

## Can text messages save lives? A field experiment on blood donor motivation

Toke Fosgaard <sup>1</sup>, Lars Hansen,<sup>1</sup> Catrine Jacobsen,<sup>2</sup> Erik Sørensen,<sup>3</sup> Merle Romose,<sup>3,4</sup> and Henrik Ullum<sup>3</sup>

**BACKGROUND:** Continuous effort around the globe is exerted into donor management, with the overall aim of keeping a constant flow of new donations. To achieve this goal, blood banks and blood donor associations are taking initiatives to get the same donor to make repeated donations. In general, such initiatives are implemented without proper evaluation. This study circumvents this trend and evaluates the effect on donations from sending blood donors a text message when their donation has helped a patient.

**METHODS AND MATERIALS:** In a large-scale field experiment ( $n = 20,365$ ), we randomized donors such that half are sent a text message when their donation was used. Among those who were randomized to the text message, we also randomized the time of day the text message was sent.

**RESULTS:** The messages increased subsequent donations by 3.6% ( $p = 0.023$ ), compared with donors who did not get the message. It was also shown that optimizing the time of day when the text messages were sent increased the effect substantially. Text messages sent in the evening increased donations by 6.5% ( $p = 0.011$ ). Finally, it was found that, among whole blood donors, the text messages did not have a significant effect ( $p = 0.554$ ), whereas it did among the plasma donors ( $p = 0.003$ ).

**CONCLUSION:** Several blood banks have adopted the strategy of sending blood donors a text message that acknowledges that donors' contributions helped a patient. This study is the first to formally test the effects of such a message with a control group.

In many countries, blood is supplied by healthy adults participating in voluntary donation programs.<sup>1</sup> Even though many citizens are willing to participate in these programs, it is a challenge for blood banks to recruit and keep donors active and motivated. How to meet this challenge has been the focus of recent research.<sup>1–10</sup> Despite the obvious importance of this challenge, the existing evidence about what is important to recruit donors and keep them active is originating from self-reported survey answers and hence lacking clear documentation of actual influence on behavior. One exception is the prominent debate on whether paying donors for their donations is a good way to increase donations.<sup>1</sup> While the evidence suggests that paying for blood donations is an effective strategy,<sup>8,9</sup> there are potential pitfalls. The payment can backfire and actually reduce the desired behavior, in particular if the behavior was initially motivated by an intrinsic desire to help.<sup>11,12</sup> Another concern is that a payment might attract donors who pose a higher risk of transfusion-transmitted infection,<sup>13</sup> thereby jeopardizing the quality and safety of the transfusion blood supply. Furthermore, there may be ethical, legal, and financial reasons as to why voluntary unpaid blood donation programs are preferred in most countries.<sup>14</sup>

From the <sup>1</sup>Department of Food and Resource Economics, University of Copenhagen, Frederiksberg; <sup>2</sup>Bro Kommunikation, Esplanaden; <sup>3</sup>Copenhagen Hospital Biobank Unit, Department of Clinical Immunology, Copenhagen University Hospital, and the <sup>4</sup>The Danish Blood Donor Association, Region Copenhagen, (GivBlod), Copenhagen, Denmark.

*Address reprint requests to:* Toke Fosgaard, Department of Food and Resource Economics, University of Copenhagen, Rolighedsvej 23, 1958 Frederiksberg C, Denmark; e-mail: [tf@ifro.ku.dk](mailto:tf@ifro.ku.dk).

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Our aim was to suggest a nonfinancial approach to donor management and test its practical implication in a controlled behavioral experiment. Specifically, our idea was to send blood donors a text message when their donation helped a patient. If the text message is unimportant to the blood donors, it should not have an effect on their donation behavior; on other hand, if donors attach value to the text message, it could increase the donors' utility and possibly lead to increased donation behavior. Furthermore, to learn more about how to optimize the use of such messages, we also randomize the time of day the message is sent.

The adoption of text messages being sent to donors when their blood is used is already implemented in other blood banks, including blood banks in Australia (Brisbane and New South Wales), Denmark (South Jutland), Ireland, Sweden (Dalarna and Stockholm), and the United Kingdom. In these locations, however, the effect of implementing the messages was not measured by comparing behavior in a clearly identified treatment group to a control group. We contribute with the lacking knowledge.

