


# Can inactive blood donors be re-recruited? A stratified randomised pilot study

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## SUMMARY

**Objective:** The aim of this study was to evaluate the effectiveness of recruitment of inactive donors by telephone call and cell phone short message service (SMS), to assess the causes of donor self-deferral and to determine the appropriate sample size for a formal study

**Background:** Blood donor retention is essential for sustaining blood safety and sufficiency.

**Methods:** We conducted a single-centre open-label parallel randomised controlled trial in Guangzhou, China. A total of 1188 inactive donors with the last donation between 2009 and 2013 were enrolled and randomly assigned to two intervention groups (telephone call and SMS groups) and one control group without any intervention. Donors were followed up for 7 months; their responses including donation activities were analysed.

**Results:** The re-donation rates among the three groups were statistically significantly different ( $P = 0.044$ ), particularly between the phone call group and the control group ( $P = 0.017$ ). Within the phone call group, the re-donation rate was positively associated with the frequency of prior donation ( $P = 0.026$ ), and the age of the donors ( $P = 0.043$ ). Medical issues, time constraints and group donation were the main causes of self-deferral. The appropriate sample size for each group for a formal study to detect difference between the phone call and SMS groups was estimated to be 1429 participants.

**Conclusions:** Our findings suggest that active interventions, especially phone call reminders, can increase blood donation. Further studies are required to compare the efficacy and effectiveness between phone call and SMS reminders using a larger sample size.

**Key words:** blood donation, inactive donors, recruitment, self-deferral reasons.

With the development of modern medicine, the blood supply demands continue to increase annually in many countries. Voluntary non-remunerated blood donors are the foundation of a safe blood supply and this safety will be further improved when donors donate regularly. Blood donor retention is a critical strategy to ensure the safety and sufficiency of clinical blood supply. An effective strategy can prevent donors from lapsing and eventually becoming inactive. According to the Donor Management IN Europe (DOMAINE), lapsing donors are defined as those who have donated at least once within the last 24 months, but have not donated within the last 12 months; whereas inactive donors are donors who have not donated within the last 24 months (van Dongen, 2015). Retention strategies should aim to encourage repeat donations as early as possible (Volken *et al.*, 2015). Although it is believed that re-recruiting lapsed donors is easier than re-recruiting inactive donors, the latter group is a large and indispensable group that could be encouraged to return and become active donors.

The most common ways to encourage donor return include telephone call, e-mail and cell phone short message service (SMS). It has been documented that phone call reminders can convert first-time donors into repeat regular donors (Agawal & Tiwari, 2014). In addition, there are reports suggesting that utilising phone calls and e-mails is more effective in triggering blood donation than a phone call or e-mail alone (Germain & Godin, 2016).

Better understanding why donors lapse in donating is essential for donor retention. Numerous studies from different countries have found that medical reasons, time constraints and a fear of needles and bleeding are the top common barriers to blood donation (Moog, 2009; Duboz & Cuneo, 2010; Weidmann *et al.*, 2012; Kasraian & Negarestani, 2015). In addition, there are studies reporting that lapsed donors were more likely to be female, younger, unemployed, have moved or were dissatisfied with the last donation experience (Weidmann *et al.*, 2012), whereas male donors were more likely to return when they were older, had a higher previous return rate and had no past deferrals

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(Wevers *et al.*, 2014). In contrast to reports from other countries, lack of time to donate has been found to be the most common reason of lapsing in China, followed by medical reasons, never coming across blood drives and forgetting to donate (Wu *et al.*, 2014; He *et al.*, 2015). In addition, a recent study performed in Guangxi, China suggests that men are more likely to stop donating than women (Wu *et al.*, 2014). Another study from Zhejiang, China, demonstrated a significantly higher likelihood of re-donating among people younger than 40 years old, medical or military personnel and those with college or higher level education (He *et al.*, 2015).

Most studies on donor retention have focused on lapsing donors but not inactive donors. There are a few reports of stratified randomised controlled trials. All studies in China have concentrated on the reasons for lapsing instead of the retention methods. To fill these gaps, we performed a single-centre open-label parallel randomised controlled trial in Guangzhou, China, which involved a total of 1188 inactive donors randomly assigned to two intervention groups and one control group without any intervention. The two intervention groups included reminders for blood donation through a telephone call or cell phone SMS. The objectives of this pilot study were to determine the appropriate sample size for a formal study, to evaluate the effectiveness of recruitment of inactive donors by phone call and cell phone SMS and to assess the causes of donor deferral.

