Blood Drive Day-Related Factors Affecting University Student Blood Donation in Grenada, West Indies: A Case-Control Study

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Short title: Factors Affecting University Student Blood Donation in Grenada, West Indies

Synopsis: Electronic and in-person advertising, no academic assignments within a week of the blood drive and large blocks of free time for donating, were positively associated with university-student blood donation. University-student blood donation rates may be increased by scheduling each on-campus blood drive around the timetables of specific student groups using personal and/or electronic advertising.

Key words: Grenada, blood donation, university, students, case-control

Abstract

Objectives

The goal of this study was to determine which factors acting in close temporal proximity to the day of a university campus blood drive were associated with university-student blood donation.

Methods

An incidence density case-control study was conducted at St. George's University, Grenada, West Indies. Cases (69) were students interviewed while donating blood at blood drives (February-April 2010). Controls (437) were non-donating students interviewed on the same days as cases. Exposures of interest were: Sources of knowledge of the blood drive, the presence or lack of academic deadlines within a week of the blood drive, and the number of hours of classes on the day of the blood drive. Data were analysed using logistic regression with adjusted odds ratios approximating risk ratios (RR).

Results

Associations with blood donation were higher for electronic and/or personal (RR_{Email} = 5.1; 95% CI: 2.7-9.6, $RR_{Facebook}$ = 4.3; 95% CI: 2.1-9.0, $RR_{PersonalReminder}$ = 2.9; 95% CI: 1.6-5.4) than for impersonal ($RR_{ClassAnnouncement}$ = 2.4; 95% CI: 1.3-4.8) sources of blood drive knowledge. Additionally, students with classes only in the morning (RR_{AMonly} = 1.9; 95% CI: 1.2-3.2), or afternoon (RR_{PMonly} = 1.5; 95% CI: 0.7-2.9) and those with no academic deadlines within a week of the blood drive were more likely to donate blood.

Conclusion

University-student blood donation shows a stronger association with personal and/or electronic advertising than with impersonal and/or non-electronic advertising. University blood drives should target students with similar timetables at times of reduced academic stress using personal and electronic modes of advertising.

Introduction

Research on tertiary student donors has largely described their knowledge, attitudes, beliefs and blood donation experiences (1-15), with studies reporting between 10 and 83% of student participants having at least one previous blood donation experience (1-7, 9-12, 16). Common motivations for donation among students have been humanitarian or altruistic,(5, 7, 17, 18) self-satisfaction (4), the need to help a friend or relative (14, 16), and national catastrophes (14, 16). Frequently cited reasons for non-donation are medical (including safety) concerns (4, 7, 12, 14-16, 18), fear (4, 7, 9, 10, 15, 16, 18-20), and a lack of time (4, 9, 15, 16). Notwithstanding this research, questions remain as to the specific reasons why students may or may not donate blood at any given blood drive and, why there is a substantial difference between the percentage who view blood donation positively and those who actually donate (4, 9, 15, 21-23). It is likely that transient factors occurring in close temporal proximity to a blood drive play a major role in determining whether or not donation occurs. Such factors are likely to include the medium through which the blood drive is advertised to students, class schedules and the presence or lack of academic deadlines. Possibly because this seems intuitive, the effects of these factors on actual blood donation have not been evaluated. While this is best done by comparing the incidence of donating blood among students with and without the factor in question, paradoxically, blood donation is often not the outcome investigated in blood donation studies. Many studies are conducted outside of the context of blood drives (1-5, 7-14, 16-18, 20-23) and/or cross-sectionally compare characteristics of students with and without blood donation histories (1-16, 19).

To determine whether specific student-related factors occurring in close temporal proximity to the day of a university campus blood drive were associated with student blood donation, we conducted an incidence density case-control study at St. George's University

(SGU) campus, Grenada, West Indies.

