



## Reduction in blood donations: the importance of campaign donation in Goiânia, Goiás, Brazil

*Redução de doações de sangue: a importância da doação de campanha em Goiânia, Estado de Goiás, Brasil*

Livia Lara Pessoni<sup>1</sup>, Erika Carvalho de Aquino<sup>2</sup>, Keila Correia de Alcantara<sup>3\*</sup>

<sup>1</sup> Master student of Postgraduate Program in Health Care and Evaluation, Federal University of Goiás, Goiânia (GO), Brazil. <sup>2</sup> PhD student of the Postgraduate Program in Tropical Medicine, Federal University of Goiás, Goiânia (GO), Brazil. <sup>3</sup> Associate professor at the Federal University of Goiás (UFG), Faculty of Pharmacy. Professor of the Stricto-sensu graduate program in Assistance and Health Evaluation at the Faculty of Pharmacy / UFG and the Multiprofessional Residency Program in Hematology and Hemotherapy at Hospital de Clínicas, Universidade Federal de Goiás, Brazil.

\*Corresponding author: Keila Correia de Alcantara - E-mail: keilalcantara7@gmail.com

### ABSTRACT:

To analyze the trends of blood donations in a public blood center of Goiás, Brazil (HEMOGO – Hemocentro do Estado de Goiás), considering incentive campaigns and transfusion transmissible infection. Retrospective study of the blood donations between 2010-2016. Donors were grouped into autologous, voluntary, replacement and campaign categories. There were 149,983 donations with a reduction of 29% ( $p < 0.05$ ) in the investigated period. Donations by males, aging between 18 and 29 years old, and those with a lower level of education decreased ( $p < 0.05$ ) over time. Almost 50% of donations were from the voluntary category, 30% from campaign, 18% from replacement and 1% from other categories. The campaign donations decreased 5.02% ( $p < 0.05$ ) during the 2010 to 2016. The prevalence of transfusion-transmitted infections (TTI) was 3.71% and the chance of campaign donors having TTI was lower (OR = 0.8628; CI: 0.8126 - 0.9161;  $p < 0.0001$ ). The results showed a significant reduction in the number of blood donations mainly influenced by a decrease in campaign donations.

Keywords: Blood bank. Blood donors. Health promotion.

### RESUMO

Analisar as tendências das doações de sangue no Hemocentro do Estado de Goiás (HEMOGO), Brasil, considerando as campanhas de incentivo e as infecções transmissíveis por transfusão. Estudo retrospectivo das doações de sangue entre 2010-2016. Os doadores foram agrupados em categorias autóloga, voluntária, de reposição e de campanha. Houve 149.983 doações com redução de 29% ( $p < 0,05$ ). As doações por homens, com idade entre 18 e 29 anos e com menor escolaridade diminuíram ( $p < 0,05$ ) ao longo do tempo. Quase 50% das doações eram da categoria voluntária, 30% de campanha, 18% de reposição e 1% de outras categorias. As doações da campanha diminuíram 5,02% ( $p < 0,05$ ) entre 2010 a 2016. A prevalência de infecções transmitidas por transfusão (ITT) foi de 3,71% e a chance de doadores de campanha terem ITT foi menor (OR = 0,8628; IC: 0,8126 - 0,9161;  $p < 0,0001$ ). Os resultados mostraram uma redução nas doações de sangue, influenciadas principalmente por uma diminuição nas doações da campanha.

Palavras-chave: Banco de sangue. Doadores de sangue. Promoção da saúde.

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## INTRODUCTION

Annually, more than 81 million blood donations are done in the world, and only 45% occur in developing and transition countries, where 81% of the world's population live<sup>1</sup>. In addition, the rate of blood donations does not exceed 2% in South American countries that exhibit similar Human Development Index like Brazil, such as Peru, Colombia, and Ecuador<sup>2</sup>.

The number of donors is steadily declining in several countries, like United States<sup>3</sup> and Sub-Saharan African Countries<sup>4</sup> which leads to the promotion of new strategies that might increase donations<sup>5,6</sup>, like offering incentives and the use of e-mail and telephone to invite donors<sup>7,8</sup>. However, donation incentives may reduce pro-social motivation from regular donors<sup>9</sup> and compromise blood quality, since individuals can omit their transfusion-transmissible infections (TTI) status in order to obtain the incentive<sup>10</sup>. Conversely, other studies have shown that offering financial incentives do not significantly increase the proportion of TTI<sup>11,12</sup>.