## MATERIALS AND METHODS

### Study design, setting and population

A single-centre open-label parallel randomised controlled trial involving two interventions (telephone call or SMS reminders) and a no-intervention control was performed in Guangzhou, China. A flow chart of the study design was shown in Figure 1. All data were provided by the Guangzhou Blood Center through the Blood Donation and Supply System (Guangzhou Blood Center, 2016). We did not include e-mail as an intervention method because an e-mail address is not required for registration of blood donation in the Guangzhou Blood Center. Guangzhou is the provincial capital of the Guangdong Province where there is the largest immigrant population from all over China as well as other countries (Liang, 2012). Both whole blood and apheresis platelet donors whose last donations were between 1 September 2009 and 1 November 2013 were eligible for the screening. Those who aged above 50 years were excluded from the screening because previous studies have found that most older individuals are unlikely to come back due to some physical reasons (Liu, 2012). Furthermore, individuals with an invalid cell phone number were also excluded from this screening. All participants were stratified into 18 tiers by age (20–30, 31–40 and 41–50 years, coded as 1, 2 and 3 in SPSS, respectively), gender (male and female) and frequency of prior donation, which refers to number of times a donor donated before becoming inactive (once, twice to thrice and four times or more, coded as 1, 2 and 3). We did not include lapsing donors (with donation after 1

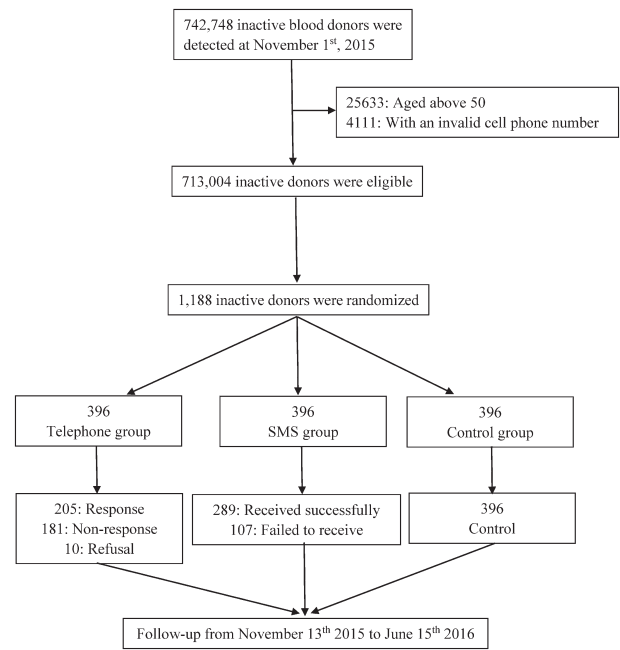


Fig. 1. Flow chart of the study design.

November 2013), because they were continuing to receive phone call and/or SMS reminders occasionally from Guangzhou Blood Center. As a pilot study, we did not know the expected response rate or re-donation rate. After investigating other surveys and evaluating the resources needed to complete this study (including budget, time and personnel), the sample size was estimated to be 1 188 (396 in each group). We used the 2013 Excel software (Microsoft Corporation, Redmond, WA, USA) 'rand()' function to rank the data in each tier. The first 22 donors from each tier were assigned to the telephone group, the 23rd to 44th were assigned to the SMS group and the 45th to 66th were assigned to the control group.

### Interventions procedures

From 2 November to 13 November 2015, telephone calls were given to the donors in the phone call group, text messages were sent to an equal number of donors in the SMS group and equal number of donors were marked as the control group at the same day. The number of donors recruited in each group every day depended on the number of donors contacted by telephone call. We recognised that between the day that the initial data on inactive donors was collected and when recruitment reminders occurred, the participants may have donated again. Therefore, donor information was checked again on the day we performed the recruitments. If the donors were found to have donated again before the recruiting day, a corresponding number of new inactive donors would replace them.

