Journal of Development Economics 171 (2024) 103318

Contents lists available at ScienceDirect

Journal of Development Economics

journal homepage: www.elsevier.com/locate/devec

Short communication

Passing the message: Peer outreach about COVID-19 precautions in Zambia[☆]

Alfredo Burlando[a], Pradeep Chintagunta[b], Jessica Goldberg[c,*], Melissa Graboyes[a], Peter Hangoma[d,e], Dean Karlan[f], Mario Macis[g], Silvia Prina[h]

[a] University of Oregon, United States of America
[b] University of Chicago, United States of America
[c] University of Maryland, United States of America
[d] University of Zambia, Zambia
[e] Chr. Michelsen Institute, Norway
[f] Northwestern University and Innovations for Poverty Action, United States of America
[g] Johns Hopkins University, United States of America
[h] Northeastern University, United States of America

ARTICLE INFO

JEL classification:
Codes
O1
I1

Keywords:
COVID-19
Social networks
SMS
Incentives
Zambia
Health

ABSTRACT

During public health emergencies, spreading accurate information and increasing adherence to recommended behaviors is critical 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 scalable 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 in Zambia. None of the treatments affected health behavior among primary study participants or their peers. The suggestion to pass messages to peers increases dissemination, but financial incentives do not have any additional impact.

1. Introduction

Providing accurate and actionable information to the public about strategies for protecting themselves and their communities is a core component of combatting communicable diseases. The COVID-19 pandemic posed serious and varied challenges for information dissemination efforts worldwide. In Zambia, building on the widespread availability of mobile phones,[1] 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., 2023), which was itself motivated by a model of employment referrals by Beaman and Magruder (2012). The TB study found that peer outreach outperformed health-worker outreach, and that financial incentives increased the effort TB patients exerted to influence their peers to get screened for the disease.[2] 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

☆ IRB approval from the University of Zambia (#00001131; No. 1044-2020) and University of Maryland (#1616808). AEA RCT Registry #0005940. For funding, we thank the National Science Foundation #2033321, the Kilts Center for Marketing, and the University of Chicago Booth School of Business. We thank Dr. Abel Kabalo from the Ministry of Health (MOH-Zambia) and Dr. Mazyanga Mazaba from the Zambia National Public Health Institute (ZNPHI) for project support. For project management, field support, and research assistance, we thank Blake Hardin, Sofia Olofsson, and Tereza Varejkova. The authors retained full intellectual freedom to report and interpret the results.

* Corresponding author.
E-mail addresses: burlando@uoregon.edu (A. Burlando), pradeep.chintagunta@chicagobooth.edu (P. Chintagunta), jagold@umd.edu (J. Goldberg), graboyes@uoregon.edu (M. Graboyes), peter.hangoma@cmi.no (P. Hangoma), karlan@northwestern.edu (D. Karlan), mmacis@jhu.edu (M. Macis), s.prina@northeastern.edu (S. Prina).

[1] The 2018 Zambia Demographic Survey found that over 75% of households own a phone (ZDHS, 2020). At the individual level, phone penetration is estimated at about 80% of the population (DATAREPORTAL, 2023).

[2] See Online Appendix C for a detailed comparison between the TB setting in India and the COVID-19 setting in Zambia.

https://doi.org/10.1016/j.jdeveco.2024.103318
Received 17 July 2023; Received in revised form 12 May 2024; Accepted 28 May 2024
Available online 31 May 2024

the disease. The intervention was motivated by a simple model with two theoretical predictions that we hypothesized also apply to Short Message Service (SMS)-based outreach for COVID-19 in Zambia:

1. Individuals 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 trusted than information shared through direct messaging from health authorities.

In our experiment, we first asked individuals to name peers and then incentivized them to disseminate information, aiming to inspire peers to engage in pro-social public health behaviors. Using random-digit dialing, we generated our core sample (we refer to the sample as Random Digit Sample, or RDS) 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 RDS Participants and their associated 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.[3] 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.

We find that individuals in Zambia do forward public health SMSs when they are encouraged to do so (similar to the case in India with TB patients). 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 forwarded the COVID-19 safety SMSs to peers (relative to the control group). Nonetheless, considerably more contacts of RDS participants reported receiving SMSs when sent from the government health authority than from peers. However, financial incentives did not increase the likelihood that individuals forwarded SMSs (in contrast to the observed outcomes in the India study with TB patients). Additionally, we find no evidence that any of the treatments changed either RDS or Peer Participants' self-reported precautionary health behaviors (masking, hand washing, not traveling outside the village, and avoiding gatherings) relative to the control condition, in which RDS participants received but were not asked to forward messages.

