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The effects of information, social and financial incentives on voluntary undirected blood donations: Evidence from a field experiment in Argentina

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ABSTRACT

In many low- and middle-income countries blood donations per capita are substantially lower than in advanced economies. In these countries blood supply is mostly collected through directed donations from relatives and friends to individuals needing transfusions or to replace blood used in emergencies. The World Health Organization considers this method of blood supply inefficient compared to *undirected voluntary* donations. To examine methods to motivate undirected voluntary donations, we ran a large-scale, natural field experiment in Argentina, testing the effectiveness of information, social and financial incentives. We find that only higher-valued financial incentives generated more donations, increasing with the value of the reward. These incentives did not create adverse selection in the safety or usability of the donated blood. We discuss the implications of our findings for researchers interested in understanding motivations for pro-social behavior and for health agencies and policymakers concerned with the current and growing shortages in blood supply in low- and middle-income countries.

Introduction

Guaranteeing an adequate supply of safe blood is a major health challenge in developing countries where blood shortages are common and have severe consequences (WHO, 2011). In part, shortages are due to inefficient blood supply systems based on directed donations from relatives and friends to individuals needing transfusions or to replace blood used in emergencies. This approach may work well for one-time uses and in small communities, but is inefficient for chronic needs of blood (e.g., to treat blood diseases and many types of cancer) and in areas with weaker social ties (e.g., large urban areas). The World Health Organization argues that a blood supply system based on undirected donations by regular voluntary donors will ensure more donations and provide safer blood by being able to better monitor donors' health conditions (WHO, 2009). Undirected donations also reduce inefficiencies due to donor-recipient blood incompatibility. Because the demand for blood transfusions in developing countries is likely to increase dramatically due to population aging, advances in medical technologies and general improvements in economic conditions, shifting from emergency/replacement donations to voluntary undirected donations represents a pressing public health challenge.

There have been several attempts to create voluntary undirected donation systems to improve the supply of blood in low- and middle-income countries. These efforts typically include the reorganization of blood collection towards a centralized "national blood system" and massive media and educational campaigns to change social attitudes from donating blood to relatives and friends to voluntary undirected donations as a "public good" (Fraser, 2005; Lancet, 2005; WHO, 2009, 2011). These initiatives are financially and organizationally demanding and can take years to implement.

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Although these efforts may in the long term be successful, in the short term additional and alternative micro-level approaches are available that can be introduced immediately to address the current and growing demand for blood.

In this study we examine three micro-level approaches to motivate blood donations. We assess the impact of information, social prestige and financial rewards on the individual decision to make undirected voluntary blood donations by running a field experiment in Argentina where 88% of blood donations are emergency/replacement donations (Ministerio de Salud, 2010).

We chose these treatments because each provides potential benefits associated with motivating volunteer undirected donations (rather than motivating emergency donations). First, people are unlikely to be aware of the benefits of an undirected volunteer-based donation system, therefore providing this information might be sufficient to increase donations. Second, in higher-income countries volunteer blood donations are usually associated with "doing good," thus offering social recognition could increase the benefits donors receive by providing a credible signal of their pro-sociality. Third, the costs to donate (in terms of time or expected pain) may outweigh the social benefits for a substantial share of the population; therefore, financial rewards could tip the tradeoff in favor of donating by increasing the total benefit of donating. However, there are two possible concerns with offering financial incentives. One concern is that extrinsic incentives may conflict with people's intrinsic motives to "do good" (Bénabou & Tirole, 2006; Gneezy & Rustichini, 2000) and thus lead to a reduction in blood donations. A second concern is that donors motivated by rewards might provide more unsafe blood (Abolghasemi, Hosseini-Divkalayi, & Seighali, 2010; Lancet, 2005; Titmuss, 1971; WHO, 2009). Although both social and economic rewards have been effective in developed countries (DellaVigna, List, & Malmendier, 2012; Goette & Stutzer, 2008; Lacetera & Macis, 2010, 2013; Lacetera, Macis, & Slonim, 2012, 2013a; Rodriguez del Pozo, 1994), and without adverse effects on blood safety (Goette & Stutzer, 2008; Lacetera et al., 2012), responses may differ in other contexts. For instance, giving blood is associated with being pro-social in developed countries, but it might carry a negative stigma in developing countries where blood is sometimes (illegally) sold for cash.

To test the effectiveness of these treatments, we conducted an intervention in September and October 2011. We randomly selected from the electoral list 18,500 individuals aged 18–65 who were residents in San Miguel de Tucuman (SMdT) in northern Argentina. The subjects were sent flyers inviting them to donate at the Centro de Medicina Transfusional y Hematologia (CMTH), a well-established, private blood bank located in a central neighborhood in SMdT. Subjects were randomly assigned to one of seven different conditions that included: (a) a "pure control" flyer inviting them to make a voluntary undirected donation; (b) an "information only" flyer that included information on the benefits of undirected donations as opposed to emergency systems; and five conditions that combined information with reward offers: (c) a T-shirt indicating they are blood donors; (d) a mention in the "Socials" page of the local newspaper in recognition of their voluntary blood donation; and (e) vouchers for use at a local supermarket in three values (AR$ 20, 60 or 100).

We examine the effects of the treatments on both quantity and quality (i.e., safety and usability) of undirected donations. For quantity, we consider the number of individuals who present to donate (i.e., turnout) and the number usable units of blood collected among those invited. We also anticipate and measure "indirect" effects in which individuals other than subjects will be more likely to donate in the voucher treatments given that Lacetera, Macis, and Slonim (2013a) found indirect effects in their study with American Red Cross blood donors. For quality, we assess whether the treatments affected deferral rates of presenting subjects and rejection rates of donated blood after subsequent blood screening tests were conducted.

We find that only the two financial rewards of higher value (vouchers for AR$60 and 100) led to a positive, significant increase in undirected donations, whereas the other treatments had no effect. The effects increased with the value of the rewards and generated the anticipated indirect effect. We further find that, compared with emergency/replacement donations, the donations of the incentivized subjects did not have lower blood safety or usability. Thus we conclude that financial incentives can effectively motivate individuals to make voluntary, undirected donations in contexts where undirected donations are not the norm.

This is the first study that provides field-experimental evidence on the effects of social and financial incentives on undirected blood donations in a setting where the prevailing social norm is to make donations directed to specific recipients. Moreover, most previous studies have only examined individuals who had already given blood in the past whereas the sample in this study is taken randomly from the general population and thus includes mostly non-donors. A further advance compared to existing studies is that we are also able to distinguish ineligible-to-donate and rejected blood units in order to explore the exact reasons for non-usable donations. Finally, this study contributes to a growing stream of research that highlights the role of field experiments in providing policy-relevant evidence to tackle major problems in global health and development (see, e.g., Ashraf, Bandiera, & Jack, 2012; Ashraf, Berry, & Shapiro, 2010; Baird, Garfein, McIntosh, & Özler, 2012; Cohen & Dupas, 2010; Duflo, Hanna, & Ryan, 2012; Dupas, 2011; Okeke et al., 2013; de Walque et al, 2012).