The telephone call intervention group received telephone calls by two staff members, who worked at Guangzhou Blood Center with the responsibility of blood donor recruitment. Donors

who could not be reached by phone due to a wrong number, disconnected phone line or no answer after two call attempts in the first day and another attempt in the next day were considered as non-respondents. Donors who answered the phone but refused the interview request were marked as refusing donors. All non-response and refusing donors were included for further follow-up as described below. Donors who answered the phone call and agreed to be interviewed were asked for the reasons why they had stopped donating according to a pre-designed questionnaire (Appendix). Depending on the donors' responses, the interviewer provided corresponding explanations of our study, and asked whether and when they were willing to donate in the future.

The SMS intervention group received the following text message: 'Dear Donors, thank you for your donation which brought hope to patients. Please give blood again to save lives if you are available. Thank you for your support'. The message was sent through the SMS platform of Guangzhou Blood Center, the message receipt which stated if a message was received successfully or not was retrieved from the SMS platform within 48 h. All donors either receiving or not receiving the message were included for further follow-up as described below.

#### *Follow-up and outcome monitoring*

Starting from 13 November 2015, the donation activities of all participants were followed for an additional 7 months following the intervention period. June 14 is the World Blood Donor Day (World Health Organisation, 2016), which might cause a higher likelihood that previous donors will return to donate on this date. Therefore, on 15 June 2016, we checked the donation activity of all participants. The primary outcome was to discover the repeat donation rate of participants within the 7-month follow-up. Participants who donated at least once after the intervention period were marked as re-donated donors; otherwise participants were marked as no donation. The secondary outcomes included the reasons of self-deferral.

#### *Statistical analysis*

All analysis was conducted using the 2013 Excel software (Microsoft Corporation, Redmond, WA, USA) and SPSS Statistics, version 23, for Windows (Statistical Package for Social Sciences, SPSS Inc., Armonk, NY, USA). The response rate in the phone call group was calculated by dividing the number of participants who were successfully interviewed by the total number of participants enrolled in this group. The message receiving rate in the SMS group was estimated by dividing the number of participants who successfully received the message by the total number of participants in this group. The re-donation rate was estimated by dividing the number of participants who donated during the follow-up period in each group by the total number of participants enrolled in the corresponding group. The effective recruitment rate was calculated by dividing the number of participants who donated during the follow-up period in each

group by the number of participants who successfully received the phone call or SMS. Categorical variables were analysed by  $\chi^2$  test or the Fisher exact test if the expected number in any cell was less than five. One-way analysis of variance (ANOVA) was used to compare the statistical difference among the three groups. Logistic regression was used to analyse associations of re-donation with gender, age and donation frequency. The significance level was set at a  $P < 0.05$  for all tests. Frequencies and percentages were used to analyse reasons of donor deferral.

#### *Ethics*

The study was approved by Institutional Review Board of the Guangzhou Blood Center. Oral informed consent was obtained from participants in the phone call group, but not other groups because all data were processed anonymously and no biological material was used. The registration number for this study on ClinicalTrials.gov is NCT02646059. This study is reported according to the CONSORT statements.

## RESULTS

#### *Summary of participants*

There were four donors in the phone call group, six in the SMS group and seven in the control group who donated blood before the recruiting day. They were all excluded and an equal number of participants had replaced them. In the phone call group, 205 (51.8%) participants were successfully interviewed, 181 (45.7%) could not be reached and 10 (2.5%) refused to be interviewed. Multivariable logistic regression analysis showed that donors with a higher donation frequency [adjusted odds ratio (aOR): 1.43; 95% confidence interval (CI): 1.12–1.83;  $P = 0.005$ ] and those who were older (aOR: 1.35; 95% CI: 1.05–1.72;  $P = 0.018$ ) were more likely to accept the interview. Among those participants who responded, 125 (70.0%) expressed interest to donate again, 59 (28.8%) refused to or could not donate again and 21 (10.2%) were uncertain. In the SMS group, 289 (73.0%) participants received the message successfully, and 107 (27.0%) did not.

#### *Comparison of intervention groups and control group*

Table 1 shows the number and rate of donors who re-donated. ANOVA test showed a significant difference in the re-donation rate among the three groups ( $P = 0.044$ ). Through paired comparison, a significant difference was found only between the phone call group and control group (4.8 vs 1.8%,  $P = 0.017$ ; 7.3 vs 1.8%,  $P < 0.001$ ), while there was no significant difference between the phone call group and the SMS group (4.8 vs 2.8%,  $P = 0.136$ ; 7.3 vs 3.8%,  $P = 0.085$ ), or between the SMS group and the control group (2.8 vs 1.8%,  $P = 0.340$ ; 3.8 vs 1.8%,  $P = 0.100$ ).

