Passing the Message: Peer Outreach about COVID-19 Precautions in Zambia

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Abstract

During public health emergencies, spreading accurate information and increasing adherence with recommended behaviors is vital for communal welfare. However, uncertainty, mistrust, and misinformation can slow the adoption of best practices. Preexisting social networks can amplify and endorse information from authorities, and technology makes peer-to-peer messaging scaleable and fast. Using text messages and small cash incentives, we test a peer-based information campaign to encourage adherence to recommended COVID-19 related health behaviors. Individuals respond favorably to the suggestion to pass messages to peers; however, financial incentives neither generate further passing of messages nor cause changes in health behaviors.

Keywords: COVID-19, social networks, SMS, incentives, Zambia, health
JEL Codes: O1, I1

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1 Introduction

Providing accurate and actionable information to the public about strategies for protecting themselves and their communities is a core component of combatting any communicable disease. The COVID-19 pandemic posed serious and varied challenges for information dissemination efforts around the world. In Zambia, building on the widespread availability of mobile phones, we conducted a randomized controlled trial designed around leveraging social networks to help disseminate COVID-19 messages about preventative pro-social behavior.

To design the intervention and tests, we built off of a prior study in India on tuberculosis (TB) (Goldberg et al., 2022), which was itself motivated by a model of employment referrals by Beaman and Magruder (2012)[1]. Several key features applied to both contexts: an effort to reduce the spread of a communicable disease, the observability across peers of health behaviors, and public misinformation and misunderstanding of the disease. The intervention was motivated by a simple model with two theoretical predictions that we hypothesized also apply to SMS-based outreach for COVID-19 in Zambia:

1. Civilians–ordinary people as opposed to health workers–face costs for engaging in health outreach and, without incentives, may be reluctant to do so. Therefore, financial incentives will increase sharing of health information.

2. Information shared by peers will be more effective in generating healthy behaviors if it is higher-quality or more trustworthy than information shared by health authorities.

A large literature studies the effects of social networks on individuals' economic outcomes and behaviors (Jackson, 2011). In addition to the literature on employement referrals, several studies have highlighted the role of peers on health behaviors including obesity (Christakis and Fowler, 2007), smoking (Christakis and Fowler, 2008), hygiene products (Oster and Thornton, 2012), HIV treatment choices (Balat et al., 2018), hospital choice (Pope, 2009), and health insurance (Sorensen, 2006). Narrowing to messaging

[1]See appendix B for a detailed comparison between the TB setting in India and the COVID-19 setting in Zambia

experiments, peer networks have been employed successfully in several public health domains, including the detection of HIV infections (Gwadz et al., 2017), vaccinations (Banerjee et al., 2019), breastfeeding (Anderson et al., 2005), parenting advice to promote child development (Rockers et al., 2018), and counseling to improve psychological wellbeing among HIV patients (Harris and Larsen, 2007) and cancer patients (Giese-Davis et al., 2006).

In our study, we first asked individuals to name peers and then incentivized individuals to disseminate information to their peers, to try to inspire peers to engage in pro-social public health behaviors. We used random-digit dialing to generate our core Random Digit Dialing sample of 3207 individuals ("RDS Participants"), and in a baseline survey we asked the RDS Participants to name several peers and provide their cell numbers, thus forming our Peer Participant sample ("Peer Participants"). We then randomly assigned Peer Participants to one of four treatment arms: (1) Peer Forwarding (RDS Participants receive a message and are asked to forward it to their peers), (2) Peer Forwarding with Incentive (RDS Participants receive a message and are given a financial incentive to forward it to their peers), (3) Direct Messaging to Peer Participants (we send a health message to the RDS Participants but do not ask them to forward it; we then also send a direct message to the Peer Participants, without mention of the RDS Participants), and (4) Control (we send a health message to the RDS Participants but do not ask them to forward it, and also we do not send a direct message to the Peer Participants). We then also employed a randomized sub-treatment in which we tested two different sources for the content of the messages, either the Ministry of Health or the less politically connotated Zambia National Public Health Institute. Primary outcomes, measured via self-report in a phone survey, include wearing masks, washing hands, avoiding large groups, and socializing outdoors. We also measure the forwarding of SMSs, in order to validate that the first stage of the experimental manipulation occurred.

In Zambia (as in India, with TB patients) individuals do forward public health SMSs when they are encouraged to do so. This indicates that peers can be useful in spreading information in different public health contexts and situations. All treatments led to a statistically significant increase in the probability that RDS Participants forwaded the COVID-19 safety SMSs to peers (relative to the control group). Nonetheless, considerably more people reported receiving SMSs from the government health authority rather than peers, and there was a stronger treatment effect among those receiving SMSs from the health authority. However, financial incentives did not increase the likelihood that individuals forwarded SMSs. Additionally, we find no evidence that any of the treatments changed self-reported precautionary health behaviors (masking, hand washing, not traveling outside the village, and avoiding gatherings). This is true both for the primary target of the messaging, the Peer Participants, as well as for the RDS Participants (although note that we have no control group of RDS Participants that did not receive a message, so the null result refers to not finding any cross-treatment differences).

2 Study design

2.1 Study sample and baseline

The intervention was conducted in collaboration with the Zambian Ministry of Health (MOH), the Zambian National Institute for Public Health (ZNPHI), and the University of Zambia (UNZA). It was implemented by the Innovations for Poverty Action (IPA) field team in Zambia over two separate waves. The first wave took place between February 5 and March 11, 2021. Following preliminary analysis of the first wave, which suggested some potential but imprecisely estimated impacts, the research team conducted a second wave between May 19 and May 31, 2021.

The study design is summarized in Figure 1. Our initial sample of potential partipants is made of 10,000 cellphone numbers obtained from Random Digit Dialing (we refer to the sample as Random Digit Sample, or RDS). Over the course of the study, enumerators call potential participants daily and invite them to join the study and answer a baseline questionnaire. Of the 4,096 who picked up the phone, 74.5% (N= 3,051) of respondents consented and 73.9% (N=3,027) completed the baseline survey; we refer to the latter as RDS Participants. The questionnaire measures socioeconomic characteristics (age, gender, education level, household size) and asks a set of COVID-

19-related questions about potential COVID-19 symptoms within the household (fever, dry cough, breathing difficulty), knowledge about the disease, and protective behaviors (mask wearing, hand washing, social distancing). At the end of the baseline survey, RDS Participants are asked to provide the contact information (name and phone numbers) of up to five people to whom they are willing to forward health related SMSs.[2] The enumerators also collect information about the preferred language of these contacts. RDS Participants who complete the baseline survey receive a small payment of 6 Kwacha (about USD 0.28) in mobile money.[3]

The contacts provided by RDS Partipants generate the potential sample of Peer Partipants. These contacts are invited to join the study and, if they consent, they are included in the Peer Participant sample.

2.2 Primary randomization

After consenting to participate in the study, RDS Participants are randomized into one of four treatment arms through a random number generator. Their Peer Participants are also assigned to the same treatment arm.

T0 (Control): RDS Participants receive health-related SMSs. They are not asked to forward them to the individuals they listed as their contacts. Peers in T0 are therefore not expected to receive COVID-19-related SMSs generated by the study, and are considered as untreated.