There are many potential channels through which the text message might work. One could be that blood donors are motivated by impure altruistic preferences,<sup>15-17</sup> implying that the donors derive utility from knowing that a person in need is being helped, but also from being the one who is providing the help. The mechanism of impure altruism is well documented in controlled laboratory choice settings<sup>18,19</sup> and has been identified as an important motivation for blood donors.<sup>7,15,16</sup> Another channel through which the text messages might work is as a simple reinforcement or reminder of the importance of being donor or that the blood donations work effectively. Reminding is in general known as effective in changing behavior,<sup>20</sup> and also documented as effective among blood donors.<sup>21</sup> Third, evoked feelings, such as pride and contempt, might be driving the effect of the text message. This potential channel is supported by previous research documenting the importance of emotional states for prosocial behavior.<sup>22</sup>

## STATISTICS

To estimate the effect of the text message on donation frequency, we study all donors whose prior blood donations were used during our 3-month experiment. Of these donors, we compare the behavior of the half who were randomly sent the text message (treatment group) with the half who were not sent the message (control group). More specifically, the total number of donations made by the treatment group, from the point where the text message was sent, is compared with the total number of donations made by the control group, from the point where they would have been sent a text message had they been in the treatment group.

## METHODS AND MATERIALS

We ran a large-scale natural field experiment among blood donors from the blood banks of the Copenhagen Region in Denmark (the greater Copenhagen area). The experiment was initiated October 4, 2017, and ran for a 3-month period. We randomized the donors so that some were sent a text message when their blood donation had helped a patient, while the others were not. If the experiment had been running for a longer period, the measured effects might have been greater because the deferral period that blood donors must adhere to reduce the period where donors actually can react to an increase in motivation.

The text message read (translated from Danish): "*Thanks [first name]. The blood you donated on the [Date] just helped a patient. Best regards, The Blood Bank/Give Blood.*" Give Blood is the name of the blood donor association. If a plasma donor was randomly selected to be sent a text message, the wording was modified (translated) as follows: "*Thank you [first name]! The plasma that you donated on [Date] has just been forwarded for the further development of medicine for Danish patients in need. Best regards, The Blood Bank-GiveBlood.*"

Motivated by the literature on how mood and cognitive processing varies over the course of the day<sup>23-25</sup> and by the acknowledgment that timing of behavioral interventions is critical,<sup>26</sup> we randomly varied the time of day the text message was sent (morning, lunchtime, afternoon, or evening). We expected that the text message would be more effective if it was sent at a time when the recipient had time to read and reflect over the message immediately. For this reason, we expected that messages sent before and after normal work hours would be more effective.<sup>27</sup>

We were interested in measuring the effect of the text message on behavior in terms of making new, or canceling existing, appointments. New appointments are important for maintaining the flow of blood donations, and cancellations are interesting because they help avoid a situation where people do not show up for an appointment. We also measured the effect on actual donations. Donating was the direct outcome behavior we aimed to affect, and it was, therefore, the most important variable.

Given that our hypotheses are one-sided, we evaluated the results by comparing donations using one-sided t tests. The confidence intervals reported in the text and shown in the figures are 90% confidence intervals, where the lower bound corresponds to the one-sided test we apply.

## Participants

In the period January 1, 2015, to September 4, 2017, the blood donor corps in the capital region consisted of approximately 61,500 people who had given blood at least once in the period. We conducted our experiment on the existing corps of donors from September 4, 2017, until December 4, 2017. In this period, we randomized donors so that some

were sent a feedback text message when the first blood component of a previous donation of theirs was issued by the blood bank, while the others did not.

We used the randomly generated identification (ID) number to assign donors to either the text message treatment or the control group without the text message. More precisely, those who had an ID number that ended in 50 or higher were assigned to the treatment group. Within the treatment group, we also used the ID number to randomize donors into time slots for sending the text message. For ID numbers ending in numbers between 50 and 62, the text message was sent in the morning (8:03 AM); for ID numbers ending in numbers between 63 and 75, the message was sent at lunchtime (11:17 AM); for ID numbers ending in numbers between 76 and 87, it was sent in the afternoon (3:47 PM), while for ID numbers ending in numbers higher than 87, the message was sent in the evening (7:23 PM).

### Experimental details

The donors were automatically enrolled in the experiment but could easily opt out of receiving the text messages after the first message had been sent by contacting the blood banks or the blood donor association. During the experiment, a vague explanation of the project was made available on the donor association's Web site in an inconspicuous location. Essentially, the explanation stated that text messages would be sent out but that the project was in a test phase, which meant that not all donors would receive a text message.

### Data collection and approvals

The experiment was approved by the Institutional Review Board at the University of Copenhagen (No. 504-0021/17-5000). All data were collected by the blood banks using donor ID and donation identifiers. The data used for analyzing the project do not contain donor IDs or donation IDs and are, therefore, anonymous, which means they cannot be used to identify the individual donors. The analytical data set was constructed by combining several files. First, we identified all cases in the experiment period where a donation had been issued by the blood banks ( $n = 20,365$ ). We counted only the first issuance, even though a whole blood donation contains three components that can leave the bank separately. This procedure mimics the triggers behind the text message. For each donation, a text message was sent only the first time a blood component from a donation was used. Our main data set for the experiment contains all events of first issuing per donation during the experiment. For one-half of the events, a text message was sent to the donor, while the other one-half did not. For the sake of simplicity, we keep only one donation per donor, even though some, in particular plasma donors, who are allowed to donate every month can show up several times in the data set. The resulting data set represented our base data set.