The lack of significant difference in the latter comparison may be due to a small sample size, which does not allow adequate statistical power to detect minor difference between low-incidence events. In 2016, 275 489 people donated blood

**Table 1.** Number (%) of donors who re-donated during the 7-month follow-up

	Phone call group	SMS group	Control group
Re-donated donors/All participants enrolled	19/396 (4.8)	11/396 (2.8)	7/396 (1.8)
Re-donated donors/Participants with confirmed phone call or SMS reminders	15/205 (7.3)	11/289 (3.8)	–

(Guangzhou Blood Center, 2016), which accounted for 19.6% of the total population in Guangzhou. We calculated the sample size ( $n$ ) based on the equation:  $n = (Z_{\alpha/2} + Z_{\beta})^2 \times p_1 \times (1 - p_1) / (p_1 - p_0)^2$ , with  $\alpha = 0.05$ , two-tailed and a power of 80%. Assuming that the response rate of participants under study after intervention was 2.96%, and that the corresponding minimum difference was 1%, the calculated sample size for each group for a formal study was 2252. In the present study, the re-donation rate for the control group was 1.8%. Assuming that a difference of 1% was considered as a meaningful difference between the SMS group and control group, the required sample size was 3542 for each group ( $\kappa = 1$ ), based on the equation  $n = (Z_{\alpha/2} + Z_{\beta})^2 \times [p_1 \times (1 - p_1) + p_2 \times (1 - p_2)] / (p_1 - p_2)^2$  for having an 80% power at  $\alpha = 0.05$  for detecting the minimum difference. Moreover, the sample size needed to detect the minimum difference between the phone call and SMS groups with an 80% power at  $\alpha = 0.05$  was 1429.

#### Associations of re-donation with gender, age and donation frequency

Of the 37 donors who re-donated, three donated twice during the 7-month follow-up, and the remaining 34 donated just once. Only one of these 37 donors donated apheresis platelet, and all the remaining donated whole blood. Multivariable logistic regression analysis showed that the repeat donation rate was significantly higher among those with a higher donation frequency, or with an older age (Table 2).

#### Self-deferral reasons in telephone call group

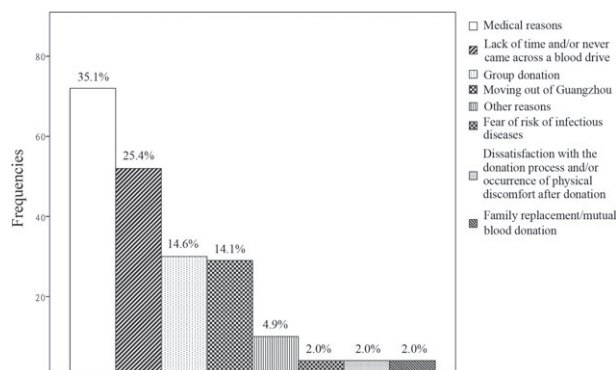
The distribution of self-deferral reasons is shown in Figure 2. There were 72 (35.1%) donors claiming their self-deferral reason was medical issues, in which 57 (79.2%) were self-perception of poor health, 13 (18.0%) were pregnancy or lactation and 2 (2.8%) were having confirmed severe diseases. Ten (17.5%) donors who expressed self-perception of poor health claimed they became unhealthy after blood donation. Within these 72 donors, 45 (62.5%) agree to re-donate when they were available, 18 (25.0%) did not and 9 (12.5%) were uncertain. There are more donors who claimed medical issues as the self-deferral reason than donors who claimed lack of time ( $P < 0.001$ ), moving

**Table 2.** Multivariable logistic regression analysis of associations of re-donation with gender, age and donation frequency

	Adjusted OR	95% CI	P-value
Phone call group (coded as 1)	2.83	1.17–6.82	0.021
SMS group (coded as 2)	1.59	0.61–4.16	0.343
Control group (coded as 3)	1		
Female	1.19	0.61–2.30	0.614
Male	1		
Age (three categories) <sup>1</sup>	1.55	1.02–2.35	0.043 <sup>2</sup>
Donation frequency (three categories) <sup>1</sup>	1.62	1.06–2.47	0.026 <sup>2</sup>

<sup>1</sup>As defined above, analysed as 1–3.