In Grenada, the Grenada Blood Bank's (GBB) current intake is approximately nine units per 1000 inhabitants per year, substantially short of the required 50 units per 1000 inhabitants as estimated by the World Health Organization and the International Federation of Red Cross and Red Crescent Societies (24). The country is heavily dependent on family donations for transfusions and there is little promotion or education on blood donation. In 2005, SGU's chapter of the American Medical Student Association (AMSA) began organizing on-campus blood drives at SGU's health clinic in order to contribute to the GBB's stores. These blood drives are held once-monthly during the academic year with each one resulting in ten to twenty-five student donations out of a population of approximately 3300 students. Apart from this student-supported blood drive, there are no structured or regular blood drives on the island. This project was a part of a wider collaborative effort, "The Blood for Grenada Project" described elsewhere (25).

Methods

Study Population

The study population consisted of students in the three divisions of SGU: School of Arts and Sciences, School of Veterinary Medicine and School of Medicine (SOM) and was approved by SGU's institutional review board. Data were collected by in-person interviews conducted by thirty trained student interviewers, twenty-two of whom had recently obtained their Master of Public Health degrees at SGU. Questionnaires were only administered during the hours (9:00AM to 3:00PM) of the once-monthly blood drive which were held on the second Wednesdays of February, March, and April 2010.

Exposure information

Data collected from study participants included demographic characteristics, information pertaining to how students learnt or were reminded of the blood drive during the week preceding the blood drive, to academic assignments with deadlines within a week of the blood drive, and to the number of hours of classes they had on the day of the blood drive.

Cases

Cases were students who entered the SGU health clinic and successfully gave blood at any one of the three monthly blood drives held in February, March, and April 2010. Cases were interviewed during blood donation in order to eliminate the possibility of misclassification and to reduce the students' time demand. All students who donated blood during the study period were enrolled as cases.

Controls

Controls were students who had not donated blood at any monthly blood drive in February, March, or April 2010 prior to being interviewed for the study. Controls were only selected on the days of the blood drives and from 9:00AM to 3:00PM. Interviews with controls were conducted at eight different high-traffic locations on campus: library, bus stops, cafeterias, study hall entrances, and other places adjacent to areas of high classroom concentration for each SGU school. These locations were selected based on previous input from students indicating the locations with the highest foot traffic on campus.

Statistical Analysis

Sixty-nine (all) cases and 437 controls were used for final data analyses in SPSS Statistics

software, version 20. Exposures of interest were: the means by which students learnt of, or were reminded of the blood drive, the presence or lack of academic deadlines within a week of the blood drive, and the number of hours of classes they had on the day of the blood drive. Specific pairs of factors related to how students learnt of the blood drive were also combined as joint exposures of interest. For each exposure of interest, initially, a subset of potential confounders was created using directed acyclic graphs (DAGS) (26). We then used logistic regression and the change-in-estimate procedure with forward selection to select confounders from each DAG-based subset to estimate ORs for blood donation. A 10% criterion was used for inclusion of a potential confounder in final regression models (27). From final models, for each exposure of interest, adjusted ORs and their 95% confidence intervals (CIs) were used to approximate Risk Ratios (RRs) and associated 95% CIs, given that the incidence of blood donation on SGU campus was less than 1% (28).

Results

Demographics characteristics

Demographic information on cases and controls is provided in Table 1. Among cases and controls, median ages (24 years) and inter-quartile age ranges (22-26 years) were the same, with the age range for cases (17-40 years) narrower for controls (16-50 years). Age did not meet the 10% criteria for inclusion in any final model.

Table 1. Distribution of blood donors (cases) and non-donors (controls) by gender, nationality, place of residence and school, St. Georges University campus blood drive, Grenada West Indies, February to April 2010

Exposure	Categories	Cases n (%)	Controls n (%)
Gender	Female	44 (64)	260 (59)
	Male	25 (36)	177 (41)
	Total:	69	437
Nationality	Caribbean[a]	11 (16)	188 (43)
	North American[b]	50 (72)	204 (47)
	Other[c]	8 (12)	43 (10)
	Total:	69	435
Residence	On campus	35 (51)	99 (23)
	Off campus (True Blue area)[d]	11 (16)	76 (17)
	Off campus (non-True Blue area)[e]	23 (33)	259 (60)
	Total:	69	434
School	Arts and Sciences	13 (19)	186 (43)
	Medical	53 (77)	229 (52)
	Veterinary Medical	3 (4)	21 (5)
	Total:	69	436