T1 (Peer, no incentives): RDS Participants receive health-related SMSs and are asked to forward them to their contacts. On the day they receive a COVID-19-related SMS, RDS Participants receive a mobile money transfer to their cellular phone covering the cost of sending the SMS to their contacts. They also get two SMSs reminding them about the request to forward the health-related SMS.

[2]Respondents often needed to look up phone numbers in the same handheld device they were simultaneously using for the interview. If the mobile device had a speaker feature, then the respondent was guided through the menu settings to their contact lists while remaining on the call. Otherwise, the enumerator asked the respondent to write down the phone numbers in a piece of paper and arranged for a later call to collect the numbers. Respondents who failed to respond to the call back did not complete the baseline and were dropped from the study (N=24).

[3]The exchange rate at the time of the study was 21.4 Kwacha to one USD.

T2 (Peer, incentives): RDS Participants receive health-related SMSs and are asked to forward them to their contacts. They receive the same set of reminders and reimbursements for forwarding SMSs as in T1. In addition, during the baseline survey, they are informed that they will receive the equivalent of 23 Kwacha (about USD 1.07) per SMS forwarded (see Appendix A for details). The incentive is paid at the end of the study, on day 13. Since verification of which SMSs were forwarded is not possible, in paying the incentive we assumed that all SMSs were sent. For example, if an RDS Participant had identified one peer and was asked to send four SMSs, she received 4x23 = 92 Kwacha (about USD 4) by the end of the study.

T3 (Health authority): As in T0, RDS Participants receive health-related SMSs and are not asked to forward them. Peers Participants in T3 also receive health-related SMSs sent using the short codes of Zambian Ministry of Health (MOH) and the Zambian National Institute for Public Health (ZNPHI).

When eliciting the names of potential contacts, the language used by the enumerators varied slightly by treatment arm. RDS in T1 and T2 were asked that the contacts they provided should consist of individuals with whom they are willing to share SMSs, while the language used for T0 and T3 did not mention this. Moreover, members of T1 were also informed of the reimbursement they would receive for forwarding SMSs, and members of T2 were informed of the additional incentives for forwarding SMSs. See Appendix A for the printout of the language used in this step.

2.3 Sub-treatment randomization

In addition to the four experimental conditions described above, we randomly assigned the name of the SMS sender to each RDS Participant. In half of the cases, the sender was the Ministry of Health Risk Communication and Community Engagement working group (MoH), which is the government agency tasked with developing community messaging strategies for COVID-19. The other half received SMSs from the Zambia National Public Health Institute (ZNPHI), an independent, public agency that has less authority than the Ministry of Health but may be perceived as less political and more technical. Peer Participants that were part of the third treatment arm (direct messaging) also received the message from a randomly assigned institutional sender. To mimic the experience of Peer Participants in other treatment arms, the randomization within T3 was done at the level of the RDS Participant, so that all Peers from the same RDS Participant received the message from the same institution (MoH or ZNPHI).

It is relevant to note that the name of the institution shows up only to the initial recipient of a message. When forwarding the message to a contact, the identity of the institutional sender switches to the name of the peer sender. The name of the institution is not embedded in the message, as that would make it too long to fit within 160 characters.

2.4 Intervention and outcome measurements

The intervention starts the day after completion of the baseline survey and lasts 13 days (see Figure 2). On day 1 of the intervention, RDS Participants and Peer Participants in T3 receive the first health-related SMS. The first round of endline phone surveys is conducted on days 2-4 for both RDS and Peer Participants.[4] The second and third health-related SMSs are delivered on day 5 and 9, and endline survey rounds 2 and 3 are administered on days 6-8 and 10-12, respectively. Given the concern of low response rates with frequent follow up interviews over a short period of time, only half the sample of RDS and Peer Participants is randomly assigned to endline survey round 2. The last health-related SMS is delivered on day 13, after the endline round 3. At that time, study participants are informed that the study has ended.

The endline surveys included questions related to COVID-19 precautions taken in the previous three days, such as: respondent washed hands frequently; did not gather unmasked (asked only to respondents who did not completely avoid gatherings during the reference period); avoided gatherings; and did not travel. In addition, Peer Participants are asked whether they received any COVID-19-related SMSs in the preceding three days. RDS and Peer Participants receive a small payment after each survey to compensate them for their time.

[4]For Peer Participants, the first endline round is also the first time they are contacted by an enumerator, so they are informed about on the study and are asked to give their consent to participate.

2.5 Content of health-related SMSs

The health-related SMSs are in line with the language approved by the Government of Zambia, which had a sub-committee devoted to COVID-19 messaging named "Risk Communication and Community Engagement unit within the Incident Management System for COVID-19." We chose to provide advice that was consistent with local conditions, recognizing that not all more broadly-promoted mitigation strategies were appropriate for low-income setting. For example, we were unwilling to advise extreme social distancing (not leaving the home for days), nor encourage receiving a COVID-19 vaccine as those were not widely available at the time.

All messages were first developed in English, and then translated and back-translated into five local languages. See Appendix A for the precise wording of each message. Messages had to fit within one SMS (160 characters) so that they could be read in full even on basic feature ("flip') phones.

In the first wave of the intervention we sent out four health-related SMSs. Three SMSs provide information designed to influence individual behavior. One encourages the use of masks as a polite strategy to protect the community (mask); another focuses on washing hands for at least 20 seconds (hand wash); the third recommends social distancing by staying outdoors and keeping meetings shorts (social distance). The fourth SMS aims at preventing or reducing any stigma associated with COVID-19, and emphasizes that anyone can become infected without anyone's fault (stigma).

In the second wave of the study we introduced two additional SMSs about vaccines emphasizing that vaccines were approved by the Government of Zambia and that they were safe, effective, and already widely available in sub-Saharan Africa. See Appendix A for the language used in each health-related SMS.

The first two health-related SMSs involved washing hands and wearing masks. The order in which these two were sent was randomized. Half of RDS Participants (and Peer Participants in T3) received the hand washing message first and the mask wearing message second. The order was reversed for the remaining half of the study participants. The stigma SMS and social distance SMS were sent as third and fourth SMSs on days 9 and 13, respectively. In addition, in the second wave, the two SMSs about vaccines were sent on the same day as the second health-related SMS we sent in the first wave.

We survey each RDS and Peer Participant up to three times. For the RDS Participants, the first round of surveying comes before they receive any health-related SMSs, and the second and third rounds come after they have received SMSs and been asked to forward them in accordance with their treatment assignment. Therefore, we do not anticipate any differences between RDS Participant health behaviors in round 1. For Peer Participants, all of the rounds of data collection occur after RDS Participants received SMSs and may have forwarded them to contacts in T1 or T2 and after SMSs were sent directly to Peer Participants in T3. While respondents differ in the SMSs they were assigned to receive in survey rounds 1 and 2, all had been assigned to the full set of SMSs before the round 3 survey.