<sup>2</sup>Test for trend for re-donation by age or donation frequency.

**Fig. 2.** Distribution of self-deferral reasons of inactive donors in the telephone call group.

out of Guangzhou ( $P < 0.001$ ) and group donation ( $P < 0.001$ ). Those donors whose self-deferral reasons was lack of time were more likely to donate again compared to those donors having other reasons (aOR: 3.79; CI: 1.30–11.04;  $P = 0.010$ ); this trend remained significant after adjusting gender, age and donation frequency (Table 3). More male donors than female donors claimed lack of time as the self-deferral reason (aOR: 3.88; CI: 1.94–7.75;  $P < 0.001$ ); whereas more female donors than male donors stopped donating because of medical issues (aOR: 3.79; CI: 1.30–11.04;  $P < 0.001$ ). Those donors with higher donation frequencies were more likely to stop donating due to lack of time ( $P = 0.020$ ), and group donation ( $P < 0.001$ ) than those with lower donation frequencies.

## DISCUSSION

Blood donor retention and re-enrollment are vital but also challenging. In the present study, we performed a pilot randomised trial to test the outcomes of recruitment interventions by phone call or SMS among inactive donors whose last donation was over 2 years ago. Compared to the no-intervention control group, the phone call group showed a significantly higher re-donation rate while there was no significant difference between the phone call group and SMS group, or between the SMS group and control



**Table 3.** Multivariable logistic regression analysis of associations of re-donation with donation history and characteristics of donors

	Adjusted OR	95% CI	P-value
Female	2.54	0.78–8.27	0.122
Male	1		
Age (three categories) <sup>1</sup>	1.23	0.63–2.41	0.547 <sup>2</sup>
Donation frequency (three categories) <sup>1</sup>	1.05	0.55–2.03	0.882 <sup>2</sup>
Lack of time	5.26	1.64–16.95	0.005

<sup>1</sup>As defined above, analysed as 1–3.

<sup>2</sup>Test for trend for re-donation by age or donation frequency.

group. These observations suggest that phone call outreach is an effective way to re-enrol inactive blood donors. The lack of significant difference between the phone call group and SMS group may be due to a small sample size. Further studies are needed using a larger number of sample (at least 1429 participants for each group).

There are pros and cons to both the SMS and phone call reminders. In China, it costs approximately US\$13 to call 100 people with 5 min each; whereas it costs only US\$0.75 to send SMS to 100 people within 1 s. Thus, from the cost-effective perspective, SMS is clearly cheaper and faster compared to phone calls. There are studies suggesting that SMS is an effective way of recruiting blood donors, especially in urgent need of donation (Xu *et al.*, 2012; Saleem *et al.*, 2014; Bruhin *et al.*, 2015; Sun *et al.*, 2016). Consistent with this notion, we found that SMS has a higher successful receiving rate compared to the response rate of telephone call ( $P < 0.001$ ). However, in the era of information overload, SMS has the disadvantage of being easily ignored by the recipients, which may explain the relatively lower re-donation rate in the SMS group than in the phone call group in this study (although the difference is not statistically significant). The effectiveness of phone call outreach may depend largely on the communication skills of the caller. It has been speculated that phone call recruitment might enhance a donor's sense of altruism, but might also affect a donor's feeling of self-determination negatively (Bruhin *et al.*, 2015). Our findings of a significantly higher re-donation rate in the phone call group compared to the no-action control group supports that phone call outreach can increase donation. An obvious advantage of phone call recruitment is that direct communication with the donors could lead to a better understanding of the self-deferral reasons as exemplified in this study. In addition, previous studies have suggested that telephone calls, as a behavioural intervention, can lead to habit formation among less-motivated donors (Bruhin *et al.*, 2015; Sun *et al.*, 2016). Donors might take action after they receive a phone call due to 'cue to action' (Godin *et al.*, 2011). According to the present study, messages can be also sent to those who could not be reached in the telephone call group in order to increase the re-donation rate to a large extent.

