemoglobin/hematocrit and recommendations for dietary enhancement and for iron supplementation in order to improve their health and increase the efficiency of blood collection. With respect to the higher-risk behavior deferrals at Hemominas, we suspect

these reflect an overly cautious interpretation of the safety principals regarding risk factors given the low rates of TTI markers in this region. It is important to investigate the trade-off between donor deferral and loss of donors who might not actually have higher risk. Special attention needs to be paid to use of broad deferral questions in order to avoid donor loss that results from unwarranted deferrals and the balance between blood safety and blood availability in settings where insufficient blood is available. The increasing risk behaviors in younger male donors in Brazil could also be important, suggesting the need for targeted risk reduction measures.

In summary, this analysis helps to show the disparity in donor deferrals across blood centers in Brazil. These differences are attributable to many reasons including the deferral triage policies and variability in what constitutes a deferrable characteristic between centers. Overall, more than 20% of the persons who present to donate are not allowed to donate at the time of presentation. This represents a substantial record keeping and economic burden on blood centers in Brazil. The study suggests that efforts to better understand blood donor deferral are warranted, and developing a consistent and national standardized donor screening questionnaire with the aim to determine the most critical risk factor questions for safe donations and transfusions. We recommend periodic evaluation of the donor questionnaire, and specialized training for blood bank personnel, particularly in the use of the questionnaire for screening potential riskier donors, steps which could reduce the burden of deferral through modification of unnecessary donor selection policies

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Appendix

Appendix:

Table 1

Criteria for blood donation at each REDS-II Brazil blood center

	FPS Sao Paulo	Hemominas	Hemope
Age	18 ≤ Age ≤ 65	18 ≤ Age ≤ 65	18 ≤ Age ≤ 65
Weight	≥50 Kg or 110 lbs	≥50 Kg or 110 lbs	≥50 Kg or 110 lbs
Pulse	60 ≤ Pulse ≤ 100 bpm	60 ≤ Pulse ≤ 100 bpm	60 ≤ Pulse ≤ 100 bpm
Blood Pressure (BP)			
Systolic	100 ≤ BP ≤ 160 mmHg	100 ≤ BP ≤ 180 mmHg	100 ≤ BP ≤ 180 mmHg
Diastolic	60 ≤ BP ≤ 90 mmHg	60 ≤ BP ≤ 90 mmHg	60 ≤ BP ≤ 100 mmHg
Hematocrit (Ht) or Hemoglobin (Hb)			
Male	39 ≤ Ht ≤ 54	Hb: ≤13 g/dL 39 ≤ Ht ≤ 55	Hb: ≤13 g/dL

	FPS Sao Paulo	Hemominas	Hemope
Female	38 ≤ Ht ≤ 50	Hb: ≤12.5 g/dL 38 ≤ Ht ≤ 54	Hb: ≤12.5 g/dL
Collection Volume	450mL *	450mL **	450mL

* São Paulo: Males >=50kg = 450 mL Females >=50 to <=57 kg= 400mL Females >=57 kg= 450 mL.

** Belo Horizonte: Males >=50kg = 450 mL Females :> =50 to <=55 kg= 410mL Females :> 55 kg= 450 mL.

Table 2

High-Risk Behavior deferral grouping codes and individual blood center deferral codes.

(Grouping codes)	FPS Sao Paulo (Specific codes)	Hemominas (Specific codes)	Hemope (Specific codes)
403 – HIV exposure	Exchange drugs or money for sex	Sexual partner of HIV suspicious	Sexual partner of HIV suspicious Unsafe sex with heterosexual partner <12 months Rape
404 – STD exposure	Syphilis Other Sexually Transmitted Disease	Self reported Sexually Transmitted Diseases Has or had Sexually Transmitted Diseases	Sexually Transmitted Diseases exposure
501 – High risk (includes high risk sexual partner)	Sexual partner of hepatitis patient Sexual partner of blood recipient Sexual partner actually in prison or in the past Sexual partner of injection drug user Sexual partner of not injection drug user Bisexual partner High risk sexual relations= 6 or more sexual partners Sexual intercourse without a condom/casual one time partner. Sexual partner of prostitute Promiscuous sexual partner Contact with Infectious Disease Carrier High risk sexual partner High Risk professional activity (prostitute, men and women dancers, rent boy, male hustler, etc) Sexual partner of hemodialysis patient Sexual partner of organ/ tissue receiver	Behavioral risk –TD ** Behavioral risk-PD ** Sexual promiscuity Sexual partner of prostitute in the last 12 months Sexual partner of ex-inmate or convict Sexual partner of hemodialysis patient Sexual partner of blood recipient Contact with Hepatitis Carrier in the last 6 month More than 1 sexual partner last year	Sexual partner to a HIV risk person Prostitution Sexual partner to a HIV positive Sexual partner of prostitute <12 months High Risk suspicious Bisexual Promiscuous Sexual partner to a HTLV positive Sexual partner to a HCV positive Sexual partner of ex-inmate or convict High risk sexual relations= 6 or more sexual partners Sexual partner of blood recipient Sexual partner of injection drug user Bisexual partner High Risk professional activity (prostitute, men and women dancers, rent boy, male hustler, etc)
503 – Male who has sex with other males	MSM/ Same Sex sexual relation	MSM	Homosexual contact, just once MSM