In Brazil, the National Policy on Blood, Components and Derivatives is composed of a system of several independent blood centers. The public blood banks account for 58% of blood supply, followed by services that are licensed by the Unified Health System (SUS) (33%) and exclusively private services (7%)<sup>13</sup>. By assuming responsibility for hemotherapy, the Brazilian Government, through the public blood centers, also aims to mobilize citizens for voluntary blood donation. In most cases, the promotion of the theme takes place in the public sphere with the mediation of mass media vehicles<sup>2</sup>.

An adequate screening for a donor population is essential for safety transfusions and supplies. In addition, controlled donor management requires a complete knowledge of donor's database so that recruitment or retention activities can be developed. Knowing the actual profile of blood donors also allows the comparison with the general population and provides information on the percentage of this population that is currently engaged in donation activity<sup>14</sup>.

Thus, this study carried out a temporal trend analysis on the number and characteristics of the blood donations and verified the effect of the recruitment campaign in the total number of donations and TTI rate.

## MATERIAL AND METHODS

Retrospective and descriptive study in which the database of Blood Bank system was used, referring to the records of blood donors of Public Blood Bank of Goiânia (HEMOGO), from January 1, 2010 to December 31, 2016. Spreadsheets without the identification of the donors and presented the number, date, and modality of the donations and their serological results. These spreadsheets were made available by HEMOGO's computer sector, generated exclusively for this research without public access.

Goiânia is the capital of the Goiás, central region of Brazil, and has approximately 1,256,514 citizens<sup>15</sup>. The Public Blood Bank from Goiânia receives donors from Goiânia and its metropolitan area and also from other regions of Goiás State. This Blood bank also recruits blood donors through a mobile unit. The data from the Public Blood Bank of Goiânia were available as this study was approved by the Brazilian Ethics Committee on Research (60772016.6.0000.5083).

For detailed analysis, the donors were included in the following modalities: *indoor voluntary donation*, which is donation from people motivated in keeping the bloodstock of the hemotherapy service without identifying the name of the possible recipient; *replacement donation*, defined as donations from individuals that aim to replenish the bloodstock of the hemotherapy service by the need of a family member or friend; *campaigning donation*, a voluntary donation made in external recruitment and donations from participants of the University Scholarship Program; *autologous donation*, which is the donation of the patient for his exclusive use; and *invited donation*, characterized by the donation made by an individual who was invited by the hemotherapy service to donate due to a rare or lacking blood type in the blood stock.

Following the Brazilian legislation<sup>13</sup>, laboratory tests of high sensitivity and specificity for hepatitis B, hepatitis C, human immunodeficiency virus (HIV), syphilis, human T-cell lymphotropic virus 1 and 2 (HTLV-1/2) ) and Chagas disease were performed according to manufacturer’s instructions. Positive results were confirmed by specific tests, and the donors were invited to be informed about the results and referred for proper medical follow-up.

The estimated population measure by the Brazilian Institute of Geography and Statistics (IBGE) were used to calculate the donation rate of the local population, available on the website of the Department of Informatics of SUS (DATASUS). For the trend analysis of the time series, we used the Prais-Winsten-Regression, which provided the *beta* value (slope of the curve). The significance level of 95% was established. The Kruskal-Wallis test was used with monthly frequency to verify the existence of seasonality in the series. Data processing and statistical analyzes were performed in Stata v13.0 (StataCorp. 2013. Stata Statistical Software: Release 13. College Station, TX, US: StataCorp LP).

**RESULTS**

Between 2010 and 2016, there were 149,983 blood donations, in which 87% of the donors are aged between 18 and 45 years, 67.9% were males, 86.5% were Brazilian Caucasian, and 50.8% were single. A total of 39.2% of the donors had a high school diploma, and 93.7% lived in the capital Goiânia or the metropolitan region of the city (Table 1).