The following section describes the study setting and Section Methods presents the methods of our study. Section Results reports the findings. Beside the academic relevance in understanding whether any of the approaches examined here can increase pro-social behavior in the context of blood donations in a middle-income economy, an important policy question is whether these approaches are financially feasible to address blood shortages. This is particularly pressing in low-income countries where financial constraints are likely to be tight. Thus we also assess the cost of our intervention. Section Discussion and implications discusses the implications of our findings, the limitations of this study and outlines avenues for future research.

Study setting

Blood donation in Argentina

Like in most low- and middle-income countries, blood shortages in Argentina are frequent and, due to increasing life expectancy and technical advances (e.g., in surgery and transplants), likely to worsen without improvements in supply. In 2002, the Argentine Health Ministry launched a "National Blood Plan" aimed at creating awareness about blood donations and increasing the number of voluntary blood donors. Following WHO recommendations, the National Blood Plan aims to foster voluntary *unpaid* donations. In terms of total blood collected, Argentina performs better than most transitional economies with 12.4 donations per 1000 persons in 2008 (Ministerio de Salud, 2010), but this rate is still well below the 38 per 1000 persons (WHO, 2011) in developed countries. Further, the average masks significant regional differences. For instance, there are 14 donations per 1000 persons in the Central region (where Buenos Aires is located) but only 9 donations per 1000 persons in the Northeast (where the current study was conducted). According to the Health Ministry, the plan has increased the number of voluntary donors. Nonetheless, the Argentine system still relies heavily on emergency/replacement donors which in

Table 1
Comparison of Argentina, San Miguel de Tucuman and the study sample. This table reports summary information for Argentina, the city of San Miguel de Tucuman (SMdT), and the study sample (limited to the information available to us). For Argentina and SMdT, the data sources are: INDEC - Censo 2010 for age and gender (ages 18–65), INDEC - Censo 2001 for education (ages 15+), INDEC - Encuesta Permanente de Hogares (EPH) Segundo Trimestre 2011 for income, and Ministerio de Salud (2010) for the blood donation statistics (Argentina and Northeast provinces). For the study sample, age and gender were recovered from the information in the electoral list. NA indicates data Not Available.

	Argentina	San Miguel de Tucuman	Study sample
Female	51.1%	52.5%	53.5%
Age (average)	38.1	37.6	38.5
18–29	32.8%	34.8%	29.9%
30–41	28.2%	27.6%	30.2%
42–53	21.6%	20.3%	21.9%
54–65	17.5%	17.3%	18.0%
Education			NA
None	3.7%	3.9%	
Primary	42.2%	46.9%	
Some high school	20.9%	19.0%	
Completed High school	16.2%	13.6%	
Some college	8.2%	9.3%	
Completed College	8.7%	7.4%	
Monthly income			NA
No income	41.6%	45.0%	
<AR$1500	21.8%	25.6%	
AR$1500–AR$2500	13.1%	13.8%	
AR$2500–AR$5000	17.4%	10.7%	
>AR$5000	5.8%	5.0%	
N. donations/1000 pop.	12.4	9.0	NA
% emergency/replacement	88.0%	NA	NA

2008 represented 88% of all blood collected (Ministerio de Salud, 2010).

Tucuman and the blood bank

We conducted our experiment with the Centro de Medicina Transfusional y Hematologia (CMTH) in SMdT, the capital of the Tucuman province in northeastern Argentina. SMdT is a city of 530,000 (metro area: 830,000). Table 1 reports demographics and other indicators for Argentina as a whole (column 1) and for SMdT (column 2). SMdT is very similar to Argentina in terms of gender, age distribution and educational attainment, but somewhat poorer when compared to the rest of the country. In terms of blood donation, Tucuman has a lower donation rate (9/1000) than in the country (12.4/1000).

CMTH is one of four private blood banks in SMdT that, taken together, collect roughly 50% of blood for transfusions (the public blood bank collects the other half). In 2011, CMTH collected 3220 units of (mostly) whole blood from 3139 emergency-replacement donors, corresponding to approximately 20% of all donations in SMdT. Founded in 1948, CMTH is one of the oldest blood banks in SMdT; it employs 18 people, and in addition to collecting blood, it provides treatment to patients with blood diseases. CMTH is centrally located in downtown SMdT and is easily accessible through private or public transportation. All the addresses of individuals receiving invitations to donate in our study were within a 15-min drive of CMTH. The location and easy access makes non-donations due to the location an unlikely explanation for not responding to the invitation to donate.

Methods

Sample selection

The subject population of our experiment consisted of 18,500 individuals randomly selected from SMdT's electoral list. The electoral list includes all residents of SMdT who were at least 18 years old ($N = 399{,}755$) as of April 30, 2011. Before selecting the sample, we removed anyone over 65 because they are ineligible to donate blood. We were left with 334,816 individuals. To select the sample, we used the statistical software Stata to generate random numbers for each individual. We then sorted individuals based on these random numbers and selected the first 18,500 to form our sample.

Outcomes

The core outcomes of interest in this study are whether subjects who received an invitation showed up at CMTH ("turnout"), whether they made a usable donation ("productive units"), the reasons for unsuccessful blood collection such as ineligibility for medical reasons ("ineligible donors") or walking away before donating ("walkouts"), and the blood testing positive for infectious diseases ("discarded units"). We also assess whether anyone else who did not receive an invitation presented at CMTH and made a usable donation ("indirect" effects).

Randomization and treatments

We randomly assigned subjects to treatment conditions as follows. Ranking the 18,500 subjects in our sample based on the random number generated in the previous step, we divided the sample into the following seven experimental conditions:

T0 (Baseline: Invitation only): Individuals received a flyer sent by CMTH inviting them to make an undirected, voluntary blood donation within three weeks.

T1 (Information only): T0 + the flyer indicated the importance of voluntary, undirected donations as opposed to emergency/replacement donations.

T2 (T-Shirt): T1 + the flyer indicated that if they presented at CMTH within three weeks, recipients would receive a t-shirt indicating that they are a blood donor.

T3 (Newspaper mention): T1 + the flyer indicated that if they presented at CMTH within three weeks, their generous act of making an undirected blood donation would be recognized in the local newspaper "La Gaceta".

T4, T5, T6 (Supermarket vouchers): T1 + the flyer indicated that if they presented at CMTH within three weeks they would receive a coupon worth AR$20 (T4), AR$60 (T5), or AR$100 (T6) for a local supermarket chain ("VEA"). The coupons were not refundable or redeemable for cash. At the time of the experiment, AR$20, AR$60 and AR$100 were approximately equal to 1.5 h, 4.5 h and one days wages, respectively. To give a sense of the purchasing power of the vouchers, here are the prices of some popular items sold in the local department store in September 2011: 1.5lt bottle of Coke: AR$9.19; 1lt of milk: AR$6.95; 500 g Spaghetti: AR$5.85.