3 Estimation

The intersection of four messaging treatments and two information sources creates eight unique treatment conditions. In our analysis the reference condition is T0 (Control) with SMSs that use the Ministry of Health (MOH) short codes. We use the following estimating equation:

$$\begin{aligned} Y_{ir} = \alpha &+ \beta_1 \textit{Peer, no incentives, MOH}_i + \beta_2 \textit{Peer, no incentives, ZNPHI}_i \\ &+ \beta_3 \textit{Peer, incentives, MOH}_i + \beta_4 \textit{Peer, incentives, ZNPHI}_i \\ &+ \beta_5 \textit{Health authority, MOH}_i + \beta_6 \textit{Health authority, ZNPHI}_i \\ &+ \beta_7 \textit{Control, ZNPHI}_i + \Omega_d + \epsilon_{ir}, \end{aligned} \tag{1}$$

where Y_{ir} are measured at the individual level i in each of three survey rounds r. Our main results are from round 3, with outcomes from rounds 1 and 2 reported in the appendix. We include fixed effects Ω_d for the date on which the referring RDS Participant was first contacted, which account for inclusion in the first or second wave of the experiment. We estimate robust standard errors with respect to heteroskedasticity.

In the endline surveys, we collect data about four precautionary health behaviors for each RDS and Peer Participants, the measures of Y_{ir}. Two of the behaviors correspond directly to the health-related SMSs (i.e., washing hands and wearing a mask). The two remaining behaviors are about social distancing, (i.e., avoiding gatherings with people from outside the household, and avoiding traveling outside home villages) and were not directly targeted by our SMSs. In addition, we also construct an aggregated outcome equal to the sum of these four precautionary health behaviors, thus it takes integer values between 0 and 4.

4 Summary statistics

Table 1 shows basic demographic characteristics for our sample of 3,027 RDS Participants and for the population of Zambia from the 2015 Living Conditions Monitoring Survey (Central Statistical Office 2015). The minimum age of RDS Participants is 18, whereas the LCMS data considers Zambian adults 20 years or older.[5] In our sample, 45.7% of RDS Participants are women, a smaller proportion than in the general population (51.5%). Average household size in our sample, about 5.2 individuals, is similar to the average in the population (5.1). Our study participants, however, are younger and more educated than the overall population. 47.6% of RDS Participants are in the 20-29 age group and 7.9% are 50 or older (compared to 38.5% and 18.8% in the general population, respectively). Individuals with secondary and post-secondary education are 45.9% and 39.6% of our sample (compared to 20.2% and 8.4% in the general population). Finally, geographically, our sample over-represents residents of Lusaka (34.6% of RDS Participants live in that province vs. 17.9 in the overall population of Zambia).

[5] The 2015 LCMS reports the age distribution by groups; the 18-19 years old are in the 15-19 age group and thus their proportion could not be recovered.

5 Results

5.1 Sample selection

Contact information for RDS Participants comes from a random digit dial sample purchased from a commercial firm. While non-response may result in a non-representative sample of cell phone users, it is uncorrelated with treatment status by design. However, Peer Participants are generated from RDS Participants, and we attempt to survey Peer Participants *after* they either received SMSs from the health authority short code or are assigned to receive SMSs from their RDS Participants. Thus, we first analyze whether response rates differ for Peer Participants across treatment conditions.

As shown in Table 2 we were able to reach about two thirds of peer contacts by phone, with no statistically significant differences between any of the treatment and control conditions with SMSs attributed to the Ministry of Health (MOH). We fail to reject the null hypothesis that the joint effect of the treatments on the response rate is zero.[6]

5.2 Receipt of SMSs

First, we examine a key outcome, albeit self-reported: do Peer Participants report receiving any SMSs about COVID-19? To obtain comparable outcomes for the control and treatment groups (and in recognition that respondents may not remember exactly who sent the SMS), we ask about any SMSs about COVID-19 safety rather than SMSs from specific senders.

As indicated in Table 3, among Peer Participants in the control group whose RDS Participant contacts received SMSs attibuted to the Ministry of Health, about one quarter–24% in round 1, 22% in round 2, and 28% in round 3–report receiving such

[6]We attempted to contact fewer participants for round 2 interviews than for rounds 1 and 3. This mechanically lowers response rates overall for round 2; the average contact rate in the control group who received SMSs from MOH is 39 percent. In round 2 only, the contact rate for all three measures is 6.2 percentage points higher for those in T2 whose SMSs were sent using the ZNPHI short code than in the reference condition. Because this contact rate advantage vanishes in round 3, we do not adjust for contact rates in subsequent analyses.

SMSs. This could reflect an underlying tendency to forward the experimental SMSs, but also captures the underlying rates of messaging about COVID at the time of the study. Peer participants were no more likely to report receiving SMSs about COVID-19 if their RDS Participants had been sent SMSs attributed to ZNPHI instead of the MOH–in round three, the difference was only 0.2 perentage points (a coefficient of close to zero), which eases the interpretation of the effect of other treatment conditions relative to the excluded control condition.

All treatments significantly increase the probability that Peer Participants receive SMSs. As expected, the effect is stronger for Peer Participants in the health authority condition. Since all Peer Participants in this condition receive the health-related SMSs, in principle everybody should have reported having received the SMSs. In practice, as of round 3 the health authority condition increases reported receipt of SMSs, with a 32 percentage point increase for SMSs attributed to MOH and a 35 percentage point increase for SMSs attributed to ZNPHI. Effects were somewhat larger in round 2 and smaller in round 1, with no signficant differences between MOH and ZNPHI attribution.

The peer treatments also increased reported receipt of SMSs. As of round 3, the incentivized request to forward an SMS from MOH increased receipt by 10.1 percentage points and the incentivized request to forward a message from ZNPHI, by 11.5 percentage points. Requests to forward SMSs without financial incentive (though with reimbursement for the airtime cost) were similarly effective: 13.1 percentage points when the messages originated with MOH and 12.1 when they originated with ZNPHI. Therefore, by round 3, incentives did not appear to increase message receipt relative to a simple appeal to public health. In round 1, incentives were actually less effective than the un-incentivized request to share information (for MOH messages, 5.1 percentage points without incentives compared to 2.1 with; and for ZNPHI messages, 9.0 percentage points without incentives and 4.7 percentage points with). While we do not have the data (nor the statistical power) to disentangle the mechanism and any difference had dissipated by round 3, people who valued the messages more and/or were more intrinsically motivated to share them may have done so earlier.

These results provide strong evidence that all treatments increased the probability of receiving information about COVID-19 safety, and that, nearly mechanically, the health authority treatment condition had a stronger effect. The robust first stage result motivates our subsequent investigation of the effect of these messages on the health behaviors they advised.

5.3 Precautionary health behavior

Next, we examine the primary health-relevant outcomes. Employing an intent-to-treat specification, we examine four pre-specified health precautions: washing hands frequently, wearing masks if at a gathering, avoiding gatherings, and not traveling outside the community. The first two outcomes were directly targeted by the experimental messages, and the other two were not. We also report the effect on the index of these four precautionary health behaviors.

We report results for round 3 in Table 4 (and results for rounds 1 and 2 in Appendix A1). While there is considerable variation in the adoption of these health precautions among the reference group, it does not change significantly between rounds. In round 3, the control group, T0, means are 35% (washing hands frequently), 8% (wears a mask if gathering), 38% (avoids gatherings), and 80% (did not travel outside of village). The mean for the summary outcome is 1.54.