Our research contributes to several strands of literature. First, our work adds to the vast literature on the impact of social networks on economic outcomes and behaviors (Jackson, 2011).[4] Additionally, our study contributes to the literature focusing on the use of information and nudges to influence behavior, particularly through messaging. In this context, the meta-analysis conducted by Orr and King (2015) highlighted the effectiveness of mobile phone SMS messages in promoting healthy behaviors across diverse populations and domains, with greater impact observed with more frequent messages.[5] Lastly, our study contributes to the mixed results of messaging campaigns in developing countries during the COVID-19 pandemic. Our findings complement those of Bahety et al. (2021), who observed limited efficacy in an SMS-based campaign in rural Bihar, India. In contrast, other studies such as Banerjee et al. (2021) and Siddique et al. (2020) present more positive outcomes in similar contexts. Banerjee et al. (2021) demonstrated the success of a large outreach effort in West Bengal, India, where video messages from Nobel laureate Abhijit Banerjee led to significant behavioral changes, including increased hand washing and masking, as well as reduced travel. These results align with the impactful role of celebrity endorsements found by Alatas et al. (2022) in their Indonesian Twitter experiment. Similarly, Siddique et al. (2020) found that in India and Bangladesh, phone calls providing information and facilitating conversation about COVID-19 were more effective than simple text messages. These studies, along with our own findings, contribute to a nuanced understanding of the varied impacts of messaging campaigns in developing countries during health crises like the COVID-19 pandemic.

The next section of the paper describes the survey design, and Section 3 presents our findings. Finally, Section 4 discusses the interpretation and implications of our findings, placing them in the context of closely related studies.

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 Fig. 1. Our initial sample of potential participants includes 10,000 cellphone numbers obtained from random-digit dialing (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 4096 who answered the phone, 74.5% (N = 3051) of respondents consented and 73.9% (N = 3027) completed the baseline survey; we refer to the latter as "RDS Participants". The baseline 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 and concern about the disease, vaccine status, and protective behaviors (mask wearing, hand washing, social distancing).

[3] Delivery rates of messages from the bulk messaging system to the phone listings was measured once three weeks after the start, and averaged over 90%, which is considerably higher than the average delivery rates in the platform (between 65 and 80%). We have also verified that messages were also delivered within minutes of their scheduled delivery time.

[4] In health-related contexts, this literature includes the influence of peers on various health behaviors such as 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), health insurance (Sorensen, 2006), and infectious disease screening (Goldberg et al., 2023).

[5] Messaging experiments involving peer networks have shown success 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).