(Grouping codes)	FPS Sao Paulo (Specific codes)	Hemominas (Specific codes)	Hemope (Specific codes)
(MSM)	Bisexual		Bisexual
600 – Other deferral	Came to blood bank to get blood tests/also HIV test Drug user (IDU **/ Not IDU *) Past Drug user (IDU/ Not IDU *)	Came to blood bank to get blood tests/also HIV test illegal drug user **	Came to blood bank to get blood tests/also HIV test Drug user (IDU **/ Not IDU *)

* Temporary Deferral

** Permanent Deferral

Table 3

Percentage of Medical deferral by hemocenters.
Table 3- Medical Diagnoses deferrals by Blood center

	HEMOPE	HEMOMINAS	FPS SAO PAULO
1-GASTROENTEROLOGY DISEASES:	28.3	6.0	0.0
2-INFECTIOUS DISEASE:	14.6	23.3	18.5
3-NEUROLOGY/-PSYCHIATRIC DISEASES	19.0	14.4	4.4
4-ENDOCRINOLOGY/METABOLIC DISEASES:	8.9	3.9	0.5
5-DERMATOLOGIC DISEASES:	7.4	6.5	0.0
6-ALCOHOLISM:	6.1	1.4	2.2
7-CARDIAC DISEASES:	5.7	23.9	7.6
8-DENTAL PROCEDURES:	4.1	7.4	10.5
9-PULMONNARY DISEASES:	3.0	5.3	4.4
10-ALLERGIC DISEASES:	0.0	1.8	2.8
11-OTHER DISEASES:	0.1	0.0	32.1
12-MISCELLANEOUS:			
RENAL DISEASES:	0.3	0.9	0.0
NEOPLASIA:	0.6	0.2	0.0
MEDICAL TREATMENT:	0.0	0.0	10.1
GYNECOLOGY DISEASES:	0.0	1.0	0.0
AUTOIMMUNE DISEASES:	1.5	0.1	0.4
ORTHOPEDIC DISEASES:	0.3	0.9	0.0
HEMATOLOGIC DISEASES:	0.3	2.8	6.5
	100	**100**	**100**

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Table 1

Demographic characteristics of donor presentations: successful donation and deferral visits from Aug 1 2007 to Dec 31 2009 at the three blood centers in Brazil

	Total *n*(%)	Donation Visits *n* (%)	Deferred Visits *n* (%)
Blood Center			
Hemope	329,240 (34)	253,475 (77)	75,765 (23)
Hemominas	234,205 (24)	169,852 (73)	64,353 (27)
FPS Sao Paulo	400,074 (41)	323,326 (81)	76,748 (19)
Sex			
Male	634,565 (66)	517,110 (82)	117,455 (18)
Female	328,953 (34)	229,542 (70)	99,411 (30)
Missing	1 (0)	1 (0)	0 (0)
Race/Ethnicity			
White	351,164 (36)	289,977 (83)	61,187 (17)
Mixed	385,708 (40)	311,812 (81)	73,896 (19)
Black	99,135 (10)	79,337 (80)	19,798 (20)
Asian	8,996 (1)	7,504 (83)	1,492 (17)
Other	2,926 (.5)	2,296 (78)	630 (22)
Missing	115,590 (12)	55,727 (48)	59,863 (52)
Age (in years)			
< 21	91,459 (9)	62,864 (69)	28,595 (31)
21–30	361,633 (37)	279,909 (77)	81,724 (23)
31–40	265,796 (28)	213,515 (80)	52,281 (20)
41–50	169,671 (18)	133,949 (79)	35,722 (21)
>51	74,795 (8)	56,313 (75)	18,482 (25)
Missing	165 (.001)	103 (63)	62 (37)
Years of school			
< 8	105,510 (11)	86,971 (82)	18,539 (18)
8	123,187 (13)	102,520 (83)	20,667 (17)
9–11	409,530 (42)	343,627 (84)	65,903 (16)
>12	117,431 (12)	99,454 (85)	17,977 (15)
Missing	207,861 (21)	114,081 (55)	93,780 (45)
Donation history			
First time	342,674 (36)	229,609 (77)	113,065 (33)
Repeat	620,518 (64)	517,042 (83)	103,476 (17)
Missing	327 (0)	2 (0)	325 (99)

Table 2

Reasons for deferral: Number and proportions (per 10,000 donations) of deferred visits made by first-time and repeat donors from Aug 1 2007 to Dec 31 2009.