[a]Caribbean Islands and Guyana

[b]United States of America, Canada

[c]Non-Caribbean or Non-North American

[d]Approximately within a square mile radius from St. Georges University campus

[e]More than 1 mile from St. Georges University campus

Source of information about the blood drive

When the effects of individual sources of information about the blood drive were examined, each was associated with at least a two-fold increase in likelihood of donation (Table 2). RRs for donating blood were also higher for students who learnt of the blood drive via electronic means (versus those who did not) than for students who learnt through non-electronic means (versus those who did not) (Table 2).

Table 2. Distribution of blood donors (cases) and non-donors (controls) by source of blood drive information along with adjusted risk ratios (RRs) and 95% confidence intervals (CIs) for associations between source of information and donating blood, St. Georges University campus blood drive, Grenada West Indies, February to April 2010

Source of blood drive information	Categories	Cases n (%)[a]	Controls n (%)[a]	RR	95% CI
Email[b]	Yes	23 (36)	37 (9)	5.1	2.7 – 9.6
	No	41 (64)	384 (91)	1	
	Total:	64	421		
Facebook post[b]	Yes	16 (25)	22 (5)	4.3	2.1 – 9.0
	No	48 (75)	399 (95)	1	
	Total:	64	421		
Saw donor[c]	Yes	9 (14)	21 (5)	3.5	1.6 – 5.4
	No	55 (86)	399 (95)	1	
	Total:	64	420		
Personal verbal reminder[b]	Yes	22 (34)	52 (12)	2.9	1.6 – 5.4
	No	42 (66)	369 (88)	1	
	Total:	64	421		
Sign on campus[b]	Yes	16 (25)	64 (15)	2.8	1.4 – 5.6
	No	48 (75)	357 (85)	1	
	Total:	64	421		
Saw interviewer[d]	Yes	17 (27)	56 (13)	2.5	1.4 – 8.5
	No	46 (73)	364 (87)	1	

	Total:	63	420		
Class announcement[e]	Yes	25 (39)	67 (16)	2.4	1.3 – 4.8
	No	39 (61)	354 (84)	1	
	Total:	64	421		

[a]May not add to 100 due to rounding error

Adjusted for:

[b]Nationality

[c]Nationality, having an academic deadline on the day of blood drive and number of hours of class before between 9:00 am and 12:00 pm. on the day of blood drive

[d]Residence and number of hours of class after 12:00PM on the day of the blood drive

[e]School

When the effects of selected combinations of information sources were investigated, RRs for donating blood were highest for combinations which included an electronic communication followed by combinations which included no electronic communication but included a personal communication, followed by combinations which included neither electronic, nor personal communication (Table 3). Most RRs for the joint information sources were also greater than the RRs of either of the component sources taken individually (Table 3). Exceptions to this were observed for the sign-class announcement and the class announcement-email combinations. For example, students who had seen a sign on campus and heard an announcement in class regarding the blood drive were 3.4 (95% CI: 0.9-12.7) times as likely to donate blood than those who had neither seen a sign nor heard an announcement (Table 3) but were just as likely (RR = 1.2 (95% CI: 0.3-4.5)) to donate blood as those that had only heard a class announcement. Students who had both received an e-mail and heard a class announcement were 5.9 (95% CI: 2.2-16.0) times as likely to donate than those who had experienced neither, slightly less likely (RR = 0.7 (95%

CI: 0.2-2.2)) to donate than those who had received an e-mail and heard no class announcement, but 2.9 (95% CI: 1.1-7.5) times as likely to donate than those who had heard an announcement but received no e-mail.