We find no evidence that the treatments changed health behaviors. Of 35 reported coefficients in Table 4, only two are significantly different from zero at the 95 or 90% confidence levels. The magnitudes of the coefficients are small, with the largest representing a 6.8 percentage point increase in reporting frequent handwashing for Peer Participants who were directly sent SMSs attributed to ZNPHI. The SMSs sent using the health authority short codes were most likely to be received, but were not differentially effective in changing health behaviors. For reference, the next-largest magnitudes are in effect of the control condition in which RDS Participants received SMSs from ZNPHI (instead of MOH) but were not asked to share them.[7]

There are also no consistent patterns or meaningful effects in rounds 1 and 2, reported

[7] The unit of the coefficients in column 5 is number of precautionary health behaviors, on a scale from 0 to 4. The outcomes in columns 1-4 are binary.

in Appendix Table A1. For example, the 5.7 percentage point increase in frequent hand-washing in the incentivized peer message (ZNPHI) condition in round 1 RDS Participants to 2.9 percentage points in round 2 and 1.9 in round 3. The unincentivized peer message (MOH) condition apparently reduces the probability of avoiding gatherings in round 2, but the effect is of the opposite sign in round 1.

Our conditions were designed to affect the adoption of precautionary health behaviors by Peer Participants, who received SMSs under the treatment conditions randomly assigned to their RDS contacts who were included in our original random-digit-dial sample. All RDS Participants in the study received health-related SMSs; because of the urgency of the COVID-19 crisis at the time of the intervention, we did not include a pure control group. And, at the same time we conducted our messaging intervention, both MOH and ZNPHI were actively disseminating similar messages throughout the country, using radio, television, Twitter, social media, and even SMS campaigns. Therefore, we are unable to estimate the effect of receiving health-related messages on the health behavior of the RDS Participants. However, it is possible that the identity of the sender affected adoption of the message and/or that being asked or incentivized to share the message changed how it was perceived by the RDS Participants. Being asked to forward the message–and especially being compensated for doing so–could either elevate the importance and urgency of the message to the RDS Participants or devalue it or undermine its credibility from scientific or pro-social to merely commercial.

Therefore, we estimate the effect of assignment to an SMS-forwarding scheme on the health behavior of RDS Participants, in order to learn whether being asked to endorse a message changed the way that they internalized and acted upon its content. We report the results of this estimation in Table 5. Adoption of precautionary health behaviors in round 3 is the same for RDS Participants Peer Participants in the control condition: 35% washed their hands frequently, 8% wore masks when gathering, 38% avoided gatherings, and 80% did not travel outside the village. The interpretation of treatment effects on the RDS Participants is different than on the Peer Participants: for example, as discussed above, treatment changed the probability of message receipt for Peer Participants and could have changed any extra content or endorsement accompanying the forwarded

SMSs, whereas for the RDS Participants, the only “effect" of the treatments would be limited to changing the perceived value or credibility of the messages by varying to whom they were attributed or whether there was an explicity request to forward them. Regardless, the pattern of estimated treatment effects is similar for the two samples. Only three of 35 coefficients are statistically significantly different from zero at the 90 or 95 percent confidence level, with the largest point estimates coming in conditions where RDS Participants were not asked to forward the SMSs they received. We estimate a 7.7 percent increase in the probability of avoiding gatherings when RDS Participants received SMSs from ZNPHI and the research team send the same SMSs to their peer contacts, and a 6.8 percentage point increase in the probability of avoiding unmasked gatherings when RDS Participants received SMSs from ZNPHI and were not asked to forward them to Peer Participants.

Taken together, the results show that varying the conditions under which messages were shared did not affect the precautionary health behaviors of either RDS or Peer Participants.

6 Discussion and Conclusions

We examined the impact of a community-based text messaging approach on the spread of information about and adoption of COVID-19 preventive behaviors. Treated participants in this study were statistically significantly more likely to forward COVID-19 text SMSs than those in the control group. This replicates a key finding from Goldberg et al. (2022), confirming that peers can be a vehicle to spread health-relevant information in communities.

However, neither peer nor health authority messages changed the precautionary health behaviors of message recipients. This could be because text messages are less compelling than personal outreach. However, it could also be because network-based information dissemination was not well suited to COVID-19 outreach. COVID susceptibility was homogenous, especially early in the pandemic and the COVID-19 messages were general and not based on personal experience. At the time of our study in Zambia, information about COVID-19 was widely disseminated by radio, newspaper, and through social media. The messages shared through our study did not differ in content from other information being disseminated at the same time, and therefore may not have increased knowledge on the margin.

Additionally, the behaviors promoted in Zambia were purely precautionary. There is significant evidence of higher take-up of curative health care than preventative health care, and this gap could be amplified rather than reduced by outreach and incentives, especially if both information sharing by existing patients and action by their contacts are lower-probability outcomes for precautionary health behaviors.

Finally, Zambian participants had only to report forwarding a message in order to qualify for payment. While the cost for outreach was lower, the scope for shirking was much greater. The lack of enforceability could explain why incentives did not increase the rate at which contacts reported receiving SMSs. Alternatively, there could have been so much information shared about COVID that contacts were unable to identify marginal messages generated by this project.

The null effects in our study are consistent with other attempts to influence COVID-19 precautions through text message or social media campaigns. These studies typically measure direct effects of messaging, comparable to effects on the behavior of RDD participants in our study, rather than the effects of peer outreach. For example, a campaign in India found that similar messages promoting social distancing and handwashing did not change behavior of direct message recipients (Bahety et al., 2021). A meta-analysis of Facebook and Instagram messages shared by 174 health authorities around the world found very small effects on beliefs and vaccine take-up; results in each of the more than 800 individual studies were underpowered (Athey et al., 2023). One exception is the success of a large outreach effort sharing video messages recorded by Nobel laureate Abhijit Banerjee with 2.5 million residents of West Bengal, India (Banerjee et al., 2021). Message recepients and their geographic neighbors reduced travel and increased both hand washing and masking relative to those who received control information from government sources. A second successful intervention was phone messaging in India and Bangladesh; unlike text messages with comparable information, phone calls that provided both information and opportunity for conversation about COVID-19 increased awareness of and compliance with guidance about travel, hand washing, and social distancing (Siddique et al., 2020). These two successful outreach campaigns differed from our intervention in Zambia, and from other interventions that also led to null effects, by providing information that was plausibly of higher quality – delivered by a highly credible expert with local connections in one case, and offered through interactive personal conversation in the other.