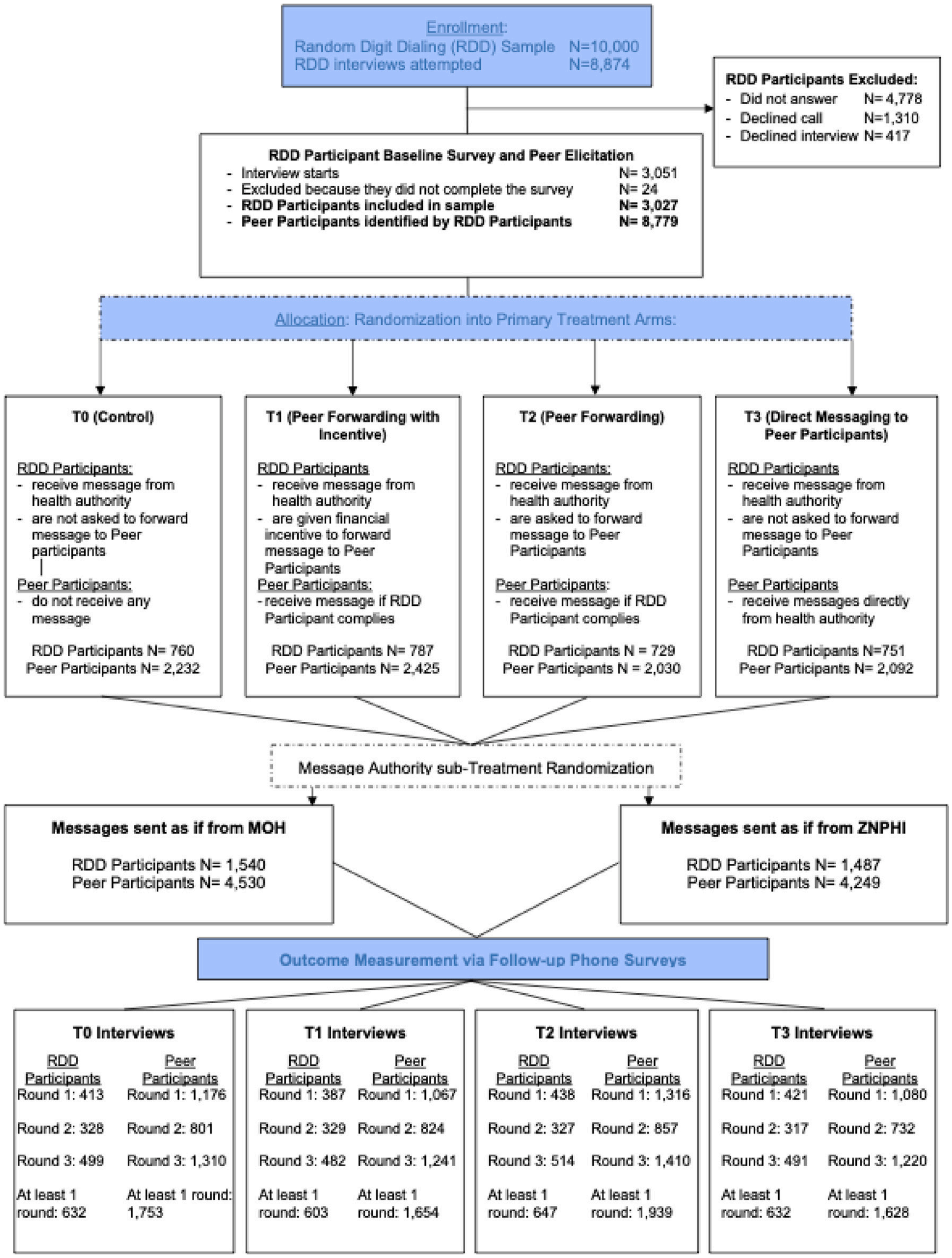

Fig. 1. Overview of protocol.

Participants are highly aware of Covid-19 and report substantial effects on personal and community behaviors. More than 96 percent of RDS respondents had heard of covid, and 92 percent report that they had changed their behavior because of the virus. Similarly, 92 percent report that they believe Covid-19 to be "very risky" and another 6 percent believe it to be "somewhat risky". Eighty three percent believe that they are personally at risk of Covid-19. While concern is high, people are less confident of their knowledge: 61 percent agree that they know enough about Covid-19 and how to mitigate the risk, but 39 percent say they do not have sufficient information. Fifty percent believe that they have received misinformation about Covid-19 within the past month. The Ministry of Health is the most prevalent source of information, with 71 percent of respondents saying that they are most likely to follow its advice to protect themselves. In contrast, fewer than three percent are most likely to follow advice from ZNPHI, the other information source we use in our study. Government (16 percent), friends and family (9 percent), and social media (9 percent) are the other major sources of information our respondents rely upon. In terms of precautions, 54

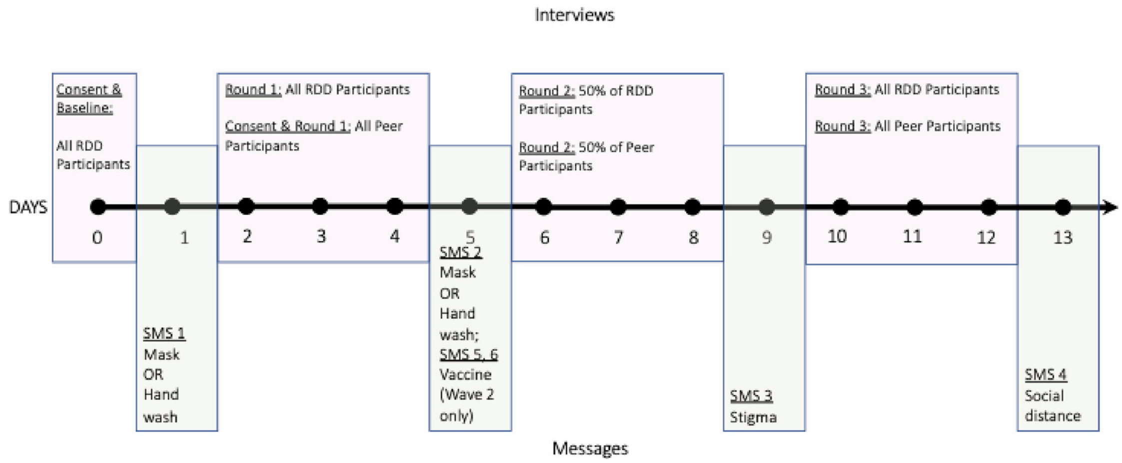

Fig. 2. Timeline of intervention.

percent report that wearing a mask is the most important precaution, followed by staying at home (16 percent), washing hands (16 percent) and social distancing (14 percent). Fifty two percent of respondents report that most people in their communities are masking most of the time, and 44 percent report that most people are social distancing. We report these and other baseline data separately by treatment group in Appendix Tables B2 and B4.

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.[6] 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.[7]

The contacts provided by RDS Participants generate the potential sample of Peer Participants. 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, therefore, receive information according to their RDS contact's treatment status and behavior.

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. These participants received an average of 37 kwacha ($1.73) as compensation for survey participation.[8] These payments, like those in all treatment arms, were made after the final survey.