Table 3. Distribution of blood donors (cases) and non-donors (controls) by combined sources of blood drive information along with adjusted risk ratios (RRs) and 95% confidence intervals (CIs) for associations between combined sources of information and donating blood, St. Georges University campus blood drive Grenada, West Indies, February to April 2010

Source of blood drive information	**Categories**	**Cases n (%)[a]**	**Controls n (%)[a]**	**RR**	**95% CI**
Sign and class announcement[b]	Both	4 (6)	8 (2)	3.4	0.9 – 12.7
	Sign only	12 (19)	56 (13)	4.0	1.7 – 9.3
	Class announcement only	21 (33)	59 (14)	2.9	1.5 – 5.8
	Neither	27 (42)	298 (71)	1	
	Total:	64	421		
Sign and personal verbal reminder[c]	Both	7 (11)	10 (2)	6.9	2.3 – 20.5
	Sign only	9 (14)	54 (13)	2.4	1.0 – 5.6
	Personal verbal reminder only	15 (23)	42 (10)	2.6	1.3 – 5.3
	Neither	33 (52)	315 (75)	1	
	Total:	64	421		
Sign and Facebook post[d]	Both	4 (6)	3 (1)	10.5	2.0 – 54.2
	Sign only	12 (19)	61 (14)	2.5	1.1 – 5.6
	Facebook post only	12 (19)	19 (4)	4.1	1.7 – 9.6
	Neither	36 (56)	338 (80)	1	
	Total:	64	421		
Class announcement and Email[e]	Both	9 (14)	13 (3)	5.9	2.2 – 16.0
	Class announcement only	16 (25)	54 (13)	2.9	1.3 – 6.1
	Email only	14 (22)	24 (6)	8.4	3.7 – 19.1

	Neither	25 (39)	330 (78)	1	
	Total:	64	421		
Personal verbal	Both	5 (8)	5 (1)	8.5	2.1 – 35.0
reminder and	Personal verbal reminder only	17 (27)	47 (11)	3.3	1.6 – 6.7
Facebook post[f]	Facebook only	11 (17)	17 (4)	5.8	2.4 – 14.2
	Neither	31 (48)	352 (84)	1	
	Total:	64	421		
Personal verbal	Both	8 (12)	9 (2)	10.2	3.4 – 30.5
reminder and Email[g]	Personal verbal reminder only	14 (22)	43 (10)	3.1	1.4 – 6.6
	Email only	15 (23)	27 (6)	7.0	3.2 – 15.4
	Neither	27 (42)	342 (81)	1	
	Total:	64	421		

[a]May not add to 100 due to rounding error

Adjusted for:

[b]Residence, nationality, total hours of class on the day of the blood drive, having an academic deadline the day after the blood drive

[c]Nationality

[d]Nationality, residence, having an academic deadline the week of the blood drive, residence, and number of hours of class between 12:00 pm. and 3:00 pm. on the day of the blood drive.

[e]School, Total hours of class on the day of the blood drive,

[f]Nationality, gender, having an academic deadline the day after the blood drive,

[g]School, number of hours of class between 9:00 am and 12:00 pm. on the day of the blood drive, number of hours of class between 12:00 pm. and 3:00 pm. on the day of the blood drive

Assignments within a week of blood drive

In general, students that did not have an academic deadline in close proximity to the blood drive were more likely to donate than those that had, with the highest relative risks observed for not having a deadline at any time within the same week as the blood drive (RR = 1.9 (95% CI: 1.0-3.7) (Table 4). Nevertheless students, who did not have an assignment the day before the blood drive were just as likely to donate as those who had (RR = 1.1, 95% CI: 0.6-1.9).