### Structure of data sets

We combined the base data set with a booking data set and donation data set to identify our variables of interest. To count the donations, we combined the base data set with all donations that were made from the beginning of the experiment until April 13, 2018. Donations enter the data set if they were made after at least one component of a donation was issued. To count new appointments and cancellations, we added booking data to the base data set. The recordings in the booking data set are not time stamped, so we used changes to the list of booking recordings at different times to identify new and canceled bookings. The list of booking data was extracted on September 30, 2017; October 23, 2017; and December 4, 2017. For the purpose of our analysis, we considered only new bookings and cancellations made after the point where a component of a donation was issued. For the treatment group, the issuing triggered the text message being sent out; for the control group, it did not.

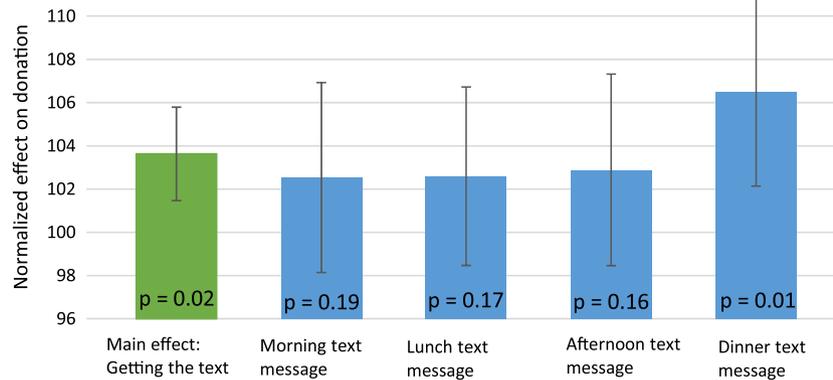
In practice, all donors give the blood banks their cell phone numbers because the blood banks send text reminders a day before an appointment.

## RESULTS

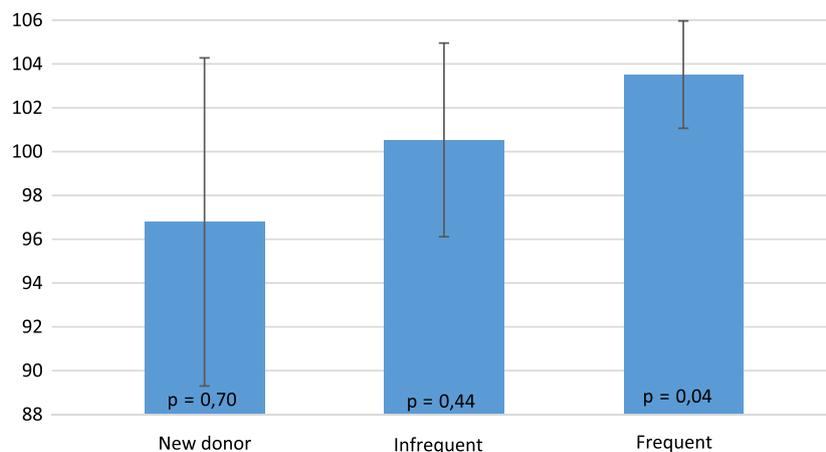
In the experiment, we find that those who were sent the text message increased the number of subsequent donations by 3.6% (confidence interval [CI], 1.5%-5.8%;  $p = 0.023$ ). We also found that the effectiveness of the text messages varied depending on when they were sent during the day. The morning, lunchtime, and afternoon messages had smaller and insignificant positive effects on donations (morning, 2.5%, CI, -1.9%-6.9%,  $p = 0.190$ ; lunch, 2.6%, CI, -1.5%-6.7%,  $p = 0.174$ ; afternoon, 2.9%, CI, -1.5%-7.3%,  $p = 0.158$ ), while the evening text message had a much stronger and significant effect (6.5%; CI, 2.1%-10.8%;  $p = 0.011$ ; see Fig. 1). In the experiment period, seven donors (0.0007%) asked not to receive the text message.

To understand how the text messages affect the decision to donate again, we also explored what happens before a donation is made. We found that sending the text message increased the frequency of making future appointments to make donations by 5.6% (CI, 3.1%-8.0%;  $p = 0.003$ ) and the frequency of canceling appointments by 16.0% (CI, 9.1%-22.9%;  $p = 0.002$ ), which might reflect that the text message influenced donors to reschedule future appointments. This is supported by the fact that the average time between donations tends to be shorter for those who were sent the text message (1.2% shorter; CI, 0.3%-2.1%;  $p = 0.055$ ).