We assigned 2500 subjects to the first six treatments (T0–T5) and 3500 to the highest valued financial incentive treatment (T6). We included an extra 1000 subjects in the AR$100 treatment to give us the most power to detect effects in the condition that we had *a priori* hypothesized, based on work in developed countries (Lacetera et al., 2012, 2013a) would have the largest effect. If we find no effect in this condition, we will be confident of a null result.

We chose to randomize at the individual level rather than across geographical areas (clusters). Although cluster randomization has the advantage of potentially reducing communication across subjects in different treatments, SMdT is a large city, thus the risk of communication between subjects in different conditions is relatively small. Moreover, cluster randomization (e.g., at the neighborhood level) would reduce the statistical power of our analyses to infer treatment effects from confounds because there could be

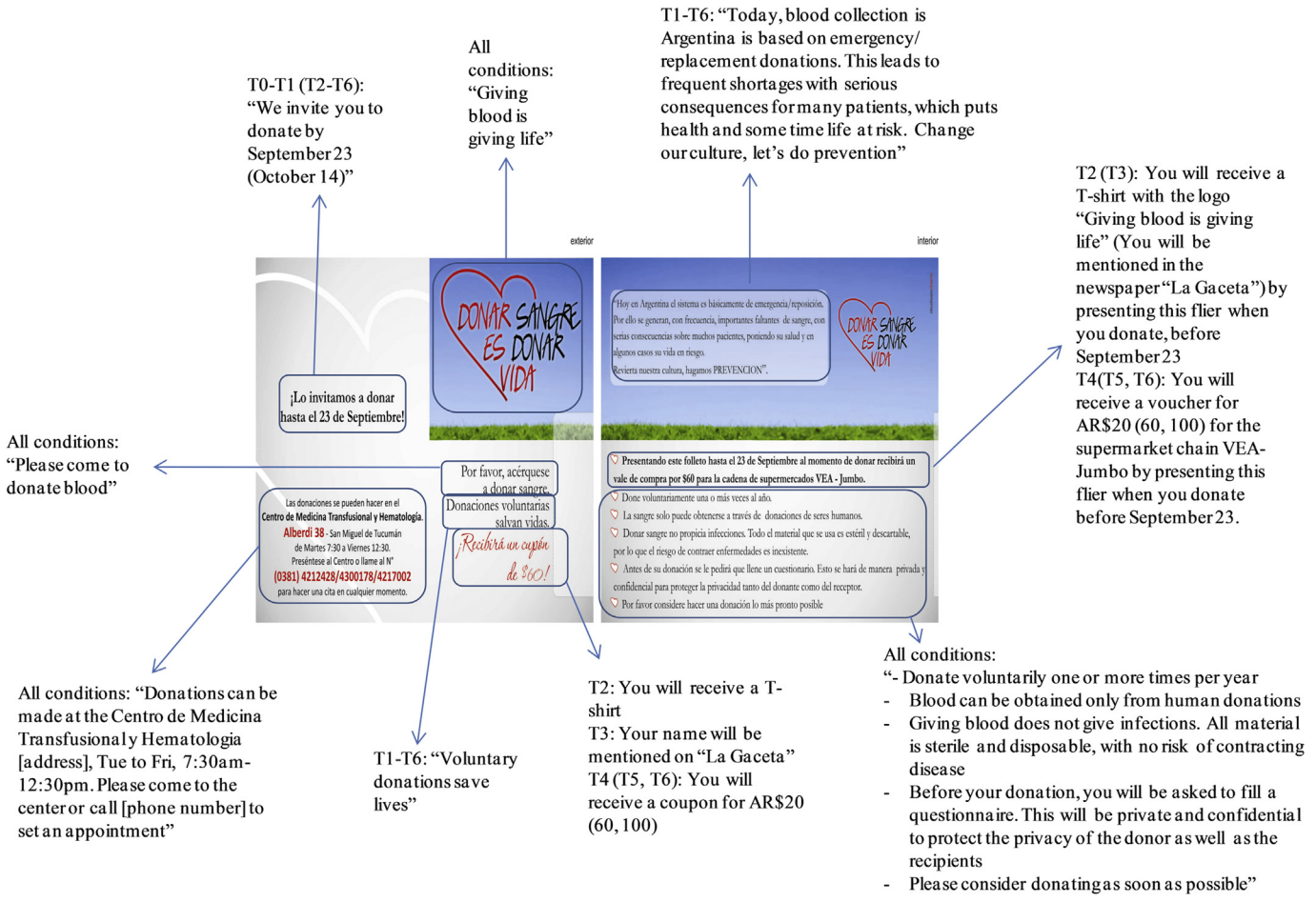

Fig. 1. Flyers used in the experiments. This figure shows a sample flyer was mailed to the study participants, as well as the explanation and English translation.

several sources of unobserved heterogeneity across a small set of clusters (e.g., ethnicity, employment, convenience), that would be potential confounds, but that would be extremely unlikely with randomization at the individual level.

Treatment T0 serves as the baseline control, T1 examines the role of information (at the individual level and not as part of a large-scale information or education campaign), T2 includes both an economic component (a t-shirt) and a social image component (the indication of donor status on the t-shirt), T3 considers a purely social-image incentive, and T4–T6 examine purely financial rewards. The choice of t-shirts, newspaper mentions and vouchers were based on studies in other (high-income) contexts where these rewards are frequently used and were found to be effective in encouraging blood donation (Lacetera & Macis, 2010; Lacetera et al., 2012, 2013a). The choice of the particular newspaper was motivated by institutional features: "La Gaceta" is the main local newspaper in Tucuman, it is distributed broadly in SMdT and it includes a widely read "socials" section.

The treatments were run sequentially to minimize the likelihood that subjects who were assigned to non-economic rewards conditions could observe (at the blood bank) subjects receiving rewards in the reward conditions. Subjects in T2 and T4–T6 were mailed flyers on September 2nd, 2011 and given until September 23rd to show up at CMTH to receive the reward. Subjects in T0, T1 and T3 were mailed flyers on September 23rd and were encouraged to come by October 14th. The different dates for the flyer conditions avoided subjects receiving a reward at the same time that subjects in the other conditions might show up to donate. Fig. 1 shows a sample flyer and its English language translation.

A few additional details of the study design are worth mentioning. First, subjects were unaware that they were participating in a study. Thus, responses were not influenced by "experimenter effects" or social desirability biases (Lacetera, Macis, & Slonim, 2013b; Levitt & List, 2007; List, 2008). Second, CMTH personnel were not involved in the treatment assignment, and therefore they did not know ex ante which condition each subject was in or the identity of the subjects. Third, subjects interacted exclusively with CMTH personnel if they showed up to donate. Fourth, all donations took place at CMTH's one physical location, and CMTH personnel followed their normal procedures, as described next. When a donor arrived at CMTH, she was directed to a receptionist who collected personal information. Then, the donor was sent to a separate room where she was asked to complete a questionnaire aimed at assessing her health history and determining whether she engaged in "risky" behaviors (e.g., travel to malaria-prone regions or engaged in unprotected sexual activities). Next, provided that there were no "red flags" in her answers, the actual blood draw took place. The whole process typically took an hour. Finally, and consistent with higher-income country procedures to eliminate the risk of coercion or any incentive to misrepresent medical history in order to obtain a reward, receipt of the rewards in T2–T6 was not conditional on donating, being eligible to donate or completing the questionnaire. Fig. 2 offers a graphical representation of the experimental design.