Table 4. Distribution of blood donors (cases) and non-donors (controls) by proximity of academic Deadlines[a] to the day of a campus blood drive along with adjusted risk ratios (RRs) and 95% confidence intervals (CIs) for associations between proximity of academic deadlines[a] and donating blood, St. Georges University campus blood drive, Grenada, West Indies, February to April 2010

Proximity of academic deadlines to day of blood drive	**Categories**	**Cases** n **(%)**	**Controls** n **(%)**	**RR**	**95% CI**
None same week[b]	Yes	26 (38)	95 (22)	1.9	1.0 – 3.7
	No	43 (62)	335 (78)	1	
	Total:	69	430		
None day before[c]	Yes	40 (58)	247 (57)	1.1	0.6 – 1.9
	No	29 (42)	183 (43)	1	
	Total:	69	430		
None on same day[d]	Yes	55 (80)	284 (66)	1.7	0.9 – 3.3
	No	14 (20)	144 (34)	1	
	Total:	69	428		
None on day after[e]	Yes	49 (71)	247 (58)	1.5	0.9 – 2.7
	No	20 (29)	180 (42)	1	
	Total:	69	427		
None week after[f]	Yes	20 (29)	81 (19)	1.8	1.0 – 3.1
	No	49 (71)	350 (81)	1	
	Total:	69	431		

[a]Includes, assignment deadlines and assessments

Adjusted for:

[b]Nationality, not having an academic deadline the day before the blood drive, and not having an academic deadline the day after the blood drive

[c]Nationality, not having an academic deadline the week after the blood drive

[d]Not having an academic deadline the day after the blood drive

[e]Not having an academic deadline the day of the blood drive

[f]No variable changed crude RR estimate by more than 10%

Hours of class on day of blood drive

Students who did not have class in the morning (9:00AM-12:00PM) were more likely to donate than those that had (Table 5). A similar pattern was observed for afternoon (12:00PM-3:00PM) classes, with students who had no classes more likely to donate than those who had, Finally, having no classes (9:00AM-3:00PM) on the day of the blood drive, was more consistent with a lower likelihood than a higher likelihood of donating blood (Table 5).

Table 5. Distribution of blood donors (cases) and non-donors (controls) by class schedules between 9:00 am and 3:00 pm on the day of a campus blood drive, along with adjusted risk ratios (RRs) and 95% confidence intervals (CIs) for associations between class schedule and donating blood, St. Georges University, Grenada West Indies, February to April 2010

Class time on day of blood drive	**Categories**	**Cases n (%)**	**Controls n (%)**	**RR**	**95% CI**
9:00 am. -12:00 pm.[a]	No	13 (19)	78 (18)	1.5	0.7 – 2.9
	Yes	56 (81)	355 (82)	1	
	Total:	69	433		
12:00 pm. - 3:00 pm.[b]	No	35 (51)	150 (35)	1.9	1.2 – 3.2
	Yes	34 (49)	282 (65)	1	
	Total:	69	432		
9:00 am. – 3:00 pm.[c]	No	4 (6)	28 (6)	0.5	0.1 – 2.3
	Yes	65 (94)	406 (94)	1	
	Total:	69	431		

Adjusted for:

[a]School

[b]No variable changed crude RR estimate by more than 10%

[c]School, number of hours of class between 9:00 am. and 12:00 pm. on day of the blood drive, and number of hours of class between 12:00 pm. and 3:00 pm. on day of the blood drive

Discussion

This study adds to existing research on tertiary student blood donation by linking factors occurring in close temporal proximity to a university campus blood drive to actual donation. We

believe this is the first case-control study to address this issue and one of few studies on student blood donation done in the context of a blood drive (6, 15, 19, 29-31).

All sources of information advertising the blood drives were associated with a substantial (two-fold or more) increase in the likelihood of students donating. This suggests that all of these sources of blood drive information are likely to increase blood donation if instituted in close proximity to a blood drive. The strong associations observed for Facebook and e-mail reminders are consistent with electronic media being common and effective tools for communication among tertiary students (32, 33).