To investigate this heterogeneity, we divide our sample in half (at the median) with one-half comprising those who had made the most historical donations and the other one-half comprising those who had made the fewest historical donations, measured over approximately 3 years before the



**Fig. 1.** The effect of being sent the text message on subsequent donation behavior. The graph shows the normalized effect of being sent the text message relative to the group of donors whose donation was used, but who were not sent a text message. The green bar shows the main effect of sending the text message, whereas the blue bars show the effect of sending the text message at a particular time of the day, compared to not sending the text message at all. The test probability resulting from a one-sided t test that compares the donation behavior of those who were sent the text messages with those who were not is shown above each bar. [Color figure can be viewed at [wileyonlinelibrary.com](#)]



**Fig. 2.** The effect of the text message across the different donation histories. Historical donation frequency before the experiment was used to divide our population into “Frequent” and “Infrequent” donors. Those who entered the donor pool during the experiment are labeled “new donor.” [Color figure can be viewed at [wileyonlinelibrary.com](#)]

experiment. New donors who had no donation history before the experiment were analyzed as a third group (new donors constitute 8.6% of the sample). We find that frequent donors are positively affected by the message (3.5%; CI, 1.1%-6.0%;  $p = 0.044$ ), while infrequent donors (0.5%; CI, -3.9%-5.0%;  $p = 0.444$ ) and new donors (-3.2%; CI, -10.7-4.3%;  $p = 0.696$ ) are not (see Fig. 2). Thus, the main effect of the text message was that it led to an increase in donations made by donors who were already donating frequently.

To shed even more light on the heterogeneous effects of the text messages, we investigated how they affect different types of donation. The default situation is that donors do a whole blood donation (84.7% of all blood donors). The text message had no significant effect on the whole blood

donors (-0.2%; CI, -2.0%-1.6%;  $p = 0.554$ ), but it had a highly significant treatment effect on the plasma donors (8.2%; CI, 4.7%-11.7%;  $p = 0.003$ ). It should be noted, however, that the later effect might also reflect the shorter deferral period of the plasma donors.

## DISCUSSION

In this paper, we propose that a text message be sent to blood donors when their donation has helped a patient. We tested this nonfinancial approach to promote blood donations in a controlled behavioral experiment. Our results show that the text message had a positive effect. However, an important question is whether the effect of the text

message is large enough to warrant acting upon. At first glance, a 3.6% increase in donations might not seem impressive, but if you consider that this means that every time 100 automatically generated text messages are sent, three to four more donations are made, the potential becomes obvious. The cost of sending automatically generated text messages is very low, while the benefits derived from extra donations are substantial. Therefore, sending the text messages is a highly cost-effective way of promoting donations. Furthermore, we found that the use of the text messages can be optimized. For example, we found that sending out the messages in the evening results in an increase of 6.5% in donations. Once the experiment was completed, the blood banks and the blood donor association were so pleased with the experience during the experiment that use of a text message was rolled out to all donors, while they were still able to opt out if they did not want to continue to receive the text messages.

Our findings show a great potential for increasing blood donations, but they are also a source of optimism for other alternative interventions, for example, actively announcing the kind act of making a blood donation to others via, for example, social media. We would like to point out that the feedback text message that we identified as important for blood donation may be relevant for many other altruistic behaviors, such as charity donations and voluntary community work.

An important message from our study is that the effect of the acknowledging text message is heterogeneous. Heterogeneous effects of behavioral interventions is well known in other choice domains.<sup>28,29</sup> For example, with regard to exercising, it has been found that the introduction of incentives works primarily on those who are not already exercising.<sup>29</sup> We also expected to observe heterogeneity in the effect of the text message. Previous research has found that frequent donors are more motivated than less frequent donors.<sup>30</sup> Given this and the fact that the text message is supposed to reinforce motivation, we expected a greater reaction from the, presumably, more motivated frequent donors. In accordance with this, we did find that the text message works primarily for those who are more motivated. Both being among the most frequent donors and being a plasma donor, which is presumably associated with a higher degree of motivation, is associated with a stronger effect of the text message. Among the plasma donors, another reason for the stronger effect of the text messages could be that their donation is used for fractionation, and as a result, they may be more unsure of the direct patient benefit of their donation. It seems that reminding plasma donors of the use of their donation is more effective in inducing a warm glow feeling and subsequent active donation.

The stronger effect of the text message, which we observed for the evening, we expect to be a result of the donors' time resources. In the evening, most people have more time to pay attention to private arrangements such as

blood donation, which implies that the likelihood that the donors can react by making a new appointment when receiving the messages, is expected to be higher.

## CONFLICT OF INTERESTS

The authors have disclosed no conflicts of interest.

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