**Table 1.** Demographic characteristics of 149,983 blood donations, Brazil, 2010-2016

(Continua)		
Characteristics	n	%
<b>Gender</b>		
Male	101,880	67.9
Female	48,103	32.1
<b>Age (years age)</b>		

(Conclusão)		
Characteristics	n	%
< 30	71,852	47.9
> = 30	78,131	52.1
<b>Marital status</b>		
Married	61,116	40.8
Others	88,867	59.2
<b>Educational level (years)</b>		
< = 12	107,615	71.8
> 12	42,368	28.2
<b>Race/ethnicity</b>		
Brazilian white	129,914	86.6
White	8,484	5.7
Black	6,780	4.5
Mixture	4,615	3.0
Yellow	127	0.1
Indian	63	0.04
<b>Home</b>		
Capital	98,604	65.8
Metropolitan region	42,138	28.1
Innnercities	9,241	6.1

The number of donations corresponded to 1.08% of the local population and decreased 29% during the studied period, with a monthly decrease of -0.59% ( $b = -0.034, p = 0.001$ ) (Figure 1). The months with the most substantial number of donations were in March (9.8%), November (9.6%), and June (8.9%). A low number of donations were observed in January (7.7%), October, August and July, with 7.2% of donations each.

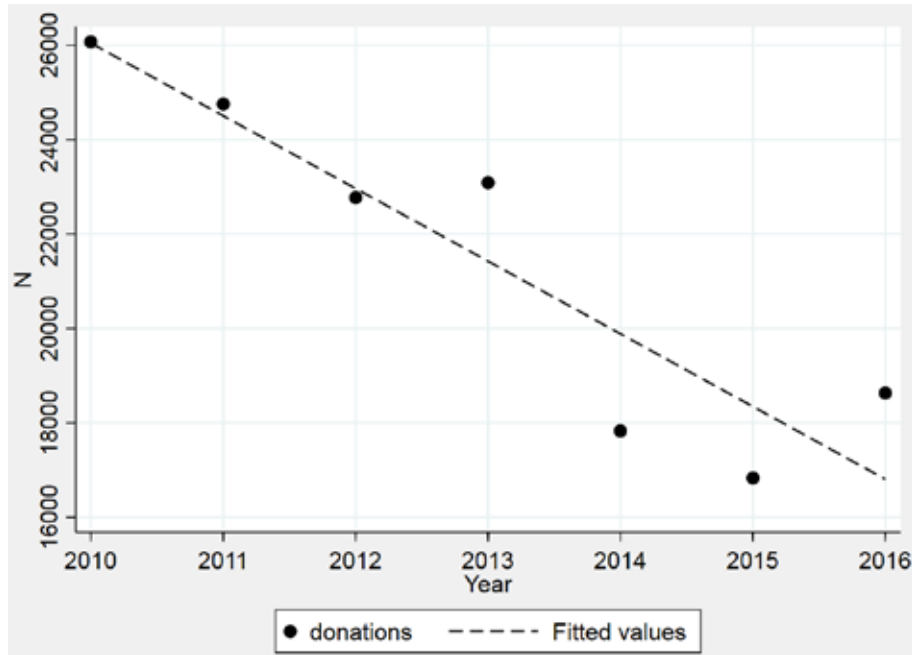


Figure 1.

The number of female donations increased during the studied period ( $b = 0.014, p = 0.016$ ), while donations by male ( $b = -0.007, p = 0.012$ ) and by young people aging 18 to 29 years ( $b = -0.010, p = 0.002$ ) decreased. We also observed that individuals with higher education were more frequent donors when compared to those with less education.

Indoor voluntary donations were 49.81% ( $n = 75,718$ ) of the 149,983 donations, 30.38% ( $n = 45,569$ ) were campaigning donations, 18.87% ( $n = 28,314$ ) were replacement donations, and less than

1% ( $n = 382$ ) were either autologous or invited donations. The campaigning donations decreased 5.02% during the investigated period, indoor voluntary donations increased from 10,918 in 2010 to 13,427 donations in 2016 ( $b = 0.051; p < 0.001$ ). Donations incentive program and external donations were part of the campaign mode, Figure 2 shows blood donation stratified by year, category and periods without (first period), during (second period) and again without incentive programs and external donations (third period).