T1 (Peer Forwarding, Financial 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. Additionally, during the baseline survey, RDS participants in this condition are informed that, on top of the cost reimbursement, they will receive an additional reward of 23 Kwacha (about USD 1.07) for each SMS forwarded (see Online 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, we relied on self-reports to determine payment amounts. The average participant in T1 received a total payment of 145.6 kwacha ($6.81), including the incentive, reimbursement, and small compensation for participating in the survey. Also, participants in this condition receive two SMSs reminding them about the request to forward the health-related SMS.

T2 (Peer Forwarding, No Incentives): RDS Participants receive health-related SMSs and are asked to forward them to their contacts. Like in T1, participants in this arm received SMS reminders and a mobile money transfer covering the cost of sending the SMS(s) to their contacts. This transfer was specifically intended and framed as a way to neutralize any financial burden by covering the cost of sending the SMS to their contacts. Unlike T1, respondents in T2 were not offered any additional incentives for forwarding the messages. The average payment to a participant in T2 was 48 kwacha ($2.24).

T3 (Direct Messaging to Peer Participants): As in T0, RDS Participants receive health-related SMSs and are not asked to forward them. Peer Participants in T3 also receive health-related SMSs sent using the short codes of the Zambian Ministry of Health (MOH) or that of the Zambian National Institute for Public Health (ZNPHI). Participants assigned to T3 received an average of 38.1 kwacha ($1.78) as compensation for survey participation.

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, participants in T1 and T2 were informed of the reimbursement they would receive for forwarding SMSs, and participants in T1 were additionally informed of the additional incentives for forwarding SMSs. See Online 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 identity of the SMS sender to each RDS and

[6] 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 callback did not complete the baseline and were dropped from the study (N = 24).

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

[8] For comparison, the average monthly income in Zambia in 2022 was 3443 kwacha according to the 2022 Zambia Living Conditions Monitoring Survey (LCMS).

direct-messaging Peer Participant.[9] In half of the cases, the sender was identified as 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 labeled as from the Zambia National Public Health Institute (ZNPHI), an independent, public agency with less prominence than the Ministry of Health but that may be perceived as less political and more technical.[10] Peer Participants in 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).

2.4. Intervention and outcome measurements

The intervention starts the day after the completion of the baseline survey and lasts 13 days (see Fig. 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.[11] The second and third health-related SMSs are delivered on days 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 about COVID-19 precautions taken in the previous three days: respondents 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 outside the village. 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.

2.5. Content of health-related SMSs

The content of the health-related messages was based on contemporary recommendations from the Zambia Ministry of Health and adapted for the length and format of text messages. The specific language used in our study was developed with feedback with the Ministry of Health Risk Communication and Community Engagement (RCCE) subcommittee. That group included staff from the Ministry of Health and ZNPHI, as well as the University of Zambia. The content of the messages, as well as other study procedures, were approved by the National Health Research Authority at the University Teaching Hospital in Lusaka. All messages were first developed in English and then translated and back-translated into five local languages. See Online Appendix A for the precise wording of each message. Messages had to fit within one SMS (160 characters) to 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 s (hand washing); the third recommends social distancing by staying outdoors and keeping meetings short (social distancing). The fourth SMS aims at preventing or reducing any stigma associated with COVID-19, and emphasizes that anyone can become infected without personal fault.

In the second wave of the study, we introduced two additional SMSs about vaccines. We emphasized that vaccines were approved by the Government of Zambia and that they were safe, effective, and already widely available in sub-Saharan Africa. See Online 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 the 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 the 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 Participants' 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.

2.6. Estimation

The intersection of four messaging treatments and two information sources creates eight unique experimental 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:

$$\begin{aligned} Y_{ir} = \alpha &+ \beta_1 Peer\ messaging,\ incentives,\ MOH_i \\ &+ \beta_2 Peer\ messaging,\ incentives,\ ZNPHI_i \\ &+ \beta_3 Peer\ messaging,\ no\ incentives,\ MOH_i \\ &+ \beta_4 Peer\ messaging,\ no\ incentives,\ ZNPHI_i \\ &+ \beta_5 Direct\ messaging,\ MOH_i + \beta_6 Direct\ messaging,\ ZNPHI_i \\ &+ \beta_7 Control,\ ZNPHI_i + \Omega_d + \epsilon_{ir}, \end{aligned} \tag{1}$$

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 Online Appendix B. 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 Participant, the measures of

[9] The name of the institution is visible only to the initial recipient of a message. It is displayed as the sender of the message, not embedded in the text of the message itself. This means that when the message is forwarded to a contact, the identity of the original sender is no longer visible. Therefore, peer participants who received forwarded messages were likely unaware of their original source.