Human subjects

The study received clearance from the IRB at Johns Hopkins University and from the Ethics Board at the University of Toronto. The intervention was conducted according to the Centro de Medicina Tranfusional y Hematologia (CMTH)'s ethical and professional guidelines. The researchers had no direct contact with the subjects (who were, in turn, unaware of taking part in a study), and all operations were conducted by CMTH following their routine procedures. The participants who were considered ineligible to donate blood were communicated the reason for their ineligibility by CMTH personnel, in accordance to legal requirements and professional guidelines. Those participants whose blood tested positive to a transmissible disease were – again according to regulations – contacted by CMTH by mail, invited for an appointment at the clinic, informed in person of their disease and (if needed) referred to a specialist. CMTH is also required by law to inform the local branch of the Ministry of Public Health of each case of transmissible diseases they detect. Moreover, when donors arrive to make a donation, they are informed of these procedures and are asked to consent before the blood donation proceeds.

Results

Randomization checks

The computer-generated random number procedure described above ensures that the sample is representative of the relevant

Table 2A
Randomization check: gender and age. This table reports comparisons of gender and age distributions of subjects across the seven experimental conditions.

		Sex		Age			
		Males	Females	18–29	30–41	42–53	54–65
Invitation	N	1,206	1,294	764	771	517	448
	%	48.2	51.8	30.6	30.8	20.7	17.9
Information		1,186	1,314	762	768	538	432
		47.4	52.6	30.5	30.7	21.5	17.3
T-Shirt		1,195	1,305	766	742	539	453
		47.8	52.2	30.6	29.7	21.6	18.1
Newspaper mention		1,123	1,377	722	735	580	463
		44.9	55.1	28.9	29.4	23.2	18.5
AR$20 Voucher		1,150	1,350	728	772	562	438
		46.0	54.0	29.1	30.9	22.5	17.5
AR$60 Voucher		1,129	1,371	741	762	570	427
		45.2	54.8	29.6	30.5	22.8	17.1
AR$100 Voucher		1,620	1,880	1,052	1,028	742	678
		46.3	53.7	30.1	29.4	21.2	19.4
Total		8,609	9,891	5,535	5,578	4,048	3,339
		46.5	53.5	29.9	30.2	21.9	18.1
Chi2 (p-value)		10.25 (0.115)		17.37 (0.498)			

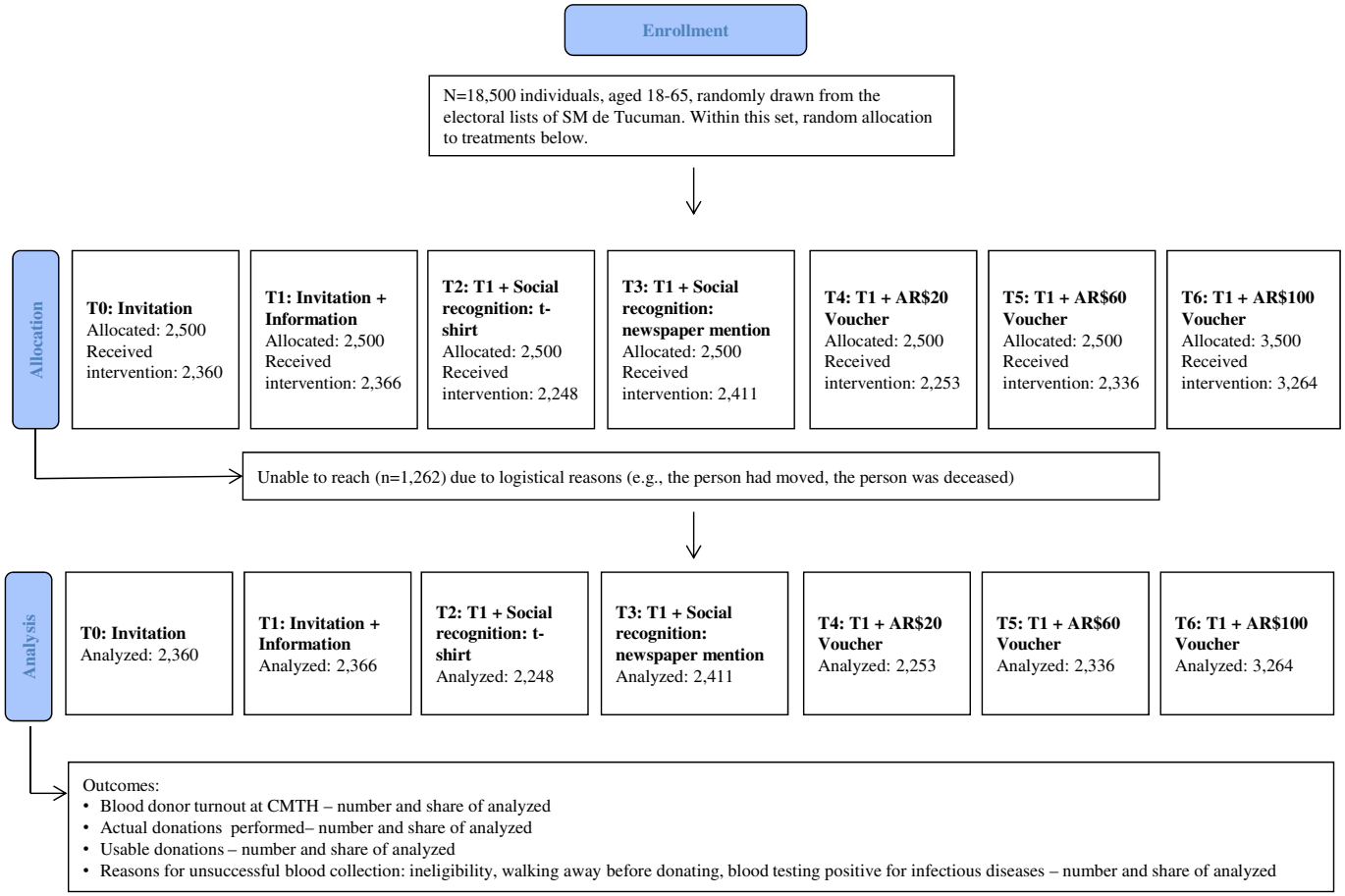

Fig. 2. Trial profile. This figure illustrates the experimental design and the trial profile of the study, including enrollment of participants, randomization of the treatment conditions and primary outcomes.

universe (i.e., the adult population of SMdT) and that samples are similar across the treatment conditions. Column 3 of Table 1 shows the resulting gender and age distribution for the entire study sample (obtained from information contained in the electoral list), which, compared to column 2, indicates that the sample characteristics are very similar to those of the universe. Randomization checks across the seven conditions are presented in Table 2A for gender and age, and in Table 2B for neighborhood of residence (electoral circuit). In all cases, Chi-Squared tests show that the distributions across conditions are statistically undistinguishable. To the extent that ethnicity, occupation, religion, or any other characteristics may vary by location of residency, the successful randomization across neighborhoods increases our confidence that there was no substantive bias on these characteristics that we could not observe directly.