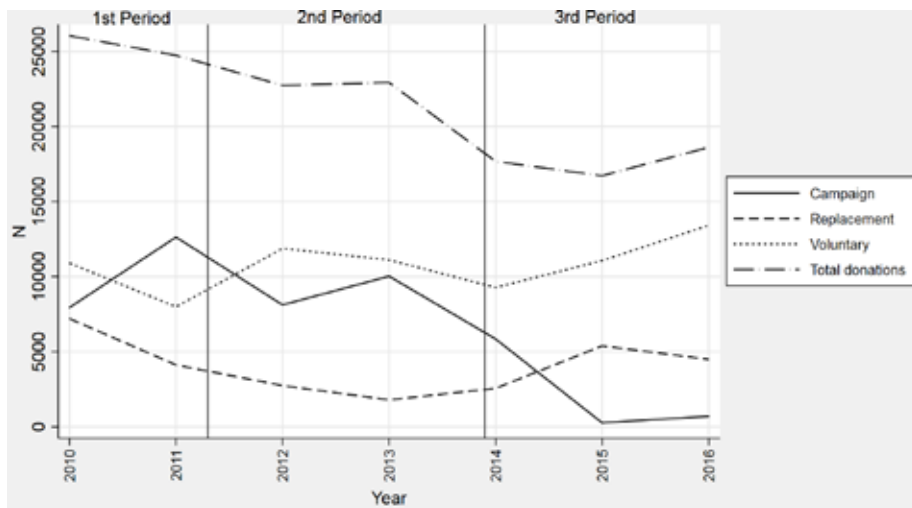


Figure 2.

We observed that the TTI rate was 3.71% (3.29 to 4.36%) with a steady trend ( $b = 0.013$ ;  $p > 0.05$ ). However, this rate increased for replacement (4.45%  $b = 0.030$ ;  $p < 0.05$ ) and indoor voluntary donations (3.65%,  $b = 0.053$ ,  $p < 0.05$ ). There were lower TTI prevalence (3.35%) and decreasing trends

( $b = -0.208$ ,  $p < 0.05$ ) among campaigning donations. The odds of campaigning donors present TTI was less than those who donated through the other categories (OR = 0.8628; CI: 0.8126 - 0.9161;  $p < 0.0001$ ). Table 2 shows the prevalence of TTI according to the donation category.

**Table 2.** Transfusion-transmissible infections, per year, by modalities of blood donations. Brazil, 2010-2016 (N = 149,983)

Modalities of donations	2010	2011	2012	2013	2014	2015	2016	TOTAL	<i>b</i> *	<i>p</i>
<b>Indoor voluntary</b>										
Total donors (N)	10,918	7,992	11,899	11,128	9,280	11,074	13,427	75,718	0.051	<0.001
TTI (n;%)	397 (3.63)	245 (3.06)	422 (3.,54)	394 (3.54)	325 (3,50)	466 (4.20)	521 (3,88)	(2,770; 3.65)	0.053	<0.001
<b>Campaing</b>										
Total donors (N)	7,941	12,645	8,125	10,044	5848	264	702	45,569	-0.210	<0.05
TTI (n;%)	253 (3.18)	432 (3.41)	322 (3.96)	300 (2.98)	182 (3.11)	11(4.16)	29 (4.13)	(1,529; 3,35)	-0.208	<0.05
<b>Replacement</b>										
Total donors (N)	7,211	4,119	2,747	1,793	2,561	5,388	4,495	28,314	0.007	>0.05
TTI (n;%)	294 (4.07)	175 (4.24)	133 (4.84)	63 (3.51)	107 (4.17)	258 (4.78)	230 (5.11)	(1,260; 4.45)	0.009	>0.05
<b>TTI (Total)</b>										
N (%)	944 (3.62)	852 (3.44)	877 (3.85)	761 (3.29)	619 (3.47)	735 (4.36)	780 (4.18)	5,568 (3.71)	0.013	>0.05
<b>TOTAL</b>	26,072	24,756	22,772	23,089	17,830	16,833	18,631	149,983	-0.034	<0.001

\* Regression of Prais Winsten. *b* = beta coefficient; TTI = Transfusion-transmissible infections.