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Figure 1: Overview of protocol

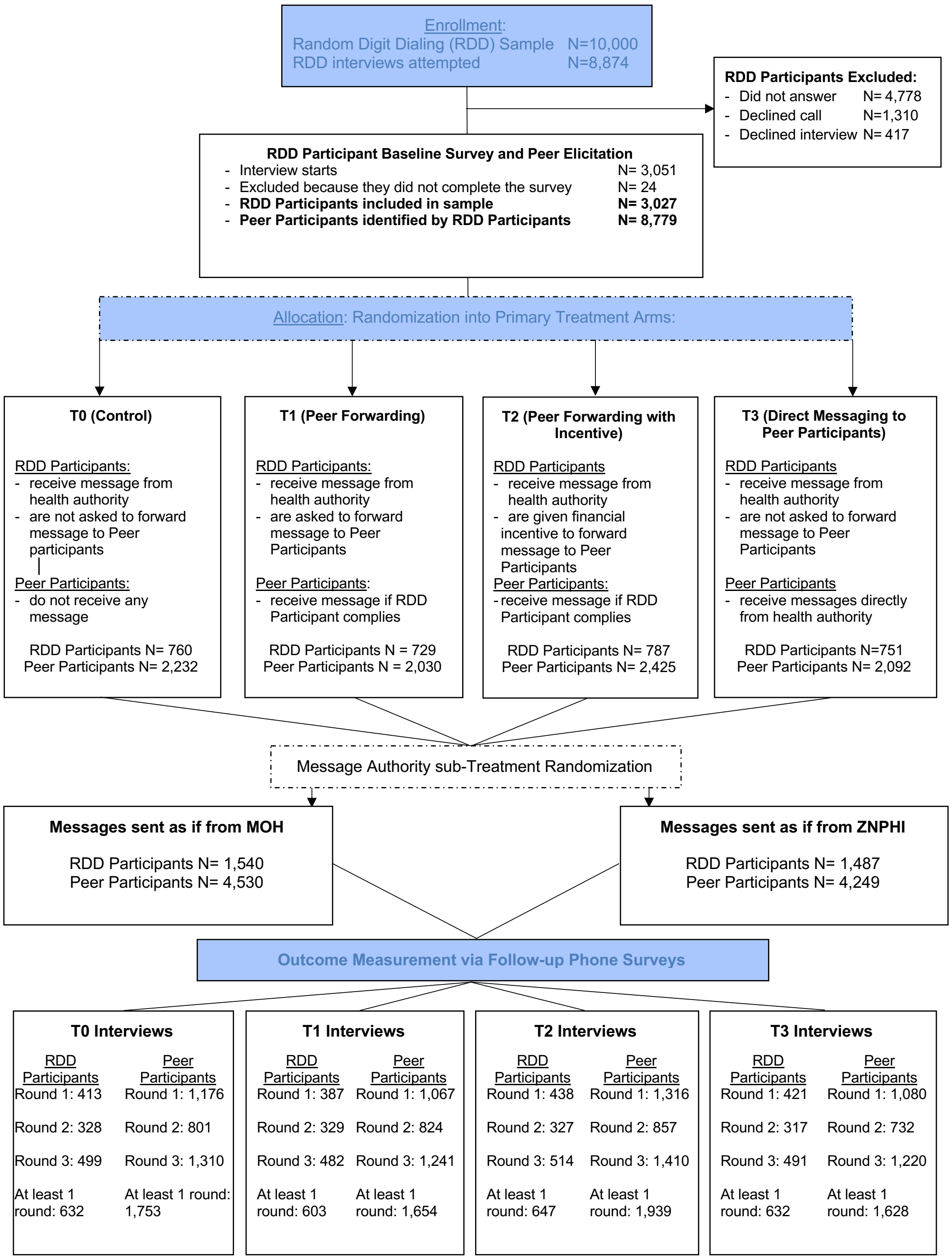

Figure 2: Timeline of intervention

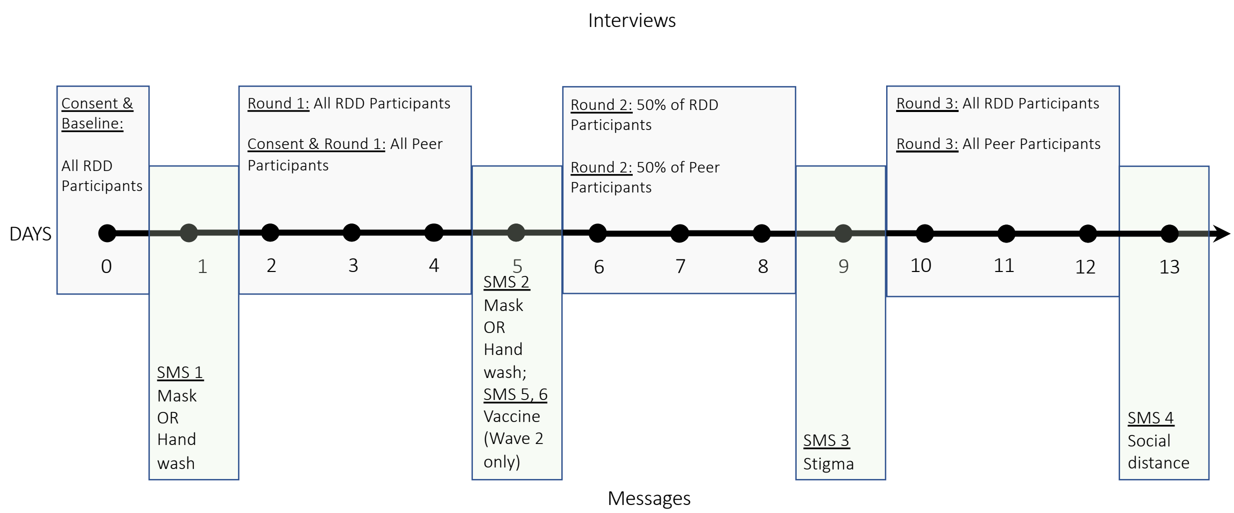

Table 1: Comparison of basic demographics in our sample and in the population

	Our Sample (Age 18+)	**LCMS 2015 (Age 20+)**
Women	0.457	0.515
Household size	5.2	5.1
Age group		
18-19	0.063	-
20-29	0.476	0.385
30-39	0.256	0.266
40-49	0.125	0.162
50-59	0.051	0.095
60+	0.028	0.093
Education		
Less than primary	0.007	0.099
Primary	0.045	0.412
Junior	0.093	0.203
Secondary	0.459	0.202
Post-secondary	0.396	0.084
Province		
Central	0.081	0.098
Copperbelt	0.288	0.153
Eastern	0.050	0.117
Luapula	0.032	0.073
Lusaka	0.346	0.179
Muchinga	0.028	0.058
Northern	0.029	0.084
Northwestern	0.051	0.054
Southern	0.068	0.120
Western	0.026	0.064
Number of RDS participants	3,027	

Statistics for Zambia are from the 2015 Living Conditions Monitoring Survey (Central Statistical Office 2015). In the LCMS column, proportions refer to the 20+ years old population, with the exception of household size and the distribution by province, which refer to the overall population of Zambia.

Table 2: Contact rates, Peer Participants

	Reached (1)	Consented (2)	Interviewed (3)
Peer forwards message from MOH, no incentive	0.03*	0.03*	0.03
	(0.02)	(0.02)	(0.02)
Peer forwards message from MOH, financial incentive	0.01	0.01	0.01
	(0.02)	(0.02)	(0.02)
Message sent directly by MOH	0.02	0.02	0.02
	(0.02)	(0.02)	(0.02)
Peer forwards message from ZNPHI, no incentive	0.01	0.01	0.01
	(0.02)	(0.02)	(0.02)
Peer forwards message from ZNPHI, financial incentive	-0.01	-0.01	-0.01
	(0.02)	(0.02)	(0.02)
Message sent directly by ZNPHI	0.02	0.02	0.02
	(0.02)	(0.02)	(0.02)
Control condition, message from ZNPHI	0.01	0.01	0.00
	(0.02)	(0.02)	(0.02)
Observations	8,779	8,779	8,779
R-squared	0.25	0.25	0.25
Mean of dep. var. in reference group	0.62	0.62	0.62

Notes: Sample includes all Peer Participants. Outcomes are measured in the final round of data collection. The reference group is Peer Participants identified by RDS Participants in the control condition, with messages attributed to MOH. MOH is the Zambian Ministry of Health. ZNHPI is the Zambia National Public Health Institute. RDS Participants were reimbursed for the cost of forwarding SMSs in all peer-forwarding treatment arms; in the arms offering financial incentives, RDS participants were paid an additional 23 Kwacha per contact and per SMS forwarded (about USD 1.07).