The mail company delivered 93.2% of the flyers (17,238/18,500); the remaining 6.8% (1262) were not delivered for many reasons (e.g., intended recipients moved or died). The small share of undelivered flyers suggests that any bias from undelivered flyers should be negligible. We address this issue below.

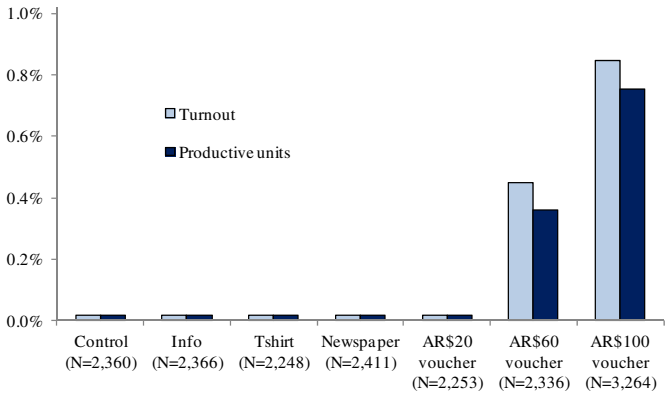

Fig. 3. Experimental results – Subject turnout and productive blood units. This figure shows the percentage subjects presenting ("turnout") and blood units collected and not discarded ("productive units") expressed as percentages of the number of contacted subjects, by experimental condition.

Effects on turnout and productive units

The analysis of turnout and usable units compares the response rates across conditions. Our main statistics are given by pair-wise comparisons using the Fisher exact test for differences of proportions. The response rates are based on flyers successfully delivered for each treatment; we reach the same qualitative conclusions if response rates were instead based on the number of flyers mailed out (see below). Fig. 3 and Table 3 show statistics on turnout and usable units for subjects contacted in each condition.

The first result is that there is no effect of information or social recognition on turnout or usable units; no subject showed up from the control condition (T0), the information only condition (T1), the t-shirt condition (T2) or the newspaper name mention condition (T3).

Second, offering the larger financial rewards (AR$60 and AR$100 vouchers) led to significant increases in turnout and usable units. The turnout was 0%, 0.43% and 0.83% in the AR$20, AR$60 and AR$100 treatments, respectively. The AR$60 and AR$100 effects are statistically significant ($p < 0.01$ and <0.001, respectively) compared to the information-only condition and the increase in turnout is nearly twice as large in the AR$100 than AR$60 condition ($p = 0.09$). The treatment effects are also significant for usable units collected. The AR$60 and AR$100 offers increased the likelihood that a subject made a usable donation by 0.34 and 0.74 percentage points compared to the information only condition ($p < 0.01$ and $p < 0.001$), respectively. Offering AR$100 more than doubled the usable donations compared to the AR$60 offer ($p = 0.07$).

Robustness

The above analyses used flyers delivered to calculate response rates. This approach implicitly assumes that the share who presented to donate among the non-delivered would have been the same as that among those contacted. To allay possible bias concerns due to undelivered flyers, we re-analyzed the data using *all* fliers mailed out and examined two different assumptions about response rates among subjects whose fliers were undelivered. First, suppose there would have been a 0% response across all conditions had these subjects received the flyers. With this assumption, the turnout in the Information only, AR$60 and AR$100 conditions would be 0%, 0.40% and 0.77%, respectively, and the difference between the AR$60 or AR$100 and the information only response

Table 2B
Randomization Check: neighborhood of residence. This table report comparisons of the distributions of subjects across the 37 neighborhoods (electoral districts) of SMdT (we report only percentages to save space; the totals are reported in the last column).

	Electoral circuit																		
	1	1A	2	2A	3	4	5	6	7	7A	8	8A	9	9A	10	10A	11	12	12A
Invitation	1.72	1.12	0.80	1.12	1.76	1.64	2.80	0.96	0.88	1.92	1.04	1.48	2.76	2.48	2.84	4.68	2.76	2.88	1.96
Information	1.28	0.72	1.04	0.96	2.04	1.96	2.16	1.16	1.00	1.12	1.24	2.20	2.88	2.68	3.28	4.12	2.28	2.64	2.44
T-Shirt	1.44	1.24	0.84	1.16	2.16	1.24	1.92	0.52	1.24	1.68	1.04	2.00	2.68	1.88	2.48	4.08	3.08	3.04	2.76
Newspaper mention	1.88	1.12	1.20	0.80	1.48	1.80	2.40	1.12	1.16	1.72	0.88	1.52	2.76	2.72	2.76	4.36	2.56	3.24	2.48
AR$20 Voucher	1.08	1.12	1.32	0.76	1.88	1.56	2.08	1.12	1.08	1.64	1.16	1.64	2.92	2.80	2.32	4.72	2.24	3.48	2.36
AR$60 Voucher	1.24	1.00	1.20	1.32	1.76	1.68	2.20	0.96	1.00	1.60	1.16	1.60	2.60	2.80	2.76	4.08	2.40	2.92	2.72
AR$100 Voucher	1.17	0.97	1.43	1.11	2.03	1.29	2.17	0.69	0.94	1.57	1.29	1.71	2.40	2.83	2.97	4.60	2.74	3.03	2.23
Total	1.39	1.04	1.14	1.04	1.88	1.58	2.24	0.92	1.04	1.61	1.12	1.74	2.70	2.61	2.78	4.39	2.59	3.03	2.41
	13	13A	14	14A	15	15A	15B	16	16A	17	17A	18	18A	18B	19	20	21	22	TOTAL
Invitation	2.24	1.20	4.64	3.52	3.52	2.56	3.80	2.56	2.88	3.44	2.64	4.32	5.64	3.64	6.12	0.80	3.12	1.08	2500
Information	3.00	0.96	5.16	2.68	3.04	2.16	4.40	3.28	2.48	4.20	2.20	3.72	6.08	4.00	5.92	1.04	3.44	1.04	2500
T-Shirt	2.92	0.84	4.88	3.48	3.36	2.24	4.16	3.56	3.00	4.16	2.36	3.96	5.40	3.40	6.20	0.84	3.16	0.96	2500
Newspaper mention	3.04	1.12	4.48	2.64	2.92	2.88	4.20	3.20	2.60	4.24	2.56	4.32	5.04	3.24	5.48	1.20	3.00	1.36	2500
AR$20 Voucher	2.88	0.88	4.60	3.04	2.64	2.68	4.36	3.68	3.76	4.32	2.20	4.48	5.68	2.64	5.16	1.32	2.68	1.40	2500
AR$60 Voucher	2.84	1.08	3.92	3.28	3.12	2.36	4.08	3.44	3.16	3.12	3.20	3.68	5.92	3.16	6.24	1.20	3.32	1.28	2500
AR$100 Voucher	2.43	1.14	4.40	3.63	3.00	3.11	4.17	3.14	2.94	3.23	2.29	3.66	6.63	3.29	5.83	1.43	2.97	1.00	2500
Total	2.75	1.04	4.57	3.21	3.08	2.60	4.17	3.26	2.97	3.78	2.48	4.00	5.82	3.34	5.85	1.14	3.09	1.15	3500
Chi2 (p-value)	208.13 (0.637)																		