	FPS Sao Paulo *n (rate)*		*Hemominas* *n* (rate)		*Hemope* *n* (rate)		*TOTAL*	
Deferral Category[†]	***First-time***	***Repeat***	**First-time**	**Repeat**	**First-time**	**Repeat**	**First-time**	**Repeat**
Low hematocrit/hemoglobin	6,495 (475)	9,189 (349)	2,272 (245)	3,331 (236)	10,835 (957)	8,444 (391)	19,602 (856)	20,964 (466)
Blood Pressure/Pulse	3,160 (231)	4,297 (163)	2,828 (305)	2,620 (185)	4,329 (382)	5,785 (268)	10,317 (890)	12,702 (485)
Medical diagnoses [†]	8,333 (610)	10,130 (385)	6,124 (660)	4,412 (312)	4,431 (391)	3,886 (180)	18,888 (879)	18,428 (476)
High-risk behaviors [†] [*]	5,648 (413)	2,125 (81)	14,317 (1543)	5,691 (402)	4,836 (427)	3,180 (147)	24,801 (961)	10,996 (573)
Unwell, colds, high temperature	1,965 (144)	1,404 (53)	1,668 (180)	1,323 (94)	3,695 (326)	2,235 (104)	7,328 (887)	4,962 (506)
Medication [†]	2,801 (205)	2,811 (107)	1,365 (147)	1,440 (102)	2,049 (181)	1,947 (90)	6,215 (858)	6,198 (482)
Other infectious exposures [†]	4,380 (320)	3,569 (136)	0 (0)	0 (0)	880 (78)	674 (31)	5,260 (757)	4,243 (394)
Couldn't wait, Changed Mind	1,207 (88)	1,480 (56)	2,560 (276)	2,865 (203)	1,978 (175)	3,225 (149)	5,745 (938)	7,570 (539)
Vaccination	1,783 (130)	2,963 (113)	387 (42)	628 (44)	382 (34)	782 (36)	2,552 (807)	4,373 (441)
Weight	1,167 (85)	288 (11)	910 (98)	237 (17)	863 (76)	142 (7)	2,940 (881)	667 (525)
Other Deferral [†]	6,026 (441)	8,567 (325)	5,044 (544)	4,324 (306)	9,990 (883)	8,444 (391)	21,060 (887)	21,335 (479)
Total Number of Deferred Visits	35,712 (880)	40,848 (436)	37,475 (1,078)	26,871 (707)	39,878 (980)	35,757 (502)	113,065 (849)	103,476 (519)

[†]Most deferrals listed are temporary – deferral categories that include a mixture of both permanent and temporary deferrals are indicted.

[*]Higher-risk behaviors include the deferrals listed in Appendix Table 2.

Table 3

Demographic characteristics and proportions (per 10,000 donations) of visits deferred for low hemoglobin, risk factor, medical diagnosis from Aug 1 2007 to Dec 31 2009.

Variables	*Deferral Hb n (rate)*	*Risk factor n (rate)*	*Medical diagnosis n(rate)*	*Total Deferrals n(rate)*	*Total Donations + Deferrals*
Gender					
Male	4,777 (75)	28,670 (452)	22,152 (349)	55,599 (876)	634,565
Female	35,798 (1088)	7,129 (217)	15,170 (461)	58,097 (1766)	328,953
Age (in years)					
< 21	4,648 (508)	7,788 (851)	3,416 (373)	15,852 (1733)	91,459
21–30	15,084 (417)	17,592 (482)	12,509 (346)	45,185 (1249)	361,633
31–40	10,743 (404)	6,384 (240)	9,760 (367)	26,887 (1011)	265,796
41–50	7,287 (429)	3,053 (180)	7,288 (429)	17,628 (1038)	169,671
>51	2,800 (374)	976 (130)	4,339 (580)	8,115 (1084)	74,795
Missing	13 (787)	6 (363)	6 (363)	25 (1515)	165
Donation history					
First time	19,602 (572)	24,801 (724)	18,888 (556)	63,291 (1846)	342,674
Repeat	20,964 (338)	10,996 (177)	18,428 (297)	50,388 (812)	620,518
Missing	9 (275)	2 (61)	6 (61)	17 (520)	327
Sites					
Hemope	19,279 (585)	8,016 (243)	8,317 (253)	35,612 (1081)	329,240
FPS Sao Paulo	15,693 (392)	7,773 (194)	18,469 (462)	41,935 (1048)	400,074
Hemominas	5,603 (239)	20,008 (854)	10,536 (450)	36,147 (1543)	234,205