Table 3: Health message receipt, Peer Participants

	Message received Round 1 (1)	Message received Round 2 (2)	Message received Round 3 (3)
Peer forwards message from MOH, no incentive	0.05*	0.16***	0.13***
	(0.03)	(0.03)	(0.03)
Peer forwards message from MOH, financial incentive	0.02	0.10**	0.10***
	(0.03)	(0.03)	(0.03)
Message sent directly by MOH	0.21***	0.38***	0.32***
	(0.03)	(0.03)	(0.03)
Peer forwards message from ZNPHI, no incentive	0.09**	0.15***	0.12***
	(0.03)	(0.03)	(0.03)
Peer forwards message from ZNPHI, financial incentive	0.05*	0.15***	0.11***
	(0.03)	(0.03)	(0.03)
Message sent directly by ZNPHI	0.26***	0.41***	0.35***
	(0.03)	(0.03)	(0.03)
Control condition, message from ZNPHI	-0.04	0.05	-0.00
	(0.03)	(0.03)	(0.03)
Observations	3,929	3,190	5,158
R-squared	0.05	0.09	0.07
Mean of dep. var. in reference group	0.24	0.22	0.28

Notes: Sample includes all Peer Participants. The survey team attempted to contact all Peer Participants in rounds 1 and 3, and a randomly-selected half of Peer Participants in round 2. The reference group is Peer Participants identified by RDS Participants in the control condition, with messages attributed to MOH. MOH is the Zambian Ministry of Health. ZNHPI is the Zambia National Public Health Institute. RDS Participants were reimbursed for the cost of forwarding SMSs in all peer-forwarding treatment arms; in the arms offering financial incentives, RDS participants were paid an additional 23 Kwacha per contact and per SMS forwarded (about USD 1.07).

Table 4: Self-reported precautionary health behaviors of Peer Participants

	Targeted behaviors		**Untargeted behaviors**		**Index**
	(1)	(2)	(3)	(4)	(5)
	Washed hands frequently	Did not gather unmasked	Avoided gatherings	Did not travel	Total precautions
Peer forwards message from MOH, no incentive	-0.02	-0.00	0.00	0.01	-0.00
	(0.03)	(0.02)	(0.03)	(0.02)	(0.05)
Peer forwards message from MOH, financial incentive	0.01	0.01	0.00	-0.00	0.01
	(0.03)	(0.02)	(0.03)	(0.02)	(0.04)
Message sent directly by MOH	0.01	-0.01	0.01	-0.00	0.01
	(0.03)	(0.02)	(0.03)	(0.02)	(0.05)
Peer forwards message from ZNPHI, no incentive	0.02	-0.03	-0.00	-0.01	0.01
	(0.03)	(0.02)	(0.03)	(0.02)	(0.05)
Peer forwards message from ZNPHI, financial incentive	0.01	0.00	0.00	-0.01	0.01
	(0.03)	(0.02)	(0.03)	(0.02)	(0.05)
Message sent directly by ZNPHI	0.07**	-0.02	0.02	-0.02	0.07
	(0.03)	(0.02)	(0.03)	(0.02)	(0.05)
Control condition, message from ZNPHI	0.03	-0.01	0.03	0.02	0.08*
	(0.03)	(0.02)	(0.03)	(0.02)	(0.05)
Observations	5,181	3,112	5,181	5,181	5,181
R-squared	0.01	0.02	0.01	0.01	0.01
Mean of dep. var. in reference group	0.35	0.08	0.38	0.80	1.54

Notes: Sample includes all Peer Participants. Outcomes are measured in round 3. The question about gathering unmasked (column 2) was only asked of those respondents who did not avoid all gatherings (column 5). The reference group is Peer Participants identified by RDS Participants in the control condition, with messages attributed to MOH. MOH is the Zambian Ministry of Health. ZNHPI is the Zambia National Public Health Institute. RDS Participants were reimbursed for the cost of forwarding SMSs in all peer-forwarding treatment arms; in the arms offering financial incentives, RDS participants were paid an additional 23 Kwacha per contact and per SMS forwarded (about USD 1.07).

Table 5: Self-reported precautionary health behaviors of RDS Participants

	Targeted behaviors		**Untargeted behaviors**		**Index**
	(1)	(2)	(3)	(4)	(5)
	Washed hands frequently	Did not gather unmasked	Avoided gatherings	Did not travel	Total precautions
Peer forwards message from MOH, no incentive	0.02	0.04	0.01	0.00	0.03
	(0.04)	(0.03)	(0.04)	(0.04)	(0.07)
Peer forwards message from MOH, financial incentive	0.04	0.04	0.05	-0.00	0.09
	(0.04)	(0.03)	(0.04)	(0.04)	(0.07)
Message sent directly by MOH	-0.00	0.03	0.02	0.02	0.03
	(0.04)	(0.03)	(0.04)	(0.04)	(0.07)
Peer forwards message from ZNPHI, no incentive	0.01	0.03	-0.02	0.00	-0.01
	(0.04)	(0.03)	(0.04)	(0.04)	(0.08)
Peer forwards message from ZNPHI, financial incentive	0.03	0.01	-0.01	0.01	0.03
	(0.04)	(0.03)	(0.04)	(0.04)	(0.07)
Message sent directly by ZNPHI	0.05	0.01	0.08*	0.03	0.15**
	(0.04)	(0.03)	(0.04)	(0.04)	(0.07)
Control condition, message from ZNPHI	0.04	0.07**	0.03	-0.03	0.04
	(0.04)	(0.03)	(0.04)	(0.04)	(0.07)
Observations	1,986	1,236	1,986	1,986	1,986
R-squared	0.03	0.04	0.03	0.02	0.04
Mean of dep. var. in reference group	0.35	0.08	0.38	0.80	1.54

Notes: Sample includes all RDS Participants. Outcomes are measured in round 3. The question about gathering unmasked (column 2) was only asked of those respondents who did not avoid all gatherings (column 5). The reference group is RDS Participants in the control condition, with messages attributed to MOH. MOH is the Zambian Ministry of Health. ZNHPI is the Zambia National Public Health Institute. RDS Participants were reimbursed for the cost of forwarding SMSs in all peer-forwarding treatment arms; in the arms offering financial incentives, RDS participants were paid an additional 23 Kwacha per contact and per SMS forwarded (about USD 1.07).

A Appendix: Information provided to participants

A.1 Onboarding process

Onboarding information received by RDS Participants after they completed the baseline at the time they are providing contact information to the research team. The following statements are read by the field agent. The statement read depends on the treatment the RDS Participant was assigned to.

Group T1 (peer forwards message, no incentive): “For the next part of the study, we would like to ask you to kindly provide up to 5 close contacts that you are willing to forward health related SMSs. They need to be adults; not part of your household; and you need to have their phone number.”