Table 3
Treatment effects. This table reports the percentage of subjects contacted who [1] presented to donate, and [2] made a blood donation that was not discarded. Treatment effects are measured as differences in proportions of donors presenting and non-discarded units of blood collected between the Information-only treatment group and the control group, and between each voucher group and the information group. *P*-values are from Fisher exact tests. Significance levels are denoted with $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Outcome variable		[1]		[2]	
		Individuals presenting to donate		Productive units of blood collected	
	Observations	%	*P*-value	%	*P*-value
Control	2,360	0		0	
Information	2,366	0		0	
T-shirt	2,248	0		0	
Newspaper	2,411	0		0	
AR$20 voucher	2,253	0		0	
AR$60 voucher	2,336	0.43		0.34	
AR$100 voucher	3,264	0.83		0.74	
AR$60-info		0.43***	0.001	0.34***	0.004
AR$100-info		0.83***	0.000	0.74***	0.000
AR$100-AR$60		0.40*	0.093	0.39*	0.071

rate would remain significant ($p < 0.01$ and $p < 0.001$, respectively). Second, to assess how large the bias would need to be such that the treatment effects would not be significant, suppose for subjects whose flyers were undelivered that there is a 0% response in AR$60 and AR$100 but a (biased) *X*% response in Information only. We then calculated the minimum value of *X* so that the differences in responses between all subjects in AR$60 or AR$100 and Information-only would not be statistically significant. We find that the difference between AR$100 and Information only remains significant ($p < 0.05$) up to an $X = 7\%$ turnout rate and the difference between AR$60 and Information-only remains significant ($p < 0.10$) up to an $X = 2\%$ turnout rate. These response rates (i.e., only for subjects whose flyers were undelivered in Information-only) in order for the overall response rates between the treatments and Information-only to not differ significantly are highly unlikely given there were no subjects who turned out among those whose flyers were delivered in Information-only, and they are 3 and 9 times larger than the response rate in AR$100 among subjects with delivered flyers. We thus conclude that the possible bias from differential response rates from undelivered flyers across treatments is highly unlikely to affect the magnitude and statistical significance of our findings based on the delivered mail.

Additional turnout effects

We also find that the financial incentives affected people who we had not mailed flyers to. Specifically, one, two and ten individuals who had not been mailed flyers showed up in the control, AR$60 and AR$100 conditions, respectively. The 12 people in AR$60 and AR$100 came with someone who was contacted ($N = 8$) or had a flyer that was sent to someone else ($N = 4$). We ran an identical analysis to the one in Table 3 to test if this indirect effect on turnout was significantly larger in AR$60 or AR$100 than in Information-only. We find that the indirect effect in AR$60 is positive 0.09% but not significant ($p > 0.2$), whereas the AR$100 offer induced a 0.31 and 0.25 percentage-point significant increase in turnout ($p = 0.007$) and usable donations ($p = 0.024$) per delivered flyer, respectively. Combining both the direct and indirect effects of the incentives, then the total turnout relative to delivered flyers was 0.5% and 1.1% in AR$60 and AR$100, respectively ($p < 0.01$; p of difference between AR$60 and AR$100 treatments <0.05). The effects are also large and significant when we consider usable donations as the outcome, with the AR$60 and AR$100 rewards increasing the likelihood of collecting a usable blood unit by 0.43 and 0.98 percentage points, respectively. However, all of the results that include the effects on the non-experimental subjects should be

Table 4
Differences in walkouts, ineligible, and blood discarded. This table presents results from Fisher's exact tests of the difference in frequencies of (1) individuals who presented at CMTH but walked out before donating, (2) individuals who presented at CMTH but were ineligible to donate for medical reasons excluding blood type mismatch with the intended recipient (only applies to emergency/replacement), (3) individuals who presented at CMTH but were ineligible to donate for medical reasons including blood type mismatch, and (4) blood units that were discarded, between the group of individuals who presented in response to the voucher treatments, and the group of individuals who presented to donate for emergency/replacement reasons in the same period. For (1), (2) and (3), the sample consists of all individuals who presented, and for (4) it includes all individuals who performed a donation. *P*-values are from Fisher exact tests. Panel A includes contacted subjects, and panel B includes all individuals who presented to donate (contacted and non-contacted). Significance levels are denoted with $^{***}p < 0.01$,$^{**}p < 0.05$,$^{*}p < 0.1$.

	Turnout	% walkouts	% ineligible (excluding blood type mismatch)	% ineligible (including blood type mismatch)	Units collected	% discarded
	Panel A: Presenting among subjects in the sample					
Voucher	37	5.41	5.41	5.41	33	3.03
Emergency/Replacement	3220	1.74	3.48	5.59	2974	4.04
Difference (Voucher-E/R)		3.67	1.93	−0.18		−1.01
(*P*-value)						
		(0.140)	(0.374)	(0.658)		(0.698)
	Panel B: All individuals presenting to donate					
Voucher	49	6.12	4.08	4.08	44	4.55
Emergency/Replacement	3220	1.74	3.48	5.58	2974	4.04
Difference (Voucher-E/R)		4.38*	0.60	−1.50		0.51
(*P*-value)						
		(0.057)	(0.688)	(0.480)		(0.698)

Table 5
Characteristics of the presenting donors. This table presents data collected through a questionnaire administered to all the individuals who presented to donate at CMTH in response to the voucher incentives. The data includes both contacted and non-contacted subjects (because the questionnaire was anonymous, we are unable to distinguish between these two types). Some presenting individuals did not complete the questionnaire, which explains why the number of completed questionnaires (43) is smaller than the number of presenting donors (49).

	All "voucher" donors	AR$60 Voucher	AR$100 Voucher
Female	41.0%	40.0%	41.9%
Age	31.8 (sd. 10.4)	35.6 (sd. 7.8)	30.6 (sd. 10.9)
Education			
None	0.0%	0.0%	0.0%
Primary	26.8%	50.0%	19.4%
Some high school	24.4%	20.0%	25.8%
High school	22.0%	30.0%	19.4%
Some college	24.4%	0.0%	32.3%
College	2.4%	0.0%	3.2%
Monthly income			
No income	30.0%	0.0%	40.0%
<AR$1,500	30.0%	60.0%	20.0%
AR$1,500–AR$2,500	27.5%	40.0%	23.3%
AR$2,500–AR$5,000	12.5%	0.0%	16.7%
>AR$5,000	0.0%	0.0%	0.0%
N	43	10	33

cautiously interpreted because we do not know if observations are independent (e.g., some subjects came together).