## DISCUSSION

The World Health Organization (WHO) recommends that 3 to 5% of the population of a country should donate blood<sup>1</sup>. Taking into consideration that public blood banks account for almost 60% of total donations, we expected to find a percentage of at least 1.5% of donations. However, this study, performed in a public blood bank in the central-western region of Brazil, showed that only 1.08% of the local population donated blood between 2010 and 2016. This rate was below the national average of 1.7%<sup>13</sup>. The number of donations was lower in school holidays (July and January), when many people travel, leading to a reduced donation activity. In the same period, the number of car accidents rises leading to a higher demand for blood transfusions. The seasonality of donations varies among blood banks around the world and is related to cultural, religious, seasonal, and school holidays<sup>16,17</sup>.

The bigger adherence of donors from a higher level of education may be related to the national increase of the people on the same educational level. On the other hand, the recent economic crisis in Brazil that resulted in a considerable rise in the unemployment rate of the population with lower educational levels aging 16-29 years old<sup>18</sup> may have contributed to the lower participation of these groups of donors. In addition, the women's involvement in blood donations has increased, as observed all over Brazil<sup>13</sup>. Although women's donations are still a minority, this group represents a potential target for blood donation campaigns to enhance the donation rates in the country.

Indoor voluntary donations was responsible for most of the donations and increased over the study period, showing that the hemotherapy service is moving towards 100% voluntary donations recommended by WHO<sup>1</sup>, this being a worldwide trend<sup>19,20,21</sup>. However, increasing the number of indoor voluntary donations was not sufficient to increase the total number of blood donations in the evaluated period.

The Brazil's legislation can impact donors recruitment by granting medical statements, a loyalty card that concedes half-admission to public cultural events, registration fees for public tenders, and other benefits<sup>22,23</sup>. In Brazilian's central-western, State of Goiás, the law nº 17,405<sup>24</sup> declared that low-income students are eligible to benefit from university scholarships and in return, the students are encouraged to participate in humanitarian actions, such as blood donation. This incentive was available from September 2011 until November 2013. In our study, donations incentive program and external donations were part of the campaign mode, and this type of donation reduced significantly after 2013. These data shows that government actions that indirectly encourage blood donation can contribute to increase and decrease in blood donations. Despite the importance of attracting donors in the hemotherapeutic process, there is still a lack of scientific publications about this activity in Brazil.

The mobility unit gives the citizen the opportunity to be a blood donor, since the most common reason why individuals have not donated blood is due to the lack of opportunities to do so<sup>25</sup>. The number of donations may have lowered down due to the decrease in the activities of the mobile blood bank unit, for technical reason, during the period evaluated.

Transfusion transmissible infections rate had a steady trend ( $b = 0.013$ ;  $p > 0.05$ ). A previous study suggested that the increased rate of syphilis may have contributed to the fact that the overall rate of TTIs did not decrease in the evaluated period<sup>26</sup>. Differences between the TTI rates of indoor voluntary and campaigning donations were not identified, suggesting that blood quality is similar even when the donor attends to incentivate campaigns. In addition, high blood

quality may result from the features of the population and their education levels<sup>5</sup>, and mainly because of the efficient screening criteria applied. Non-monetary incentives, if carefully targeted, can be useful in attracting and retaining donors. However, the Food and Drug Administration continues to restrict cash-value incentives, although there is no substantial evidence showing that modest rewards to draw donors have a negative impact on blood safety<sup>12,27</sup>.

Replacement donors showed an increased chance of positive TTI. The referred ones donate blood to replenish the consumed bloodstock. In addition, in some cases, there is a pressure from the health services on the family individuals who will undergo a surgical procedure. In this cases, a specific number of donations is required to guarantee that the medical procedure will occur. Unfortunately, family members may illegally pay for donations<sup>28</sup> and for dishonesty in clinical screening, which compromises blood quality<sup>25,29</sup>.

## CONCLUSION

Our findings showed a decrease in the number of donations in the last years, influenced to a great extent by the decline in campaigning donations, which presented the lowest rate of TTI. The local incentive policy adopted for donor recruitment, together with the external recruitment, may contribute to the maintenance of bloodstocks with a guarantee of safety transfusions. Our results suggest that donor uptake supported by ethical and planned practices may be required in countries where the donation rate is still low, and the population is not aware of its vital role in donating blood.

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