Group T2 (peer forwards message, financial incentive): “For the next part of the study, we would like to ask you to kindly provide up to 5 close contacts that you are willing to forward health related SMSs. They need to be adults; not part of your household; and you need to have their phone number. We will also be reaching out to them as part of this study. We will pay you 23 Kwacha for each SMS you forward to the contacts you provide.

Groups T0 (control) and T3 (health authority sends message): “For the next part of the study, we would like to ask you to kindly provide up to 5 close contacts that you are regularly in contact with."

A.2 Health-related messages delivered through SMSs

(Mask wearing): “Everyone should cover their nose and mouth in public to prevent corona from spreading. Using a mask is a polite, responsible way to protect the community."

Delivered 1 or 5 days after onboarding

(Hand washing): "Wash hands with soap and water or chlorine-treated water for 20 seconds, or use hand sanitizer to make sure you do not have corona on your hands and spread it."
Delivered 1 or 5 days after onboarding
(Stigma reduction): "Even people with no symptoms can spread corona. Some people get infected but never show symptoms, and others might spread corona before feeling sick."
Delivered 9 days after onboarding
(Social Distancing): "Reduce the risk of corona: maintain social distance, stay outdoors or make sure there is fresh air, and keep visits short."
Delivered 13 days after onboarding
(Vaccine): "Government-approved COVID-19 vaccines have been proven by scientists to be highly effective at preventing death or serious illness from corona virus."
Delivered 5 days after onboarding, second wave of intervention only
(Vaccine): "Government-approved COVID-19 vaccines have been proven safe. 15 million Africans have gotten a vaccine, with very few serious side effects."
Delivered 5 days after onboarding, second wave of the intervention only

A.3 Forwarding instructions delivered via SMS

Message 1: "1/2 You will receive <1 or 3> text from <SOURCE>. Read and forward to the <$n \in [1,4]$> contacts you gave us to help keep the community safe."
Message 2: "2/2 Earlier today we sent you <PAYMENT AMOUNT> Kwacha to reimburse the cost of forwarding the Corona messages. Please send the messages soon so you don't forget!"
Both SMSs delivered 15 minutes before each health message

A.4 End of study message (to T2)

“This is a message from IPA SMS study. Thank you for participating in this effort of forwarding the texts to your contacts. You just received a payment of <PAYMENT AMOUNT>."
Delivered 13 days after onboarding

Table A1: Self-reported precautionary health behaviors of RDS Participants (Rounds 1 and 2)

	Targeted behaviors		**Untargeted behaviors**		**Index**
	(1)	(2)	(3)	(4)	(5)
	Washed hands frequently	Did not gather unmasked	Avoided gatherings	Did not travel	Total precautions
Panel A: Round 1					
Peer forwards message from MOH, no incentive	0.034	0.023	0.024	-0.025	0.033
	(0.029)	(0.026)	(0.030)	(0.024)	(0.051)
Peer forwards message from MOH, financial incentive	0.036	-0.000	0.036	-0.019	0.053
	(0.027)	(0.024)	(0.028)	(0.023)	(0.048)
Message sent directly by MOH	0.016	-0.006	0.033	-0.030	0.019
	(0.028)	(0.026)	(0.029)	(0.024)	(0.050)
Peer forwards message from ZNPHI, no incentive	0.023	0.008	0.035	-0.021	0.037
	(0.029)	(0.026)	(0.030)	(0.024)	(0.050)
Peer forwards message from ZNPHI, financial incentive	0.057**	-0.009	0.001	-0.003	0.056
	(0.027)	(0.024)	(0.028)	(0.023)	(0.048)
Message sent directly by ZNPHI	0.001	0.041	0.019	0.009	0.029
	(0.029)	(0.026)	(0.030)	(0.024)	(0.051)
Control condition, message from ZNPHI	0.020	0.001	-0.001	0.020	0.040
	(0.028)	(0.025)	(0.029)	(0.024)	(0.049)
Observations	4639	2766	4639	4639	4639
R-squared	0.01	0.03	0.01	0.01	0.01
Mean of dep. var. in reference group	0.32	0.13	0.39	0.82	1.52
Panel B: Round 2					
Peer forwards message from MOH, no incentive	0.018	-0.053*	-0.006	-0.011	-0.000
	(0.035)	(0.029)	(0.035)	(0.029)	(0.059)
Peer forwards message from MOH, financial incentive	-0.019	-0.039	0.054*	0.002	0.036
	(0.033)	(0.028)	(0.033)	(0.028)	(0.056)
Message sent directly by MOH	-0.013	-0.059**	0.054	0.008	0.049
	(0.035)	(0.029)	(0.035)	(0.029)	(0.059)
Peer forwards message from ZNPHI, no incentive	0.016	-0.025	-0.023	-0.028	-0.035
	(0.033)	(0.027)	(0.033)	(0.028)	(0.057)
Peer forwards message from ZNPHI, financial incentive	0.029	-0.016	-0.004	-0.016	0.009
	(0.034)	(0.028)	(0.034)	(0.029)	(0.059)
Message sent directly by ZNPHI	0.020	-0.024	-0.019	-0.005	-0.004
	(0.035)	(0.029)	(0.035)	(0.030)	(0.060)
Control condition, message from ZNPHI	0.019	-0.036	0.030	-0.005	0.045
	(0.035)	(0.029)	(0.035)	(0.029)	(0.059)
Observations	3214	2028	3214	3214	3214
R-squared	0.02	0.03	0.02	0.01	0.02
Mean of dep. var. in reference group	0.36	0.11	0.35	0.80	1.50

Notes: Sample includes all Peer Participants. Outcomes are measured in rounds 1 and 2. The question about gathering unmasked (column 2) was only asked of those respondents who did not avoid all gatherings (column 5). The reference group is Peer Participants identified by RDS Participants in the control condition, with messages attributed to MOH. MOH is the Zambian Ministry of Health. ZNHPI is the Zambia National Public Health Institute. RDS Participants were reimbursed for the cost of forwarding SMSs in all peer-forwarding treatment arms; in the arms offering financial incentives, RDS Participants were paid an additional $0.25 per message forwarded.

B Comparison of Zambia COVID-19 study to India TB study

Goldberg et al. (2022) finds positive impacts from an intervention in India that employed monetary incentives to TB patients to share health information and increase screening and testing for TB. The study enrolled patients who were being treated for TB by a large nongovernmental organization (NGO) and asked them to help with outreach to others in their personal networks who would benefit from information about and testing and treatment for TB. The design compared outreach by peers to outreach by health workers (and both to a control condition), and varied whether the already-enrolled patients received small payments for any of their contacts who got tested for TB and whether they received a extra conditional payment for those who tested positive for TB. While both peer and health-worker outreach increased screening, direct peer outreach proved more effective than outreach by trained health workers in convincing potential patients to be screened and tested for TB. Compared to outreach by health workers, peer outreach was almost twice as effective (an increase of 0.12 newly screened contacts from peer outreach, compared to 0.06 newly screened contacts who were approached by health workers), and the cost of case-finding by health workers was 2.5-3.5 times higher than by peers. Incentives for outreach also roughly doubled the number of new contacts who sought screening, from 0.04 per already-enrolled patient without incentives to 0.10 with incentives, and reduced the cost of case finding by 45 to 55 percent. The impact of financial incentives was even larger when peers were tasked with outreach.