In this study, we found that medical reasons and a lack of time were the two main causes of self-deferral, with the former

(35%) being more common than the latter (25%). While these findings are generally in line with previous studies (Moog, 2009; Duboz & Cuneo, 2010; Wu *et al.*, 2014; HE *et al.*, 2015; Kasraian & Negarestani, 2015), the relative frequency of these causes in our study appears to be slightly different from previous reports from other blood banks in China, which report that a lack of time is more common than medical reasons (Wu *et al.*, 2014; He *et al.*, 2015). Self-perception of poor health accounted for 79.2% of the medical deferral reasons, which is consistent with previous reports from China (Wu *et al.*, 2014; He *et al.*, 2015). In contrast, reports from developed countries state that clinically confirmed diseases are the most common reason for deferral (Di Lorenzo Oliveira *et al.*, 2009; Kasraian & Negarestani, 2015). Our observations are consistent with the belief in the Chinese traditional culture that blood is vital to human life (the Mother of Qi) and losing it equals to ruining one's constitution (Yu *et al.*, 2013). Ten donors in the telephone call group claimed they became unhealthy after blood donation, but they would return to donate when they 'got well'. This erroneous concept may lead to a significant loss of donors. Another common reason for self-deferral among female donors was pregnancy and lactation, consistent with previous studies (Madrona *et al.*, 2014). For the sake of retaining those donors, apart from altruistic appeal, benefits of donating blood should be expressed through the telephone call for recruitment. For instance, blood donation could lower donor's blood iron levels and thus reduce the risk of cancer (Yuan *et al.*, 2016). Also, blood donation could reduce the risk of heart diseases, such as myocardial infarction (Yuan *et al.*, 2016). Furthermore, information could be directed given to female donors that they may continue to donate blood after lactation.

Although time constraints were found as another common reason for self-deferral in this study, we also observed that donors claimed time constraints as the self-deferral reason were more likely to donate again compared to donors who claimed other reasons, similar to previous reports (Charbonneau *et al.*, 2016). This observation is encouraging, implying that this donor population could be re-enrolled by appropriate and effective strategies. When donors considered blood donation to be too time consuming, it would be helpful to explain that donating blood is an act of generosity, mutual aid and civic duty rather than purely time consuming (Duboz & Cuneo, 2010).

Group donation is a special donation form in China, which is defined as blood donation organised by governmental institutions, corporations, universities and other groups. In 2015, there were 262 897 times of group blood donation in Guangzhou, accounting for 50.9% of the total donation in this year. In China, many people believe that losing blood has a negative impact on donors' health (Li *et al.*, 2013); therefore, donors are often given either subsidies (usually money) or paid vacations from their organising agencies to help recover. This incentive is far more expensive than a souvenir given by the blood collection institution, which is valued no more than US\$0.15. Most group donors are regular donors since the group donation activity is usually organised annually. Not surprisingly, some donors would stop

donating if their groups no longer organised donation activities, because the incentive might be one of their donation objectives (Ferguson, 2015). This may explain why group donation is the third most common reason for self-deferral (14.6%) found in this study. Some experts have criticised that this kind of donation is harmful to the development of voluntary non-remunerated blood donation.

Strengths of the current study includes stratified randomisation to ensure balance within each stratum, single blinding of donors to the interventions and prospective computerised tracking of return donations. There are a few limitations to this study. First, the re-donation rates were low in all groups compared to previous reports (Agawal & Tiwari, 2014; Germain & Godin, 2016); it is unclear if the low rates are due to a small sample size and/or not long enough follow-up time. It is also unknown if the low rates were associated with the communication skills of the interviewers and the content of the SMS. Moreover, we asked the donors about their self-deferral reasons and addressed their concerns in the phone call group, instead of simply persuading them to return. The donor return rate might be different if we made a short phone call requesting re-donation, without saying anything more than the SMS message. Second, donors moving out of Guangzhou could not be followed up with, and therefore, the re-donation rate might be underestimated. Third, the participants included only inactive donors but not lapsing donors. The differences between the two types of donors could not be compared. Fourth, the self-deferral reasons were only obtained from the phone call group, but not from SMS group

and control group. More detailed understanding of the reasons for self-deferral could have important implications for the development of new strategies to educate, recruit and retain donors.

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## COMPETING INTERESTS

The authors have no competing interests.

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## APPENDIX

Q1: Your last donation was on XX month, XX, XX year (date), could you tell me why you stop donating since then?

Q2: According to the answer of the donor, interviewers would provide the corresponding response.

Q3: Would you donate again if you are available? (If the donor has some temporary deferral reasons)

Q4: Thank you for your donation. (If the donor has some permanent obstacle reasons)

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