[10] The Ministry of Health is an arm of government lead by a politically elected or appointed official. While it is widely recognized, it has been implicated in scandals including a highly-publicized drug procurement scheme in 2020 that resulted in the arrest of the Minister of Health in 2022. The ZNPHI was originally a technical department within the Ministry of Health, but a 2020 law changed its status to that of a separate legal entity with responsibility for coordinating and conducting surveillance and other epidemiological tasks functions. ZNPHI is headed by a Board of Directors, which appoints a Director General.

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

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, which thus takes integer values between 0 and 4.

3. Data and results

3.1. Summary statistics

Appendix Table B1 shows basic demographic characteristics for our sample of 3027 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.[12] In our sample, 45.7% of RDS Participants are women, a smaller proportion than the general population (51.5%). The 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 of the overall population of Zambia).

We conduct balance tests of the characteristics of the RDS participants and report the results in Appendix Tables B2 and B4. Appendix Table B2 reports the means of baseline variables separately for the pure control group and for each of the primary treatment arms. We fail to reject the equality of means for the four groups for any of the variables. To increase power to detect differences between the control arm and the three treatment arms, Appendix Table B4 reports results from a pooled test. The control group is 4.8 percentage points less likely to have post-secondary education (p = 0.019) and 3.4 percentage points less likely to report having received a Covid vaccine (p = 0.069) than the pooled treated groups; there are no significant differences for any of the measures of attitudes about Covid-19 or about trust in various sources of information. The *p*-value for the test of joint orthogonality is 0.49.

3.2. 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 (‘‘direct messaging’’) 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 Appendix Table B6, 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.[13]

3.3. Receipt of SMSs

First, we examine whether 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 asked about any SMSs about COVID-19 safety rather than SMSs from specific senders.

As indicated in Table 1, among Peer Participants in the control group whose RDS Participant contacts received SMSs attributed to the Ministry of Health, about one quarter–24% in round 1, 22% in round 2, and 28% in round 3–report receiving such 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 percentage 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 direct messaging 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 direct messaging 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 significant 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 13.1 percentage points, and the incentivized request to forward a message from ZNPHI by 12.1 percentage points. Requests to forward SMSs without financial incentives (though with reimbursement for the airtime cost) were similarly effective: 10.1 percentage points when the messages originated with MOH and 11.5 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 somewhat more effective than the un-incentivized request to share information (for MoH messages, 5.1 percentage points with incentives compared to 2.1 without; and for ZNPHI messages, 9.0 percentage points with incentives and 4.7 percentage points without). We do not have the data (nor the statistical power) to disentangle the mechanism and any difference had dissipated by round 3.

These results provide strong evidence that all treatments increased the probability of receiving information about COVID-19 safety, and that, nearly mechanically, the direct messaging 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.[14]

---

[12] 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.

[13] 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%. 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.

[14] We did not ask the RDS participants about messages received, so we cannot benchmark the first stage effect on Peer participants to reported receipt among the RDS participants. However, the difference between reported message receipt for peers of RDS participants in T0 and T3 may be instructive. Peers of RDS participants in T0 were not targeted with any messages – that is, RDS participants were not asked to share messages (thought they may have organically) and the research team did not send messages directly. Nonetheless, between 22 (round 1) and 28 (round 3) percent of these participants reported

Table 1
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, financial incentive	0.051*	0.157***	0.131***
	(0.030)	(0.034)	(0.027)
Peer forwards message from MOH, no incentive	0.021	0.096**	0.101***
	(0.028)	(0.032)	(0.025)
Message sent directly by MOH	0.210***	0.382***	0.317***
	(0.029)	(0.034)	(0.026)
Peer forwards message from ZNPHI, financial incentive	0.090**	0.145***	0.121***
	(0.029)	(0.032)	(0.027)
Peer forwards message from ZNPHI, no incentive	0.047*	0.150***	0.115***
	(0.028)	(0.033)	(0.026)
Message sent directly by ZNPHI	0.256***	0.408***	0.349***
	(0.030)	(0.034)	(0.027)
Control condition, message from ZNPHI	−0.037	0.053	−0.002
	(0.029)	(0.034)	(0.027)
Observations	3929	3190	5158
R-squared	0.053	0.094	0.073
Mean of dep. var. in reference group	0.237	0.221	0.275

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 2
Self-reported precautionary health behaviors of Peer Participants.