We aimed to adapt the use of incentives and peer outreach to a context without a stock of already-enrolled patients with first-hand experience, and where face-to-face outreach was not feasible (due to COVID-19). Our adaptation required replacing outreach by health workers with text messages sent in the name of a public health authority and replacing outreach by peers with outreach by peers specifically via forwarding an SMS message to personal contacts. We also only include unconditional incentives, and provide them to initial participants who report sharing SMSs with peers – a weaker requirement than in Goldberg et al. (2022) where incentives were conditional on the potential patients acting on the information. These modifications morph the intervention to be lighter-touch than the TB study, but were the necessary modifications for the context and preserved several conceptual distinctions we conceived of as important: a comparison of information shared by peers to information shared by health experts and a comparison of incentives to no incentives to encourage civilians to engage in outreach efforts.

The adaptation also requires some shifts in the outcome measure, specifically and most importantly self-reported precautionary behaviors rather than documented care-seeking behavior for individuals with observed symptoms of illness. COVID-19 testing capacity was severely constrained and not indicated by prevailing medical guidelines for asymptomatic individuals. Thus, testing as an outcome did not make sense. The mechanisms by which outreach changes precautionary behaviors are closely related to those by which outreach changes care-seeking behavior; Dupas et al. (2011) summarizes differences in the effect of social learning on precautionary vs. curative health investments, noting that whereas curative health care is more likely to result in tangible changes, which can be observed by or conveyed to peers, the benefits of preventative care are less obvious and thus more difficult to spread through social channels. Thus, while we expected the magnitude of impacts to be different in the Indian TB and Zambian COVID-19 contexts, the interventions themselves remained relevant.

Table B1 reports the equations from Goldberg et al. (2022), derived from the model in Beaman and Magruder (2012), describing the two behaviors of interest and their drivers: (1) equation determining the propensity of an individual (i) to convey information to their peer (j) and (2) the likelihood that the peer j adopts the relevant behavior(s). The table describes the factors that, according to the conceptual framework from Goldberg et al. (2022), affect (1) and (2), their counterparts in Goldberg et al. (2022) TB setting in India and in our COVID-19 replication-with-adaptation in Zambia, and differences between the two contexts. It also reports experimental manipulations as well as outcomes and implementation details in the two studies. The first part of the table shows that each theoretical notion in the conceptual framework from Goldberg et al. (2022) has a direct counterpart in both the India-TB and the Zambia-COVID scenarios. This mapping motivates and justifies our replication exercise. At the same time, as described above, significant *contextual* differences exist, which motivated our adaptation. In the Discussion and Conclusions section, we discuss how these differences likely explain the different results we obtained compared to Goldberg et al. (2022).

Table B1: Replication Summary: Mapping This Study to Goldberg et al. (2018)

Theoretical Framework	**Goldberg et al. (2018)**	**Our study**
Eq. (1) = propensity of individual i to convey information to peer j $d_{ij} + \lambda_{ij}(f_i + \pi_j * p_i)$, where	If (1) > 0, individual i conveys information on benefits of TB screening and testing to peer j	If (1) > 0, individual i conveys information on COVID-19 preventive behaviors to peer j
d_{ij} = net benefit person i receives when conveying information to peer $j = g_{ij} - s_{ij} - c_{ij}$, where		
g_{ij} = altruism/warm glow	Present if person i cares about peer j's health	Same
s_{ij} = social cost (e.g. due to stigma)	Stigma associated with TB	Stigma associated with COVID-19 preventive behaviors
c_{ij} = cost of time and effort	Cost incurred by i for in-person interaction with peer j	Cost incurred by i for forwarding SMSs to peer j
f_{ij} = fixed payment to person i for each peer j (referred by i)	Financial payments to i for each peer j presenting for TB screening	Financial payments to i for SMSs forwarded
π_j = probability that peer j benefits from information	Probability that peer j has TB (as assessed by person i)	Probability that peer j adopts the relevant COVID-19 preventive behaviors
p_i = financial payment to i conditional on j adopting the relevant behavior	Financial payment to i if peer j gets tested and tests positive for TB	Financial payment to i if peer j adopts COVID-19 preventive behaviors (not included in study design)
Eq. (2) = likelihood that peer j adopts the desired behavior $\lambda_{ij} = \lambda_{ij}(X_j, q_{ij})$, where	Probability that peer j gets screened for TB	Probability that peer j adopts COVID-19 preventive behaviors
X_j = peer j's characteristics	Lifestyle, risk factors, etc. (rich set of characteristics collected by in-person survey)	Same (very limited characteristics collected via short phone survey)
q_{ij} = quantity and quality of information available to peer j about the benefits and costs of adopting the desired behavior	· Information already possessed by j about benefits and costs of TB testing (India had longstanding public campaigns about TB and conducts outreach to family members of newly identified TB patients) · Information conveyed by i (based on own experience through treatment and interaction with health workers) · Credibility of information from i's endorsement (current patients all had first-hand experience with TB screening and treatment)	· Information already possessed by j about benefits and costs of COVID-19 preventive behaviors (Zambia was conducting public health campaigns including radio, social media, and SMSs) · Information conveyed by i (forwarded content of text SMSs sent by research team on behalf of health authorities · Credibility of information from i's endorsement (RDS participants were not selected based on personal experience with COVID, and given prevalence, they likely had not been infected at the time of the study
Experimental Manipulations		
f_{ij} = fixed payment to person i	· No-incentive condition: 0 · All incentive conditions: Rs 150 (USD 3) paid to i for each peer j (referred by i) presenting for TB screening (based on adminsitrative data)	· No-incentive condition: Reimbursement of cost of sending SMSs (based on self reports) · Incentive condition: Reimbursement of cost of sending SMSs + Kw 23 (USD 1.07) paid to i per SMS forwarded (based on self reports)
p_i = payment to i conditional on j adopting the relevant behavior	· No-incentive condition: No payment · Unconditional incentive condition: No payment · Conditional incentive condition: Rs 150 (USD 3) paid to i if j gets tested and tests positive for TB	Not included in the study design
q_{ij} = quantity and quality of information available to peer j about the benefits and costs of adopting the desired behavior	· Control: no peer outreach or contact elicitation from person i · Peer outreach condition: person i directly reaches out to peer j · Health-worker outreach condition: health-worker reaches out to peer j (contact info for peer j provided by i)	· Control: person i is not asked to forward any SMSs · Peer forwarding condition: person i is asked to forward SMSs · Health authority condition: peer j receives SMSs from health authority (contact info for peer j provided by i)
Outcomes and Implementation		
Sample	Referrers: existing patients Peers: Contacts outside of the households	Referrers: RDS cell phone users Peers: Cell phone contacts of RDS respondents
Outcomes	Outcomes measured at the referrer level: Using administrative data: · Number of peers who reported for screening · Number of peer recommended for testing · Number of peers who got tested · Number of peers who tested positive Using incentive-compatible elicitation: · Number of unused referral cards returned	Outcomes measured at the peer level using self-reported data: · Received health SMSs · Wash hands frequently · Did not gather unmasked · Avoided gatherings · Did not travel