The association of "Saw donor" and "Saw interviewer" with blood donation suggests that, on the day of the blood drive, making donors and other persons associated with a blood drive easily recognizable, might be an effective means of blood drive promotion. Previous work has suggested that having solicitors wearing shirts advertising the blood drive (29, 30) and being asked to donate blood by a donor (31) might increase the number of donors on blood drive day. It is likely that the visual effect of seeing these persons serves to trigger or reinforce the decision to donate. Associations with blood donation observed for combined sources of information suggest that specific sources of information used jointly in a targeted manner can have an advantageous effect on blood donation compared to when used singly. This seems particularly true for combinations of personal verbal reminders with e-mails or Facebook posts. In addition to electronic communication being frequently used by tertiary students, a possible explanation for this may be that both personal verbal reminders and electronic communications are likely to be both direct and come from personal acquaintances. Previous reports have suggested that direct requests and solicitations by personal acquaintances are likely to have a more positive effect on blood donation than the use of signs (6, 18, 31). The fact that the class announcement-sign combination (a combination of two impersonal means of communication), showed no greater

association with blood donation than class announcement or sign individually, also supports a view that in a targeted campaign, it would be best to include at least one personal means of advertising for maximum effect.

The increased likelihood of donation of students that did not have assignments due either the same week or the week after the blood drive, compared to those who did, is consistent with an expectation that students are more likely to donate blood when they do not have academic deadlines in close proximity to the blood drive. In addition to time-related concerns, a potential explanation for this is a concern by students that blood donation might negatively affect their academic performance because of consequent feelings of dizziness and/or weakness. Both these explanations have previously been cited as deterrents to blood donation (4, 9, 16).

The fact that students who did not have classes in the morning and students that did not have classes in the afternoon on the day of the blood drive were more likely to donate blood than those who had classes in the afternoon and morning respectively, suggests that ensuring that blood donation is possible at a time that does not conflict with class schedules is beneficial to increasing blood donation. It is likely that rather than just hours of class on the day, it is also the presence or lack of a sufficient block of time for donation which determines whether donation occurs. If so, it is unlikely that blocks of time in excess of the required amount will result in an increase in the rate of blood donation. This view is supported by the observation that results for students with no classes at all on the day of the blood drive were more consistent with lower than higher likelihoods of donating (Table 5).

Comprehensively, these results suggest that it is advantageous to plan blood drives during periods when students are less likely to have major academic assignments and to ensure that the hours of the blood drive are extended long enough to guarantee even students with very packed timetables an ample block of time within which to donate. The most feasible way to do this is to

organize student-group specific blood drives targeting students at similar stages of their academic career.

Low numbers of blood donors resulted in imprecise RR estimates for some exposures of interest and prevented examination of the potential modifying effects of nationality and school of enrollment on the exposures of interest. Notwithstanding this, we believe this report makes a valuable contribution to the literature on student blood donation, as the quantification of these associations provides empirical and concrete evidence on which marketing campaign strategies can be based.

Conclusions

First, this study reveals that personal and/or electronic modes of advertising university blood drives result in larger increases in university-student blood donation than impersonal and non-electronic modes of advertising. Second, university-students are more likely to donate blood if they do not have class assignments within a week of the blood drive and third, if, in addition to having few classes on the day of the drive, students are provided with a sufficient block of time in which to donate blood, they are more likely to do so. Given that students are likely to have closer relationships with classmates than with non-classmates, they should be asked to advertise the blood drives to their classmates via personal reminders, e-mails and Facebook messages. Personal reminders should be followed up with, or preceded by, class announcements along with signs placed at strategic places on campus. It is likely advantageous to plan blood drives around the timetables of homogenous groups of students at similar stages of their academic career as they should have similar timetables. Finally, rendering donors and blood drive affiliates conspicuous to the campus population is also likely to increase the number of blood donors on the day.

While this study was conducted in the context of blood drives organized by St. George's University's American Medical Student's Association and the Grenada Blood Bank, student communication strategies as well as student class and academic assignment schedules are features of all university environments and thus, these results should have relevance to organizations conducting blood drives on other university campuses within as well as outside of the West Indies.

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Authors note

SN and LMI, jointly designed the study. SN conducted data collection, analysed the data and wrote initial drafts of the methods and results. LM wrote initial drafts of the introduction and discussion and both SN and LM contributed to successive drafts of the manuscript.

The authors have no conflicts of interest to declare

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