	Targeted behaviors		Untargeted behaviors		Index
	(1) Washed hands frequently	(2) Did not gather unmasked	(3) Avoided gatherings	(4) Did not travel	(5) Total precautions
Peer forwards message from MOH, financial incentive	−0.017	−0.001	0.001	0.013	−0.003
	(0.027)	(0.022)	(0.028)	(0.022)	(0.047)
Peer forwards message from MOH, no incentive	0.005	0.013	0.005	−0.002	0.008
	(0.026)	(0.021)	(0.026)	(0.021)	(0.044)
Message sent directly by MOH	0.006	−0.007	0.008	−0.001	0.014
	(0.027)	(0.022)	(0.027)	(0.022)	(0.046)
Peer forwards message from ZNPHI, financial incentive	0.019	−0.026	−0.004	−0.006	0.010
	(0.027)	(0.022)	(0.027)	(0.022)	(0.046)
Peer forwards message from ZNPHI, no incentive	0.014	0.005	0.003	−0.006	0.011
	(0.026)	(0.021)	(0.027)	(0.022)	(0.046)
Message sent directly by ZNPHI	0.068**	−0.018	0.022	−0.016	0.074
	(0.028)	(0.023)	(0.028)	(0.023)	(0.048)
Control condition, message from ZNPHI	0.028	−0.013	0.030	0.022	0.080*
	(0.027)	(0.022)	(0.027)	(0.022)	(0.047)
Observations	5181	3112	5181	5181	5181
R-squared	0.012	0.018	0.010	0.006	0.014
Mean of dep. var. in reference group	0.355	0.084	0.383	0.800	1.538

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).

3.4. 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 village. The first two outcomes were directly targeted by the experimental messages, and the other two were not. We also report the effect on a summary index of these four precautionary health behaviors (i.e., the total number of precautions adopted, ranging from 0 to 4).

We report results for round 3 in Table 2 (and results for rounds 1 and 2 in Online Appendix B). 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% (wearing a mask if gathering), 38% (avoiding gatherings), and 80% (not traveling outside of the 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 2, 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 (“direct messaging”) were most likely to be received but were not differentially effective in changing health

receiving a message. These reports could refer to messages from our study, or to messages from other sources. Peers of RDS participants in T3, in contrast, were sent messages directly by the research team, on behalf of a health authority. In principle, 100 percent of these respondents received messages. In practice, between 47 percent (round 1) and 61–62 percent (rounds 2 and 3) report receiving messages.

Table 3
Self-reported precautionary health behaviors of RDS Participants.

	Targeted behaviors		Untargeted behaviors		Index
	(1) Washed hands frequently	(2) Did not gather unmasked	(3) Avoided gatherings	(4) Did not travel	(5) Total precautions
Peer forwards message from MOH, financial incentive	0.019	0.036	0.008	0.002	0.029
	(0.043)	(0.029)	(0.044)	(0.037)	(0.074)
Peer forwards message from MOH, no incentive	0.036	0.037	0.051	−0.002	0.085
	(0.043)	(0.029)	(0.043)	(0.036)	(0.073)
Message sent directly by MOH	−0.004	0.025	0.016	0.017	0.029
	(0.043)	(0.029)	(0.044)	(0.037)	(0.075)
Peer forwards message from ZNPHI, financial incentive	0.010	0.026	−0.020	0.001	−0.009
	(0.044)	(0.029)	(0.044)	(0.038)	(0.076)
Peer forwards message from ZNPHI, no incentive	0.025	0.014	−0.010	0.010	0.026
	(0.043)	(0.029)	(0.044)	(0.037)	(0.074)
Message sent directly by ZNPHI	0.048	0.012	0.077*	0.025	0.151**
	(0.043)	(0.030)	(0.044)	(0.037)	(0.074)
Control condition, message from ZNPHI	0.036	0.068**	0.032	−0.029	0.039
	(0.043)	(0.029)	(0.044)	(0.037)	(0.074)
Observations	1986	1236	1986	1986	1986
R-squared	0.033	0.038	0.031	0.018	0.038
Mean of dep. var. in reference group	0.355	0.084	0.383	0.800	1.538

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).

behaviors. For reference, the next-largest magnitudes are in the effect of the control condition in which RDS Participants received SMSs from ZNPHI (instead of MoH) but were not asked to share them.[15]

There are also no consistent patterns or meaningful effects in rounds 1 and 2, reported in Appendix Table B7. For example, the 5.7 percentage point increase in frequent hand-washing in the non-incentivized peer message (ZNPHI) condition in round 1 RDS Participants fades to 2.9 percentage points in round 2 and 1.4 in round 3. The incentivized 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.

It is also helpful to express which potential impacts are ruled out by our results, by identifying the uppermost values of the 95% confidence intervals (Appendix Table B8). In all but one case we can rule out effect sizes in excess of 10 percentage points, which corresponds to the impact of peer incentives in the TB study (Goldberg et al., 2023). In seven of the 35 estimates, on the other hand, we are able to rule out even modest estimates of five percentage points or higher. Comparing specific behavioral outcomes with those in other COVID information campaign studies, we thus reject the treatment effects on handwashing from Siddique et al. (2020) et al. (whose campaign improved handwashing by 35 percentage points). In contrast, the statistically significant estimates on handwashing and masking in Banerjee et al. (2020) (respectively, 4.7 percentage points and 1.9 percentage point improvements) fall within the confidence intervals of our own estimates (columns 1 and 2). In that study, the largest effect of the information campaign was on reducing traveling outside of the village (by 7.4 percentage points). Since we did not target this type of behavior in our messaging, it is perhaps unsurprising that their estimate falls outside of our confidence intervals (column 4).