Walkouts, ineligible donors and discarded donations

The third result is that offering the larger economic rewards did not negatively affect usable donations. Although our intention was to compare the quality of the donations in the treatments to the quality in the control and information-only conditions, this is not possible because there was only one donation in the control and information-only treatments. Instead, we compare the quality of the donations when subjects were offered incentives to the 3220 emergency donations made in 2011 at CMTH. While a comparison of the economic incentives and information only conditions would have let us focus on the unique impact of incentives, comparing the quality of the donations in the incentives conditions to emergency/replacement donations is perhaps the most important comparison for policy since it indicates whether changing the motivation away from emergency donations to undirected voluntary donations affects blood supply safety.

The results are presented in Table 4. Panel A includes subjects who turned out among only those in the study sample and shows no significant differences in quality for any comparisons between the subjects and emergency/replacement donors. We observe no significant difference in the share of ineligibility (2/37 [5.4%] vs. 112/3220 [3.5%]; p of the difference = 0.37) or of donations testing positive for an infectious disease (1/33 [3.0%] vs. 120/2974 [4.0%]; p of the difference = 0.69). Adding blood type mismatch to the causes of ineligibility, the share of ineligible individuals is higher (though not significantly so) among emergency/replacement donors (2/37 [5.4%] vs. (112 + 68)/3220 [5.6%]; p of the difference = 0.66). This mismatch is not often stressed with regard to emergency/replacement donations; by relying on a restricted pool of donors for a specific recipient, there is a non-negligible chance of donor-receiver blood incompatibility. This is rarely the case with undirected volunteer donations. We also find that the share of walkouts is higher (though not significantly) among the subjects who responded to the financial incentive than for the emergency donors (2/37 [5.4%] vs. 56/3220 [1.74%]; p of the difference = 0.14). This may reflect a potential downside in which offering financial incentives motivates opportunistic (unproductive) behavior, although here the effect is neither significant nor costly (since walkouts do not waste personnel time nor require blood testing). Panel B adds the people who donated who were not subjects but either came with a subject or presented an AR$60 or AR$100 flyer addressed to someone else. There are again no statistically significant differences for any of the variables considered with the exception of a marginally significantly higher share of walkouts for individuals receiving the voucher.

Table 6
Cost per productive unit collected. The values in row 1 are obtained by multiplying the unit cost of printing and mailing (AR$1.8) by the number of flyers mailed (2,500 for the AR$60 voucher and 3,500 for the AR$100 voucher). The values in row 3 are derived as N. of individuals presenting*AR$ value of the voucher. In row 6, we divide the total AR$ cost (row 4) by the number of productive units collected (raw 5). Finally, the conversion from AR$ to US$ is based on an exchange rate of $US 0.23 per AR$.

		AR$60 voucher	AR$100 voucher
1	AR$ cost of printing + mailing	$4,500	$6,300
2	Individuals presenting	12	37
3	AR$ cost of providing incentives	$720	$3,700
4	Total AR$ cost	$5,220	$10,000
5	Productive units collected	10	32
6	AR$ cost per unit collected	$522	$312.5
US$		US$120	US$72

Overall, the usable units collected from the AR$60 and AR$100 as a share of turnout is 42/49 = 85.7% among the donors who received a voucher, and 2864/3220 = 88.9% for emergency/replacement donors (p of difference = 0.49). The shares are even more similar if we exclude either walkouts (91.3% vs. 90.5%; p of difference = 0.99) who do not require screening and testing, or if we further exclude the cases of blood type incompatibility (91.3% vs. 92.5%; p of difference = 0.78) where the inability to make a donation was not due to the donor presenting any health risks. These comparisons suggest that financial incentives did not disproportionately trigger adverse selection in the likelihood of collecting usable blood compared to the emergency/replacement approach to collect blood.

Donor characteristics

All presenting donors were asked to complete an anonymous survey regarding demographics and other individual characteristics such as education, occupation and income. Table 5 shows the responses for all donors who responded to the survey in the reward treatments (only one person presented for any of the other treatments), and separately for the AR$60 and AR$100. We compare these with the statistics for all residents in SMdT ages 18–65 reported in Table 1, column 2. Compared to the population, presenting donors were (1) less likely to be female (donors: 41%; population: 52.5%), (2) younger (average age of donors: 32; population: 37.6) and more educated (e.g., 48% of donors completed at least high school vs. only 30% of the population). The income distribution of the presenting donors is comparable to the distribution in SMdT, with, for example, about 85% of donors reporting a monthly income below AR$2500.

Cost analysis

To determine the cost per productive unit of blood collected, we proceed as follows (and Table 6 concisely shows the estimates). First, the cost of printing and mailing the flyers to individuals in conditions T5 and T6 was AR$1.8*6000 mailed = AR$10,800. Second, the cost of the vouchers for those who presented (including both direct and indirect effects) was AR$60*12 + AR$100*37 = AR$4420. Thus, the

total cost to print and mail the flyers plus provide the vouchers to donors was AR$15,220. This can be disaggregated into the total costs of AR$5220 and AR$10,000 for the AR$60 and AR$100 offers, respectively. Because there were 10 and 32 productive units collected in the AR$60 and AR$100 conditions, respectively, the cost per productive unit was AR$522 (US$120) and AR$312 (US$72). These estimates ignore the incremental costs that CMTH incurs in their operations to collect, process, and store each additional unit which we assume are small given that additional staff and equipment are unlikely to be needed to collect the extra units. The costs associated with the three walkouts (AR$300) is under 2% of the total costs (=AR$300/AR$15,220).

Discussion and implications

The effect of the AR$60 and AR$100 reward offers on turnout and usable donations are consistent with Lacetera et al. (2012, 2013a) who found that offering economic rewards to existing blood donors in the U.S. increased the donations of contacted and non-contacted donors. Lacetera et al. (2012, 2013a) also found that the effects are strongest for their highest valued economic incentive. The effects in the current study are quite substantial considering that we asked for voluntary undirected blood donations rather than follow the norm and ask for donations directed to a specific person familiar to the donors, and we targeted the general population rather than individuals who had already given blood before. For comparison, response rates to direct mailings soliciting monetary donations to charitable organizations typically range between 0.5 and 2.5% (Turner, 2002), and these fundraising efforts are usually targeted at individuals who are *a priori* more likely to give (e.g., individuals with higher incomes or who live in certain neighborhoods).

It is interesting that t-shirts, public recognition and the smallest voucher had no effect on motivating donations given the findings in higher-income countries (positive public image effects found in Lacetera & Macis, 2010; positive t-shirt and small reward effects found in Lacetera et al., 2012, 2013a). The contrast with Lacetera and Macis (2010), a study conducted in Italy, underscores the importance of understanding local contexts and norms that can lead to different responses. Given the lack of any effect on donations from the pure social recognition or AR$20 conditions, it is not surprising that a t-shirt offer had no effect on donations since t-shirts combine social recognition with an item that has approximately the same financial value as the $AR20 reward; it is possible that either the Argentine context or a population who have not donated before made the smallest reward insufficient to attract new donors.

We also found that the higher financial incentives did not increase the share of ineligible subjects or the share of non-usable donations compared to emergency/replacement donors. This evidence is consistent with Goette and Stutzer (2008) and Lacetera et al. (2012) who also report no negative effects on the "quality" of blood donations when incentives are offered. The current results add to those findings because we targeted here a population who never donated before whereas the previous studies examined existing donors. Combining these papers, the evidence contrasts Titmuss' (1971) conjecture that offering rewards for donations would necessarily lead to a lower quality of blood donations.

In sum, financial incentives increased the pro-social behavior of blood donations in a middle-income economy. This conclusion is consistent with several recent studies that have shown how individual-level economic rewards positively affect behavior and help alleviate other major health and social problems in developing countries (Baird et al., 2012; Duflo et al., 2012; Miller et al, 2012; de Walque et al. 2012).

Although we estimated the cost of the intervention (per unit of blood collected), estimating the social benefit from collecting one extra unit of blood is difficult (Lacetera et al., 2013a). A lower bound is the amount reimbursed by insurance companies ("Obras Sociales") to blood banks for each unit of whole blood. Based on conversations with local physicians, in 2011 in Argentina this reimbursement rate ranged between AR$405 and AR$620. Another approach is to consider the value of the potential uses of the blood collected. For example, about seven units of blood are needed for brain surgery or hip replacement, and for a week's treatment for an average cancer patient. Although the variation in the expected benefits from a blood unit is large due to the many possible uses, it is reasonable to assume that the benefits will easily outweigh the per-unit costs that we have estimated.

We conclude by pointing out directions for future research. First, studies in more countries and contexts (e.g., in rural areas) would be useful to further examine the robustness of the effects of information, social and economic incentives to address major social problems. Second, alternative ways to approach potential donors (e.g., phone calls and even more personal contact in group or individual settings such as churches and offices) could help us understand the importance of social distance and the interactions of social distance and incentives on pro-social responses. Third, examining whether offering incentives one time or across multiple periods could induce different responses has received little attention in the literature. To examine longer-term effects, we sent flyers inviting all the presenting individuals to donate again and found that none of them returned by the suggested deadline or for at least six more months. However, our small sample does not allow us to draw conclusions. Fourth, even though our results indicate that micro-level information communications targeting individuals were ineffective at motivating undirected donations, it is possible that a much greater education and information campaign may have had an effect. Finally, social recognition could also have a positive effect if coupled with a large-scale information campaign, or if awarded by a public blood bank rather than a private one; this is also something that future research could fruitfully explore.

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References

Abolghasemi, H., Hosseini-Divkalayi, N. S., & Seighali, F. (2010). Blood donor incentives: a step forward or backward. *Asian Journal of Transfusion Science, 4*, 9–13.

Ashraf, N., Bandiera, O., & Jack, K. (2012). *No margin, no mission? A field experiment on incentives for pro-social tasks*. CEPR Discussion Paper No. DP8834.

Ashraf, N., Berry, J., & Shapiro, J. (2010). Can higher prices stimulate product use? Evidence from a field experiment in Zambia. *American Economic Review, 100*(5), 2383–2413.
Baird, S. J., Garfein, R. S., McIntosh, C. T., & Özler, B. (2012). Effect of a cash transfer programme for schooling on prevalence of HIV and herpes simplex type 2 in Malawi: a cluster randomised trial. *The Lancet, 379*(9823), 1320–1329.
Bénabou, R., & Tirole, J. (2006). Incentives and pro-social behavior. *American Economic Review, 6*(5), 1652–1678.
Cohen, J., & Dupas, P. (2010). Free distribution or cost-sharing? Evidence from a randomized malaria prevention experiment. *Quarterly Journal of Economics, 125*(1), 1–45.
DellaVigna, S., List, J., & Malmendier, U. (2012). Testing for altruism and social pressure in charitable giving. *Quarterly Journal of Economics, 127*, 1–56.
Duflo, E., Hanna, R., & Ryan, S. (2012). Incentives work: getting teachers to come to school. *American Economic Review, 102*(4), 1241–1278.
Dupas, P. (2011). Health behavior in developing countries. *Annual Review of Economics, 3*, 425–449.
Fraser, B. (2005). Seeking a safer blood supply. *The Lancet, 365*(9459), 559–560.
Gneezy, U., & Rustichini, A. (2000). Pay enough or don't pay at all. *Quarterly Journal of Economics, 115*(3), 791–810.
Goette, L., & Stutzer, A. (2008). *Blood donation and incentives: Evidence from a field experiment*. IZA Discussion Paper 3580.
Lacetera, N., & Macis, M. (2010). Social image concerns and pro-social behavior: field evidence from a nonlinear incentive scheme. *Journal of Economic Behavior and Organization, 76*, 225–237.
Lacetera, N., & Macis, M. (2013). Time for blood: the effect of paid leave legislation on altruistic behavior. *Journal of Law, Economics & Organization* (in press).
Lacetera, N., Macis, M., & Slonim, R. (2012). Will there be blood? Incentives and displacement effects in pro-social behavior. *American Economic Journal - Economic Policy, 4*(1), 186–223.
Lacetera, N., Macis, M., & Slonim, R. (2013a). Rewarding volunteers? A field experiment. *Management Science* (in press).
Lacetera, N., Macis, M., & Slonim, R. (2013b). Economic rewards to motivate blood donations. *Science, 340*(6135), 927–928.
Lancet. (2005). Blood supply and demand. Editorial. *The Lancet, 365*(9478), 2151.
Levitt, S., & List, J. (2007). What do laboratory experiments measuring social preferences reveal about the real world? *Journal of Economic Perspectives, 21*(2), 153–174.
List, J. (2008). Informed consent in social science. *Science, 322*(5902), 672.
Miller, G., Luo, R., Zhang, L., Sylvia, S., et al. (2012). Effectiveness of provider incentives for anaemia reduction in rural China: a cluster randomised trial. *British Medical Journal, 345*, e4809. http://dx.doi.org/10.1136/bmj.e4809.
Ministerio de Salud. (2010). Sistema Nacional de Sangre. *Revista Argentina de Salud Publica*, (March issue).
Okeke, E., Adepiti, C., & Ajenifuja, K. (2013). What is the price of prevention? New evidence from a field experiment. *Journal of health economics, 32*, 207–218.
Rodriguez del Pozo, P. (1994). Paying donors and the ethics of blood supply. *Journal of Medical Ethics, 20*, 31–35.
Titmuss, R. M. (1971). *The gift relationship*. London: Allen and Unwin.
Turner, M. A. (2002). *The impact of data restrictions on fund raising for charitable & nonprofit institutions*. Information Services Executive Council.
de Walque, D., Dow, W. H., Nathan, R., et al. (2012). Incentivising safe sex: a randomised trial of conditional cash transfers for HIV and sexually transmitted infection prevention in rural Tanzania. *BMJ Open, 2*(1). Available http://bmjopen.bmj.com/content/2/1/e000747.short Accessed 21.07.12.
WHO. (2009). *Global consultation: 100% voluntary non-remunerated donation of blood and blood components, Melbourne, 9–11 June 2009*. Geneva: World Health Organization.
WHO. (2011). *Fact sheet N°279*. Geneva: World Health Organization.