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. By design, 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 the 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 incentivized 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 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 3. Adoption of precautionary health behaviors in round 3 is the same for RDS Participants and Peer Participants in the control condition. 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 explicit 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% 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 percentage point increase in the probability of avoiding gatherings when RDS Participants received SMSs from ZNPHI and the research team sent 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.

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

4. 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. (2023), confirming that peers can be a vehicle to spread health-relevant information in communities. Text (and social media) messages are inexpensive enough that universal dissemination by health authorities is feasible and, indeed, was adopted by some countries during the pandemic. However, peer endorsement could still improve health outcomes if it increased the probability of behavior change.

In contrast with Goldberg et al. (2023), neither peer nor direct messages changed the health behaviors of message recipients. This could be because text messages are less compelling than personal outreach, which was used in the India TB study.

However, it could also be because network-based information dissemination was not well suited to COVID-19 outreach. Unlike TB, 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 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.

Moreover, and again differently from Goldberg et al. (2023), incentives did not affect the likelihood of forwarding messages. A possible explanation is that 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. Also, there could have been so much information shared about COVID that contacts were unable to identify marginal messages generated by this project. Alternatively, although our experiment attempted to distinguish between the "no incentive" and "incentive" conditions by providing an extra payment in the "incentives" treatment arm (in addition to reimbursement of network charges for sending a message), participants may have perceived both conditions as financial incentives to forward messages. In this interpretation, the amount of the extra payment in the incentives treatment arm was insufficient to generate additional sharing of information. Consequently, the lack of a differential impact observed in our study could reflect that incentives of different sizes do not necessarily lead to varying behavioral outcomes.

Additionally, the behaviors promoted in Zambia were purely precautionary. Dupas et al. (2011) document 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.

The null effects in our study are consistent with other attempts to influence COVID-19 precautions through text messages or social media campaigns. These studies typically measure the direct effects of messaging, comparable to effects on the behavior of RDS 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 the 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 recipients and their geographic neighbors reduced travel and increased both hand washing and masking relative to those who received control information from government sources. Interestingly, the estimated effects from that study are not ruled out in ours. 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.

Our study reveals two significant insights regarding the dissemination of health information during pandemics. First, direct messaging ensures a greater number of message deliveries, making it a superior distribution strategy for reaching the maximum number of individuals with specific information. Second, it demonstrates the potential for effectively mobilizing the population to convey health messages to their peers, even in the absence of financial incentives. Because providing incentives is complicated, this finding offers a streamlined approach to implementing peer outreach initiatives. Importantly, these lessons remain relevant even in scenarios, such as ours, where messages turn out to be ineffective. During pandemics, determining effective communication strategies can be challenging for health authorities, necessitating action even in the absence of definitive knowledge. For instance, imagine a scenario where the message needs to be tailored to a specific subset of the population characterized by traits easily identifiable within a social network but less discernible outside of it. This could apply, for instance, if a health advisory is meant for specific groups such as livestock holders or certain categories of informal workers. Since our experiment employed untargeted messages, additional research is required to refine our strategy for targeted messaging.

CRediT authorship contribution statement

Alfredo Burlando: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Writing – original draft, Writing – review & editing. **Pradeep Chintagunta:** Conceptualization, Methodology, Project administration, Writing – original draft, Writing – review & editing. **Jessica Goldberg:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Writing – original draft, Writing – review & editing. **Melissa Graboyes:** Conceptualization, Investigation, Methodology, Project administration, Writing – original draft, Writing – review & editing. **Peter Hangoma:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Writing – original draft, Writing – review & editing. **Dean Karlan:** Writing – original draft, Writing – review & editing, Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology. **Mario Macis:** Writing – review & editing, Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Writing – original draft. **Silvia Prina:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Writing – original draft, Writing – review & editing.

Acknowledgments

The authors obtained IRB approval from the University of Zambia (#00001131; No. 1044-2020) and University of Maryland (#1616808). The experiment was registered as AEA RCT Registry #0005940. For funding, we thank the National Science Foundation, United States #2033321, the Kilts Center for Marketing, and the University of Chicago Booth School of Business.

Appendix A. Supplementary data

Supplementary material related to this article can be found online at https://doi.org/10.1016/j.jdeveco.2024.103318.

References

Alatas, V., Chandrasekhar, A.G., Mobius, M., Olken, B.A., Paladines, C., 2022. Designing effective celebrity messaging: Results from a nationwide Twitter experiment promoting vaccination in Indonesia.

Anderson, A.K., Damio, G., Young, S., Chapman, D.J., Pérez-Escamilla, R., 2005. A randomized trial assessing the efficacy of peer counseling on exclusive breastfeeding in a predominantly latina low-income community. Arch. Pediatr. Adolesc. Med. 159 (9), 836–841.

Athey, S., Grabarz, K., Luca, M., Wernerfelt, N., 2023. Digital public health interventions at scale: The impact of social media advertising on beliefs and outcomes related to COVID vaccines. Proc. Natl. Acad. Sci. 120 (5), e2208110120.

Bahety, G., Bauhoff, S., Patel, D., Potter, J., 2021. Texts don't nudge: An adaptive trial to prevent the spread of COVID-19 in India. J. Dev. Econ. 153, 102747.

Balat, J.F., Papageorge, N.W., Qayyum, S., 2018. Positively Aware? Conflicting Expert Reviews and Demand for Medical Treatment. Technical report, National Bureau of Economic Research.

Banerjee, A., Chandrasekhar, A.G., Dalpath, S., Duflo, E., Floretta, J., Jackson, M.O., Kannan, H., Loza, F.N., Sankar, A., Schrimpf, A., et al., 2021. Selecting the Most Effective Nudge: Evidence from a Large-Scale Experiment on Immunization. Technical report, National Bureau of Economic Research.

Banerjee, A., Chandrasekhar, A.G., Duflo, E., Jackson, M.O., 2019. Using gossips to spread information: Theory and evidence from two randomized controlled trials. Rev. Econ. Stud. 86 (6), 2453–2490.

Beaman, L., Magruder, J., 2012. Who gets the job referral? Evidence from a social networks experiment. Amer. Econ. Rev. 102 (7), 3574–3593.

Central Statistical Office, C., 2015. Living conditions monitoring survey 2015.

Christakis, N.A., Fowler, J.H., 2007. The spread of obesity in a large social network over 32 years. New Engl. J. Med. 357 (4), 370–379.

Christakis, N.A., Fowler, J.H., 2008. The collective dynamics of smoking in a large social network. New Engl. J. Med. 358 (21), 2249–2258.

DATAREPORTAL, 2023. DIGITAL 2023: ZAMBIA. Accessed 29 June 2023.

Dupas, P., et al., 2011. Health behavior in developing countries. Annu. Rev. Econ. 3 (1), 425–449.

Giese-Davis, J., Wilhelm, F.H., Conrad, A., Abercrombie, H.C., Sephton, S., Yutsis, M., Neri, E., Taylor, C.B., Kraemer, H.C., Spiegel, D., 2006. Depression and stress reactivity in metastatic breast cancer. Psychosom. Med. 68 (5), 675–683.

Goldberg, J., Macis, M., Chintagunta, P., 2023. Incentivized peer referrals for tuberculosis screening: Evidence from India. Am. Econ. J.: Appl. Econ. 15 (1), 259–291.

Gwadz, M., Cleland, C.M., Perlman, D.C., Hagan, H., Jenness, S.M., Leonard, N.R., Ritchie, A.S., Kutnick, A., 2017. Public health benefit of peer-referral strategies for detecting undiagnosed HIV infection among high-risk heterosexuals in New York City. J. Acquir. Immune Defic. Syndr. (1999) 74 (5), 499.

Harris, G.E., Larsen, D., 2007. HIV peer counseling and the development of hope: perspectives from peer counselors and peer counseling recipients. AIDS Patient Care Stds 21 (11), 843–860.

Jackson, M.O., 2011. An overview of social networks and economic applications. Handb. Soc. Econ. 1, 511–585.

Orr, J.A., King, R.J., 2015. Mobile phone SMS messages can enhance healthy behaviour: A meta-analysis of randomised controlled trials. Health Psychol. Rev. 9 (4), 397–416.

Oster, E., Thornton, R., 2012. Determinants of technology adoption: Peer effects in menstrual cup take-up. J. Eur. Econom. Assoc. 10 (6), 1263–1293.

Pope, D., 2009. Reacting to rankings: Evidence from "America's Best Hospitals". J. Health Econ. 28 (6), 1154–1165.

Rockers, P.C., Zanolini, A., Banda, B., Chipili, M.M., Hughes, R.C., Hamer, D.H., Fink, G., 2018. Two-year impact of community-based health screening and parenting groups on child development in zambia: Follow-up to a cluster-randomized controlled trial. Plos Med. 15 (4), e1002555.

Siddique, A., Rahman, T., Pakrashi, D., Islam, A., Ahmed, F., et al., 2020. Raising COVID-19 awareness in rural communities: A randomized experiment in Bangladesh and India. Munich Pap. Political Econ. 9, 2020.

Sorensen, A.T., 2006. Social learning and health plan choice. Rand J. Econ. 37 (4), 929–945.

ZDHS, 2020. Zambia Demographic and Health Survey 2018. Technical report, ZSA, Zambia Statistics Agency - and MOH, Ministry of Health - and University Teaching Hospital Virology Laboratory - UTH-VL and ICF, Lusaka, Zambia.